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SHARED HARVESTS: Agriculture, Trade, and Employment

Editors: David Cheong, Marion Jansen, and Ralf Peters

Shared Harvests: Agriculture, Trade and Employment

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FOREWORD

The world is still reeling from the effects of the global food, fuel price, and financial crises in the second decade of the 21st. century. Almost a billion people are suffering from chronic hunger, 200 million people are out of jobs, and markets are in disarray. Agriculture has both played a role in and been affected by these global crises. As a consequence, many countries have refocused attention onto the agricultural sector and seek new policy responses to enhance food security, employment creation and structural transformation.

Almost half of the developing-country workforce is employed in agriculture - often in informal, low-paid or unremunerated jobs and under poor working conditions - because few alternative employment opportunities exist. Agriculture provides a livelihood directly to these workers and their families and indirectly to other members of their rural communities as well as those in related sectors such as fertilizer production and retailing. Most developing-country farmers have low yields from their crops and limited access to markets from which they can source agricultural inputs and to which they can supply their harvests.

Agricultural trade, as a share of domestic agricultural production and consumption, has been increasing despite relatively high trade distortions. Agricultural trade is an opportunity for many developing countries and at the same time a sensitive area. It appears that trade policy has not always been very development friendly. In some cases, rapid liberalization with a parallel dismantling of extension services for farmers has led to a drying up of investment in the agricultural sector. In many countries, particularly in sub-Saharan Africa, agricultural production has been almost stagnant. Coupled with expanding rural populations, this has resulted in falling farm incomes and increased poverty. Some countries subsidize and protect their farmers, preventing other more competitive producers from selling their agricultural products.

Agriculture is key to the structural transformation agenda. Without productivity improvements in agriculture, resources will mostly be used to meet basic food demands instead of being allocated towards “modern” agricultural products, manufacturing and services. Vulnerable employment, concentration in a narrow range of products, food insecurity, and high poverty rates can be linked to low agricultural productivity. Therefore, development is likely to be catalyzed and sustained with increases in agricultural productivity, which may come through national or international channels. However, the short- and medium-term adjustments, particularly in labour markets, will have to be managed.

The work on this edited volume grew out of a technical cooperation project entitled "Assessing and Addressing the Effects of Trade and Employment" managed jointly by the European Commission and the International Labour Office (ILO) with funding from the European Union, and collaborative work between the ILO and the United Nations Conference on Trade and Development (UNCTAD). The research findings in this volume emphasize the need to make agriculture (or re-establish it as) a high policy priority, particularly in the domains of trade and employment. This volume suggests that policymakers can maximize the development benefits from agriculture by carefully considering agricultural trade policy and its effects on employment within the context of national development strategies that aim at economic diversification, sustainable growth, and social inclusion.

The ILO and UNCTAD have collaborated on this edited volume given their shared interests in how the agricultural sector affects the world of work and broad development processes. It is hoped that, even though we are quickly approaching 2015, this volume can still contribute in part to work in line with the targets set under the first Millennium Development Goal of eradicating poverty and hunger through poverty relief, productive employment, and food security.

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All views expressed in the book are the views of the authors alone and should not be attributed to the EU, ILO or UNCTAD or to any other organization with which the authors are affiliated.

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SHARED HARVESTS: AGRICULTURE, TRADE AND EMPLOYMENT

An Overview

David Cheong, Marion Jansen[1], and Ralf Peters

Agriculture provides a livelihood for more people worldwide than any other sector. In developing countries the sector employs 1.3 billion workers, representing around 50 per cent of total employment (FAO, 2011a). In the Least Developed Countries (LDCs), agricultural employment represents as much as 72 per cent of total employment (table 1). In many countries, policy changes affecting agriculture are therefore likely to affect the incomes of a large share of the population.

Those affected by policy changes targeting agriculture are also often particularly vulnerable. Over 60 per cent of the global agricultural work force is estimated to be informally employed (Bacchetta et al., 2009). The World Bank estimates that three out of every four poor people live in rural areas in developing countries, and most of them depend on agriculture for their livelihoods (World Bank, 2008). Policy changes affecting agriculture are therefore likely to have a significant impact on poverty.

New factors are contributing to a rapidly changing and globalizing political economy of agriculture. These include an increasing role of trade in agriculture, population growth, high unemployment rates, expansion of biofuel production, market speculation, changing nutrition in emerging markets, food insecurity, land-grabbing, and climate change (Karapinar, 2010). These factors as well as the food price crisis in 2007 have revitalized an interest in agriculture as an important sector of activity in the world economy.

This book focuses on one of these drivers of change - agricultural trade – and it looks at how this driver affects agricultural employment, mainly in developing countries. The contributions to this book analyse to what extent trade and trade liberalization in agriculture creates or destroys jobs in developing countries and what kind of jobs would be affected. It discusses how concerns about agricultural employment are reflected in national trade policies and regional and multilateral trade agreements. Furthermore, the book attempts to shed light on how such factors as food and job security, rural–urban migration, skill mismatch, and domestic regulation affect the relationship between trade and employment in this important sector.

[1] Marion Jansen contributed to this Overview during her stay at the International Labour Office (ILO) as the Head of the Trade and Employment Programme of the ILO's Employment Sector. The opinions expressed in this chapter can in no way be taken to reflect the views of the ILO or the World Trade Organization (WTO).

This volume contains 10 chapters in addition to this introductory chapter. The first three chapters are survey chapters that set the stage for the country- and region-specific studies that follow. Chapter 1 provides a synthesis of the economic literature that analyses the relationship between employment, productivity, and international trade in the agricultural sector. Chapter 2 focuses on legal aspects as it examines the role of agriculture in trade agreements, both multilateral and regional. Chapter 3 then provides a framework for the quantitative analysis in this volume by reviewing the different methods used to estimate the effects of agricultural trade on employment. Chapters 4 to 10 provide a rich body of country- and region-specific evidence with individual chapters dedicated to each of the following countries: Bangladesh, Benin, Bosnia and Herzegovina, Guatemala, Indonesia and Mexico. Chapter 8 is dedicated to agricultural trade in Africa.

Through its focus on employment, this volume adds to a relatively extensive literature that examines the role of agriculture in the development process and to the quantitative literature assessing the welfare effects of agricultural trade. The contributions to this volume provide insights into the mechanisms through which agricultural trade affects the distribution of income (for instance across types of workers) and into the labour market adjustments that relevant changes in trade policy may trigger. Given the importance of employment as a source of income for the poor, the volume also provides useful insights into the possible effects of agricultural trade on poverty through its effect on employment.

AGRICULTURE: IMPORTANT AND SENSITIVE

Agriculture is a sector of utmost importance and sensitivity. This is natural, given its primary purpose of producing food, which is essential to human life. In addition, agriculture has economic functions such as providing employment and supporting livelihoods in rural areas; social functions such as conserving tradition and community engagement; and ecological functions such as environmental protection and preserving biodiversity and watershed areas. Agriculture is also linked to the concept of self-sufficiency, as food production provides producers with control over access to a requisite for survival. In the history of many societies, the distribution of land for agriculture has both reflected and determined the distribution of wealth and the nature of economic growth.

These reasons help to explain why agricultural production has played and continues to play a special role in the economic policy of many countries. It also explains why agricultural trade has tended to be dealt with as "an issue apart" in trade negotiations.[2]

[2] An example of a controversial question discussed in the WTO negotiations and regional trade agreements is whether agriculture's multifunctionality, i.e. the numerous functions of agriculture besides producing food, justifies trade interventions.

Importance of agriculture in terms of employment, gross domestic product, and trade

Agriculture is an important sector in developing countries and the sector's evolution will figure among the major challenges for developing countries in the coming decades. As mentioned before, in developing countries an average of about 50 per cent of the work force is employed in the agricultural sector (see chapter 1). Regional differences are substantial. In 2010, employment in agriculture reached 75 per cent of all jobs in East Africa, for example, whereas, the sector accounted for only 13 per cent of employment in South America. In terms of contribution to gross domestic product (GDP), the sector is generally less important. As shown in table 1, agriculture accounts for only 2 per cent of GDP in high-income countries and 9 per cent in middle-income countries. Agriculture's smaller share in GDP, compared to the shares of industry and services, mainly reflects the relatively lower level of labour productivity in the sector. In least developed countries the sector nevertheless accounts for 32 per cent of GDP on average.

As countries grow richer, both the share of agriculture in GDP and the share of agricultural employment in total employment decrease (table 1). Variations among the six countries specifically discussed in this volume reflect this general pattern. The shares of agriculture in GDP and in total employment are the highest in the two least developed countries, Bangladesh and Benin, while in Bosnia and Herzegovina, Guatemala and Indonesia these shares are lower. In Mexico, which has the highest GDP per capita among these six countries, the share of agricultural value added approximates the sector's significance in high-income countries, even though Mexico still has a large rural territory and population.[3]

Table 1: The share of agriculture in gross domestic product (GDP) and employment

Countries	**Value added in agriculture (per cent of GDP)**	**Employment in agriculture (per cent of total)**
High income	2	4
Middle income	9	40
Least developed	32	72
World	4	37
Bangladesh	18	48
Benin	32	43
Bosnia and Herzegovina*	9	18
Guatemala	11	33
Indonesia	17	38
Mexico	4	14

Source: World Development Indicators, World Bank, latest available year. * Employment share data from chapter 9.

[3] Among OECD countries, Mexico has the largest population living in predominantly rural areas. Rural poverty is high; 56 per cent of the people in rural areas live in poverty (OECD, 2007).

Chapter 1 of this volume reports that between 1980 and 2010 the shares of agriculture in GDP and in total employment shrunk in most developing countries. These trends reflect an economic transition from being agrarian to becoming more manufacturing- and services-driven. This structural transformation away from agriculture is often challenging because a large share of agricultural workers are particularly vulnerable. Evidence reported in Bacchetta et al. (2009) suggests that informal employment is widespread in developing-country agriculture, as own-account workers and contributing family members - who together account for 62 per cent of the agricultural workforce - are often informally employed. Informality is one of the main sources of vulnerability of significant parts of the population living in rural areas. Many agricultural workers are employed on a seasonal basis. Undernourishment is another source of vulnerability, and, of the world's one billion undernourished people, 70 per cent are estimated to live in rural areas (World Bank, 2007).

Developing countries that undertake the transition away from being agrarian economies often do so in the context of markets that are affected by international trade, which could make the task even more complex but which could also provide opportunities. Agricultural trade, as a share of domestic agricultural production and consumption has been increasing despite relatively high trade distortions in agriculture. The average annual volume growth in agricultural trade between 1950 and 2010 was about 4 per cent, higher than the annual growth in global agricultural production which was about 2 per cent.[4]

FAO projections suggest that trade in agricultural commodities will expand considerably until 2050 (FAO, 2009) and that the structure of trade will continue to change. Developed countries are likely to continue to provide a growing share of developing countries' food needs and will in return import other agricultural products such as tropical beverages. Developing countries' imports of cereals, for example, are expected to increase threefold to account for 14 per cent of their consumption, up from 9 per cent in 2006/08 (FAO, 2009). This pattern can also be seen in countries analysed in this volume. Mexico, for instance, is importing more staple crops and meats from the US while exporting more beverages, seasonal fruits, and vegetables to the US (chapter 10).

Recent growth in agricultural trade is to a large extent driven by increasing trade in processed agricultural products. This change often goes hand in hand with an increased role of transnational firms with global production and distribution systems (FAO, 2003). The shift towards increased trade in processed agricultural products can be observed in both developed and developing countries and it implies that there has been greater specialization in the value-added process. Most low-income countries, however, continue to have a very low share of processed products in their agricultural exports.

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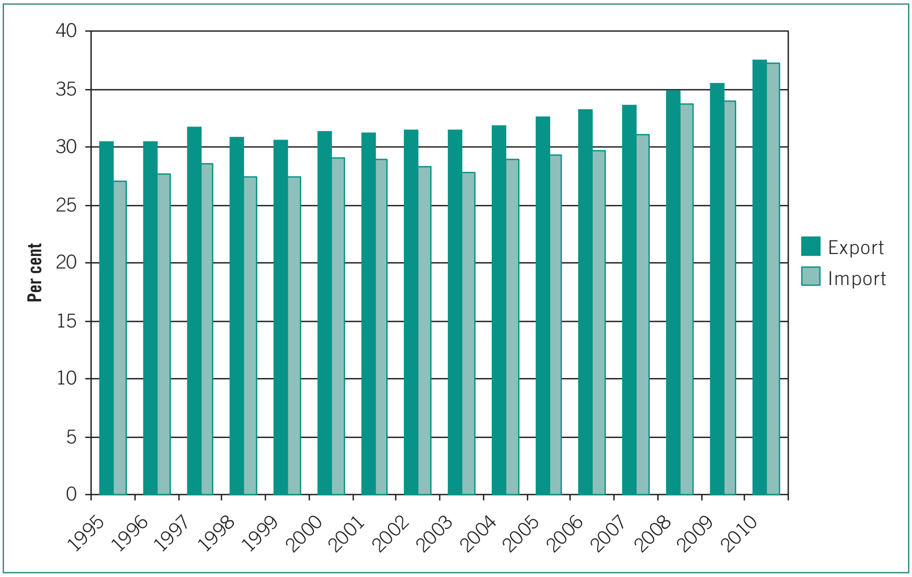
[4] Volume growth calculated by authors based on WTO (2011), Table A1. Growth in production calculated by authors refers to 1961 to 2010 and is based on FAOstat gross production index and gross production value at constant prices.

Figure 1: Share of developing-country agricultural exports and imports in world exports and imports



Source: UNCTADstat.

For many developing countries, revenue from agricultural exports is a major source of income. In Latin America, excluding Mexico, the share of agricultural export revenue in total merchandise export revenue is as high as 30 per cent. In LDCs, exports of agricultural products account for about 21 per cent of total merchandise exports. In some sub-Saharan African countries and several other low-income countries, agricultural products account for almost half of merchandise export revenue.

As a group, developing countries are net-agricultural exporters although the surplus is considerably lower than it was before the 1980s. They account for 37 per cent of global agricultural trade, a share that has increased from about 30 per cent in 2000 (figure 1). Trade among developing countries (or South–South trade) is increasing and, thus, developing countries are becoming important and dynamic markets for other developing countries. About 43 per cent of developing country agricultural exports go to other developing countries, and 48 per cent of their agricultural imports originate from other developing countries.[5]

LDCs as a group import more agricultural goods in absolute value than they export and most LDCs are in fact net food-importing countries, which is an important consideration when the economic effects of trade liberalization are analysed. Another

[5] Paragraph based on UN Comtrade data and World Development Indicators, World Bank.

important aspect is the concentration of their exports in a narrow range of products, mostly primary commodities. This concentration is very high for LDCs, where the weighted average of the top three export products accounts for 76 per cent of the share of total merchandise exports (UNCTAD, 2002, p. 108). The lack of diversification is a concern because it leaves countries exposed to the risk of commodity price fluctuations.

Food security: a concern when markets are open?

High levels of price volatility in recent years, accompanied by extreme forms of price hikes in agricultural commodities, have put the issue of food security very high on the policy agenda.[6] However, concerns over the link between food security and trade were already raised during the Uruguay Round and before. Contributing to these concerns were the globalization of agricultural markets, with increasing specialization of the South in export crops such as sugar, coffee, and palm oil, coupled with, often subsidised, surpluses from some Northern countries.

"Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2002).

This definition implies that attention should go to both the demand and supply sides of the food security equation.[7] Given that employment is an important means of reducing poverty, which is particularly widespread in rural areas, it makes sense for job-creation to occupy a central place in national food security strategies to address the demand side.

In closed economies, the supply side of the food security equation depends above all on local productivity levels and climatic conditions. History offers many examples of populations suffering from the consequences of bad harvests. The main challenge that policy-makers face in closed economies is to bring productive capacity up to levels that can sustain food security and to build buffer systems that would prevent food scarcity in times of bad harvest.

Trade in agricultural commodities makes it easier to deal with bad harvests, as food can be imported when enough cannot be produced at home. At the same time, however, fears have often been expressed about an increased dependency on food imports that may lead to loss of technical knowledge (WTO, 2006) or the capacity to produce food at home in case a country is cut off from world markets (e.g. in a situation of war).

Openness to agricultural trade also exposes countries to the price fluctuations of global markets. Some have argued that such fluctuations have increased in recent years, and recurring price hikes have been an important concern to policy-makers.

[6] The FAO food price index, which is a monthly measure of international prices of a basket of food commodities, registered record levels in June 2008 and October 2010. See also FAO (2011b).

[7] According to FAO, food security has four pillars: availability, access, utilization and stability.

Poor households tend to spend a large share of their income on food which makes them particularly vulnerable to price fluctuations. ILO (2011a) reports that in the majority of a sample of 72 developing countries the share of food expenditure in total income among households in the lowest quintile is more than 60 per cent. In periods of high prices local populations may not be able to afford enough food, even if it is in principle available. This leads to increases in poverty and also to social unrest, as occurred during the Great Recession. The World Bank (2011) has, for instance, estimated that rises in food prices between June and December 2010 pushed an additional 44 million people below the US$1.25 poverty line.

Some argue that greater self-sufficiency is advantageous in achieving food security. This view appears to have become more popular after the recent food-price crisis. Others argue that the dependence on food imports does not necessarily imply a higher risk of food insecurity, and inversely that a higher rate of food self-sufficiency is not always a viable solution to food insecurity. Although a higher rate of food self-sufficiency can help to increase a country's food security, efforts to promote food self-sufficiency can have high opportunity costs in countries that have neither a current nor a potential comparative advantage in food production. Evidence shows that the majority of countries that depend on food imports are not affected by food insecurity, whereas a large number of countries that have a relatively large agricultural sector tend to be affected by food crises (Herrmann, 2007).

Guaranteeing food safety when markets are open

Although recent hikes in food prices have also affected consumers in high-income countries, concerns about food safety rather than food security have been high on the policy agenda in those countries. Indeed, as consumers become rich enough not to worry about access to food, the quality of food becomes an issue of concern. The bovine spongiform encephalopathy (BSE, or "mad cow disease") crisis in the late 1990s, the 2011 E. coli outbreak, and bird flu transmission through poultry trade in the past decade are only a few examples of how health risks could be transmitted from country to country through trade in foodstuffs. Concern about health risks explains why the conclusion of the WTO Agreement on Agriculture during the Uruguay Round was accompanied by the conclusion of the Agreement for Sanitary and Phytosanitary Measures (SPS Agreement). The SPS Agreement allows countries to use food safety (and other) measures in order to protect consumers, while at the same time it disciplines the use of food safety measures that distort trade (see chapter 2).

Food safety measures represent a major challenge for developing countries, as it is often costly for them to adhere to standards in potential export markets. In recent years, therefore, substantial amounts of trade-related technical assistance, notably under the umbrella of the Standards and Trade Development Facility, have been directed towards helping developing-country exporters to become familiar with foreign food safety measures and to be able to meet foreign standards.

The existence of different food safety standards at the global level creates an additional layer of complexity. Therefore, the SPS Agreement encourages countries to adhere to international food safety standards, notably those set by the Codex Alimentarius, and to support the work of relevant standard setting bodies. Participation in such bodies can help developing countries to contribute to the design of international standards and to obtain up-to-date information on food safety matters. Unfortunately, developing countries continue to be under-represented in relevant expert bodies (Jansen, 2010).

Agriculture and the environment: a problem or an opportunity?

Agriculture and agricultural trade are also strongly linked to environmental challenges. In many countries – particularly developing countries – climate change threatens to damage the natural resource base upon which agriculture depends. At the same time, agriculture accounts for about 13 to 15 per cent of greenhouse gas (GHG) emissions (Hoffmann, 2011). Sustainable agriculture has the potential to lower GHG emissions while also having a positive employment effect. Hoffmann (2011) argues for a large-scale shift away from conventional, industrial, monoculture-based production highly dependent on external inputs and towards mosaics of sustainable production systems. This would transform agriculture from being part of the climate change problem to becoming an essential part of the solution. However, the choice of adaptation and mitigation actions in agriculture to tackle climate change would not only depend on a country's resources and its prioritization of environmental amenities but, due to the global nature of climate change, also on international cooperation. It has been argued that rising competition resulting from trade liberalization could increase incentives towards the industrialization of agricultural production and the exploitation of scale economies, which would run counter to sustainable production.

Sustainable agriculture has been shown to be a way for small-scale farmers to increase their productivity and profitability. Organic production is typically dominated by small-scale farmers, for example, in Mexico. Sustainable agriculture relies on such techniques as crop rotation, composting, and biological pest control to increase soil productivity. Yields increase without the need for expensive inputs such as agro-chemicals but using locally available inputs and technologies instead. Also, organic products receive a price premium in important markets. To benefit from this, it is important that these farmers are connected to regional and global markets. Sustainable production is more labour-intensive than conventional agriculture, thus creating more jobs and reducing poverty (UNCTAD/UNEP, 2008).

Few studies attempt to determine the potential environmental impact of agricultural trade liberalization, but the net environmental effect is likely to vary by agricultural activity and country (Cooper, 2005). Some argue that increased trade and economic growth will contribute to the exhaustion of natural resources. Yet if agricultural trade liberalization raises a country's income, then there may be higher demand for environmental amenities such as cleaner air and water and a push for regulations on production processes that cause environmental damage. Liberalizing international agricultural trade may actually facilitate the diffusion of cleaner production technologies and be a means for developing-country farmers to learn about consumer tastes in international markets for "green" agricultural products. However, agricultural trade liberalization may lead countries with lax environmental standards to specialize in highly polluting agricultural activities or to lower their environmental standards in order to attract international capital investment, which in turn may lead to a "race to the bottom" in environmental protection.

AGRICULTURE: UNEQUAL AND DISTORTED

Agriculture is an unequal sector …

The agricultural sector is in many respects a highly diverse sector that is often characterized by situations of polarization. In many developing countries large and highly productive plantations or farms coexist with smallholders and landless farm workers who barely manage to make a living. An increase in landlessness over the past 50 years (IFAD, 2010) has contributed to this phenomenon. The polarization of land ownership has also been aggravated by rapid population growth, which has reduced average farm sizes among smallholders. Land ownership among indigenous populations, ethnic minorities, and women is limited and shrinking, as laws and social norms tend to be unfavourable towards these groups (FAO, IFAD, and ILC, 2004; UN, 2009). The inequality in land ownership is mirrored in holdings of livestock and farm equipment.

Employment in agriculture is characterized largely by self-employment (which is often in informal, smallholder farming) and wage labour (frequently on temporary contracts). Among developing-country agricultural workers, own-account workers constitute the largest group, at an average share of 38 per cent of all agricultural workers; wage workers are the second largest group (30 per cent); and about one-quarter are contributing family workers (see chapter 1). Unpaid family work is a phenomenon that affects above all women. It accounts, for instance, for 34 per cent of women's informal employment in India and for 85 per cent of women's informal work in Egypt (FAO, IFAD and ILO, 2010). Agricultural employment is physically demanding but often poorly compensated. Many developing-country workers engage in it by default, as employment opportunities in other sectors of the economy are either unavailable or inaccessible.

In most developing countries income inequality remains high, and agricultural wage workers tend to be at the extreme lower end of the income distribution. To take the case of Guatemala, 96 per cent of agricultural wage workers in 2010 had a monthly income less than the minimum wage, set at Quetzales 1930 (US$240) for that year (Linares, 2012). In Mexico, wages in the primary sector are about one fifth to one quarter of wages in other sectors (see chapter 10). Very few agricultural workers are covered by public social insurance schemes. In a study on African agriculture, Mwamadzingo (2003) found that workers in the agricultural sector formed the majority of the working population in Africa but were excluded from social security schemes because of informal and self employment. In Guatemala, according to the country's 2006 Labour Force Survey, only 5.2 per cent of agricultural workers are members of the country's national social security scheme (see chapter 6).

Working conditions differ across agricultural workers and for wage workers often depend on the type of employer. In a study of African rural labour markets, Oya (2010) found that "smaller, resource-poorer employers (e.g. small-scale farmers and small traders) would offer worse working conditions in comparison with larger-scale, more technologically dynamic and productive employers (usually large plantations, sometimes foreign-owned, featuring greater crop specialization and strong links with global markets)." Agricultural wages and working conditions are also related to the types of crops grown and tasks performed, a segmentation that has often emerged because of skill and socio-cultural barriers. For example, in the Riau region of Indonesia small tractor operation is limited to workers who have been taught by family members or other operators (Paman et al., 2012) and in Sri Lanka tea plucking is considered a female activity because of the "aptitude" of women for doing careful work (Samarasinghe, 1993).

As rural residents, smallholders and agricultural workers are often the victims of geographic isolation and the economic and political power held by "rural elites" (Bardhan, 2002). Through privileged relations with their urban counterparts, rural elites control access to public services as well as to input and output markets for rural residents which provides them with opportunities to extract significant rents. The lack of proper housing, medical services, and schooling in rural areas affects smallholders and agricultural workers, who, along with most of their neighbours in these rural communities, are susceptible to disease and have little education. Bad roads and poor communications infrastructure in rural areas worsen the detachment of smallholders and agricultural workers from sources of financial capital, agricultural inputs, technology, know-how, and markets for their agricultural output.

Last but not least, actors in the agricultural sector also differ greatly in their ability to influence policy-making, for instance, in the context of trade negotiations. For this purpose four interest groups can be distinguished: large land owners, smallholders, landless workers employed on large farms or plantations, and landless workers active elsewhere. Anecdotal evidence shows that it is mainly the first group that exerts direct influence on the positions of trade negotiators. Smallholder interests tend to be indirectly represented in trade negotiations through the agriculture ministries. Landless workers instead find it hard to organize unless they work on large farms or plantations where it is – at least logistically – easier to form unions and organize their activities. However, even if they can form unions, organized labour in the agricultural sector of developing countries does not necessarily find it easy to influence trade negotiations. Indeed, the working and living conditions of plantation workers have been a continued source of concern according to ILO (2011b).[8] In order to strengthen the bargaining position of the vulnerable population in rural areas, efforts have been made in recent years to create alliances between trade unions and small

[8] See also ILO (2008) for a detailed discussion on labour standards applied on plantations.

farmers' organizations. The Confederação Nacional dos Trabalhadores na Agricultura (CONTAG) in Brazil, for instance, represents both agricultural wage earners and self-employed farmers and is the largest national organization of this nature.[9]

… and distorted

Agriculture is among the most distorted sectors in international trade with relatively high tariffs and subsidies that are not allowed in other sectors. Despite the tariff reductions agreed at the Uruguay Round, there remains a considerable degree of tariff protection for agricultural products, especially compared to tariffs on non-agricultural products (see chapter 2).

In addition to relatively high average tariffs, tariff peaks and tariff escalation distort agricultural trade. Tariffs are very high for some sensitive products, e.g. above 500 per cent. They tend to be higher for processed products than for unprocessed products. This phenomenon of tariff escalation is one of the obstacles that keep developing countries from adding more value to their exports and establishing processing industries for exports. Tariff peaks occur mainly in major agricultural staple foods such as meat, sugar, milk, butter and cheese, cereal, and tobacco products. Also, tariff escalation persists in a number of product chains, often those of importance to developing countries such as coffee, cocoa, oilseeds, vegetables, and fruits.

The Uruguay Round (UR) did not succeed in changing the tariff structure described above. Although the UR was successful in binding all agricultural tariffs (i.e. agricultural products have a ceiling above which tariffs cannot be applied), the formula chosen to reduce tariffs still allowed countries to maintain very high tariffs on sensitive products to protect their farmers and food processing industries.

Tariffs, however, are not the only and often not even the most important trade barrier. Market entry conditions are determined by the legal and administrative conditions imposed by the importing countries under internationally agreed trade rules as well as private standards and market structures, including the characteristics of the supply chains. Thus, market access, i.e., the absence of (quantitative) import restrictions and sufficiently low tariffs, is generally a prerequisite for market entry but is not sufficient. Evidence shows that, especially for smaller countries and smaller producers, non-tariff measures (NTMs) highly restrict market entry opportunities. Safety standards such as hygiene requirements that protect consumers' health are legitimate rights of countries but, nevertheless, can constitute an obstacle to trade. Furthermore, for agricultural products private standards imposed by supermarkets, for example, often go beyond nationally applied standards. In high-income countries NTMs are on average three times more restrictive than tariffs.[10] Furthermore, for agricultural products NTMs

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[9] See ILO (2008). This publication also contains a reference to the International Union of Foodworkers' "Land and Freedom Project" that helps trade unions and small farmers to work more closely together.

[10] See UNCTAD (2012a) and references given therein for more information on definitions and measurement of the trade restrictiveness of NTMs.

are almost three times more restrictive than those for industrial goods. Thus, costs to comply with NTMs are higher in agriculture than in other sectors.

Distortions also arise from the structure of agricultural input and retailing markets. The production of agricultural inputs often involves high research and development costs. This tends to result in higher market concentration among sellers of agricultural inputs. Fuglie et al. (2011) report that by 2009 the largest four firms in the crop seed, agricultural chemical, animal health, animal genetics/breeding, and farm machinery sectors accounted for more than 50 per cent of global market sales in each sector. For certain agricultural products, farmers tend to have less market power than intermediaries and final retailers due to the large number of farmers, the seasonality of agricultural production, and the perishability of agricultural output. For example, Hossain et al. (2004) in an analysis of several supply chains in Bangladesh found that jute producers received around 54 per cent of the consumer price of jute while rice and wheat farmers received 71 and 66 per cent of the consumer prices of rice and wheat respectively. In food markets, the increasing appearance of supermarkets has led to increasing downstream concentration along food supply chains. Private cooperatives and government institutions such as marketing boards have emerged as a response to these distortions in agricultural output markets. Appropriate competition policies are important to ensure competition and a balance in market power.

Domestic support and export subsidies further distort agricultural trade. The UR was the first round to discipline agricultural subsidies. As a result of the UR, certain types of support are subject to reduction commitments and are capped at ceiling levels. Other types of support have to fulfil certain criteria, with the objective that they are not or only minimally trade-distorting. However, allowed subsidies are still very high, especially in a couple of developed countries (see chapter 2). One deficiency arising from the UR is that allowed support can be shifted between products and so can become concentrated on a few products. Some countries have also changed support measures, mainly by "decoupling" the support from current production, so that they fall into the allowed non-capped category. Whether such support does not distort trade or is only minimally trade distorting is controversial and debated. Furthermore, reduction commitments were made on the basis of spending during the base period of the UR. Thus, developed countries that had high subsidies during that period have higher allowances for certain types of support than most developing countries. This creates an imbalance in the international trading system, weighted against developing countries.

The OECD (2012) estimates that the "total support to agriculture" in OECD countries amounts to US$366 billion in 2010. Although the OECD measure is different from domestic support as defined by WTO terminology, it shows that, despite the reduction commitments, the level of support remains high in OECD countries. Chapter 2 in this volume reports that in some OECD countries support to producers is as high as 50 to 60 per cent of the value of their agricultural production.

Anderson (2009) finds that assistance to agriculture – as indicated by domestic-to-border price comparisons adjusted for transport costs and quality differences, among others – is slowly decreasing in high-income countries but increasing in developing countries. In the period 1985–89 developing countries had a negative nominal rate of assistance to agriculture, indicating in effect a tax on agriculture rather than subsidization. However, in 2000–04 developing countries had a positive nominal rate of assistance to agriculture. There are differences between developing countries in this regard. African countries still have policies in place that tend to discourage rather than encourage agricultural production, while increasingly Asia is supporting agriculture, although still considerably less than many developed countries (Herrmann and Peters, 2010).

The distortions remaining show that, despite the achievement of the UR of incorporating agriculture into the international trading system, it did little to meaningfully improve market access for developing countries or to remove distorting subsidies. Given the lack of progress in multilateral trade negotiations, most trade liberalization has taken place in the context of Regional Trade Agreements (RTAs) in recent years. But RTAs appear to contribute little to reducing distortions in agricultural trade. First, agricultural tariffs are more often excluded from RTAs or governed by different rules than are industrial tariffs. Second, domestic support cannot be, or is not, addressed in RTAs (see chapter 2). Third, from the perspective of developing countries, particularly the least-developed ones, RTAs with developed countries are redundant as many developing countries already have preferential access to developed-country markets for their agricultural exports through existing agreements such as the Generalized System of Preferences (GSP) and duty and quota free market access schemes for LDCs such as the EU's "Everything But Arms" initiative. Lastly, South-South RTAs do not appear to significantly increase agricultural trade (Grant and Lambert, 2008).

AGRICULTURAL TRADE AND EMPLOYMENT: CHALLENGES AND OPPORTUNITIES

The role of agriculture in development and growth has been debated over decades – and with this also employment and trade in the sector. Agriculture is often considered to be a sector of low productivity that can only provide limited contributions to overall economic growth. Indeed, despite the significant share of agriculture workers in the world's total labour force (around 40 per cent), agricultural labour productivity (i.e. agricultural value added per worker) is very small so that agriculture's share in global gross domestic product is only 4 per cent. The world's labour productivity in services and industry are both more than 10 times higher than the one in agriculture.[11]

Low productivity levels in agriculture are particularly prevalent in LDCs where growth in agricultural productivity has lagged behind that in other economies.

[11] Calculation based on world employment figures by sector (ILO, Global Employment Trends, 2011) and current world value added by sector (UNCTADstat).

Agricultural labour productivity in LDCs is just 46 per cent of the level in other developing countries and below one per cent of the level in developed countries. Labour productivity grew by only 18 per cent in LDCs between 1983 and 2003, by 41 per cent in other developing countries and 62 per cent in developed countries (Herrmann and Peters, 2010). In addition, the contribution of agriculture to real GDP growth is relatively low. For the world as a whole, it varied between 2.3 per cent and 4 per cent between 1971 and 2009 (UNCTAD, 2011, table 2). As a consequence, agriculture has often been considered a sector that countries should try to diversify away from in order to speed up growth.

Another reason to diversify away from agriculture is linked to the observed long-term decline of the terms of trade for agricultural products. Until 2002 there was a secular falling trend in the relative price of commodities to those of manufactured goods. These declining barter terms of trade for commodity exporters, which were historically developing countries, implied that on world markets primary commodities were effectively being exchanged for ever smaller quantities of manufactured goods. This may explain why authors like Stiglitz (2006) warned that countries whose static comparative advantage lay in agriculture risked stagnation.

Both of the arguments presented above would lead to the conclusion that policy-makers in developing countries should focus on facilitating the contraction of the agricultural sector while providing support to growth in other sectors. Successful development processes have indeed tended to go hand-in-hand with a shrinking of the agricultural sector.[12] However, the size of agriculture in developing countries and strong linkages with the rest of the economy imply that any negative impacts on the sector could have harmful repercussions for the rest of the economy. There is also evidence that growth in agriculture is likely to have a stronger effect on poverty reduction than growth in other sectors.[13] Indeed, in the past agricultural productivity growth has often preceded the industrial development of countries. In today's industrialized countries rapid agricultural growth was the precursor to industrialization. More recently, in countries such as China and Vietnam agricultural growth again preceded the rise of industry (World Bank, 2007). Productivity gains in agriculture have freed labour that could be employed in other sectors, mainly manufacturing and increasingly also services, laying the ground for structural change. Thus, productivity growth in agriculture has been and remains important.[14]

In addition, two important recent developments have changed the image of the sector as a 'low productivity sector' and altered the sectors' possibilities to contribute to growth through exports. First, the agricultural sector grew more dynamically

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[12] For example in countries where production and exports of manufactures became the engine of growth, such as the Asian economies, the share of agriculture in GDP fell considerably. It fell from almost 30 per cent in 1980 to less than 12 per cent in developing countries in East Asia and the Pacific (authors' calculation based on World Development Indicators, World Bank).

[13] Ligon and Sadoulet (2007, cited in World Bank, 2007) found that the expenditure gain of the poorest decile is more than twice as high as the average gain from growth in agriculture while their benefit is disproportionately low from growth in non-agriculture.

[14] See also World Bank (2012) on this argument.

than the average non-agricultural sector in recent years, indicating the sectors' changing importance in growth particularly in Africa and some agricultural exporters (UNCTAD, 2011). The production of high value agricultural products in certain developing countries has contributed to this development. In addition, the modern agro-processing industry can in many cases be considered a high productivity sector. While it is not necessary for the processing industry to rely on domestic agricultural production, the presence of local production can facilitate the development of processing activities.

Second, rapidly growing demand for commodities has led to rising commodity prices including the prices of many agricultural products, while a rapidly increasing supply of manufactures often from developing countries produced at low costs, has led to a falling price of many manufactures (UNCTAD, 2008). Since 2002 the terms of trade of commodity exporters have been increasing, fuelling the discussion about opportunities in agriculture, especially staple food. High food prices can provide an impetus for agricultural production, as more farmers in developing countries may find it lucrative to invest and to increase agricultural production.

These two recent phenomena have arguably contributed to a rethinking about the role of the agricultural sector in growth and development. While long-term trends of shrinking agricultural employment are likely to persist, policy-makers may want to remain open to the possibility that the sector can play a driving role in countries' growth processes. Creating an environment that allows productive segments of the agricultural sector to flourish could be highly beneficial for the economy. As for the long-term reduction in agricultural employment, this transition deserves policy-makers' attention, as the sector's role in poverty reduction is undeniable.

Challenges regarding agricultural trade ...

Given the extent and the vulnerability of agricultural employment in many developing countries, it is easy to see why a transition from a rural to an urban society can pose important challenges. The additional challenge of international trade is that it may put economies under pressure to undertake the transition more rapidly. One of the results of large-scale adjustments is that they may lead to bottlenecks in labour markets. This phenomenon has been analysed in the theoretical literature (Davidson and Matusz, 2004) but also in qualitative case studies.

A case that has received particular attention in the economic literature is the effect of the North American Free Trade Agreement (NAFTA) on the Mexican corn sector (Levy and van Wijnbergen, 1995; and chapter 10 in this volume). Farm employment in Mexico has dropped dramatically in recent decades. This development coincides with a trade policy that has led to more open markets, especially within the NAFTA region, and significantly increased trade in agricultural products. Corn is of particular interest, as both Mexico and the United States grow corn. At the signing of NAFTA, Mexican producers were concerned about being flooded with cheap imports of corn following the removal of tariffs. Corn prices were twice as high in Mexico before NAFTA came into effect. Furthermore, corn growing is subsidized in the US – by up to 16 per cent. For corn in Mexico the NAFTA agreement had a 14-year phase-in period of tariff reductions to protect the Mexican market from imports of US corn. Still, imports of corn were 670 per cent higher in 2008–10 than in 1991–93. Almost all of the imported corn comes from the US. The self-sufficiency ratio, i.e. the share of local production to consumption, declined from 91 per cent in 1991—93 to 77 per cent in 2005—07.

Adjustment processes accompanying the shrinkage of the agricultural sector are rendered difficult by a relative lack of mobility of rural populations, though mobility between agricultural sectors appears to function (discussed in more detail in chapters 1 and 3). Rural residents are often hesitant to move to towns or cities because they fear losing the easy access to food in rural areas. These concerns can be particularly strong among smallholders, as leaving the rural area often means giving up land ownership. Rural workers also tend to be less skilled than the average member of the workforce, which puts them at a competitive disadvantage when looking for work in the city. Urban areas also have difficulties absorbing large-scale migration. Accompanying measures facilitating rural-urban mobility can have high pay-offs in this context.

... and opportunities

Agricultural trade does not only present threats for developing countries; it also offers real opportunities in terms of exports and jobs in competitive agricultural sectors. Several countries such as Argentina, Brazil, Canada, and New Zealand have demonstrated that agriculture can be a major sector contributing to export revenue and employment. Success stories in other developing countries confirm this potential. For example, despite competition from its northern trading partners, Mexico has managed to utilize its preferential access for beverages, seasonal fruits, and vegetables. Agricultural exports from Mexico to the US, its major trading partner, are increasingly concentrated in these products, and revenue from these exports increased from US$3 billion in 1993 to almost $14 billion in 2010. Other countries such as Colombia and Kenya have successfully increased exports of high-value horticultural products, such as cut flowers and tropical fruits. These successful strategies are based on agricultural trade.

Industrialization today needs to be understood more broadly. It can include modern agriculture and related services activities. Exploiting high value added products including horticulture, technology-intensive processing, and integration into value-chains can provide important opportunities (UNCTAD, 2012b). Increasing value addition through higher processing of agricultural products before exporting (e.g. processing and exporting cocoa butter or even chocolate instead of exporting cocoa beans) could also contribute to the much needed structural change in developing countries. The processing industry would link the agricultural and industrial sectors as well as the services sectors, which would expand and create the capabilities to meet the requirements of agricultural supply chains. In fact, there is a need to strengthen not only primary agriculture but also upstream activities of the farm in seed multiplication, soil enhancement, and production and distribution of fertilizer and other inputs, as well as downstream activities such as storage, processing, marketing, and food quality and safety standards (FAO, 2011b).

Smallholders play a critical role, as they constitute a large group of farmers in developing countries. Often, those farmers are not linked to regional or international markets. Improving such linkages could contribute to commercialization, i.e. producing more for markets, which could improve their incomes and livelihoods. Interesting initiatives in this direction exist. In Viet Nam, for instance, the Chamber of Commerce and Industry has assisted a large cashew farmer's organization in providing members with market price information updated through radio bulletins (ILO, 2008). The Chamber also introduced business partners to their provincial counterparts in order to establish sustainable market linkages.

Meeting the required health and safety standards in international markets is a challenge, however. Globalization, despite its problems, can contribute to development of the knowledge required to meet these standards. Knowledge on food safety standards is increasingly transmitted through global value chains, i.e. the geographical fragmentation of production brings knowledge from one country to another; in this particular case often from developed to developing countries. Swinnen and Maertens (2007), for instance, illustrate how integration into a global value chain helps local suppliers to meet international standards, because international buyers in the chain transmit relevant knowledge. Furthermore, Colen et al. (2012) show that infrastructure and training of workers to comply with GlobalGAP requirements, a major private standard, improve employment conditions at GlobalGAP-certified firms compared with other firms.

LINKS BETWEEN AGRICULTURAL TRADE AND EMPLOYMENT: COMPLEX BUT STRONG

The contributions to this book focus on the relationship between agricultural trade and employment, and thus on only one of the many facets of the agricultural sector discussed above. Most of the chapters provide quantitative assessments of the impact of agricultural trade on employment, often based on simulation methods.

The book reveals a complex picture even within this relatively narrow area of analysis. It illustrates that the effects of trade reform on employment will very much depend on the nature of trade reform and, in particular, on whether trade liberalization is multilateral, regional, or unilateral. The effects on employment will differ across types of employment, i.e. agricultural versus manufacturing, or high skilled versus low skilled. The contributions to this book also make it possible to compare the effects of productivity increases with those of trade reform, a comparison important from a development perspective.

There is no simple conclusion regarding the links between trade and employment, and there can be no simple conclusion about the employment effects of trade liberalization in agriculture. Trade liberalization can have a demand-creating effect, as it may lower prices, shift production from less to more competitive countries as well as from less to more competitive farms, and increase productivity. Higher agricultural demand raises demand for labour. However, increasing productivity has the opposite effect on labour demand for a given level of output. Trade liberalization also can have indirect effects, such as income effects that lead to changing consumer behaviour such as purchasing more meat and processed food products (see chapter 3). Nevertheless, some important observations can be made from the assesments presented in this volume.

Assessing the employment effects of agricultural trade reform

Nine of the chapters in this volume provide assessments of the impact of different policies, particularly trade policy, on employment in developing-country agriculture. Most chapters analyse individual countries; others focus on regions or on global agricultural trade. Table 2 provides an overview of the studies and information about the models and data used for the quantitative work. The technical reader will notice that this volume covers a rich set of modelling approaches and information regarding quantitative assessments of the employment effects of agricultural trade.

The robustness of quantitative analyses depends to a large extent on data quality. In the case of the assessments of employment impacts of trade, employment statistics are often the weak element, in particular in studies focusing on developing countries. This well-known problem is aggravated for studies focusing on the agricultural sector. Rural employment statistics, particularly of agricultural workers, are often collected using methods that are deficient and inadequate given the peculiarities of rural labour markets. Oya (2010) emphasizes that employment statistics in developing countries suffer from infrequent labour force surveys and problems in the employment modules of household surveys. Concerning the latter, he notes that the employment modules rely on a 7-day reference period, which may fail to capture an agricultural worker's employment given seasonality. He also observes that the conventional dichotomy of paid versus own employment is difficult to operationalize in survey work in developing countries because "own-account work" is often simply conflated with informal employment even if certain informal activities should be classified as paid employment. In agricultural employment statistics it is therefore difficult to accurately distinguish between formal/informal agricultural workers and wage/non-wage agricultural workers because of the survey problems mentioned above. This makes it particularly difficult to provide thorough quantitative assessments of the employment effects of changes in agricultural trade.

Almost all studies in this volume implement computable general equilibrium (CGE) models, and most of them use information from social accounting matrices (SAMs). Despite the limitations and shortcomings of these approaches, CGE models are useful for the analysis of the effects of trade in agriculture on employment because they can take into account economy-wide effects (see chapter 3).[15] Since agriculture

[15] See Piermartini and Teh (2005) for a discussion of different quantitative methods to assess the economic effects of trade reform.

accounts for such a large share of the economy in developing countries, economy-wide models are important. They also capture complex linkages such as, for example, the effects on the production of industrial goods when wages in the agricultural sector increase.

Two modelling assumptions are particularly important when it comes to the assessment of the employment effects of agricultural trade. One is the assumption regarding the substitutability between imported and domestically produced agricultural goods. The other is the set of assumptions regarding the functioning of the labour market in developing countries, in particular, of the agricultural labour market.

The studies in this volume illustrate that assumptions regarding the substitutability between imports and domestic goods have an important impact on findings about the employment effects of agricultural trade.[16] Agricultural goods tend to be homogeneous commodities. Therefore, models focusing on agricultural trade liberalization typically assume that imports and domestically produced goods are highly substitutable. One consequence is that consumers switch more quickly from domestic to foreign agricultural products in cases of liberalization than they do with manufactured imports. This results in less demand for domestic agricultural output and a stronger impact on agricultural employment.

Modelling assumptions regarding the functioning of the labour market tend to affect simulation outcomes in terms of the extent of employment or wage effects. As a rule of thumb, the less mobile labour is assumed to be, the lower the effect on sectoral employment levels but the higher the effect on wages. Standard simulation models tend to assume that economies are characterized by full employment and variable wages. But it is possible to model labour market frictions, such as search and matching frictions, which lead to unemployment (see chapter 2). Chapter 3 discusses and compares various labour market assumptions in models evaluating employment impacts of agricultural trade.

Table 2 provides an overview of the labour-market assumptions that underlie the models used in the nine chapters of this volume that contain quantitative assessments. The approaches chosen vary significantly across chapters. The assumption that wages are fixed for certain types of labour reflects a supposed surplus of this type of labour. In the studies of Bangladesh and Mexico, as well as in the global study in chapter 3, this assumption is made with respect to unskilled labour, given that unskilled labour is expected to be overly abundant in those countries. Most of the studies in this volume have assumed that there is some degree of immobility, particularly of unskilled labour. This assumption is pertinent to conditions in developing countries where the majority of workers, especially in rural areas, are low skilled and have few opportunities for employment except in agriculture.

[16] This substitutability is contained in the Armington elasticity parameters of CGE models. In CGE-based analyses, these parameters are important determinants of how trade reforms affect output and welfare (see Valenzuela et al., 2008).

Table 2: Agriculture, trade, and employment: Methodologies used in the quantitative studies

Chapter	Country/region	Model	Source data	Labour market assumptions	Scenarios
1	Representative developing country and global	Satchi and Temple (2009) GE and GTAP CGE	Satchi and Temple (2009) GTAP Version 7	- In Satchi-Temple model: search and matching frictions in manufacturing sector and underemployment in urban informal sector - In GTAP: Fixed total labour supply and flexible wages	1) Increase in agricultural productivity in Satchi-Temple model 2) Global removal of all import tariffs in GTAP model
3	Global	GTAP CGE	GTAP Version 8	Four labour-market scenarios: 1) Standard: fixed total employment and flexible wages 2) Fix: Fixed real wages for unskilled labour 3) Primary: Standard closure with doubling of elasticity of substitution between primary factors 4) Intermediates: Standard closure with substitution between intermediate inputs	1) Unilateral agricultural trade liberalization in Bangladesh, Indonesia, and Guatemala 2) Global trade liberalization under Doha 3) Subsidy policy
4	Bangladesh	GTAP CGE	- GTAP Version 7.1 Database - Social Accounting Matrix of Bangladesh for 2007 - Employment Satellite Matrix (data from Labour Force Survey 2005-06) - UN COMTRADE	Fixed wage rate of unskilled labour and a flexible wage rate of skilled labour (supply of unskilled labour is not fixed)	1) Global trade liberalization under Doha 2) FTA between Bangladesh and India 3) Unilateral agricultural trade liberalization 4) Subsidy policy 5) Growth in agricultural productivity
5	Benin	Benin CGE	- INSEA - RGPH3 - Social Accounting Matrix of Benin for 2003	Unemployment exists for each type of worker and depends on the wage rate	1) Signing an EPA with the EU 2) Export restrictions on cotton seeds 3) Common external tariff (ECOWAS) 4) Tariff reductions on agricultural products
6	Guatemala	Regression and Leontief Multiplier Model	- Labour data from Guatemalan Institute of Social Security - Social Accounting Matrix of Guatemala for 2006	Fixed wages and surplus labour	1) Regional FTA with the rest of Central America, the Dominican Republic, and the United States (DR-CAFTA)
7	Indonesia	GTAP, then Indonesian CGE	- IndoLab database, Indonesian 2008 Input Output tables & 2005 Social Accounting Matrix - SAKERNAS for wage data	- Fixed labour supply - Wages of farmers and operators are identical in every agricultural sub-sector - Wages of administrators and professionals are equal to wages in the manufacturing sector - Labour substitution between alternative occupations, industries and regions (elasticity of 0.5)	1) ASEAN-China FTA: all existing 2007 tariffs between ASEAN and China are removed (except on highly sensitive goods) 2) Likely Doha Outcome: tariff reductions in agricultural and non-agricultural sectors 3) Labour productivity increase in the agricultural and non-agricultural sectors 4) Enhanced skills in the agricultural or non-agricultural sectors: 1% increase in the number of skilled workers and decreasing the number of unskilled workers accordingly, -0.02% for agriculture only and by –0.57% for non-agriculture
8	Africa	MIRAGE Dynamic CGE	- GTAP Database Version 7, 2004 data - MAcMap-HS6 database version 2 (protection structures)	- Full employment of labor, wage flexibility - Perfectly mobile skilled labor - Unskilled labor: imperfect mobility between agricultural and non-agricultural sectors but the mobility is perfect within each sector	1) Two Regional FTAs implemented by 2017 - full elimination of tariff barriers on goods within two regional groups 2) Continental FTA implemented by 2017 - all tariff barriers on goods are fully removed within the African continent
9	Bosnia-Herzegovina	GSIM Partial Equilibrium	- WITS (bilateral trade flows) - FAOSTAT (production) - GTAP Database Version 8 (using Bulgaria since BH is not available), 2007 data - AMAD (export subsidies) - UNCTAD's ATPSM (demand & supply elasticities)	Labour is assumed to be used in fixed proportions with other inputs (changes in employment proportional to the changes in output)	1) EU accession: Removal of tariffs on Bosnia-Herzegovina-EU trade, and change in Bosnia-Herzegovina tariffs on Rest of World imports to EU levels 2) WTO accession: Reduction in Bosnia-Herzegovina tariffs on imports from Rest of World to 5%
10	Mexico	GTAP CGE	- GTAP Database Version 8, 2007 data	- Mobile skilled labour but fixed in supply, with no surplus labour - Semi-flexible unskilled labour market - Wages are fixed	1) Increasing tariffs on agricultural imports from NAFTA countries to MFN levels 2) Increasing support on output to 5% 3) Removing payroll tax on agricultural labour 4) Funding R&D to increase agricultural productivity

Notes: (i) In Model column: GE = general equilibrium, CGE = computable general equilibrium, GTAP = Global Trade Analysis Project, and GSIM = global simulation model.
(ii) In Source data column: INSAE = National Statistical Institute of Benin, RGPH3 = 3rd. General Population and Household Survey of Benin, and SAKERNAS = National Labour Force Surveys of Indonesia.
(iii) In Scenarios column: EPA = Economic Partnership Agreement, EU = European Union, ECOWAS = Economic Community of West African States, DR CAFTA = Dominican Republic–Central America–United States Free Trade Agreement, ASEAN = Association of Southeast Asian Nations, FTA = Free Trade Agreement, WTO = World Trade Organization, NAFTA = North-American Free Trade Agreement; MFN = Most Favoured Nation.

Table 3: Summary of employment and wage results from simulations of policy scenarios in the quantitative studies

Chapter	Region/Country	POLICY SCENARIOS: FTAs	Unilateral tariff changes	Global tariff changes	Productivity increase	Other scenarios
1	Representative developing country and global			**Global removal of all import tariffs** Developing country skillled agricultural employment (+) Developing country unskilled agricultural employment (+)	**Agricultural productivity increase in representative developing country** Agricultural employment (+) Agricultural wages (+) Manufacturing employment (-) Manufacturing wages (+) Urban informal employment (-)	
3	Global		**Unilateral agricultural tariff removal in Bangladesh, Indonesia, and Guatemala** Unskilled agricultural employment (-) Unskilled non-agricultural employment (+) Real wages all workers (+)	**Global trade liberalization under Doha** Developing countries unskilledl agricultural employment (+) Developing countries unskilled total employment (+)		
4	Bangladesh	**Bangladesh-India FTA** Unskilled employment (+) Skilled employment (-)	**Unilateral agriucltural tradeliberalization** Unskilled employment (-) Skilled employment (+)	**Global trade liberalization under Doha** Unskilled employment (+) Skilled employment (-)	**Cereal productivity increase** Unskilled employment (-) Skilled employment (+)	**Agricultural production subsidy increase** Unskilled employment (+) Skilled employment (-)
5	Benin	**EPA with the EU** Skillled employment (-), wage (-) Unskilled employment (-), wage (-) **Tariff increases to ECOWAS common external tariffs** Skillled employment (+), wage (+) Unskilled employment (+), wage (+)	**Unilateral reduction agricultural tariffs** Skilled employment (-), wage (-) Unskilled employment (-), wage (-)			**Restriction of cotton grain exports** Skilled employment (-), wage (-) Unskilled employment (-), wage (-)
6	Guatemala	**CAFTA-DR FTA** Agricultural employment (+) Total employment (+)				
7	Indonesia	**ASEAN-China FTA** Farmers' real wages (+) Administrators' real wages (+) Operators' real wages (-) Professionals' real wages (+)		**Likely Doha outcome** Farmers' real wages (+) Administrators' real wages (-) Operators' real wages (-) Professionals' real wages (+)	**Labour productivity increase in agriculture** Farmers' real wages (-) Administrators' real wages (+) Operators' real wages (-) Professionals' real wages (-)	**Skills increase in agriculture** Farmers' real wages (-) Administrators' real wages (+) Operators' real wages (-) Professionals' real wages (-)
8	Africa	**Two regional FTAs** Agricultural employment (-) Unskilled non-agricultural real wages (+) Non-agricultural employment (+) Unskilled agricultural real wages (+) Skilled real wages (+) **Continental FTA** Agricultural employment (-) Unskilled non-agricultural real wages (+)				
9	Bosnia–Herzegovina	**EU Accession** Meat and dairy employment except poultry (-) Poultry employment (+) Cereals employment (+) Vegetables, and wine employment (-)	**Unilateral reduction (WTO accession)** Meat and dairy employment, except poultry (-) Poultry employment (+) Cereals, vegetables, and wine employment (-)			
10	Mexico	**Agricultural tariff increases to MFN levels for NAFTA partners** Unskilled employment (-) Agricultural employment (+) Overall employment (-)			**Agricultural productivity increase** Total employment (+) Unskilled employment (+) Unskilled agricultural employment (+)	**Subsidies increase** Agricultural employment (+) Unskilled employment (+) **Removal of payroll tax** Agricultural employment (+) Unskilled employment (+) Skilled wages (+)

Notes: (i) (+) indicates an increase and (–) indicates a decrease in employment or wages.
(ii) Employment and wage results are for individual countries except for chapters 1 and 3.
(iii) FTA = Free Trade Agreement, EPA = Economic Partnership Agreement, EU = European Union, ECOWAS = Economic Community of West African States, DR CAFTA = Dominican Republic-Central America-United States Free Trade Agreement, ASEAN = Association of South East Asian Nations, Doha = Doha Round of Trade Negotiations, WTO = World Trade Organization, MFN = Most Favoured Nation.

Whom you trade with matters

Table 3 summarizes the resulting employment and, in some cases, wage effects from the simulations of the different policy scenarios. It illustrates that the direction of change differs across countries and depends on the trade liberalization scenario.

A comparison of the findings from the simulations of free trade agreements (FTAs) shows that the employment and wage effects of FTAs are mixed, implying that the choice of trading partners is an important determinant of these effects (see also Ornelas, 2012, on this point). FTAs are found to reduce agricultural and unskilled employment in Benin, Africa and Bosnia and Herzegovina (chapters 5, 8, and 9), and the reversal of FTAs - by raising tariffs against FTA partners - in chapters 5 and 10 is shown to increase agricultural employment in the case of Benin (ECOWAS) and Mexico (NAFTA).

In contrast, the studies in chapters 6 and 7 show that FTAs can have a positive effect on agricultural employment and wages. The study of Guatemalan agricultural trade with the US under DR-CAFTA shows that this FTA has increased overall and agricultural employment. Both the study on African trade integration and the study of the effect on Indonesia of the ASEAN–China FTA find a tendency for wages in the agricultural sector to increase with trade under the respective FTAs. Underlying these results on agricultural employment and wages is the competitiveness of a country's agricultural sector. A country that can produce and export agricultural products at lower cost than its FTA partners while preserving the labour-intensive nature of agricultural production is more likely to see positive effects from an FTA on both agricultural employment and wages.

In chapter 4 the FTA between Bangladesh and India leads to an overall increase of unskilled employment in Bangladesh which results mainly from increased exports in textiles, leather, and other industries rather than in agriculture. Chapter 8 finds a similar result for Africa in the case of a continental free trade agreement. Employment shifts from agriculture to the industrial sector and overall labour demand increases due to an increase in production and intra-African trade in industrial goods.

Unilateral agricultural liberalization tends to reduce agricultural employment

As shown in chapters 3, 4, 5, and 9, unilateral reductions in agricultural tariffs are predicted to be detrimental to unskilled or agricultural employment. For example, the study in chapter 9 concludes that liberalizing imports of meat, dairy, cereals, vegetables, and wine into Bosnia and Herzegovina as part of WTO accession will displace production and workers in these agricultural subsectors. Unlike trade in manufactures, there is relatively little intra-industry and intermediate trade in food and agricultural products so that opening up the agricultural sector does not stimulate production and exports in that sector to compensate for jobs lost in import competing enterprises.

The effect of unilateral agricultural liberalization on overall employment may be the opposite of the effect on agricultural employment. Chapter 3 shows that unilateral liberalization in agriculture reduces employment in that sector but increases employment in industrial sectors. Thus, employment shifts from the agricultural sector, in which competition increases, to other sectors. The total employment effect depends on labour market assumptions, but it can be positive if there is surplus labour.

Multilateral liberalization is likely to benefit developing countries but benefits are most significant for highly competitive exporters of agricultural commodities

Global trade liberalization, as shown in chapters 1 and 3, is expected to increase skilled and unskilled agricultural employment in developing countries.[17] As agricultural production shifts from protected developed countries to developing countries, employment decreases in the former and decreases in the latter.

Developing countries as a group are expected to benefit in terms of employment and output, although gains most likely would be concentrated in developing countries that are highly competitive agricultural exporters on the world market, such as Argentina, Brazil, Indonesia, and Thailand.

Bangladesh and some African countries that are net importers of agricultural products could see a contraction of their agricultural sector under a potential Doha Round scenario. However, if agricultural liberalization is coupled with liberalization in other sectors, unskilled employment could increase in Bangladesh as more jobs are created in its textiles and ready-made garments sectors (see chapter 4). This shows that if agricultural trade liberalization is part of a wider liberalization agenda employment in one sector may shrink but job losses may be more than compensated for by gains in other sectors.

As discussed in chapter 7, Indonesian farmers would benefit from higher wages if there is a Doha Round agreement, implying that Indonesia commands a comparative advantage in agricultural production globally. These findings show the potential of multilateral liberalization to create jobs in developing countries by reducing some of the current distortions in agriculture. However, special attention is required for developing countries with less competitive agricultural sectors.

The effects of agricultural subsidies, payroll taxes, and export restrictions: different policies to meet different targets

Which policy measures are appropriate to strengthen the agricultural sector depends on a country's specific objectives. Policies to reduce poverty and rural-to-urban migration differ from those that increase export revenue or maximize agricultural output. The studies presented in this book focus on the employment effects of agricultural

[17] The use of the term 'unskilled' rather than 'low skilled' is driven by the terminology used in one of the standard CGE models used for the analysis of trade policies, the so-called GTAP (Global Trade and Analysis Project) model.

trade policies but also consider other important policy instruments that are relevant to agriculture.

Agricultural subsidies are considered in chapters 4 and 10. From an efficiency perspective, agricultural subsidies are distorting; they artificially draw resources into the agricultural sector from other, more productive activities. Nevertheless, countries often subsidize agriculture, probably driven by political economy considerations and with the intent to promote agricultural production amid concerns over rising agricultural and commodity prices or to stem rural-to-urban migration. The studies find that raising domestic support to farmers increases agricultural and unskilled employment, but it reduces skilled employment. Propping up the agricultural sector creates farm employment but at the taxpayers' expense and with an undesirable change in the country's employment structure towards more unskilled work.

Chapter 10 models another policy scenario with strong fiscal implications: the removal of payroll taxes on skilled and unskilled labour in the agricultural sector. The authors find a strong positive impact on agricultural employment with negligible effects on output and trade. This result indicates the potential effects of wage policy in generating employment, even in agriculture.

In chapter 5 a cotton export restriction is predicted to reduce both skilled and unskilled employment and wages. This finding reflects the importance of access to foreign markets for the health of the agricultural sector in a small developing country such as Benin. Using export restrictions as a successful developmental tool to increase value addition would require the existence or development of the productive capacity to process the raw material in the country.

Productivity increases in agriculture: ambiguous effect on agricultural employment

Policies targeting productivity increases in the agricultural sector are likely to have positive pay-offs in terms of poverty reduction and economic growth. Yet, the studies in this volume show that the effects of productivity increases on agricultural employment are ambiguous, which highlights the need to clearly define and evaluate policy objectives.

An increase in agricultural productivity can have two main effects on agricultural employment. On the one hand, less labour is required for the same output, i.e. labour is freed from agriculture and moves into industry or services or becomes unemployed. On the other hand, farmers can produce at lower cost and sell agricultural output at lower prices, which increases the quantity demanded of agricultural output and, in turn, the demand for farm workers. Thus, there are opposing forces, and the net employment effect of an agricultural productivity increase depends on the nature of the productivity increase, the agricultural production technology used, and the responsiveness of consumers to changes in the price of farm output.

In Bangladesh and Indonesia an increase in agricultural productivity leads to a drop in agricultural employment, while, in Mexico and the typical developing country modelled in chapter 1, agricultural employment increases. The negative employment effects occur when domestic and foreign demand for agricultural goods is relatively fixed. Increasing agricultural productivity coupled with the possibility of rising demand, especially in foreign markets, will tend to increase employment in the agricultural sector.

THE WAY FORWARD

Significant untapped potential exists for agricultural development, and current opportunities are promising, arising from recent economic developments such as positive movements in the terms of trade and continued upward trends in commodity prices. Coherent agricultural trade and development strategies are needed to better harness any beneficial effects. Such strategies would vary from country to country according to resource and technology endowments and the significance of agriculture in the economy.

Agricultural trade liberalization alone is unlikely to produce job miracles. In the same way, agricultural trade liberalization should not be expected to produce dramatically negative employment effects. To optimize employment and development effects from agricultural trade, countries should probably consider a combination of strategie trade liberalization, targeted promotion of agricultural productivity and government action to reduce the vulnerability of agricultural workers.

Although the constitutions and labour codes of most developing countries contain sections devoted to worker rights and provisions relating to social security, there are often workers who fail to benefit from this type of legislation. The majority of agricultural workers in developing countries fall into this category because of institutional problems coupled with rural isolation, political weakness, and poverty. Many are excluded from the scope of labour legislation because of the nature of employment (e.g. casual or seasonal workers) or their membership in a particular group (e.g. migrant workers or indigenous peoples). For agricultural trade liberalization to create decent jobs, the legal protection afforded by national labour standards needs to be realized for these workers (ILO, 2008). Ensuring that many more agricultural workers are covered by social insurance schemes would reduce the challenges for these workers to adjust to trade liberalization.

Gradual or phased-in liberalization can also facilitate adjustment processes and help to avoid bottlenecks in the labour market that may arise, for instance, when large numbers of rural workers move into urban areas. However, gradual liberalization is not enough to make the best of export opportunities. The latter may require a stronger business-enabling environment and policies to increase productivity. Given the great and growing importance of global supply chains, government support to attract major international players to the country may be important.

Following trade liberalization, some developing countries may increase specialization in agricultural production. Complementary measures should ensure an increase in value addition and promote structural change that can include modern agriculture and related services. Policies promoting productivity increases and innovation may also help countries to avoid falling into the low value-added trap. Flanking measures to help farms and farm workers adjust by diversifying into specialty agricultural products or non-farm activities may be useful. Measures reducing trade costs for farmers, in particular smallholders, should figure prominently among them. These include infrastructure investments but also the provision of information about aspects like price developments, about changes in foreign demand and distribution networks. Employer organizations or export promotion agencies can play an important role in this.

What is special in agriculture is that the changes in the size of the agricultural sector typically go hand in hand with changes in the urban concentration of a country's population, which are reflected in rural-to-urban migration. If trade reform triggers or intensifies such migrations, measures to facilitate integration in urban areas could make a big difference. Those could be simple measures, such as providing more information regarding accommodation or job opportunities, or support to peri-urban agriculture (i.e. growing crops and raising livestock in small areas within and around cities) to contribute to food security for new urban residents. Given the high incidence of poverty among rural workers, changing from one job to another or moving from one location to another may cause significant hardship. Reducing this hardship is a noble objective and will most likely contribute to increased economic efficiency.

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1. EMPLOYMENT, PRODUCTIVITY, AND TRADE IN DEVELOPING-COUNTRY AGRICULTURE

David Cheong and Marion Jansen[1]

1.1 INTRODUCTION

Agriculture employs more than a billion people in developing countries. In low- and middle-income countries, the agricultural sector tends to be the primary source of employment. Productivity increases in the agricultural sector - through the use of more efficient inputs and better technology - can not only raise agricultural output but also improve the work conditions of agricultural workers. More broadly, higher agricultural productivity is considered to be a key driving force of structural transformation and economic development. Trade policy and trade flows can have an important impact on both employment and productivity in the agricultural sector. Trade also affects access to agricultural products, whether produced domestically or abroad, in various ways. Thus, the links between employment, productivity, and trade in agriculture are crucial to understanding why policies related to agriculture are often considered sensitive, why the agricultural sector remains controversial in trade negotiations, and why agriculture is at the heart of the development debate.

This chapter provides an overview of the characteristics of and trends in agricultural trade and employment in developing countries. We also look at the relationship between productivity and employment in the sector. By focusing on these topics, this survey contributes to the broad literature on the role of agriculture in development and the more specific literature on linkages between trade and employment in developing countries.[2]

The agricultural sector has fallen in and out of favour among development thinkers and policy-makers several times in the last six decades. In the 1950s and

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[2] See Dethier and Effenberger (2011) for a brief review of the literature on agriculture and development. For an overview on the linkages between trade and employment in developing countries, see Jansen and Lee (2007) and Jansen et al. (2011).

1960s, development strategies strongly emphasized industrialization and urbanization. Governments taxed agriculture through overvalued exchange rates and export taxes while affording trade protection and investment to manufacturing activities (for Latin America see Baer, 1972, and for East Asia see Wade, 2003). In the 1970s development policy began to acknowledge that, in the development process, squeezing agriculture was not a sustainable strategy. Agriculture was not just a "resource reservoir" but rather a sector interdependent with the rest of the economy (Timmer, 1988). Hence, the agricultural sector was integrated into development planning and modernization efforts, with an emphasis on the mechanization and industrialization of agricultural production. International development aid became increasingly directed at developing-country agriculture; the "Green Revolution" was one of its most important results. Agricultural modernization, however, had an immediate and significant impact in only a minority of countries and in most of the developing world proceeded slowly. In the 1990s and 2000s, the development community's focus shifted away from agriculture again. Success in the manufacturing and services sectors of East and South Asia, respectively, drew attention back to "engines of growth", while governance issues took centre stage in reform efforts. The agricultural sector's share of international development aid dwindled from about 10 per cent in the mid-1990s to about 5 per cent in the mid-2000s (Islam, 2011). More recently, there have been calls to put agriculture back onto the development and trade agenda, given fears for food security and the ecological consequences of industrial agriculture as well as concerns that developing countries have been left out of or short-changed in globalization processes (Byerlee et al., 2009).

Following this introduction four sections form the core of this chapter. Section 2 looks at patterns and trends in developing-country agricultural employment. It also discusses the terms and conditions of employment, wages and earnings, and mobility of agricultural workers in developing countries. Section 3 focuses on agricultural productivity and its effects on the employment structure of a representative developing country. This section also discusses agricultural innovation in developing countries and obstacles to modernizing agriculture. Section 4 surveys the nature and extent of agricultural trade policies and domestic support measures in developing countries and the distortions caused in agricultural markets. It also discusses how linkages between developing-country agriculture and global markets affect agricultural terms of trade, price volatility, and food security. The section also assesses the potential for regional trade agreements to liberalize agricultural trade. Section 5 reviews the evidence and provides an analysis of the impact of trade liberalization on agricultural employment in developing countries. Section 6 provides our conclusions and the policy implications of the findings.

1.2 AGRICULTURAL EMPLOYMENT IN DEVELOPING COUNTRIES

In developing countries about 50 per cent of workers are employed in the agricultural sector. In contrast, in developed countries agriculture employs just over 4 per cent of workers. Thus, 98 per cent of the world's agricultural workers are employed in developing countries. Although agriculture is the largest employer in most developing countries, there are wide regional differences in the agricultural share of the labour force. Table 1.1 shows that the share in East Africa in 2010 was almost 75 per cent, whereas that in South America was only 13 per cent.

Since 1980 agricultural shares of the labour force have declined in all countries, both developed and developing. Table 1.1 shows that the importance of agricultural employment has fallen most in North Africa and in West Asia and the Middle East;

Table 1.1: Economically active population, agricultural share of labour force, and change in agricultural share of labour force by region, 1980, 1995, and 2010

Geographic units	Total economically active population (millions)			Agricultural share (% of total)			Percentage point change in agricultural share, 1980 to 2010
	1980	1995	2010	1980	1995	2010	
World	1 895	2 575	3 282	50.4	46.1	39.9	–10.5
Countries in developed regions	542	575	625	13.1	7.5	4.2	–8.9
Countries in developing regions	1 353	2 001	2 657	65.3	57.2	48.2	–17.1
Africa	173	268	408	68.4	60.3	53.1	–15.3
Sub-Saharan Africa	148	227	347	71.9	65.4	58.4	–13.5
Middle Africa	21	34	51	73.9	67.0	57.7	–16.2
East Africa	61	97	153	84.7	80.6	74.5	–10.2
North Africa	32	50	75	53.1	37.8	28.3	–24.8
West Africa	48	71	108	65.7	55.6	46.4	–19.3
Asia excluding Japan	1 053	1 533	1 964	68.6	61.1	52.0	–16.6
Central Asia	n.a.	21	29	n.a.	27.6	20.5	n.a.
East Asia excluding Japan	527	737	856	72.4	67.2	58.6	–13.8
South-East Asia	148	221	299	63.2	56.0	46.8	–16.4
South Asia	349	497	700	67.2	59.3	51.1	–16.1
West Asia and Middle East	29	57	81	44.0	30.4	19.2	–24.8
Latin America and the Caribbean	126	196	280	33.6	22.0	14.8	–18.8
Caribbean	11	14	18	33.6	25.3	20.4	–13.2
Central America	30	46	64	37.5	26.8	18.6	–18.9
South America	85	135	197	32.3	20.0	13.0	–19.3
Oceania excluding Australia and New Zealand	2	3	4	72.1	65.8	59.0	–13.1

n.a.=not available

Source: Adapted from FAO, 2011, table A4. The agricultural sector includes agriculture, hunting, fishing, and forestry.

in both regions there has been a 24.8 percentage point decline in the agricultural share of the labour force.[3] From a continental perspective Africa and Asia (excluding Japan) experienced similar declines in the proportion of workers in agriculture, with almost the same starting and end points.

This change in the sectoral composition of employment has occurred for two main reasons. First, the structure of world production has changed. The share of agricultural value-added in World gross domestic product (GDP) fell from 6.6 per cent in 1980 to 3.2 per cent in 2010 (World Bank, 2011). In low- and middle-income countries, this share fell from 20.7 per cent in 1980 to 10.2 per cent in 2010, while in high-income countries it declined from 4 per cent in 1980 to 1.3 per cent in 2010. Worldwide, there has been a clear structural shift in economic production from agriculture to manufacturing and services. Second, there has been an increase in the productivity of agricultural workers, which has therefore reduced labour demand in agriculture. High-income countries have seen the average value-added per worker in agriculture rise by almost 300 per cent from 1980 to 2009, while in low- and middle-income countries the increase in productivity has been about 75 per cent.

Despite relative declines, the agricultural sector continues to be an important source of employment in developing countries. As can be gleaned from table 1.1, the absolute number of agricultural workers has increased worldwide, from 955 million in 1980 to 1.31 billion in 2010. Since 1980 countries in developing regions have accounted for well over 92 per cent of the world's agricultural workers. In absolute terms these countries accounted for 884 million agricultural workers in 1980 and 1.28 billion in 2010.

1.2.1 Forms of agricultural employment

Employment in developing-country agriculture takes different forms, depending on production orientation, technique used, and crops planted, which are themselves interrelated. Production orientation is defined as the value-driven aims of and constraints on agricultural activity (Van Ittersum and Rabbinge, 1997). Agricultural production may be oriented towards subsistence (own immediate consumption) or towards sale in domestic or export markets. In an analysis of 14 developing countries around the year 2000, Davis et al. (2007) find that 60 to 99 per cent of rural households participated in agriculture and derived some part of their income from it. In each of these countries, except Nigeria and Ghana, less than 15 per cent of rural households were subsistence-oriented.[4] A household was classified as subsistence-oriented if 50 per cent or less of its agricultural production was sold to the market. On average, 32 per cent of

[3] North Africa includes Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, and Western Sahara. West Asia and the Middle East covers Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iraq, Israel, Jordan, Kuwait, Lebanon, the Occupied Palestinian Territory, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, and the United Arab Emirates.

[4] The countries were Albania, Bangladesh, Ecuador, Ghana, Guatemala, Indonesia, Madagascar, Malawi, Nepal, Nicaragua, Nigeria, Pakistan, Panama, and Vietnam.

rural households derived more than 75 per cent of their income from wage employment in both farm and non-farm activities. Another 34 per cent of households, on average, had diverse sources of income from sale of their own farmed products, wage employment in farm and non-farm activities, and urban employment.

Subsistence agriculture is characterized by high labour intensity and minimal use of other inputs. It is carried out by poor farmers on small plots that are mainly communal. Employment in subsistence farming comprises self-employment, family employment, and some wage labour provided by very poor, often landless, households. Taylor (2001) conducted an employment-based analysis of agriculture on the Yucatan Peninsula, where subsistence farming dominates. Peasant farmers and their families use a traditional Mayan production system (*milpa*) of rotational slash-and-burn agriculture to grow corn, beans, and squash. The traditional rotation period, 16 to 25 years, in this system is sufficiently long for sustainable agricultural production, but population growth and conversion of fields to pastures for cattle ranching has shortened the rotation period to six to eight years. The land has become less fertile, farming productivity has dropped, and nutrition levels have fallen. Some farmers have invested in improved technology (improved *milpa*) to reverse these trends. Taylor estimated that the traditional system provided employment for about 32 people per 100 ha per year, while the improved system more than doubled labour requirements, to 75 people per 100 ha per year. He estimated that cattle ranching employed only

Table 1.2: Size of land holdings and production technique

Type of holdings	Production technique
Micro holdings very limited area	• subsistence agriculture
Small holdings under 10 ha	• traditional methods • small cattle-raising • small locally marketable surplus
Middle-sized farms 10 to 50 ha	• traditional methods and semi-mechanized agriculture • small cattle-raising • nationally and internationally marketable production
Large farms 50 to 500 ha	• advanced mechanized agriculture with great use of chemicals • intensive and extensive industrial agriculture and cattle raising • nationally and internationally marketable production
Larger farms above 500 ha	• advanced mechanized agriculture with great use of chemicals • intensive and extensive industrial agriculture • large cattle-raising • nationally and internationally marketable production

Source: ILO, 2000a.

5 people per 100 ha per year, but, in monetary terms, cattle ranching was the most profitable. Taylor concluded that, "if policymakers are concerned about sustainability, increased employment for the poor, and a more equitable distribution of income, they should promote traditional *milpa* over cattle production and improved *milpa* over traditional *milpa*."

Market-oriented, or commercial, agriculture is aimed at supplying food and fibres to domestic and export markets. Higher agricultural productivity distinguishes market-oriented agriculture from subsistence farming. The most productive market-oriented farms tend to export. Commercial farms specialize in cash crops, notably grain and horticulture. Land use tends to be on a larger scale, with more mechanization and the use of chemical fertilizers and pesticides and high-yielding seed varieties (table 1.2). Hence, the labour intensity of production is reduced, in general. However, given larger output, market-oriented farming tends to increase the absolute level of employment while creating more differentiation and specialization of agricultural employment by skills and tasks, e.g. tilling, ploughing, sowing, planting, weeding, reaping, harvesting and herding. Self-employment and family employment decline, while temporary wage labour (which is seasonal, subcontracted, and/or migrant) assumes a larger share of agricultural employment. Larger farms may also employ permanent wage labour.[5]

Traditional production techniques, which characterize subsistence and small-scale farming, require the intensive use of human and animal labour. In a study of agriculture in the Muzaffarnagar district of western Uttar Pradesh in India, Parikh (1985) found that farms were rarely mechanized, and farmers operated mainly with labour provided by the farmers themselves, their families, animals, and wage labour. Moreover, he found that: (i) On small farms wage labour could substitute for the farmer's own labour and family labour, while on medium-size farms this relationship did not hold. (ii) Hired labour was more price-elastic for small farms, and so, if the wage rate was raised, there were greater reductions in employment on small-size farms than on medium-size farms. (iii) On medium-size farms the use of major implements was complementary to family labour, which suggests that more mechanized tasks were allocated to family workers instead of to hired hands.

Mechanized production techniques tend to be labour-saving. In an early set of International Labour Office (ILO) country studies (1973), the use of tractors was found to displace labour in certain countries in East Africa, Latin America, and East and South Asia. In a study of the North-West Frontier Province (currently Khyber Pakhtunkwha) of Pakistan, Ali and Parikh (1992) also found that tractors had substituted for human labour. They suggested that, since tractors had no significant effect

[5] For example, Labowitz 2007) documents that in Karnataka and Maharashtra, India, hybrid vegetable seed production requires a long-term, stable workforce to carry out the specialized production activities. Farmers, therefore, make long-term arrangements with workers by making pre-season payment advances and loans to them. Collins and Krippner (1999) document the predominance of permanent labour contracts among workers on vineyards in the Sao Francisco Valley in Brazil in the early 1990s.

on productivity and cropping intensity, tractorization could not promote labour absorption. They also found that: (i) Seeds were complements to labour, i.e., a reduction in the price of seed induced more demand for labour. (ii) Changes in the prices of other inputs had no significant effect on the demand for labour. (iii) An increase in output due to technological change (either introduction of high-yielding varieties or changes in the crop mix) did not have labour-displacing effects.

The timing of and level of demand for different types of agricultural labour vary according to which crops are planted, crop duration, and crop combination. For example, on a per-hectare basis, gram and barley require less labour than wheat and rice, which in turn have lower labour requirements than fruit and vegetable production (see Bala and Sharma, 2005, for an example from India). Labour demand and the set of required agricultural tasks also are influenced by land characteristics and irrigation. The size of plots determines the feasibility of animal or vehicle tractors (and less use of labour); soil fertility determines whether agricultural workers apply fertilizer; and the availability and quality of water determine if agricultural workers need to draw and carry water from tanks, wells, or rivers.

In many developing countries there has been a decline in average smallholder farm sizes and an increase in landlessness over the past 50 years. The 2011 Rural Poverty Report (IFAD, 2010, p. 89) provides examples: (i) In India average landholding size fell from 2.6 hectares in 1960 to 1.4 hectares in 2000. (ii) In Bangladesh, the Philippines, and Thailand, average farm sizes have declined and landlessness has increased over approximately the last 20 years. (iii) In Cambodia rural landlessness went from 13 per cent of the population in 1997 to 20 per cent in 2004. (iv) In eastern and southern Africa, cultivated land per capita has halved over the last generation, and, in a number of countries, the average cultivated area per capita today amounts to less than 0.3 hectares. These trends in land distribution have been driven by increasing concentration of land ownership, land degradation, and rapid population growth.

1.2.2 Terms and conditions of agricultural employment

Agricultural employment is physically demanding. Workers are prone to physical injury due to the intense rhythm and long duration of work (i.e. the workday varies from 9 to 12 hours per day, with a few short breaks) and the difficult working postures for agricultural tasks. Health problems are common because workers are in the open air and are exposed to allergens, poisons, parasites, chemicals, and biological products.

Farm workers in developing countries usually engage in multiple activities, such as household production, trading, agro-processing, manufacturing, commercial, and service activities on a small scale. Rural households engage in these non-farm activities to provide consumption goods (such as clothing, processed food, furniture, and household items) and farm inputs (such as ploughs and tools) for themselves or for sale to others.

In the ILO LABORSTA database, workers whose main activity is in agriculture are classified according to the following employment-status categories: (i) employees,

(ii) employers, (iii) own-account workers, (iv) members of producers' cooperatives, and (v) contributing family workers. The first category, employees, includes all hired agricultural workers; their wages may be pecuniary (fixed, daily or monthly, or at a piece rate) or in kind. The contractual arrangements for wage workers may be formal or informal, permanent or temporary, and explicit or implicit about tasks and remuneration. The second category, employers, refers to farmers who hire labour and typically own or lease farm assets such as land and equipment. The third category, own-account workers, consists of self-employed farmers who are independent and do not have any employees. The fourth category, members of producers' cooperatives, refers to persons who are active members of an agricultural cooperative. The fifth category, contributing family workers, consists of rural family members, often women and children, who work without pay.

Table 1.3 reports the mean shares of agricultural workers by employment status from a sample of 42 developing countries over the period 2001 to 2008. The average shares show that, globally, own-account workers (with an average share of 38 per cent) form the largest group of agricultural workers. Agricultural wage workers are the second largest group, with an average share of 30 per cent. On average, about one-quarter of agricultural workers are contributing family workers. These figures suggest that informal employment is widespread in developing-country agriculture, as own-account workers and contributing family members, who together account for 62 per cent of the agricultural workforce, are often informally employed (Bacchetta et al., 2009). The predominance of informal workers in developing-country agriculture reflects the low wages paid to formal agricultural employees and insufficient employment opportunities in the regulated sectors of the economy.

Table 1.3: Shares of the agricultural workforce by employment status in developing countries, 2001 to 2008

	Employees	**Employers**	**Own-account workers**	**Members of producers' cooperatives**	**Contributing family workers**	**Not classifiable**
Global	30%	6%	38%	0.52%	24%	2%
South-East Asia	12%	22%	35%	0%	28%	4%
Europe and central Asia	26%	2%	53%	0.36%	19%	0%
Latin American and the Caribbean	40%	7%	34%	1%	17%	2%
Middle East and North Africa	25%	7%	30%	0.26%	38%	0%
South Asia	4%	1%	50%	0.60%	45%	1%
Sub-Saharan Africa	44%	3%	23%	0%	24%	7%

Source: Authors' computations using statistics from the ILO database LABORSTA (2012). The sample included 42 countries that reported employment status data by the International Classification by Status in Employment (ICSE) 1993 classification in the period 2001 to 2008. The global shares are the sample means, and the regional shares are the sample means of countries within each region.

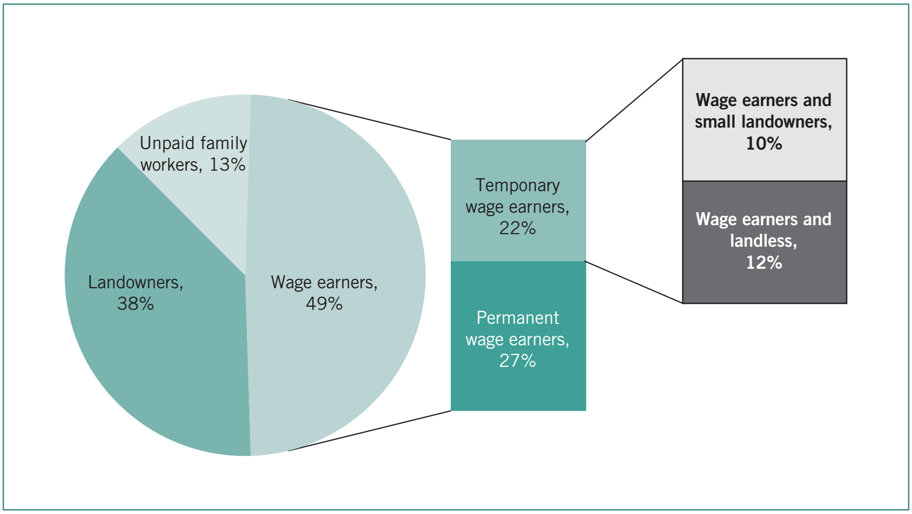
The regional mean shares of agricultural workers by employment status in table 1.3 show that own-account workers are dominant in the developing countries of Europe and central Asia and South Asia. Family labour is relatively widespread in the Middle East and North Africa. In contrast, employees (or wage workers) account for the largest share of the agricultural labour force in sub-Saharan Africa and in Latin American and the Caribbean.

In most developing countries except for certain Central and South American countries, the share of the agricultural workforce attributable to wage labour is increasing (World Bank, 2007, chapter 9). In India, Brazil, and Chile, more than half of agricultural wage workers are temporary (ILO, 1996). In contrast, in Central America temporary wage workers represent less than half of agricultural wage workers. The significance of permanent labour contracts in Central American agriculture may reflect the dominance of large-scale, export-oriented agriculture, the output of which must meet high product standards that necessitate more control over the quality of agricultural work (Collins and Krippner, 1999). However, besides having unstable work, temporary wage workers in Central American agriculture also tend to be landless or smallholders (figure 1.1).

1.2.3 Wages and earnings in developing-country agriculture

Wages earned in the agricultural sector tend to be lower than in the rest of the economy, including the rural non-farm and manufacturing sectors. Table 1.4 compares average agricultural earnings or wages in the period 2000–2008 to those in manufacturing for selected low-income and lower-middle-income countries. In these countries

Figure 1.1: Distribution of agricultural workers by category in Central America



Source: ILO. Project RLA/93/MO3/DAN – Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama (Geneva, 1998), unpublished; quoted in ILO (2000b).

earnings or wages from agriculture were, on average, 60 per cent of those in manufacturing. The relative earnings ratio was as low as about one-quarter in Kyrgyzstan and Nicaragua. Only Swaziland and Fiji had ratios above one, but not by much. Without these outliers, the average earnings or wages of agricultural workers relative to those of manufacturing workers was about 60 per cent. From 1980 to the present, agricultural wages have been declining absolutely in most Latin American countries but increasing in most Asian and African countries (World Bank, 2007, chapter 9).

A number of factors independent of the sector of activity may explain part of the difference in earnings between agricultural and manufacturing workers reflected in table 1.4. Agricultural workers may be willing to accept lower earnings or wages because the cost of living is lower in rural areas; they are often compensated in kind; and the work may not require as much training or skills as work in manufacturing. Productivity differences provide a broader explanation for the wage gap, however. Gollin et al. (2011), using a sample of more than 100 developing countries, find that agricultural workers are initially only one-quarter as productive as workers in the rest of the economy; the productivity ratio rises to 50 per cent after adjustment for omitted

Table 1.4: Average earnings or wages of agricultural and manufacturing workers in selected developing countries in the period 20002008 in US dollars

Country	Type of Data	Agriculture (A)	Manufacturing (M)	Relative (A/M)
Nicaragua	Earnings per month	53.36	220.56	0.24
Kyrgyzstan	Earnings per month	23.32	92.32	0.25
Tanzania, United. Rep. Of	Wage rates per month	62.45	155.92	0.40
El Salvador	Earnings per month	94.04	214.01	0.44
Tajikistan	Earnings per month	9.72	21.76	0.45
Moldova	Earnings per month	58.18	124.99	0.47
Madagascar	Earnings per hour	0.48	1.01	0.48
Philippines	Wage rates per day	2.38	4.96	0.48
Georgia	Earnings per month	63.35	128.97	0.49
Ukraine	Earnings per month	82.83	351.04	0.50
Sri Lanka	Earnings per day	1.70	3.23	0.53
Indonesia	Wage rates per month	50.61	90.54	0.56
Guatemala	Earnings per month	157.29	276.26	0.57
Mongolia	Earnings per month	60.11	103.62	0.58
Paraguay	Earnings per month	110.92	161.44	0.69
Syrian Arab Republic	Earnings per month	574.23	759.47	0.76
Armenia	Earnings per month	93.41	120.43	0.78
Egypt	Earnings per week	25.72	32.51	0.79
Swaziland	Earnings per month	464.28	456.35	1.02
Fiji	Wage rates per day	10.75	10.19	1.06

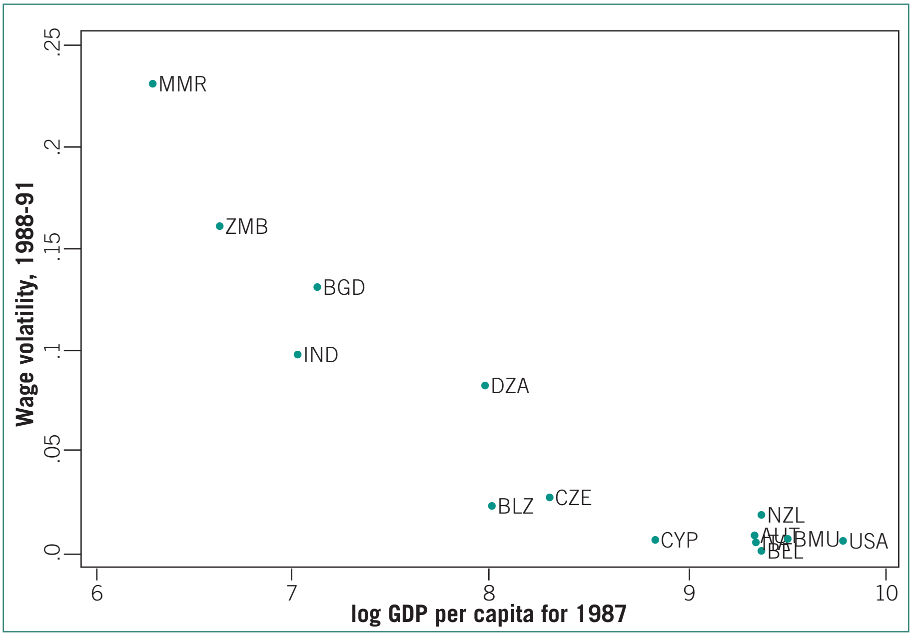
Notes: (i) Source: ILO LABORSTA database (2012). (ii) The countries shown are low- and lower-middle income countries (per the World Bank income classification in 2011) for which relevant wage or earnings data (in local currency units) are available in any year from 2000 to 2008. (iii) All wage or earnings data refer to those of both men and women, except for Swaziland, which are for men only. (iv) Exchange rates for conversion of local currency to US dollars come from the World Development Indicators.

factors. Education appears to be one of the factors explaining productivity differences and resulting wage differences, as wage differences tend to disappear once educational differences are taken into account. In the 2008 World Development Report (p. 212), a comparison of agricultural and rural non-farm workers with no schooling in India, Mexico, and Uganda found little difference in the distribution of wages.

Not only are the wages and earnings of developing-country agricultural workers lower than those of their counterparts in other sectors, they also are more volatile. Agricultural workers' wages and earnings are subject to uncertainties in the weather, risks of land degradation or dispossession, fluctuating prices and availability of farm inputs and outputs, and personal and household ill health. The lack of finance and insurance markets and limited social security provision prevent developing-country farm workers from insuring against or avoiding the risks mentioned above.

Using a sample of countries, Jayachandran (2006) plots agricultural wage volatility in 1988–91 against GDP per capita in 1987 (figure 1.2).[6] There was a clear negative relationship between national average incomes and agricultural wage volatility.

Figure 1.2: Agricultural wage volatility versus gross domestic product (GDP) per capita



Source: Jayachandran (2006). Wage volatility is calculated from Occupational Wages around the World (OWW) data (Freeman and Oostendorp, 2000). The log of annual real GDP per capita (in 1996 US dollars) is taken from the Penn World Tables. The sample consists of all countries for which farm worker wage data are available for each year in the 1988–91 period (AUT=Austria, BGD=Bangladesh, BEL=Belgium, BMU=Bermuda, BLZ=Belize, CZE=Czechoslovakia, CYP=Cyprus, DZA=Algeria, IND=India, ITA=Italy, MMR= Myanmar, NZL=New Zealand, USA=United States, and ZMB= Zambia). The OWW data set covers 1981–99; the 1988–91 period yields the largest balanced panel with at least four years per country. The patterns are similar when other subsamples are used.

[6] Agricultural wage volatility is defined as the standard deviation of log average monthly real wages for a male field crop farm worker after removing a country specific linear trend.

1.2.4 Agricultural worker mobility

Given lower and more volatile wages and earnings, why do developing-country agricultural workers not move out of the sector? Duryea at al. (2006) analyse workers' employment transitions in nine low- and middle-income countries, and they find evidence for much more persistence in agricultural employment than in non-agricultural employment.[7] The lack of agricultural worker mobility in developing countries can be ascribed to limited incentives and numerous obstacles. On the incentive side, many developing countries have not been able to industrialize, diversify their economic structures, and provide sufficient non-agricultural employment opportunities. Employment in other sectors is not only scarce but also involves giving up a secure means of obtaining food. Developing-country farmers may also be reluctant to sell or lease their land, equipment, or other farm assets because of weak property rights.

The location of the agricultural workforce in rural areas is also an obstacle to changing sectors, since most non-agricultural activities are conducted in cities.[8] Hardly any information on urban job vacancies reaches the rural population because formal communication channels are poor.[9] If there are vacancies, the costs of moving to urban areas and settling in tend to be relatively higher in developing countries due to a lack of transport and rigid housing markets. Urban social networks can contribute to reducing costs of travel and settlement (Nadal, 2000), but the higher costs of urban living may nevertheless deter agricultural workers from seeking jobs in the cities. In addition, there may be psychological costs of migration such as leaving family and friends or facing alienation or discrimination in the new urban setting. Workers who do decide to move to the city in hopes of finding a better-paid job often end up in the urban informal sector.

Another important obstacle to leaving agriculture is a lack of human and financial capital. The majority of agricultural workers in developing countries have only limited schooling and little access to non-farm vocational training. Their skills and knowledge are generally not transferable to the non-farm sector. A lack of financial capital prevents workers in agriculture from purchasing the necessary inputs to participate in cottage industry for local rural markets or in larger supply chains as sub-contractors.

1.3 PRODUCTIVITY IN DEVELOPING-COUNTRY AGRICULTURE

Although the agricultural sector is the largest employer in developing countries, it produces on average only 10 per cent of value added in GDP among low- and middle-

[7] Voluntary out-migration does occur, however. Hom et al. (2012), for instance, find evidence of significant out-migration and urbanization for remunerative employment in rural Nepal.

[8] In 2000, 60 per cent of the population in developing countries still lived in rural areas (Cohen, 2006). Most of these people were employed in agriculture and were significantly poorer than their urban counterparts.

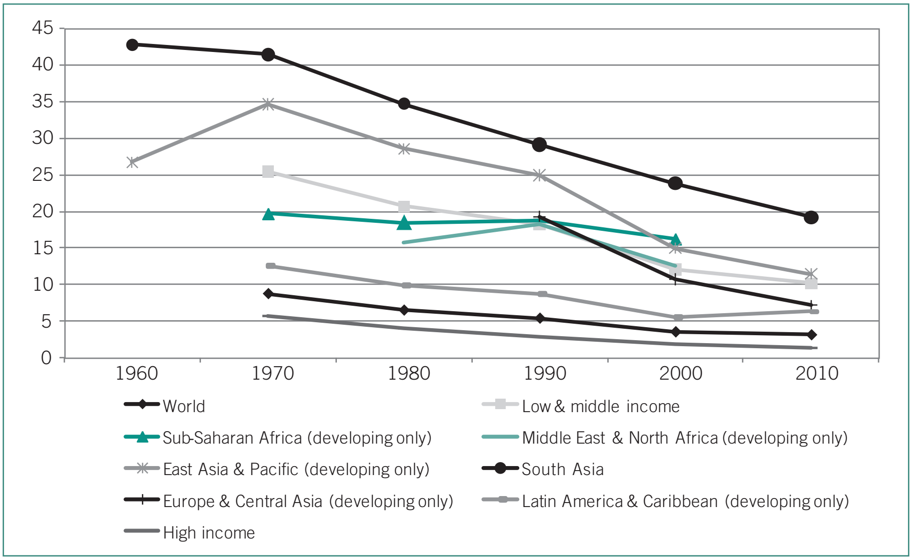
[9] Murphy and Strobl (2008) find in Trinidad and Tobago that barriers to information flows between potential employers and employees are highest in the informal sector, in rural areas, and among women.

income countries. The low share of agricultural value-added is the result of at least 40 years of structural transformation, albeit at varying speeds, in developing countries. Figure 1.3 shows that agriculture's share of value added in GDP has declined in all developing regions since 1960. South Asia and East Asia and the Pacific recorded the steepest drops in the contribution of agriculture to GDP. The fall for South Asia was 24 percentage points between 1960 and 2010, and that for East Asia and the Pacific was the same between 1970 and 2010. Agriculture in other developing regions did not contract as much, but these regions began with already lower shares in 1970. Over three decades agriculture's share in sub-Saharan Africa fell by only four percentage points.

The fact that agriculture absorbs the majority of workers but produces just one-tenth of output in developing countries implies that developing-country agricultural workers are less productive than their counterparts in other sectors. As mentioned in the previous section, value added per worker in agriculture is typically only one-quarter of that in the rest of the economy, and in certain developing countries, as low as one-eighth (Gollin et al., 2011). Low labour productivity in agriculture reflects several important characteristics of production and of workers in the sector in developing countries.

First, as described in section 1.2, agricultural production is still very labour-intensive. There is little mechanization, and much farm work is done manually with simple tools. Thus, there is high demand for labour in agricultural production relative to other sectors and in comparison with the agricultural sector in industrialized countries.

Figure 1.3: Trend in agricultural value added as a share of GDP from 1960 to 2010 by region (in per cent)



Source: World Bank, 2011.

Second, technical improvement and innovation in agricultural production have been limited and patchy. Agricultural research, which is grossly underfunded in developing countries (Beintema and Elliott, 2009), and the Green Revolution have had an uneven impact on the developing world.[10] Crop genetic improvements led to significant increases in yield in Asia and Latin America in the 1960s and 1970s, but gains arrived in the Middle East and North Africa only in the 1990s, and sub-Saharan Africa has yet to experience significant impact (Evenson and Gollin, 2003). High-yield crop varieties, advanced farming and irrigation technologies, and sophisticated fertilizers and pesticides remain out of reach for most developing-country farmers. Their unavailability or inaccessibility due to cost has kept developing-country agricultural productivity relatively low and lagging far behind that of developed countries.

Third, to supplement and diversify their incomes, many developing-country agricultural workers are also engaged in non-farm employment that competes for their time and effort. Haggblade et al. (1989) find that in sub-Saharan Africa 15 to 65 per cent of farmers have secondary employment in the non-farm sector, and 40 per cent of total family labour hours are devoted to income-generating non-farm activities. In a multi-country analysis of rural household data, Davis et al. (2009) find that off-farm sources of income account for 50 per cent of total income in almost two-thirds of the low-income countries in their dataset. Diversification into non-farm activity reduces the amount of time devoted to farming and limits the amount of agricultural output that is produced. Further, many developing-country farmers also engage in subsistence farming. Although this contributes to agricultural production, subsistence farm output is often unaccounted for in national statistics.

Fourth, farmers' lack of access to finance and education plays an important role in explaining low farm productivity. Financial market failure limits the adoption of new technologies by developing-country farmers, particularly smallholders, whose assets may not be sufficient to provide collateral for loans or to bear the risks of investment in technology.

Lastly, as described in section 1.2.2, there is often a tenuous employment relationship between the farm/plantation owner and the hired hand. Many agricultural workers are hired seasonally and paid on a task or piece-rate basis (ILO, 1996). Recruitment is often subcontracted to middlemen. Given the short-term nature of work arrangements, neither agricultural workers nor their employers have an incentive to invest in learning or training to improve the efficiency of agricultural production.

1.3.1 A model of agricultural productivity and developing-country employment

On the basis of the above, it is reasonable to expect that improvements in agricultural productivity can play a major role in improving working conditions in rural areas.

[10] See FAO (2003) for a discussion of the impact of the Green Revolution on poverty and levels of malnutrition.

But productivity increases in agriculture will also affect employment levels and conditions in other parts of the economy. In order to explain the relevant mechanisms and provide a sense of the magnitudes involved, we use in the following analysis a stylized model (Satchi and Temple, 2009) to assess the employment effects of productivity increases in agriculture.

The model represents a small, open economy with three sectors – urban manufacturing, urban informal, and rural agriculture.[11] The urban manufacturing sector uses labour and capital to produce manufactured goods, while the rural agricultural sector uses labour and land to produce agricultural commodities. The prices of manufactured and agricultural goods are exogenously fixed by world prices. The urban informal sector consists of only self-employment and requires neither capital nor land. In this model the total labour force is fixed and divided between urban and rural employment. Workers can move freely between the urban informal sector and the rural agricultural sector, which can offer as many jobs as demanded. However, the attraction of higher wages in the urban manufacturing sector induces some agricultural workers to migrate to the city. The expected urban manufacturing wage of each migrant is determined by the level of the urban manufacturing wage and the probability of finding employment in the urban manufacturing sector.

The supply of urban workers is the sum of existing urban workers and rural-to-urban migrants. Urban workers are either employed by a firm in the manufacturing sector or self-employed in the informal sector. In the model, manufacturing employment is a function of manufacturing labour demand, the efficiency of the job–worker matching process, and the supply of urban workers. The model allows workers in the urban informal sector also to search for higher-paid jobs in the formal sector. Because of matching frictions in the formal sector, the model results in some workers being unsuccessful in their search for formal jobs, and, thus, they are left underemployed in the urban informal sector. Matching depends on the search efforts of the informal-sector workers and the number of vacancies.

The model assumes that all workers in the labour force are employed. This is not an unrealistic assumption as in developing countries lack of employment opportunities is more likely to result in precarious employment than in unemployment.[12] In our model informal urban employment reflects a form of precarious employment, as those informally employed in urban areas have the combined disadvantage of low incomes and high costs of living. In the model the share of urban informal workers in the total labour force thus provides a measure of precarious employment. A reduction in this share can be interpreted as an improvement for workers.

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[11] This model combines elements of the Harris–Todaro model of rural–urban migration with Mortensen–Pissarides labour market matching frictions.

[12] The pool of unemployed in the standard Mortensen-Pissarides model corresponds to informal urban employment in the Satchi-Temple model used here.

Table 1.5: Qualitative labour market implications of an increase in agricultural productivity in the Satchi–Temple model

Labour market indicators:	**Effect**
Urban labour force	–
Share of agricultural workers in total labour force	+
Share of urban informal workers in urban labour force	–
Share of urban informal workers in total labour force	–
Agricultural wage	+
Manufacturing wage	+
Manufacturing to agriculture wage ratio	–
Search effort	+

Notes: Adapted from Satchi and Temple (2009). Results are for the version of the model with a closed capital account and wage bargaining instead of efficiency wages.

Table 1.5 shows the effects of an increase in agricultural productivity in qualitative terms. A rise in agricultural productivity reduces the urban labour force because of increased urban-to-rural migration. The ratio of urban informal workers to urban manufacturing workers also falls because migrants are assumed to leave from the urban informal sector rather than from the manufacturing sector. Interestingly, wages in both agriculture and manufacturing rise; agricultural workers are more productive, while manufacturing workers can bargain up their wages, given the smaller pool of urban workers.[13] However, the increase in the wages of agricultural workers outweighs that of manufacturing workers, leading to a drop in the manufacturing-to-agricultural wage ratio. The higher manufacturing wage, nevertheless, causes the remaining urban informal workers to intensify their search for formal manufacturing jobs.

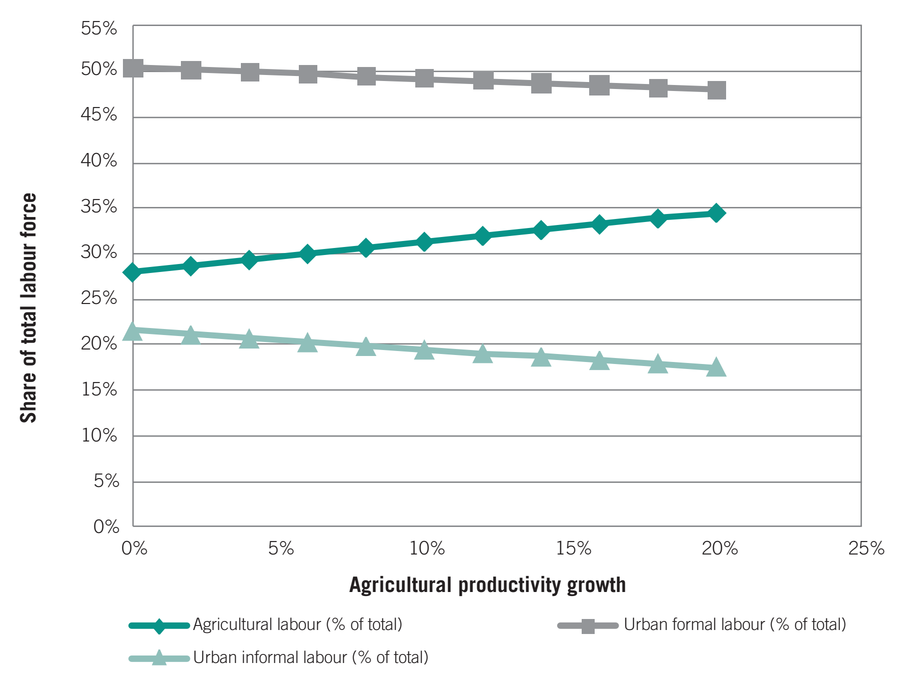
To gauge magnitudes, Satchi and Temple (2009) calibrate their model using data from Mexico. As shown in figure 1.4, they find that, for a 20 per cent increase in agricultural productivity, the share of informal workers in the total labour force falls from a baseline of 22 per cent to 18 per cent. The drop in informal employment is mainly because workers are drawn to agriculture, where the employment share rises from 28 per cent to 34 per cent. There is also a drop in the share of formal manufacturing workers (i.e. from 50 per cent to 48 per cent) because manufacturing wages rise. There is a drop in the wage ratio between manufacturing and agricultural wages

[13] The version of the Satchi–Temple model with an open capital account makes the extreme assumption that the economy is perfectly integrated into international capital markets. This assumption implies that the exogenous international return to capital fixes the domestic capital-to-labour ratio and all domestic factor returns. Hence, the ratio of urban informal workers to the urban manufacturing labour force and agricultural and manufacturing wages would not change.

from 1.80 to 1.76, which reduces income inequality. However, for a hypothesized productivity increase that would take about 20 years, the effects on employment structure and the reduction in urban informality do not seem significant.[14]

However, Mexico – as Satchi and Temple (2009) note – is a middle-income country, and its economic structure may not be representative of other developing countries. In particular, the authors use 28 per cent as the baseline share of agriculture in total employment and 22 per cent as the baseline share of informal employment. As stated in section 1.2, the average share of agricultural employment as a part of the total economically active population is about 48 per cent. Bacchetta et al. (2009) compute the incidence of own-account and unpaid family workers relative to total employment (i.e. an indicator of the share of informal employment) in developing countries and find that it was approximately 60 per cent in 2007. As there is an overlap between agricultural and informal employment in developing countries, the true shares in developing countries generally would be lower than indicated by these statistics but still higher than those for Mexico.

Figure 1.4: Impact of agricultural productivity growth on the structure of employment, Mexico

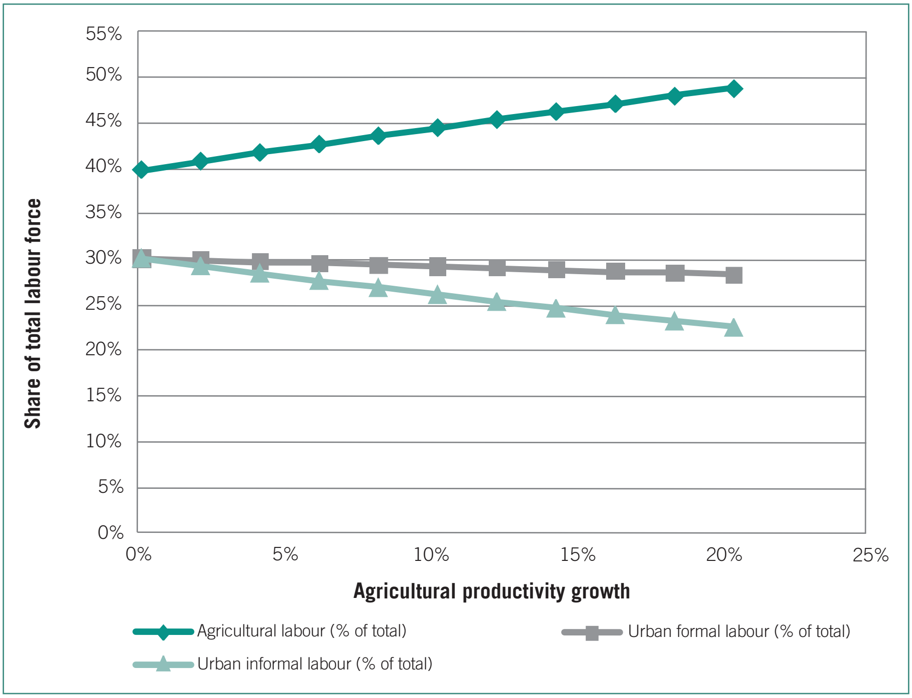


Notes: Authors' calculations. These are for the "closed economy" version of the model. The baseline agricultural employment share is 28 per cent, and the baseline informal employment share is 22 per cent.

[14] For Mexico, Klenow and Rodriguez Clare (1997) estimate an annual economy-wide productivity growth of 0.95 per cent. Hence, a 20 per cent productivity improvement would take 19.28 years.

To estimate the impact of agricultural productivity growth on a more representative developing country, we use baseline shares of 40 per cent and 30 per cent for agricultural and informal employment, respectively. Figure 1.5 depicts our simulation results. For a 20 per cent increase in agricultural productivity, there is an 8 percentage point drop in the share of urban informal workers in the total labour force (i.e. from a baseline of 30 per cent to 22 per cent). This is double the effect found for Mexico. The agricultural employment share rises from 40 per cent to 49 per cent, while the share of formal manufacturing workers drops by 2 percentage points, from 30 per cent to 28 per cent. The magnitude of contraction in formal manufacturing employment is almost the same as in the Mexican case. The ratio between manufacturing and agricultural wages falls from 1.80 to 1.77, which is slightly less than in the Mexican case but still reduces income inequality. These results show that, for the typical developing country, growth in agricultural productivity may be a potent means for reducing informal employment, relieving urban congestion, and decreasing income inequality. These effects appear to be strongest in developing countries with larger initial shares of the labour force in agriculture and informal employment.

Figure 1.5: Impact of agricultural productivity growth on the structure of employment, representative developing country



Notes: Authors' calculations. These are for the "closed-economy" version of the model. The baseline agricultural employment share is 40 per cent and the baseline informal employment share is 30 per cent.

The simulation results are consistent with theoretical and empirical findings in the literature on the impact of agricultural productivity growth on developing-country employment. In a theoretical model Ghose (2006) shows that agricultural growth cannot be neglected if employment conditions in labour-surplus economies are to improve. Headey et al. (2010) find that agricultural development (or a lack of it) has determined the differential pace and pattern of changes in the employment structures of Asia and Africa. From a broader development perspective, there is also empirical evidence that agricultural productivity growth reduces poverty.[15] Agriculture, the evidence shows, has larger multiplier effects on the rest of the economy than the non-agricultural sector (Vogel, 1994). Its multiplier effects are stronger in the rural non-farm sector than in other sectors (Lanjouw and Lanjouw, 2001). Each dollar of additional value added in agriculture generates US$0.60 to $0.80 of additional rural non-farm income in Asia and $0.30 to $0.50 in Africa and Latin America (Haggblade et al., 2007).

1.3.2 Agricultural innovation and new technologies

The previous section showed that agricultural productivity growth could have significant effects on the employment structures of developing countries. This begs at least two questions: (i) Are agricultural productivity improvements biased towards saving labour? and (ii) What determines agricultural innovation? The literature on these interrelated questions is extensive, and the dominant perspective is that of "induced innovation" (Binswanger and Ruttan, 1978; Hayami and Ruttan, 1985). Innovation is induced by the relative scarcity of an input, which provides a profit incentive for developing new technologies to substitute relatively abundant inputs for the scarce input.[16]

Land is a primary input for agriculture. Its suitability for cultivation and its distribution among the population determine how much of it is available and accessible to farmers. In developing countries, where arable land is limited and its distribution usually skewed, land is a relatively scarce input for most farmers. Agricultural productivity growth would, therefore, be mainly through innovations that make more land available or enhance the available land. These innovations would be in farming methods (e.g. irrigation improvements, crop rotation), materials (e.g. high-yield seeds, fertilizer), or machines (e.g. tube wells, pumps, mechanical threshers). So, "induced innovation" for developing-country agriculture would, in theory, be directed at saving land. For a given level of agricultural output and at constant input prices, the ratio

[15] See Christiaensen et al. (2011) for a literature review and empirical analysis of poverty reduction from agricultural productivity growth in low-income countries.

[16] For example, in the US – where labour is relatively scarce compared with land – agricultural innovation has been directed at producing labour-saving farm machinery. This has benefited Brazil, whose labour-to-land ratio is closer to that of the US, but not Bangladesh, where land is relatively scarce compared with labour.

of land to labour (or to any other input) used in production would fall. If the efficiency gains from the land-saving innovation lowered the cost and price of agricultural output and raised the quantity demanded of agricultural goods, there would be increased demand for labour.

While scarcity may be an important underlying factor for induced innovation, the emergence of new innovations requires technical feasibility and new scientific knowledge as well as the right institutional setting to provide the background for innovation activities (Sunding and Zilberman, 2001). Barrett et al. (2010) observe that many agricultural technological breakthroughs "emerged not from profit-seeking induced innovation but rather from scientific research following the non-profit motives of philanthropists, scientists, and governments". Before 1990 agricultural research and the innovations that flowed from it were driven predominantly by investments from the public sector. Moreover, in developing countries, Fan and Rao (2003) found, public spending on agricultural research had a larger impact on agricultural productivity than non-research expenditures (i.e. irrigation, roads, or subsidies for power and farm inputs). However, since 1990, the private multinational sector has become the main player in the supply of new agricultural technologies.[17]

Will developing-country farmers benefit from the privatization trend in global agricultural research and development? There is doubt that subsistence farmers will benefit, but there may be gains for larger-scale developing-country farmers (Pray et al., 2007). Multinationals are expected to focus efforts on modifying crops for application to the different agricultural settings of developing countries because the costs of adaptation are lower than the costs of generating knowledge on useful genes and engineering transgenic plants. However, a private-sector focus on the technological needs of developing-country agriculture is predicated on the ability to appropriate profits, which depends on governance institutions. Weak property rights regimes and judicial systems in developing countries may limit the profitability of serving developing-country agricultural markets. There is also a concern that the global consolidation of the bioscience industry may cause multinationals to exploit their proprietary agricultural technologies for higher profits at the expense of farmers.

Besides agricultural research, the empirical literature identifies other important determinants of agricultural innovation in developing countries. Avila and Evenson (2010) identify the adoption of modern Green Revolution varieties, increases in schooling of the labour force, and increases in nutrition as significant factors in raising agricultural productivity. Headey et al. (2010) find that pro-agricultural price policy reforms and distance to the nearest Organisation for Economic Co-operation and Development (OECD) country are significantly correlated with agricultural productivity growth. Restuccia et al. (2008) run simulations using a model of agricultural

[17] Pingali and Traxler (2002) report that in 1998 the world's top ten multinational bioscience corporations collectively spent almost US$3 billion on agricultural research and development whereas the largest developing-country programmes in China, India, and Brazil spent less than half a billion each.

productivity differences across countries and find that distortions to agricultural factor prices caused by government policies discourage farmers in poorer countries from using modern inputs to improve agricultural productivity. These findings reveal that links to global markets and the policies that affect them play a pivotal role in the transfer and adoption of more productive farm technologies in developing countries.

1.4 DEVELOPING-COUNTRY AGRICULTURE AND GLOBAL MARKETS

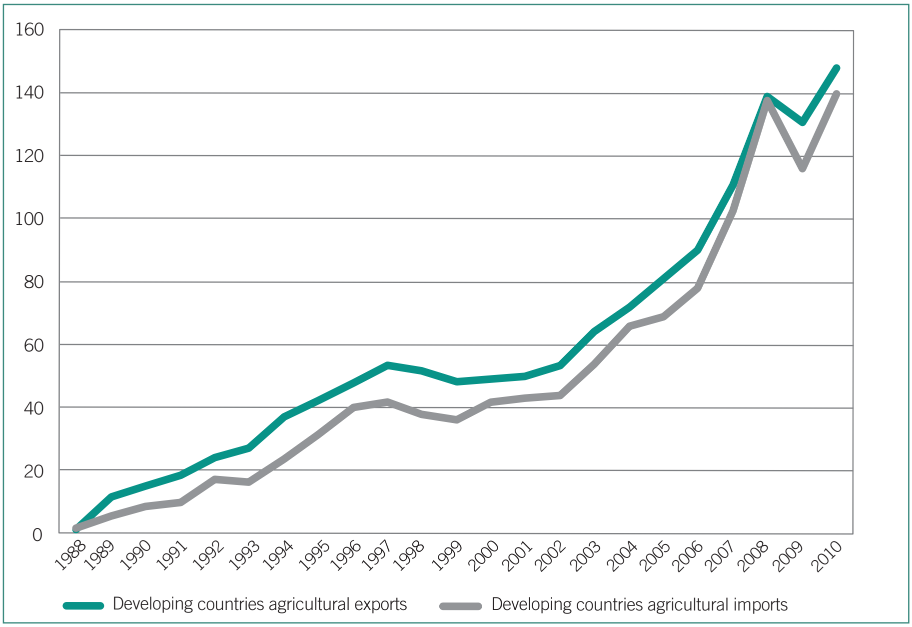
Developing countries have increased their participation in global agricultural markets over the past 25 years. In 2010 low- and middle-income countries accounted for 43 per cent of world agricultural exports, whereas 20 years earlier their share was 37 per cent. As shown in figure 1.6, from 1988 to the present, the value of developing-country agricultural trade has grown by a factor of 140, and, as a group, developing countries have been net agricultural exporters in every year since 1988. The values of developing-country agricultural exports and imports in 2010 were US$148 billion and US$140 billion, respectively, implying a US$8 billion surplus. Table 1.6 lists the 2010 developing-country trade balances for 11 agricultural commodities.[18] Just two categories account for the surplus: crops not elsewhere classified (nec), and vegetables, fruits, and nuts.[19] As a group, the developing countries were a net importer in all other categories, with the largest deficits in oil seeds and wheat. Developing countries have seen their traditional agricultural exports (e.g. coffee, tea, bananas, natural rubber, sisal) decline, while agricultural imports of cereals, livestock products, vegetable oils, and sugar have expanded, mainly to satisfy domestic demand for food.

The aggregate figures, however, hide considerable heterogeneity in agricultural trade positions between and within developing regions. Figure 1.7 shows that the developing-country trade surplus in agricultural commodities has been driven by the strong export performance of countries in Latin America and the Caribbean. Sub-Saharan Africa has also recorded agricultural trade surpluses for more than two decades. South Asia's record is mixed, with trade surpluses in the 1990s, trade deficits for most of the 2000s, and a return to trade surpluses since 2008. East Asia and the Pacific and the Middle East and North Africa have consistently recorded trade deficits since 1994. Within each region, agricultural trade positions vary from one country to another. In Latin America and the Caribbean, the continental countries, particularly

[18] A detailed breakdown for each activity can be found at: https://www.gtap.agecon.purdue.edu/databases/contribute/detailedsector.asp

[19] Crops nec include: live plants; cut flowers and flower buds; flower seeds and fruit seeds; vegetable seeds, beverage, and spice crops, unmanufactured tobacco, cereal straw and husks, unprepared, whether or not chopped, ground, pressed or in the form of pellets; swedes, mangolds, fodder roots, hay, lucerne (alfalfa), clover, sainfoin, forage kale, lupines, vetches, and similar forage products, whether or not in the form of pellets; plants and parts of plants used primarily in perfumery, in pharmacy, or for insecticidal, fungicidal, or similar purposes; sugar beet seed and seeds of forage plants; and other raw vegetable materials.

Figure 1.6: Total developing-country exports and imports of agricultural commodities, 1988–2010 (in US$ billions)



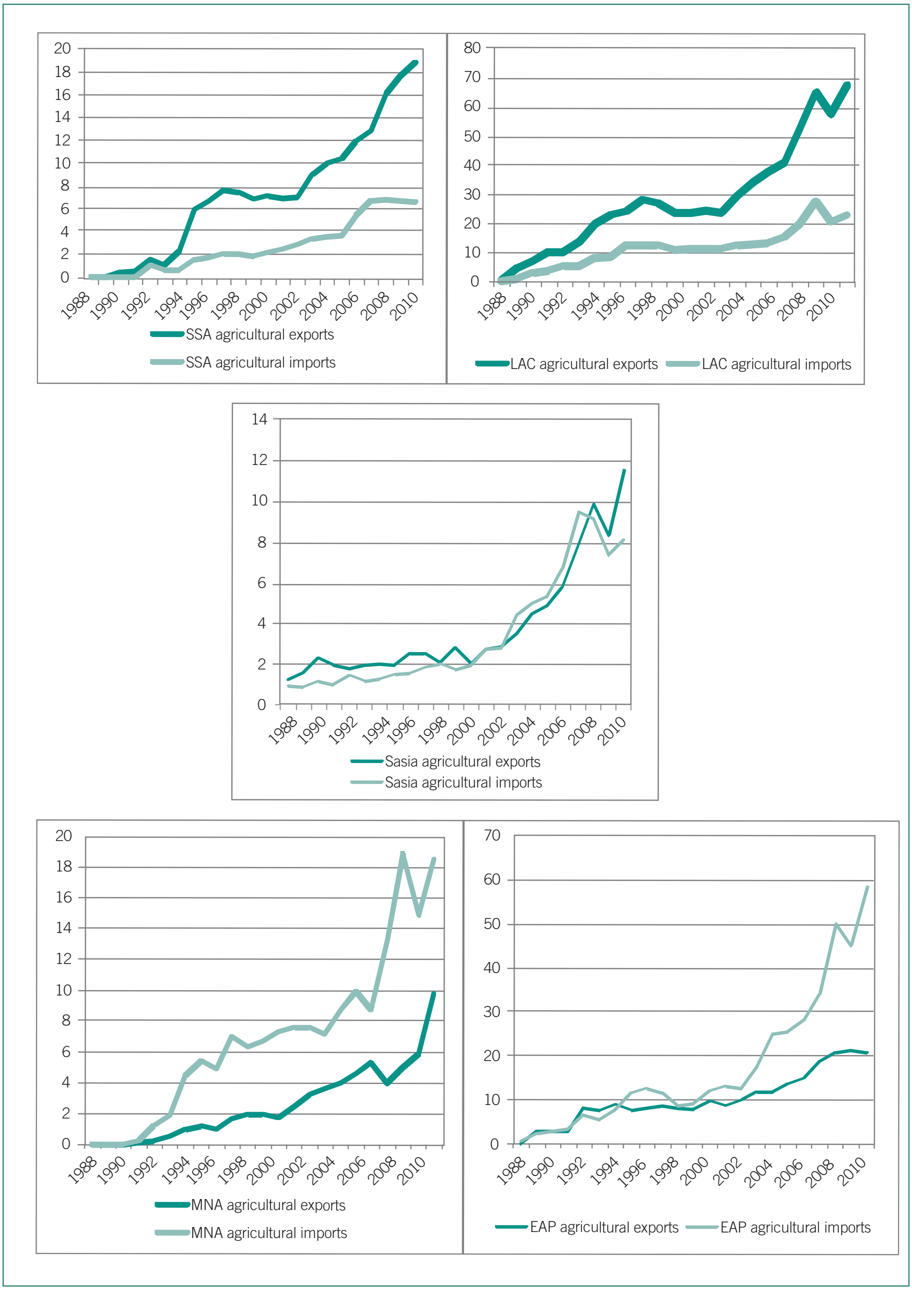
Source: UNComtrade (2012).

Table 1.6: Developing countries' net agricultural trade position by commodity, 2010 (US$ million)

Sectors	Exports minus Imports
Paddy rice	–302.53
Wheat	–12'083.44
Cereal grains nec	–2'500.00
Vegetables, fruit, nuts	21'500.00
Oil seeds	–13'400.00
Sugar cane, sugar beet	–0.36
Plant-based fibres	–6'520.99
Crops nec	23'600.00
Cattle, sheep, goats, horses	–1'139.90
Animal products nec	–289.80
Wool, silk-worm cocoons	–1'751.64

Source: UNComtrade (2012).

Figure 1.7: Developing-country exports and imports of agricultural commodities by region, 1988–2010 (in US$ billions)



Source: UNComtrade (2012).
Note: SSA=sub-Saharan Africa; LAC=Latin America and the Caribbean; Sasia=South Asia; MNA=Middle East and North Africa; EAP=East Asia and the Pacific.

Brazil, have strong net export positions, whereas the Caribbean islands are net importers. In sub-Saharan Africa, East African countries are net exporters, but West African countries have agricultural trade deficits. In South Asia India is a net exporter, whereas Bangladesh and Nepal are net importers. In East Asia and the Pacific, Malaysia, Thailand, and Vietnam have agricultural trade surpluses, but China and other East Asian countries run agricultural trade deficits.

The exceptional agricultural export performance of some developing countries masks the fact that, at present, most developing countries are net importers of agricultural commodities. Although numerous developing countries possess an endowment-based comparative advantage in agricultural production, several factors inhibit their willingness and ability to penetrate global agricultural markets:

1. Since development policy has prioritized industrialization, the export profiles of developing countries have increasingly been oriented towards manufactured goods.
2. As discussed in section 1.3, a neglect of agriculture has caused agricultural productivity to remain low and lag behind other sectors.
3. Population growth and rising incomes in developing countries have increased demand for food and focused agricultural policy on satisfying domestic food requirements.
4. Infrastructural problems (transport and communications) in many developing countries (particularly in the least-developed ones) continue to impede the access of agricultural producers to global markets.
5. Global agricultural commodity markets are now saturated, and the presence of so much competition discourages entry by new developing-country producers. The problem is compounded by farm subsidies and farmer income support in industrialized countries that artificially increase agricultural supply.
6. Agricultural tariffs (with the exception of trade preferences for the least developed countries) and non-trade barriers remain high, which reduces demand for agricultural imports. Compliance with non-trade barriers, particularly quality and sanitary and phytosanitary standards, may be difficult or impossible for developing-country producers to overcome, in which case trade preferences may be useless.
7. A lack of marketing knowledge and an absence of connections with global supply chains limit most developing-country farmers to their domestic markets.
8. Lastly, the scarcity and high cost of trade finance and insurance prohibit international transactions or make the management of transaction risk difficult.

1.4.1 Agricultural trade policies and domestic measures

In trade negotiations agriculture has been a contentious sector. Multilateral and regional trade agreements often exclude agriculture because it is politically sensitive given its links with food security and rural development. Agricultural tariffs and non-tariff barriers remain high both in developed and developing countries, with developing countries having large gaps between bound and applied tariff rates.[20] There are direct incentives for agricultural exports in developed countries (e.g. export refunds in the European Union (EU) and the GSM 102 and GSM 103 programmes in the United States). In an analysis of the World Trade Organization (WTO) Agreement on Agriculture and its effects on agricultural trade liberalization, Hoda and Gulati (2008) asserted that expectations for the agreement were meagre and its effects were limited since the most heavily protected products had experienced no liberalization.

Besides protection through trade policies, farmers also receive direct production subsidies and income support. Developing countries perceive these measures as "unfair", given their fiscal constraints, and the agricultural producers among them are frustrated by lower world agricultural prices caused by these subsidies. Governments have used trade policies and domestic measures to directly affect the prices and quantities of farm outputs and inputs or to indirectly affect agricultural markets through measures on non-agricultural commodities. Anderson (2010) describes the pattern of these interventions in a recent major global study on agricultural price distortions. He states that:

> … poor countries tax farmers, rich countries protect them, and as countries become less agrarian in the course of their development, their policies transition from the former to the latter – and to a greater extent and earlier the weaker a country's agricultural comparative advantage. The agricultural policy regimes thus also have an antitrade bias. [p. 9]

Anderson and his collaborators have produced a database on agricultural price distortions in 64 countries over the last five decades. The key category of statistics in their database is the nominal rate of assistance (NRA), which is defined as the percentage by which government policies have raised gross returns to farmers above what they would be without the government's intervention (or lowered them, if the NRA is less than 0).[21] From these data Anderson's project distils numerous important facts on agricultural price distortions, many of which concern developing countries. Among these are:

1. The average NRA for developing countries as a group moved from negative in the 1960s and 1970s to positive in the early 2000s.
2. The NRAs on certain agricultural products (sugar, rice, and milk) still remain high in all countries.
3. The NRA on cotton is high in developed countries, while cotton output is, effectively, taxed in developing countries.

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[20] Besides ad valorem tariffs, trade protection in agriculture can take the form of specific tariffs, mixed tariffs, tariff rate quotas, sanitary and phytosanitary (SPS) restrictions, price bands, licensing, standards, prohibitions, and state trading monopolies.

[21] An import subsidy or export tax would tend to reduce the NRA, while an import tariff or export subsidy would tend to raise the NRA.

4. Measures that affect agricultural prices have become less anti-trade mainly because of a decline in export taxes on agricultural commodities.
5. NRAs for import-competing agricultural producers have increased for developing countries as a whole, mainly because of import tariffs.
6. Trade policy instruments (i.e. export and import taxes, subsidies, and quantitative restrictions and dual exchange rates) account for at least 60 per cent of the agricultural NRAs in all countries and more in developing countries.[22]
7. Domestic subsidies on farm inputs and support for public agriculture research have not significantly offset the effective taxation of developing-country farmers.

The last three facts are consistent with the conjecture that developing countries use trade policy because it is simply easier to administer than domestic taxes or subsidies. Moreover, compared with non-agricultural trade, agricultural trade remains largely unconstrained by WTO rules, and constraints on agricultural import and export taxes and subsidies are not binding (although there are disciplines on agricultural import quotas). Mainly to raise revenues, developing-country governments tend to impose import and export taxes. The latter have depressed domestic prices of farm output in developing countries relative to world prices, effectively hurting developing-country farmers.

Gawande and Hoekman (2010) conduct a political-economy analysis of developing-country agricultural trade policies. They find that countries with a larger percentage of arable land and bigger rural population shares tend to impose agricultural export taxes.[23] This lowers agricultural prices for domestic consumers at the expense of farmers. A larger proportion of arable or irrigated land is associated with import subsidies, which also lower agricultural prices. They also find that, for staple foods, as import penetration rises, governments are more likely to impose import tariffs rather than import subsidies. Import tariffs are also more likely when there is greater electoral competition, as governments cater to the special interests of landowners and import-competing producers. Further, they provide evidence that governments increasingly subsidize cash crops but tax food crops as export-to-output ratios increase. The taxation of food exports may be motivated by a food-security objective.

There is evidence that tariff reductions and preferences for developing countries may not improve their export shares because supply-side constraints and non-tariff measures remain. In agriculture non-tariff barriers may be the main obstacle. For example, under WTO rules, sanitary and phytosanitary (SPS) measures may be used to prevent agricultural imports if they pose a health risk. Disdier and Van Tongeren (2010) study non-tariff measures (NTMs) imposed by governments in OECD member

[22] Under the dual-exchange rate arrangement, exporters are obliged to sell all or part of their foreign exchange to the government at a lower price, hence effectively taxing exports.

[23] This may be related to McMillan's (2001) hypothesis that governments will take advantage of sunk-cost commitments made by farmers and landowners and tax them for revenue.

countries on several hundred agri-food products. Their data suggest that these measures affect developing countries more than OECD countries themselves: Some 84 per cent of developing and emerging countries' exports to OECD countries are subject to NTMs, compared with 76.7 per cent of exports between OECD countries.

1.4.2 Agricultural terms of trade and price volatility

In the 1950s Prebisch and Singer famously postulated that the terms of trade of primary commodities (agriculture and minerals) would deteriorate over the long term relative to industrial goods. The theoretical explanations offered included a low income elasticity of demand for primary commodities, a lack of differentiation and stiffer competition among primary commodity producers, and surplus labour in countries that produce primary commodities, which keeps prices low. The Prebisch–Singer proposition was an important basis for the agro-pessimism that shaped development thinking and the policies that promoted industrialization. Their terms-of-trade hypothesis has been tested by many time-series studies, with mixed results.[24] Using a new dataset on 25 primary commodities (14 of which are agricultural) over several centuries, Harvey et al. (2010) find evidence for a secular decline in the prices of 11 commodities and a zero trend for the rest.[25] Their results imply that an export dependency on primary commodities is detrimental to the long-term growth of developing countries. Regarding agriculture, countries could benefit by exploring potential diversification into niche agricultural crops to avoid the commodity trap.

Shocks to agricultural markets are often translated into large price swings because quantities demanded and supplied of agricultural output tend be somewhat fixed. Agriculture is particularly prone to shocks and high price volatility because of fickle weather conditions and energy prices.[26] As Headey (2011) describes, global markets can multiply the sources of shocks to agricultural markets. Cyclical movements in global agricultural supply and demand, changes in foreign trade restrictions and agricultural measures, exchange rate movements, and commodity speculation all amplify price volatility in international markets. Increased exposure to global markets has made it more difficult for developing-country governments to smooth revenue flow for their farmers. Private-sector provision of insurance is still missing or limited in developing countries. The increased riskiness of agriculture due to global markets reduces the sector's viability as a source of income and employment and complicates planning. There have been proposals (see UNCTAD, 1972 and 1976) to create a global "common fund" that would manage unstable demand for primary commodities using a counter-cyclical buying or selling strategy, but there is scepticism as to the

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[24] For summaries of this literature, see Greenaway and Morgan (1999) and Cuddington et al. (2007).

[25] The 11 commodities are: aluminium, coffee, hide, jute, silver, sugar, tea, tobacco, wheat, wool, and zinc. The other commodities (banana, beef, coal, cocoa, copper, cotton, gold, lamb, lead, nickel, oil, pig iron, rice, and tin) all reveal a zero trend.

[26] Agriculture is linked to energy markets on the input side (fertilizer and transportation) and the output side (biofuel).

feasibility of such an institution and how effective it would be in the face of supply-side fluctuations.

Recent episodes of price volatility have been characterized by particularly high price hikes, triggering the use of the term "the food, fuel, and financial crisis" to describe the effects of price movements in the 2008–09 period. High prices in food markets even sparked riots in a number of countries because food became unaffordable for ordinary people. This has led to a renewed interest in food security, i.e. access to food for all people.[27] In the past the concept of food security in the context of trade was more associated with the concern that countries depending on imports may lose access to food if they are suddenly cut off from international food supplies, for instance, in the situation of war. To reduce such risks, some considered it important for countries to maintain a certain level of self-sufficiency in food supply. The current debate is rather different, as it is not linked to a hypothetical situation but rather to an existing one. It is also different because current concerns about food security are not necessarily provoked by an existing lack of supply but instead by the fact that high prices make food unaffordable. In this context a number of studies have analysed whether the volatility observed in recent years is exceptional or the reflection of an increase in price instability. Both the International Monetary Fund (2009) and the World Bank (2010) warn that food price volatility may well increase in the future, with increasing speculation in commodity markets being one of the possible drivers of the phenomenon.[28]

1.4.3 Regional trade agreements[29]

Since the Doha Round of trade negotiations has been at a standstill, governments have been pursuing their objectives for trade liberalization at the regional level. The number of regional trade agreements (RTAs) concluded since the early 1990s has grown exponentially. Most RTAs cover not just the removal of intra-regional trade barriers but also harmonization of national policies and measures to increase factor mobility. The welfare effects of RTAs are theoretically ambiguous; hence, the desirability of these agreements is an empirical issue.[30]

Agricultural trade has been either excluded from RTAs or governed by different rules than non-agricultural trade, and for the same reasons as in multilateral negotiations.[31] The role of agriculture in providing food, energy, and, in the case of developing countries, a significant source of employment and income makes countries

[27] See FAO (2003) for a definition and Maxwell (1996) and Maxwell and Smith (1992) for further discussions of concepts.

[28] See also UNCTAD (2008, 2009) on this topic.

[29] The term "regional trade agreements" is used interchangeably with preferential trade agreements between countries that may or may not be geographically contiguous.

[30] See Plummer et al. (2010) for a review of methods for the economic assessment of preferential trade agreements.

[31] See also the discussion in chapter 2 of this volume.

wary of agricultural trade liberalization. However, several studies (Furtan and van Melle, 2004; Grant and Lambert, 2008; Vollrath et al., 2006; Zanhniser et al., 2002) find that the formation of RTAs tends to increase intraregional trade in agriculture. Grant and Lambert (2008) study trade flows from seven RTAs in the period 1982 to 2002 and find that there were significant increases in agricultural trade in all the RTAs except for the South–South RTAs (i.e. Mercosur and ASEAN). Larger increases occurred in agricultural than in non-agricultural trade in all the RTAS except for ASEAN.[32] Despite the evidence for increased intra-regional trade in agriculture, Jayasinghe and Sarker (2008) find that, in the case of NAFTA, agri-food trade with non-members fell, implying trade diversion. In sum, these studies show that RTAs can be effective in dismantling agricultural trade barriers and increasing agricultural trade, at least between partners, although partnership with a Northern member may be required.

Many developing countries, particularly the least developed ones, already have preferential access to developed-country markets for their agricultural exports. Agreements such as the Generalized System of Preferences (GSP) and the Lomé and Cotonou agreements between the EU and former colonies in Africa, the Caribbean, and the Pacific (ACP), the US Africa Growth and Opportunity Act (AGOA), Caribbean Basin Economic Recovery Act (CBERA), Andean Trade Preference Act (ATPA), and others offer positive discrimination, without which developing-country agricultural exports might not be competitive. Although the uptake in these programmes has been unimpressive, they may be the only way for the least developed countries to benefit from trade. Muhammad et al. (2010) study the effects of the EU's Generalized System of Preferences Plus (GSP+) incentive scheme on EU imports of cut flowers from Colombia and Ecuador.[33] They estimate that without this scheme EU flower imports from both countries would fall. However, they find that, given Colombia's dominance of the EU flower import market, a removal of trade preferences for Colombia would also reduce flower imports from other countries, indicating a degree of complementarity. Flower imports from Ecuador, which has a small share of the market, would be replaced by flowers from other countries.

The exclusion of selected agricultural commodities from RTAs is linked to domestic support measures. Hasha (2001) finds that, in the EU's RTAs with non-EU countries, agricultural commodities that receive domestic support under the Common Agricultural Policy (CAP) are excluded. Matthews (2011) notes that the tariff liberalization schedules in the ACP agreements exempt many food staples from liberalization. Burfisher et al. (2002) note that the US GSP and other preferential arrangements for

[32] The seven RTAs studied are: the North American Free Trade Agreement (NAFTA), the Canadian–US Trade Agreement (CUSTA), the European Union (EU), Common Southern Market (Mercosur), the Andean Pact, the Association of South East Asian Nations (ASEAN), and New Zealand–Australia Closer Economic Relations (CER).

[33] As of March 2012, Colombia and Ecuador are beneficiaries of GSP+, which offers developing countries tariff-free access to the EU if they ratify and implement relevant international conventions for sustainable development and good governance.

developing countries do not cover agricultural commodities such as sugar and dairy, which are linked to US domestic support programmes. As reforms of these programmes would benefit all trading partners, multilateral rather than regional negotiations would be appropriate. RTAs could be helpful, however, in promoting harmonization of support policies and providing the initial impetus for domestic reform.

1.5 TRADE LIBERALIZATION AND AGRICULTURAL LABOUR MARKETS

To date, almost all empirical studies that relate trade liberalization to employment focus on the manufacturing sector.[34] This bias may be due to the availability of data, but it is also because agriculture has mainly been excluded from trade negotiations and because of the prevalent belief that agriculture cannot be a leading sector in development and in employment creation. Studies on the manufacturing sector generally find that trade liberalization has a limited impact on the wages of manufacturing workers and the numbers of manufacturing jobs.[35] The dominance of one or a few firms in different manufacturing activities and entry barriers are possible explanations for the dampened employment response to trade liberalization.

Agricultural employment, as discussed in section 1.2, comprises a significant share of informal and temporary work.[36] The fact that many agricultural workers are unregistered means that labour market regulation is not broadly applicable in the sector. In addition, constant returns to scale in farming and the presence of many farmers and farm workers create substantial competition in the agricultural sector. These key differences from the manufacturing sector imply that, a priori, labour-market responses in agriculture may not be small. One recent empirical study of NAFTA's impact on agricultural workers in Mexico finds that there was an insignificant change in the wages of Mexican agricultural workers but a clear effect on employment. Prina (2012) finds that employment increased in agricultural activities for export (vegetables) and fell in those that were import-competing (corn). Furthermore, the employment effect was stronger in regions closer to the US–Mexican border, i.e. regions that had higher trade exposure. Her results imply that agricultural workers were mobile across agricultural activities and that skills were not crop-specific.

The employment effects of high-value agricultural trade, particularly in horticulture, are the subject of several studies (see von Braun et al. (1989) for Guatemala; and Neven et al. (2009) for Kenya). These studies find that high-value horticultural exports tend to increase the use of hired labour on farms. Other studies of the hor-

[34] For an overview of recent empirical literature, see McMillan and Verduczo (2011).

[35] Wacziarg and Wallack (2004) and Papageorgiou et al. (1991) find that trade reforms in isolation have no effects on movements of labour between sectors (broadly defined). They do find some small and weak evidence for movements of labour between activities within the manufacturing sector.

[36] See Sinha (2011) for a more general discussion on trade and informality.

ticultural export sector go further, analysing impacts on poverty. They find that employment in the horticultural export industry helps alleviate poverty (see McCulloch and Ota (2002) for Kenya; Barron and Rello (2000) for Mexico; and Maertens and Swinnen (2009) for Senegal). Further, they find that high-value horticultural export production can increase employment and the incomes of communities and of rural households that are involved in this type of export, either as small contract farmers or hired workers on agro-industrial estates. This observation contradicts the critique that large-scale farming marginalizes small businesses and poor households and benefits only multinationals and the elite of developing countries. In this case there is a positive impact on poverty because export demand creates employment opportunities, particularly for rural households without land or other assets, and, to some degree, the export price premium filters down to farm workers' wages.

In 2005 there was a spate of publications presenting ex–ante simulation assessments of the impact of agricultural trade reform in the context of the Doha Round of trade negotiations (Anderson et al., 2006; Bouet et al., 2005; Fabiosa et al., 2005; Polaski, 2006; Van der Mensbrugghe and Beghin, 2005). A few of these studies report results on employment and wages. Table 1.7 is reproduced from the study by Anderson et al. (2006). Their simulations used the World Bank's LINKAGE model – which is a global, dynamic applied general equilibrium model – to predict the effects of full global trade liberalization (agricultural and manufactured goods but not services). They also used a partial liberalization scenario modelled according to the Doha Work Program's July Framework of 2004.[37]

Table 1.7: Linkage model simulation of impact of global trade liberalization on agricultural employment in developing countries (average annual percent growth), 2005 to 2015

	Employment growth		
	Baseline	**Full global liberalization**	**Partial liberalization**
Developing countries	1.0	1.2	1.1
East Asia and Pacific	–0.5	–0.8	–0.5
South Asia	1.5	1.4	1.5
Europe and Central Asia	2.3	2.6	2.4
Middle East and North Africa	1.7	3.4	2.4
Sub-Saharan Africa	0.2	0.0	0.2
Latin America and Caribbean	0.4	1.9	1.0

Source: Extracted from table 12.17 in Anderson et al. (2006).

[37] This scenario (number 7 in their list of experiments) entails agricultural and manufacturing trade liberalization with lesser cuts for developing countries and no reform by least-developed countries.

As table 1.7 shows, their simulation projects that annual employment growth in developing-country agriculture would accelerate by 0.1 per cent under the partial liberalization scenario and by 0.2 per cent under the full global liberalization scenario. To give these numbers some economic significance, consider that overall employment growth in developing countries was about 2 per cent per year from 2000 to 2008 and has since decelerated to 0.5 per cent per year. Given that agricultural jobs account for half of all employment in developing countries, the predictions above suggest that trade liberalization could provide an important boost, in the present context, to labour absorption in developing countries. This effect will not be even. Table 1.7 shows that employment gains in developing countries will be strongest in Europe and Central Asia, the Middle East and North Africa, and Latin America and the Caribbean. Employment growth as a result of trade liberalization is predicted to be slower in East Asia and the Pacific, South Asia, and sub-Saharan Africa.

In terms of wages Anderson et al. (2006) find that full trade liberalization would raise the real wage of skilled workers in developing countries by 3 per cent and that of unskilled workers by 3.5 per cent. As their model assumes perfect mobility of workers between sectors within each country, the wage effects are national. By assuming dual labour markets and imperfect mobility of unskilled workers between agriculture and other sectors in developing countries, Bouet et al. (2005) are able to estimate specific wage effects for unskilled agricultural workers. They simulate a Doha scenario, paying careful attention to agreed modalities in agriculture, and they find that changes in the real wage of unskilled agricultural workers range from –0.2 per cent to 1.4 per cent, which are less favourable than the estimates of Anderson et al. (2006). Polaski (2006) distinguishes three types of labour – agricultural labour, urban low-skilled and urban high-skilled – and allows for unemployment among urban low-skilled workers. In a simulation of the WTO "Hong Kong" scenario, she finds that returns to agricultural labour would increase in all developing countries, with the exception of Bangladesh, which would experience a slight decrease.[38] China and Vietnam would experience the largest returns for agricultural labour: a 1.6 per cent increase in the case of China and a 2.5 per cent increase in the case of Vietnam. For developing countries as a group agricultural employment would barely increase (0.1 per cent). Agricultural employment would decline in Indonesia, India, the rest of South Asia, and Mexico.

Other studies look at the effects of trade liberalization on employment at the product level. Van der Mensbrugghe and Beghin (2005) focus on two particular activities: (i) cereal and sugar, and (ii) livestock and dairy. They find that global agricultural and food reform would increase the level of agricultural employment in the average developing country. They find that, of the two agricultural activities considered, trade liberalization in cereal and sugar has a stronger employment-creating potential for developing countries than liberalization in livestock and dairy.[39]

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[38] This so-called 'Hong Kong scenario' represents agreements reached at the WTO Ministerial Meeting in Hong Kong in December 2005 to achieve a comparable level of market access liberalization for agriculture as for nonagricultural goods.

[39] However, products such as sugar and dairy are typically excluded from trade agreements.

Table 1.8: Global Trade Analysis Project model (version 7): Simulation of impact of global trade liberalization on employment in selected agricultural activities in developing countries

	% change in unskilled employment	% change in skilled employment	Estimated change in unskilled employment level	Estimated change in skilled employment level	Total change in employment level
Paddy rice	0.68	0.78	1'598'903	13'045	1'611'948
Wheat	–4.08	–3.97	–6'518'880	–65'681	–6'584'561
Cereal grains nec	–1.37	–1.26	–3'408'805	–39'753	–3'448'558
Vegetables, fruit, nuts	1.05	1.16	13'502'486	152'829	13'655'315
Oil seeds	0.54	0.65	1'050'319	11'969	1'062'288
Sugar cane, sugar beet	3.30	3.41	2'697'104	24'467	2'721'571
Plant-based fibres	1.19	1.30	1'079'400	10'593	1'089'992
Crops nec	–0.83	–0.72	–2'731'279	–25'503	–2'756'781
Cattle, sheep, goats, horses	3.17	3.27	4'828'728	71'373	4'900'102
Animal products nec	0.61	0.71	2'849'709	32'781	2'882'490
Raw milk	–0.37	–0.27	–567'407	–5'833	–573'240
Wool, silk-worm cocoons	–11.23	–11.13	–2'985'864	–25'222	–3'011'086
Total			**11'394'414**	**155'066**	**11'549'480**

Source: Authors' calculations.
Notes: (i) The scenario is a removal of all manufacturing and agricultural import tariffs. (ii) Total initial agricultural developing-country employment is 1.3 billion. (iii) Initial employment in each agricultural activity is proportionate to the agricultural labour cost shares, as in the Global Trade Analysis Project (GTAP) 7 database. (iv) Developed and developing countries are distinguished according to the World Bank's classification.

To provide a more complete picture, we conduct some simulations of trade liberalization using the Global Trade Analysis Project (GTAP) model and version 7 of the GTAP database, which uses 2004 as the base year. For 12 agricultural activities we estimate the percentage and level changes in each activity's employment in developing countries given full global removal of all import tariffs. Table 1.8 shows our results. We find that in developing countries global trade liberalization creates larger numbers of agricultural jobs in horticulture (vegetables, fruits, and nuts) and livestock (e.g. cattle, sheep, goats, horses), while the wheat and cereal grains sub-sectors are likely to see the greatest job losses. The percentage changes for skilled and unskilled workers are the same in direction and almost equal in magnitude. However, the level changes in unskilled workers in each agricultural activity are much larger than for skilled workers due to the preponderance of unskilled workers in developing-country agricultural activities overall. The implication is that labour-market disruptions in developing-country agriculture will mainly be an issue of helping unskilled workers to adjust.

1.6 CONCLUSIONS AND POLICY IMPLICATIONS

Agriculture is the core economic activity of the majority of workers in developing countries, but it remains a low-productivity activity that provides meagre incomes for developing-country workers. This chapter has surveyed agricultural employment and production trends in developing countries, the role of productivity in developing-country agriculture, and the links between developing-country agriculture and global markets. Concerning agricultural employment and production, the key finding is that all developing countries have seen a decline in agricultural value added per agricultural worker over the past three decades because agriculture's share of GDP has fallen considerably. Despite this contraction, agricultural employment persists in developing countries because there are significant barriers to worker mobility. These barriers take the form, for instance, of lack of access to finance or of low skill levels. Workers who do manage to move out of agriculture often end up in the informal urban sector, where employment is precarious.

In studying the role that agricultural productivity plays in determining employment structure, our overall conclusion is that a productivity improvement in agriculture can achieve multiple employment objectives. In particular, higher agricultural productivity can increase the quality of work and the wages of agricultural workers, reabsorb workers from the informal sector back into the formal agricultural sector, and leave manufacturing employment relatively unaffected. These findings are particularly important for the least developed countries and developing countries. In these countries informal employment is rampant due to a premature exit from agriculture, and more productive work is unavailable or limited in the manufacturing and services sectors. As for the sources of agricultural productivity improvement, the literature indicates that technical innovations and modern inputs, when properly adapted to developing-country settings, can enhance labour and increase demand for agricultural workers rather than displace them. The effects of agricultural innovation, however, are conditioned by policies that affect the domestic and external markets for agricultural inputs and outputs.

Regarding the links between developing-country agriculture and global markets, recent studies clearly show the high degree of policy-induced distortions in agricultural markets in both developed and developing countries. Protectionist trade policies account for at least 60 per cent of these distortions. These policies artificially support agriculture, but, at the same time, they inhibit improvements in agricultural productivity in developing countries, obstruct the realization of agricultural export potential given resource-based comparative advantages, and hamper economic diversification and creation of employment opportunities in other sectors. Simulations of a Doha

Round agreement conducted by Anderson et al. (2006) estimate that multilateral trade liberalization could double agricultural employment growth from the current rate of 0.5 per cent to just over 1 per cent per annum. Our own simulations suggest that multilateral liberalization will affect developing-country agricultural employment unevenly; job creation is expected to be highest in horticulture and livestock, while the wheat and cereal grains sub-sectors are likely to see the greatest job losses. To maximize the employment gains from trade liberalization and minimize adverse effects, governments will need to anticipate the direction and size of changes in each sector and sub-sector. In the agricultural sector this anticipation will be necessary to plan for appropriate public investments in labour (e.g. worker mobility, skills expansion, and retraining) and land (e.g. the construction of irrigation systems and physical infrastructure). As expressed succinctly by Pingali (2010), "Trade liberalization should go hand in hand with public support for improving agriculture productivity and competitiveness".

Present conditions offer a window of opportunity to harness the employment and trade benefits of agriculture in developing countries. First, in many developing countries failed attempts at industrialization and the recent global economic crisis have created a floating pool of workers who have exited agriculture but not found employment in the manufacturing sector. The expansion of agriculture, given its high labour intensity, could re-absorb this surplus labour. Second, there has been a reversal in the secular fall in the international terms of trade of agricultural products that took place throughout the latter half of the 20th century. The international prices of crops and livestock have climbed since 2000 and are expected to trend upward for the immediate future (OECD–FAO, 2011). High oil prices and biofuel mandates and support policies are expected to continue to increase the derived demand for agricultural output in biofuel production. They would also keep agricultural prices elevated. Hence, this is an opportunity for developing-country agricultural exporters to gain higher export revenues. Last but not least, the potential for yield improvement and environmentally sustainable agricultural production in most developing countries is still great, as the use of new production techniques and technology remains limited. There is also a potential for diversification of agricultural production into higher value added activities as global demand for niche agricultural products (such as organic farm produce) rises.

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2. LEGAL ASPECTS OF TRADE IN AGRICULTURE: WTO AGREEMENT ON AGRICULTURE AND PREFERENTIAL TRADE AGREEMENTS

Ralf Peters, Mina Mashayekhi, and Taisuke Ito

2.1 THE INTERNATIONAL TRADING SYSTEM AND AGRICULTURE

Agricultural trade is an important component of many countries' overall economic activity and plays a major role in domestic agriculture production, rural development, and employment as well as consumption and food security. With increasing global specialization in the production of food, goods, and services, growing environmental challenges, and many opportunities for agricultural trade for developing countries, the international trading system is fundamentally important. Agricultural trade is covered by World Trade Organization (WTO) law, in particular by the Agreement on Agriculture (AoA). Through commitments on market access and subsidies, this agreement has helped to reduce trade distortions in the agricultural sector. However, agriculture is still one of the most distorted sectors, and several loopholes in the rules exist. In addition, many developing countries see an imbalance in the commitments, providing unequal advantages to some developed countries that had major distortions during the base period used for the agreement. The fact that, in the Doha round negotiations, agriculture was, for most of the negotiation period, the main sticking point illustrates the importance and sensitivity of the multilateral agricultural trade rules and the difficulty of reforming them. Employment opportunities and challenges are not explicit elements of the negotiations, but they play an important role in determining countries' interest in such trade negotiations.

While multilateral trade negotiations are stalled, regional trade agreements continue to be concluded. One possible explanation is that countries can choose their trading partners, and so liberalization is more targeted (Jansen and Salazar-Xirinachs, 2012). Countries that have very different interests in agriculture would probably not conclude a preferential trade agreement. If agriculture plays a minor role in trade for all parties – for instance, because they have no particular export interest in that sector – they can form a preferential trade agreement that specifically excludes from liberalization agricultural products that are sensitive.

This chapter provides an overview of the international agricultural trading system. In the first section the structure and the main rules of the WTO Agreement on Agriculture are introduced. The current level of agricultural trade distortions in each

Box 2.1: Selected key GATT Articles

I Most-Favoured Nation (best treatment accorded to one trading partner is given to all)

II Schedule of Concessions (e.g. bound rates, i.e. maximum allowed tariff)

III National Treatment (treat foreign and local producers equally once goods have cleared customs)

XI Elimination of Quantitative Restrictions (but export restrictions allowed for food security)

XIX Safeguard (e.g. emergency action on imports if quantity is increased and causes or threatens to cause serious injury)

XX General Exceptions (e.g. right to protect human, animal, or plant life or health)

XIV Free-trade Agreements (e.g. regional trade agreements permissible only under certain conditions)

area is described. Progress on the agriculture negotiations discussed in the Doha Round negotiations are summarized in section 2.2. Section 2.3 provides an overview of rules for agricultural trade in preferential trade agreements. Conclusions appear in section 2.4.

2.1.1 The Agreement on Agriculture

Agricultural trade has always been covered by the General Agreement on Trade and Tariffs (GATT), signed in 1946 (WTO, 2000). Nonetheless, before the AoA came into force in 1995 as a result of the Uruguay Round (UR), many important differences between trade in agriculture and trade in industrial goods existed. Some differences persist to this day.

The AoA covers basic agricultural products such as rice, fruits, and live animals and processed products such as bread, chocolate, and sausages. Coverage also includes beverages, tobacco products, and fibres such as cotton, wool, and silk. Neither fish and fish products nor forestry products such as timber and rubber are covered, however.

The long-term objective of the AoA, as stated in the preamble, is "to establish a fair and market-oriented agricultural trading system". The preamble also refers to food security and protection of the environment but not to employment in agriculture. As part of the WTO agreements, the AoA should, nonetheless, aim to further the objective of ensuring full employment, as stated in the preamble of the Marrakesh Agreement establishing the WTO. WTO member governments are committed to internationally recognized "core" labour standards – freedom of association, no forced labour, no child labour, and no discrimination at work. At the 1996 Singapore Ministerial Conference, members clarified the WTO's role on labour standards, identifying the International Labour Organization (ILO) as the competent body to negotiate labour standards. There is no work on this subject in the WTO's Councils and Committees.

All WTO agreements and understandings on trade in goods apply to agriculture, but, whenever there is a conflict, the provisions of the AoA prevail (WTO, 2000).

Box 2.1 mentions some important principles relevant for agriculture. Two major GATT/WTO principles are:

- The most-favoured nation (MFN) clause, which specifies that countries cannot (normally) discriminate between their trading partners. This means that, for example, import tariffs on any product are the same for all foreign suppliers.[1]
- The National Treatment principle grants that, once a good has cleared customs, the same rights are accorded to foreign suppliers as to nationals. That is, there is no discrimination between domestic and foreign suppliers after customs.

Other WTO agreements that are particularly relevant for agriculture include, for instance, the Agreement on the Application of Sanitary and Phytosanitary (SPS) Measures, the Agreement on Technical Barriers to Trade (TBT), the Agreement on Subsidies and Countervailing Measures, and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). The multilateral system allows several trade defence instruments, such as antidumping, countervailing duties, and safeguards provisions, in exceptional circumstances.

The AoA provides provisions for the so-called "three pillars of agriculture": market access, domestic support, and export competition. As concerns market access, the agreement mainly specifies allowed trade barriers (normally, tariffs under a certain

Figure 2.1: Outline of the Agreement on Agriculture

"The Three Pillars"

Market Access
- Bound rates for all products
- Tariff reduction
- Tariff quota access
- Special safeguard

Domestic Support
- Aggregate measure of support commitment
- Green box
- Blue box
- S&D box

Export Subsidies
- Reduction commitments
- Prohibition of new subsidies
- Anti-circumvention (International food aid)

- Special and differential (S&D) treatment for developing and least developed countries
- Related agreements, e.g. Marrakesh Decision on Net Food-Importing Developing Countries
- Establishment of a Committee on Agriculture
- Continuation of the reform process

[1] Exceptions to this general principle include preferential tariffs for least developed and developing countries (non-reciprocal preferential access) and members of regional trade agreements (reciprocal preferential access).

ceiling level), minimum access to agricultural markets, and a special safeguard provision that can protect markets from import surges or price declines. On the subject of domestic support, support measures are categorized according to how much they distort trade. Restricting certain domestic policies that distort trade and production of agricultural goods is an important component of the AoA and other WTO agreements. As for export subsidies, the Agreement also specifies the disciplines and the commitments to reduction.

In addition to the three pillars, the AoA defines special and differential treatment for least developed and developing countries, relations to other agreements, such as the Marrakesh Decision on Net Food-Importing Developing Countries,[2] and provisions on export prohibitions and restrictions. A Committee on Agriculture was established, and ministers agreed to continue the reform process.

2.1.2 Market access

"Market access" means the terms and conditions under which agricultural products could be imported into WTO member countries. The UR resulted in a systemic change away from various non-tariff border measures, including quotas and import restrictions, and towards a tariff-only system. For each product a maximum, or ceiling level, the bound rate, is determined in each country's schedule of tariff concessions, which is an integral part of the GATT. Bound rates were determined either by calculating tariff equivalents to former protection measures (tariffication) or by setting ceiling levels. Many developing countries opted for the latter. Currently, bound rates vary from product to product and from country to country.

There remains a considerable degree of protection in market access for agricultural products despite tariff reductions agreed at the Uruguay Round. Table 2.1 shows simple averages of bound and MFN-applied tariffs in developed and developing countries for agricultural and non-agricultural products. Developed countries have an average bound tariff rate of 38 per cent. The average applied tariff rate, at 34 per cent, is close to the bound rate. Developing countries have higher bound and lower applied rates, at 61 per cent and 25 per cent, respectively. Tariffs on non-agricultural goods are, on average, considerably lower. Furthermore, in addition to relatively high tariffs in agriculture, tariff peaks and tariff escalation (i.e. higher tariffs on processed products than on raw materials) also distort trade.

Tariff-rate quotas (TRQs) were part of the tariffication package. They provide for a minimum or "current" import access, generally at low in-quota tariffs. Imports above the quota face higher tariffs. Where import access during the UR base period was insignificant, minimum access opportunities equivalent to 5 per cent of domestic consumption during the UR base period (1986–88) had to be provided. Similarly,

[2] The Marrakesh Ministerial Decision on Measures Concerning the Possible Negative Effects of the Reform Programme on Least Developed and Net Food-Importing Developing Countries recognizes that these countries may experience negative effects in terms of food availability from external sources on reasonable terms and conditions during the reform programme.

Table 2.1: Average bound and applied rates

		Bound	Applied
Agriculture	Developed countries	38	34
	Developing countries	61	25
Non-agriculture	Developed countries	4	3
	Developing countries	20	13

Source: UNCTAD Trains and WTO Consolidated Tariff Schedules.

current access opportunities already exceeding that threshold level during the base period were to be maintained in line with UR scheduling modalities. For instance, the European Union (EU) has a tariff on chilled boneless beef (HS 02013000) of €242 per tonne for the first 13,000 tonnes of imports and a tariff of 12.8 per cent of the import value plus €3,034 per tonne for imports above the quota. While TRQs were supposed to respond to agricultural exporters' concerns over lack of access to markets for certain products, another provision, the Special Agricultural Safeguard (SSG), is intended to respond to importers' concerns. The SSG allows countries that reserved their right to use this provision under certain conditions to impose an additional duty on imports in the case of an import surge or a price fall beyond a predetermined level.

Market access must be distinguished from market entry. While market access conditions are determined by the legal and administrative conditions imposed by the importing countries under internationally agreed trade rules, the ability to enter a market is a function of the competitiveness of the exporter and other market entry conditions, such as technical or health standards, set by governments and distribution networks. Rules for some of those non-tariff measures (NTMs) are discussed below. NTMs are becoming more and more important, and they constitute real challenges for developing and especially least developed countries.

2.1.3 Domestic support

The objective of the Uruguay Round regarding subsidies for the production of agricultural goods was to discipline and reduce trade-distorting domestic support while leaving scope for governments to design their own support mechanisms in light of a wide variety of specific circumstances in individual countries and sectors. The approach agreed is to classify domestic support according to its effects on trade and production. Trade- and production-distorting measures are often referred to as "amber box support". Measures that have "no, or at most minimal, trade-distorting effects or effects on production" are referred to as "green box support" (see box 2.2).[3]

[3] A less important category of measures is so-called blue box support, where payments are direct payments under production-limiting programmes made on fixed areas and yield or a fixed number of livestock. These are not discussed here. Only a few countries have made use of this category, and the amount spent under such programmes is decreasing. In the Doha Round, however, blue box support became an important issue when it was proposed to widen the scope of the box.

Box 2.2: WTO terminology on domestic support policies

Red box: Forbidden policies

Amber box: Policies subject to careful review, reduction commitments, and ceilings (e.g. market price support, input subsidies)

Blue box: Payments in conjunction with production-limiting programmes

Green box: Policies considered acceptable and not subject to limitations (e.g. research, domestic food aid)

Amber box

The trade-distorting domestic support measures in the amber box include market price support measures or payments that are directly linked to production, such as payments based on output or inputs. An administered price, where domestic production must be acquired at a certain price that is above the market price, is a typical example of an amber box support. The AoA establishes a method to quantify this trade-distorting domestic support that is provided to domestic producers per year, the Current Total Aggregate Measurement of Support (AMS). WTO members must annually notify their amber box support, which must be below a determined Bound Total AMS level. The country-specific AMS commitment is the result of such support provided during the base period of the UR minus the agreed reduction commitment. Most developing countries have a nil commitment, either because they had not provided any support during that period or because the amount of such support remained well within the de minimis levels.

The total allowed AMS of all WTO members is about US$190 billion, of which 92 per cent is held by developed countries. However, actual spending is much lower. For example, in 2008 the utilization rate of AMS support by the two biggest subsidizers was 34 per cent in the United States and 17.1 per cent in the EU. One reason that total subsidies are below the allowed maximum is that current commodity prices are high and many support programmes are counter-cyclical, i.e. payments are high if world market prices are low and vice versa. Another reason is that many countries have reformed their support programmes and, for example, decoupled the payments from current production levels so that they now fall into the green box (see below).

De minimis

Trade-distorting support that amounts to a relatively small share of the value of production is exempt from reduction commitments. This de minimis support shall not exceed 5 per cent (10 per cent in developing countries) of the product-specific value of production. In addition, non-product specific support that is less than 5 per cent (10 per cent in developing countries) of total agricultural production also is exempt. Members may exclude the de minimis support from the Current Total AMS figure.

Green box

Domestic support measures that have «no, or at most minimal, trade-distorting effects or effects on production» (AoA, annex 2) fall into the green box and are exempt from any monetary limits. The AoA sets forth the criteria and conditions for such measures. The basic criteria are that the support has to come from publicly funded government programmes, have no effect of providing price support to producers, and cannot imply transfers from consumers. Measures include, for example, infrastructure-building, pest and disease control, research and training, income insurance, and domestic food aid. Additional conditions specifically apply in certain domestic support categories. The green box also provides for the use of direct payments to producers, in the form of so-called decoupled support, that are not linked to production decisions.

Indirectly, government efforts to maintain agricultural employment are enabled through instruments of the green box. "Decoupled income support", "income insurance and income safety-net programmes", and "structural adjustment through investment aids» are such instruments, permitted under WTO law.

There is debate whether the green box support measures are, in fact, non- or only minimally distorting. For example, if direct payments are based on historical yields and not on current production levels, it can be argued, on one hand, that they might not influence the production decisions of farmers. On the other hand, if the base periods are updated from time to time and if farmers anticipate this, decoupled payments may influence their production decisions.

Green box payments are high in many developed countries. In 2008 the European Union notified to the WTO spending of €62.6 billion, and the United States provided in the same year US$86.2 billion, most of it in domestic food aid. This compares with €12.4 billion and $6.3 billion actual spending under the limited AMS support. Other main users of the green box are Japan, Republic of Korea, Switzerland, and Norway.

Development issues

Under the AoA developing countries have benefited from some special and differential (S&D) treatment in the domestic support pillar. Their reduction commitment for AMS support was lower, their de minimis level is higher, and a few provisions in the green box contain more flexibility for developing countries. Furthermore, certain programmes that encourage agricultural and rural development are exempt from limitations. These include investment subsidies that are generally available to agriculture; agricultural input subsidies generally available to low-income and resource-poor producers in developing countries; and measures to encourage diversification from growing illicit narcotic crops. With its reference to rural development, the AoA refers indirectly to employment in agriculture in developing countries.

Despite these S&D provisions, it is often argued that, inter alia, because of the AoA provisions on domestic support, the agreement is tilted against developing countries and that reform is needed. Arguments put forward include the imbalance of AMS allowances, of which 92 per cent are held by developed countries, the green box provisions that were tailored for developed-country needs, and, generally, the large amount of subsidies provided to farmers in developed countries, which has an adverse effect on producers in the South.

The Organisation for Economic Cooperation and Development (OECD) measures annually the total support to agriculture in OECD countries (OECD, 2012). The methodology differs from the WTO method for calculating support to agriculture. The OECD definition of the total support estimate is broader; for example, it includes transfer from consumers (e.g. through higher product prices due to import tariffs). In 2010 OECD countries provided US$366 billion in support to the agricultural sector for a total value of production at the farm gate of US$1,115 billion. Thus, the total support is about one-third of the total value of production – high despite the reduction commitments of the UR.

In contrast to its definition of total support, the OECD producer support estimate *excludes* transfers from consumers to producers. On average, OECD countries provide producer support amounting to 18.3 per cent of the value of production, with a variance from 0.5 per cent in New Zealand to 61 per cent in Norway. Support also varies significantly over time. Support is usually higher when world market prices are low. In the US, for example, the producer support estimate, as a share of the value of production, decreased from 23.3 per cent in 2000 to the current level of 7.0 per cent. In general, developing countries provide a lower level of support for agriculture, although according to OECD estimates a few countries, especially where the inequality between urban and rural areas is increasing, provide significant and increasing support to producers.

Anderson and a group of researchers (Anderson, 2009) estimate the Nominal Rate of Assistance (NRA) for farm products over a long time period (see table 2.3). The NRA is the percentage by which government policies have raised or lowered gross returns to farmers from what they would have been without the interventions. The concept is broader than that of the OECD and includes policies, such as taxes on inputs, that can lead to effectively negative support. Product-specific input subsidies are included in the NRA.

Anderson (2009) finds that support was high in Europe, the US, and Japan and then declined during the 2000s. In Africa farm producers were effectively taxed for production. High import tariffs on inputs such as tractors and fertilizers are examples

Table 2.2: Support to agriculture in 2010, OECD estimates

	Total support estimate (TSE)	**Producer support estimate (PSE)**
	US$ billion	% of value of production
OECD	366.5	18.3
EU	87.8	19.8
US	133.5	7.0
Japan	59.6	50.0
Brazil	10.1	4.5
China	177.2	17.4
South Africa	0.8	2.2

Source: OECD (2012)

Table 2.3: Nominal Rate of Assistance for farm producers, 1990–2007

Region	1990–94 %	1995–99 %	2000–04 %	2005–07 %
Africa	–9	–6	–7	N/A
Asia	–2	8	12	N/A
Latin America	4	6	5	N/A
Western Europe	64	44	37	18
US and Canada	16	11	17	11
Japan	116	120	120	81

Note: The Nominal Rate of Assistance is the percentage by which government policies have raised or lowered gross returns to farmers from what they would have been without the interventions.

Source: Anderson (2009), table 1.4.

of contributors to such effectively negative assistance. In Asia assistance is positive and rising but still relatively small compared with that of the developed regions.

2.1.4 Export competition

The third of the three pillars of agriculture is export competition.

Countries that had subsidized exports during the UR base period were subject to reduction commitments in terms of budgetary outlays as well as volume. Those product-specific reduction commitments are now part of members' schedules and form maximum allowed levels. Only 25 WTO members have scheduled export subsidy reduction commitments. New export subsidies cannot be introduced.

Export subsidies proliferated in the years leading up to the Uruguay Round and remained relatively high until 2000 or so. The global export subsidy expenditure between 1995 and 2000 averaged US$6.2 billion per year, of which the EU accounted for about 90 per cent (Peters, 2006). This is less than expenditures on domestic support but is considered the most trade-distorting subsidy measure.

Other forms of export support are likely to exist. Loopholes allow countries to circumvent their export subsidy commitments. These situations are discussed specifically in connection with export credits and export credit guarantees, international food aid transactions, and the operations of exporting state trading enterprises. For example, US export credit programmes are accused of having an export subsidy component since the applied interest rates did not reflect prevailing market benchmarks. Since 2000 export subsidies have decreased significantly and have become less important in times of high commodity prices.

2.1.5 Non-tariff measures

Evidence shows that non-tariff measures (NTMs) are more important in agriculture than in other sectors (UNCTAD, 2012b). Sanitary and phytosanitary measures remain the most important NTMs affecting agricultural trade. The AoA refers to the

Agreement on the Application of Sanitary and Phytosanitary Measures. This agreement allows members to take country-specific measures to protect human, animal, or plant life and health, provided these are scientifically based. At the same time, the Agreement tries to ensure that regulations do not create unnecessary obstacles to trade. It determines procedural disciplines rather than the standards themselves. Key principles encourage the use of international standards (e.g. Codex) and risk assessments if higher standards are used.

Similarly, the Agreement on Technical Barriers to Trade allows national autonomy in technical regulations while trying to ensure that regulations do not create unnecessary obstacles to trade.

Recent food crises have highlighted the role of export restrictions on food and agricultural products by exporting countries to mitigate domestic food shortages, while, for their part, importing countries sought to secure stable access to food. Export restrictions are conventionally used for various policy purposes, such as enhancing food security, promoting domestic downstream processing, and raising government revenue. Specifically, export taxes have been used as an industrial policy instrument in developing countries and as a countermeasure to tariff escalation in some markets (UNCTAD, 2011). They are predominantly applied to commodities, both agricultural and non-agricultural. For instance, Indonesia imposed an export tax on cocoa beans to support its cocoa processing industry. Evidence suggests that, where quantitative export restrictions are present, their declared purpose is conserving exhaustible natural resources (WTO, 2010).

Net-food importers addressing food security concerns point out that there are few disciplines under WTO rules on the use of export taxes and restrictions. GATT Article XI prohibits quantitative restrictions on exports, but its paragraph 2(a) permits temporary restrictions to prevent critical shortages of food. WTO rules provide no specific disciplines on export taxes.

2.2 THE DOHA ROUND

The Doha Ministerial Declaration of 2001 launched new negotiations on a range of subjects, including agriculture, on which negotiations had begun earlier under the "built-in agenda" of the Uruguay Round. The UR Agreement on Agriculture included a mandate in Article 20 to continue the reform process to achieve "the long-term objective of substantial progressive reductions in support and protection". At the fourth WTO Ministerial Conference in Doha, this mandate was reaffirmed and enforced within the Single Undertaking, in which virtually all linked negotiations were supposed to end by January 2005. The negotiations, especially agriculture and later also non-agriculture market access, turned out to be very controversial. So far, negotiations have not concluded, and the future of the Round is uncertain.

The Doha Declaration offers an ambitious mandate for continuing the reform process in agricultural trade (see box 2.3). It aims at the reduction, with a view to the phasing out, of all forms of export subsidies as well as disciplining further trade-

Box 2.3: Doha Mandate on Agriculture

- Substantial improvements in market access
- Reductions of, with a view to phasing out, all forms of export subsidies
- Substantial reductions in trade-distorting domestic support
- Special and differential treatment provisions as an integral part of all elements of the negotiations

distorting domestic subsidies and market access barriers. In addition, it provides for improvements in the current special and differential treatment provisions and/or the inclusion of new ones in all negotiating areas. Thus, the ongoing negotiations offer an opportunity to shape the multilateral rules governing agricultural products to meet the particular needs of developing countries.

Although negotiations were long, with many ups and downs, substantial progress was made on agriculture through December 2008, leaving a few unresolved and controversial issues. Since then, however, no progress has been made.[4] Both the negotiations and the Revised Draft Modalities Text for Agriculture (WTO, 2008) basically follow the outline of the AoA:

- As to market access, WTO members had signalled agreement on a tariff reduction formula that classifies tariffs into four bands according to magnitude and applies larger cuts for higher tariffs. Developing countries would undertake cuts amounting to two-thirds those of the developed countries in the same band. Also, thresholds for developing countries' tariff bands are more favourable from a defensive perspective. Cuts on the highest tariffs in developed countries would be 70 per cent. A minimum average cut for developed countries of 54 per cent, and a maximum average cut for developing countries of 36 per cent, have been proposed. It would be possible to exclude sensitive products from full reduction commitments in both developed and developing countries.[5] Developing countries would also be allowed to designate Special Products that are important for food security, livelihood security, and rural development, for which there would be less or no tariff reduction. For the 48 small and vulnerable economies, the required average cut in bound rates is 24 per cent, with no minimum cut per tariff line. Least developed countries would be exempt from reduction commitments in all three pillars.[6] A special agricultural safeguard mechanism (SSM) for developing countries would allow them to increase tariffs temporarily in response to an import surge or sudden fall in import prices. A key question is whether application of the SSM should be allowed when it would lead to duties in excess of pre-Doha bound rates.

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[4] See UNCTAD, 2010 and 2011 and earlier versions of the annual report to the Trade and Development Board of UNCTAD on the Evolution of the International Trading System.

[5] In compensation, tariff rate quotas would have to be expanded. See Vanzetti and Peters (2011).

[6] Other issues are not discussed here. These include provisions for preference erosion, liberalization of trade in tropical products, tariff escalation, etc.

- As to trade-distorting domestic support, cuts in the newly conceptualized Overall Trade Distorting Support (OTDS) are proposed at 80 per cent for the EU, 70 per cent for the United States and Japan, and 55 per cent for other developed countries. Cuts for developing countries are proposed at 37 per cent. Each component of the OTDS (basically, AMS, de minimis, and blue box support) would have its own reduction commitment or, in the case of developing countries, exemptions from reduction. Net-food-importing developing countries and developing countries with no AMS allowance would not have to reduce their OTDS. As to green box support, the text provides for clearer dissociation of direct payments from production by fixing the historical base period, so as to avoid creating an incentive for producers to expand production.
- As to export subsidies, ministers agreed at the WTO Hong Kong Ministerial Meeting (WTO, 2005) to the parallel elimination of all forms of export subsidies and disciplines on all export measures with effects equivalent to a subsidy by the end of 2013. This agreement, in 2005, was a major success in the negotiations. Due to the uncertainty of the whole round, it is now unlikely that it will take place in 2013.
- Four West African countries launched a cotton initiative, in which they proposed the eventual elimination of all trade-distorting cotton subsidies and financial compensation until these subsidies are completely removed. These and other cotton producing countries depend significantly on cotton exports. World prices and trade are distorted due to heavy subsidies in a few countries. Progress on the trade issues of the initiative have been linked to progress on the agriculture negotiations. The development aspect of cotton received much attention and has been dealt with in WTO and UNCTAD meetings, among others.[7] The major issue is the treatment of domestic support for cotton. The continually volatile and relatively low price of cotton indicates the ongoing importance of cotton issues.

Several other issues remain unresolved. The number of sensitive and special products is controversial. Agricultural exporters want to see low numbers, while countries with defensive interests prefer high numbers. The draft modalities propose 4 per cent of tariff lines for sensitive products (5.3 per cent for developing countries) and 12 per cent for Special Products.

The specific modalities for the SSM are among the most controversial areas in agriculture. Developing countries with defensive interests – the so-called G-33 group – want a flexible instrument with a relatively high possible remedy. Agricultural exporters, particularly the United States but also other exporters including some developing countries, are concerned that a too-flexible instrument could counteract liberalization, including that achieved during the UR and in accession negotiations.

[7] See WTO Cotton – Special High-Level Session, in March 2007 and subsequent meetings; UNCTAD Secretary-General's Multi-Stakeholders Meeting on Cotton, in December 2008; UNCTAD Pan-African Cotton Meeting, 2011.

From a development perspective, many observers and negotiators have emphasized the importance of elimination of export subsidies and the substantial reduction of domestic support and tariffs in developed countries. Furthermore, several special and differential treatment provisions have been proposed, such as the exemption of least developed countries (LDCs), lower reduction commitments for small and vulnerable economies (SVEs), and acknowledgement of the existence of sensitive (or, more precisely, "special") products important for food security, livelihood security, and rural development in developing countries.

A more critical view is that the base for reductions of domestic support is set at a relatively high level (e.g. reductions are from bound levels that are much higher than current actual spending), that exemptions for sensitive products in developed countries limit improvements in effective market access (e.g. highly protected products such as dairy and sugar would continue to have high tariffs), and that special and differential treatment is provided not only to developing countries but also to various developed countries in several exceptions to the general provisions (e.g. a special limit for US product-specific domestic support in Article 42 of the draft modalities text(WTO, 2008) to avoid an overly restrictive commitment). However, agriculture interests do not follow a North–South division, but rather the interests of exporters are on one side, and the predominantly defensive interests of less competitive countries are on the other side. Employment considerations, along with other aspects such as food security, play an important role in determining the interests of the negotiators.

2.3 PREFERENTIAL TRADE AGREEMENTS

2.3.1 General considerations

Preferential trade agreements (PTAs)[8] have proliferated rapidly and now number 319.[9] PTAs can be bilateral, regional, or plurilateral. The main feature of PTAs is that they constitute an exception to the most-favoured nation (MFN) provision, whereby all WTO members impose on each other the same, non-discriminatory tariff (WTO, 2011). Non-reciprocal PTAs mainly belong to the General System of Preferences (GSP), developed in UNCTAD, that allows countries to provide developing countries with preferential access to their markets on a non-reciprocal basis as long as they are generalized and non-discriminatory. The EU, for example, provides duty- and quota-free market access to all LDCs for all products except arms, including for agricultural products. Reciprocal trade agreements account for the bulk of trade under PTAs. About half of world trade is under PTAs (United Nations, 2011).

[8] The expressions "regional trade agreements (RTAs)" and "free trade agreements" are also used frequently. "Regional trade agreements", however, suggests that members are in the same region, whereas "free trade agreements" suggests that tariffs are eliminated. Often, however, members of PTAs are not in one region and only reduce tariffs or exclude sensitive products.

[9] As of 15 January 2012, 319 RTAs notified to the WTO were in force. Source: WTO RTA database.

The liberalization goal is more ambitious in PTAs than in the multilateral system. This refers to WTO-X issues, i.e. those areas that are not covered by the WTO, such as competition or labour issues. It also applies to WTO–plus issues, i.e. where commitments go beyond WTO commitments, such as the opening up of services sectors that are not bound in corresponding WTO schedules. One reason for the greater ambition is a requirement by the GATT rules (Article XXIV) that tariffs in PTAs are to be "eliminated" on "substantially all the trade" between participants within a reasonable length of time. Although there is no rule or agreed understanding of what "substantially all the trade" means, commonly suggested percentages are 90, 85, and 80. The Understanding to GATT Article XXIV clarifies that the reasonable length of time is 10 years and that no major sector would be excluded from liberalization. The "Enabling Clause" provides an exemption from the MFN obligation for regional or global arrangements amongst less-developed contracting parties. Thus, PTAs amongst developing countries do not necessarily have to eliminate tariffs on substantially all trade.

Theoretically, the relative relevance of PTAs for agriculture is greater, since MFN tariffs in agriculture are in general higher than tariffs on non-agriculture goods. WTO (2011, p. 78) shows that the preference margins on traded items are considerably higher for agricultural products than for non-agricultural products. However, agriculture products are more often excluded from PTAs as sensitive, or they involve longer transition periods.

The Free Trade Agreement between the EU and South Africa is a typical example. This Agreement provides South African exporters with progressive tariff reductions phased in over a ten-year period on a range of agriculture products. However, in addition to a safeguard clause to protect against import surges, the Agreement also exempts certain sensitive product areas and imposes quotas on duty-free access to other products (Matthews, 2003).

Notwithstanding the fact that agricultural products are more often excluded from full liberalization than are other products or involve longer implementation periods, PTAs can have a significant impact on agricultural trade. Furthermore, in several major PTAs agriculture is comprehensively covered. An example is NAFTA (see chapter 10).

2.3.2 Development issues

From a development perspective, some features of North–South PTAs have been critical. For example, tariffs are often removed progressively, but subsidies, often provided to farmers in developed countries, are not. Export subsidies are frequently eliminated in RTAs. The requirement in GATT Article XXIV to liberalize substantially all trade limits the scope for special and differential treatment (S&D) in PTAs. ACP-EU Economic Partnership Agreement negotiations, for example, comprise about 80 per cent of trade on Asia, Caribbean, and Pacific countries' side and 100 per cent on the EU's side, based on the EU's interpretation of "substantially all the trade". Thus, WTO rules could constrain the ability of developing countries to design and negotiate liberalization schedules under PTAs. In the WTO rules negotiations, developing countries engaged in North–South PTA negotiations have proposed incorporating S&D into GATT Article XXIV.

The logic of the "substantially all the trade" requirement was to prevent the undermining of the most-favoured nation principle. However, there may be an economic rationale for leaving agricultural trade out of PTAs. Where agricultural sectors are uncompetitive, their exclusion from a PTA may help to prevent trade diversion. Simulation results reported by Matthews (2003) indicate that the exclusion of agriculture from a Japan–Republic of Korea FTA unambiguously improves the welfare outcome for both countries and also for their other trading partners.

PTAs between developing countries are not required to liberalize "substantially all the trade" if notified under the Enabling Clause. The Enabling Clause permits preferential arrangements, with less than full reduction of tariffs, among developing countries in goods trade on a limited number of products. The Global System of Trade Preferences (GSTP) is an example. In 2010, 11 of the 22 developing countries participating in the Sao Paulo Round signed an agreement to reduce tariffs from MFN levels by 20 per cent on 70 per cent of their tariff lines.

Most developed countries and several developing countries provide non-reciprocal preferential market access to developing countries and especially LDCs. There is no requirement that substantially all trade has to be covered. The coverage rate varies significantly but is high in the preferential schemes of the Quad countries (Canada, EU, Japan, and US) for LDCs, as shown in table 2.4.

General System of Preferences (GSP) schemes for developing countries do not necessarily provide duty-free access for products that are covered but often grant tariff reductions on the MFN rates. Preferential access needs to be non-discriminatory but can be linked to certain conditions. The EU "GSP+" preferences, for example, are granted to countries that have ratified and effectively implemented core international conventions on labour rights. The preference providers can unilaterally decide on the schemes, and some revise their scheme annually, which can undermine predictability for investment decisions.

Table 2.4: Duty-free access of LDCs to Quad country markets in 2010, share of all tariff lines in per cent

	All products %	**Agriculture** %
Canada	98.9	92.6
EU	99.8	100.0
Japan	96.0	94.9
US GSP LDC	82.7	84.7
US AGOA textile	89.8	86.1

GSP = General System of Preferences; AGOA = African Growth and Opportunity Act

Source: UNCTAD (2012a).

Table 2.5: EPA liberalization schedules (value) in per cent of total import value

	2008	2010	2012	2013	2017	2018	2022	2023	2033	Total
Botswana, Lesotho, Namibia, Swaziland	86									86 +47 tariff lines
Cameroon						50		80		80
Caribbean	52.8		56			61.1		82.7	86.9	86.9
Comoros				21.5			80.6			80.6
Cote d'Ivoire						69.8		80.8		80.8
Eastern African Community		64						80	82	82
Fiji	24			37		78		81.5		81.5
Ghana						62.24		80.48		80.48
Madagascar				37			80.7			80.7
Mauritius	24.5				53.6		95.6			95.6
Mozambique	Mostly liberalised at entry into force								80.5	
Papua-New Guinea	88.1									88.1
Seychelles				62	77		97.5			97.5
Zimbabwe			45				80			80

Note: Cumulative value of imports from the EU, to be liberalised by the specified year
Source: ECDPM (2007).

The EU and ACP countries are replacing the earlier non-reciprocal treaty (Cotonou Agreement) with WTO-conforming reciprocal Economic Partnership Agreements (EPAs). Meyn and Kennan (2010) show in a detailed analysis of (interim) EPAs that agricultural import liberalization in ACP countries varies markedly among the agreements, as shown in table 2.5. Some appear to be front-loaded, i.e. they liberalize major agricultural sectors during the first years of implementation, and to include agriculture items that compete with domestic production. Others exclude most agricultural products that appear to be sensitive.

The following overview of provisions in PTAs focuses on reciprocal agreements.

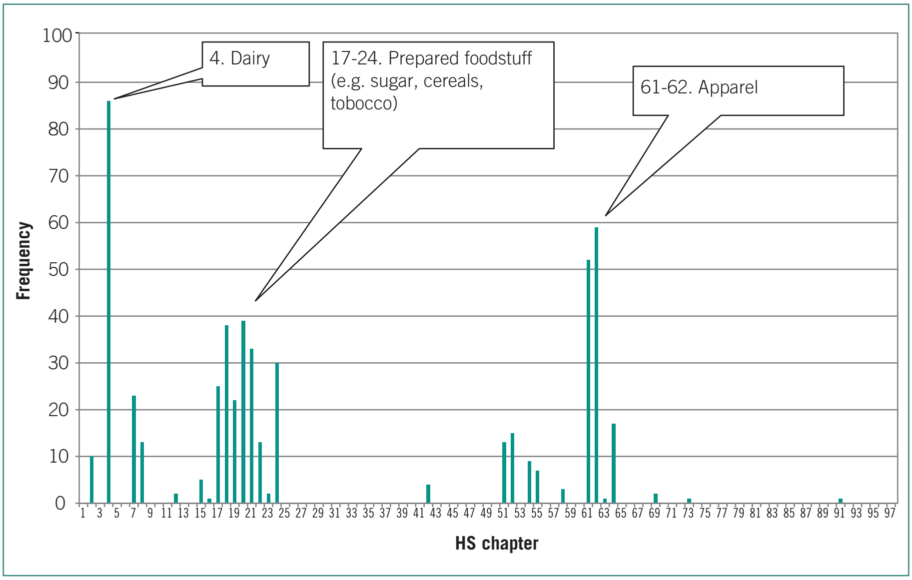
2.3.3 Market access in PTAs

Tariff liberalization

As for treatment of agricultural tariffs in PTAs, there is a mixed picture. Most PTAs include agriculture (WTO, 2011) or at least some agricultural products, such as processed food, but often agricultural products are disproportionately excluded and/or tariff reductions are subject to longer implementation periods. Damuri (2009) finds, in an analysis of 15 bilateral agreements between Canada, the European Union, Japan, and the United States and their major trading partners, that about 7 per cent of tariff lines are classified as temporarily or permanently excluded products. These sensitive products are mainly agricultural products. Of all agriculture and food products in the sample, about 27 per cent are excluded from tariff concessions, while only about 1 per cent of manufacturing products are excluded. Estevadeordal et al. (2009) confirm this finding in an analysis of 50 PTAs. After a 10-year implementation period, the overall average number of duty-free tariff lines is slightly above 90 per cent, but for agriculture it is less than 80 per cent. These figures increase further up to a 20-year implementation period, but agriculture remains below 90 per cent. To illustrate this point, figures 2.2 and 2.3 show the frequency of sensitive products, by Harmonized System (HS) chapters, for selected US and EU agreements. The frequency is higher in the first 24 chapters, those that contain mostly agricultural products, and, in the case of the US, in the chapters for textile products.

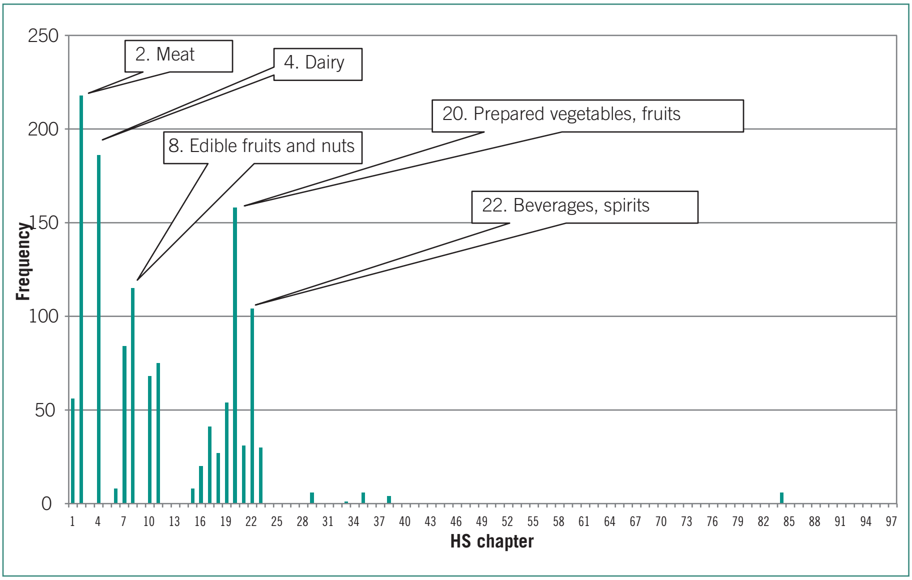
Although agricultural products are more often temporarily or permanently excluded from PTAs than are other products, the impact of PTAs on agriculture can be stronger than on industrial sectors. A main reason is the higher preference margin. Table 2.6 shows that the preference margin is significantly higher for agricultural products than for non-agricultural products except for textile products, where the margin is also relatively high. Since countries are usually members of many PTAs,

Figure 2.2: United States: Frequency of "sensitive" products by HS chapter, 2008



Source: Authors' calculation from US RTAs (Bahrain, Jordan, Morocco, Oman); products covered by only one or no RTA are classified as sensitive.

Figure 2.3: European Union: Frequency of "sensitive" products by HS chapter, 2008



Source: EU RTAs (Algeria, Egypt, Jordan, Morocco, Tunisia, Turkey); products covered by only one or no RTA are classified as sensitive.

Low et al. (2006) argue that, because imports compete with trade from other preference receivers, actual preference margins are lower than the ones calculated relative to the MFN rate. This argument, together with the fact that agricultural tariffs are more often excluded from PTAs than industrial tariffs, supports the conclusion that the preference margin in agriculture is higher than in industrial sectors.

Table 2.6: Trade-weighted preference margin of PTA compared with MFN rates

Product section	**Preference margin (%)**
Animal products	4.9
Vegetable products	4.4
Fats and oils	2.4
Prepared foods, beverages, tobacco	3.6
Average, all non-agriculture	0.8
Chemical products	0.7
Textiles	3.1
Machinery	0.5

Source: WTO (2011),table B.10; selected PTAs.

The high preference margin in PTAs makes agricultural products important in discussions about preference erosion. For instance, ACP countries proposed in the Doha Round that MFN tariff reductions would be lower for products in developed countries where ACP countries benefit from long-standing preferences, so that preference erosion would be limited. Interestingly, the EU–CARIFORUM EPA includes a provision mandating members to work toward maintaining high preference margins for traditional agricultural products by avoiding reductions of MFN rates in multilateral negotiations (see annex A.4).

Another reason for the substantial impact of PTAs on agricultural trade is that several PTAs cover agriculture comprehensively. NAFTA and Mercosur, for example, have removed nearly all agricultural trade barriers to their members. NAFTA had a longer implementation period for corn, sugar, dairy, poultry, and eggs, but by 2008 all tariffs were removed.

In terms of concessions in relation to initial tariffs, South–South agreements make the biggest move, from initially 28 per cent duty-free tariff lines to 92 per cent after the implementation period (Fulponi et al., 2011). By comparison, North–South agreements increase their share of duty-free lines from 68 per cent to 87 per cent. Estevadeordal et al. (2009) confirm that, for total trade, South–South and North–North PTAs reach a higher share of duty free tariff lines than North–South agreements.

Tariff-rate quotas

A mechanism often used to seek a balance between the interests of agricultural exporters and other PTA members' interests in protecting sensitive sectors are tariff-rate quotas (TRQs). Both developed and developing countries are frequent users of quotas in their PTAs. An example is the EU–South Africa agreement, where both parties have TRQs. Sectors where TRQs can frequently be found include sugar, dairy, and meat (Fulponi et al., 2011). TRQs in PTAs are usually in addition to TRQ entitlements under the AoA. The implementation of TRQs varies considerably across agreements, and so the simple number of TRQs is of little help assessing the economic value. For example, some TRQs expire after an implementation period, while some increase over time; some provide preferences for out-of-quota trade, while others provide only MFN rates for such trade, and so on.

Some PTAs provide for compensation for revenue lost as a result of limited liberalization of sensitive products. The US, for instance, agreed in their PTA with Peru to compensate Peru financially for the opportunity costs of lower exports of sugar, as limited liberalization in the US resulted in lower exports from Peru than they could have been under full liberalization.

Trade remedy provisions

PTAs can allow or rule out trade defence instruments such as antidumping, countervailing duties, and safeguards provisions. For example, on intra-EU trade, antidumping actions were excluded in the integrated market (WTO, 1997). Under NAFTA, however, Canada, Mexico, and the United States retain the right to apply their antidumping and countervailing duty laws to goods imported from another NAFTA country. The

Agreement establishes a mechanism for independent bi-national panels, consisting of administrative authorities in each country, to review final antidumping and countervailing duty determinations (US CBP, 1998).

Baccini et al. (2011) finds, from coding of 404 PTAs, that trade defence instruments are frequently included in such agreements. About 80 per cent of PTAs include antidumping, countervailing duties, and safeguards provisions and either allow or out-rule their use. In a sample of 50 PTAs, Teh et al. (2009) find that one-sixth have dispensed with at least one type of trade remedy. These agreements appear to share a greater degree of integration.

Thus, most PTAs appear to allow trade remedies, perhaps to cope with the removal of intra-regional tariffs. Some include agriculture-specific measures. For example, the US has included automatic agricultural safeguards in several FTAs for selected products, with the trigger level of 130 per cent to 150 per cent of TRQs. In the US–Morocco FTA, Morocco has recourse to quantity-based safeguard mechanisms, while the US retains the right to use price-based safeguards; the remedy is limited to raising tariffs up to MFN rates. Annex A.1 provides some examples of safeguard measures in PTAs.

Those safeguards are often reserved for specified products and expire after an implementation period. Products frequently appearing in safeguard lists are beef, pork, poultry, diary, vegetables, and fruits (OECD, 2011). The average duration of an agricultural safeguard is often shorter than those applied to other sectors.

Not all PTAs include special agriculture safeguards, however, even if the sensitivity of the sector is recognized. For example, the EU–CARIFORUM agreement recognizes food security concerns but has no specific safeguard for agriculture. It appears that in this case the long phase-in period for tariff concessions for CARIFORM of up to 25 years has been the means chosen to address the sensitivity of the sector. Some RTAs prohibit the application of WTO-compatible agricultural safeguards, and possibly future SSM, to intra-RTA trade. The extent to which special agriculture safeguards are agreed in addition to general safeguards reflects the sensitivity of this sector between members of PTAs. However, to the extent that the special safeguards are more limited than those in the AoA, they signal a move towards greater trade liberalization for agriculture.

2.3.5 Subsidies

Domestic support provided to agricultural producers is by its nature difficult to address in PTAs. Any production-distorting support provided to a specific product has an impact on the trade opportunities of PTA members if they produce the same or a substitutable product, whether the product is exported or not. Thus, to address domestic support effectively, PTAs would have to cover whole sectors. It could be agreed, for instance, to eliminate domestic support in sectors where PTA members have a strong export interest. It could also be agreed to link tariff concessions in importing countries to reduction commitments on domestic support in exporting countries. To the best knowledge of the authors, such provisions are not found in current PTAs.

Fulponi et al. (2011) confirm that "almost no [regional trade] agreements propose to reduce support to the agricultural sector". The imbalance of eliminating tariffs while not addressing agricultural subsidies has been a key issue underlying the asymmetry in North–South RTAs. Thus, a key problem in the AoA also is not addressed in PTAs.

However, the situation is different when it comes to export subsidies. Fulponi et al. (2011) find that, in 60 per cent of the more than 50 PTAs analysed, export subsidies are prohibited. For instance, several PTAs with the US and the EU contain commitments for the elimination of export subsidies for products destined for other parties. In the EU's EPA with CARIFORUM, elimination of export subsidies is conditioned on tariff elimination by the CARRIFORUM (zero-for-zero). Annex A.3 provides examples in which export subsidies have been ruled out on agricultural goods exported to PTA members.

2.3.6 Non-tariff measures in PTAs

Sanitary and phytosanitary measures remain the most important NTMs affecting agricultural trade. Addressing such NTMs in PTAs could be an opportunity to achieve a meaningful increase in market access. However, few of the SPS chapters in PTAs go beyond the core principles of the WTOSPS agreement.

An analysis of provisions for TBT and SPS measures in PTAs shows that about 60 percent include TBT measures and 67 percent include SPS measures (Baccini et al., 2011). Comparing North–North, North–South, and South–South agreements, it is evident that both TBT and SPS provisions are most likely to be found in North–South agreements. More recent PTAs more often include provisions for TBT and SPS than earlier agreements. However, Baccini et al. (2011) find that such provisions are rather shallow. Mostly, they refer only to corresponding WTO agreements. It appears that differences in national regulation and capacity make it difficult to go beyond multilateral agreements.

Other NTM provisions in PTAs that are particularly important for agriculture are export restrictions or export taxes. US PTAs, for example, usually prohibit export restrictions (see Annex A.2). Export taxes are prohibited unless such taxes apply to domestically sold products as well. Similarly, EU EPAs generally prohibit export duties and provide for scheduled elimination of those that exist.

Rules of Origin (RoO) are the criteria used to define where a product was made. They are important in PTAs because they determine whether or not products are eligible for preferential treatment. Two concepts are used if the product is not wholly originating from the exporting country. First, non-originating materials must undergo such a substantial transformation in the exporting country that the tariff classification is changed, e.g. the exported product falls into a different HS 2-digit chapter or 4-digit heading than the inputs imported from a third country. Second, the substantial transformation is measured by a minimum value addition required to be done in the exporting country.

Since agricultural exports are dominated by trade in raw materials, RoO are less important in this sector. However, trade of processed food is increasing faster than other agricultural trade, high value horticulture products are increasingly produced in global value chains, and it has been argued that processed food and horticulture products provide an opportunity for developing countries to add more value and to create productive employment (UNCTAD, 2011). Thus, compliance costs related to RoO are increasingly important in agriculture. RoOs relating to agricultural products are rigorous. Estevadeordal and Suominen (2005) find that in 60 analysed PTAs RoO are most restrictive for the agricultural and textile sectors. Fulponi (2011) finds that wholly originating or entire production in the exporting country is often required in PTAs for products in HS chapters 01 to 08 and 10 and 12,in which raw materials and minimal processing predominate.[10] For the other chapters, for which generally a higher degree of processing is required, requirements for a change of HS 2-digit chapter predominate, often combined with a minimal value-added requirement.[11]

Many PTAs today include provisions that are only partly or indirectly linked to agriculture; these are not discussed in detail here. They include services, investment, intellectual property (e.g. the United States recognizes "Pisco Perú" as a distinctive product of Peru), competition rules, environment, as well as development and agricultural cooperation (see e.g. annex A.5). Coverage of these issues, as well as the previously discussed WTO+ commitments, indicates that PTAs are both broader and deeper in terms of liberalization than multilateral agreements, including in agriculture.

The limitations of the analysis of PTAs should be kept in mind. The analysis and the cited literature are always based on a sample of existing PTAs. Due to the large number of PTAs, no study so far has analysed all agreements. Thus, generalizations are to be made with care. However, due to a careful selection and a broad coverage in much of the cited literature as well as the importance of the selected agreements in terms of trade volume, it can be expected that the analysis above provides a fairly representative picture.

2.4 CONCLUSION

Agricultural trade is important for many countries' economies, especially for employment and food security. Including agriculture fully in international trade rules is controversial. On one hand, it is argued, agricultural exports are important for development and employment in developing countries, and imports are equally important for consumers' food security in net food-importing countries. The efficiency arguments apply as well. On the other hand, it has been argued that agriculture is different from other goods, and each country should not be constrained to design its own agricultural policy and should have the right to produce its own food and to protect small and vulnerable farmers.

[10] De minimis criteria in 70 per cent of PTAs allow a specified small percentage of non-originating materials. In several PTAs, however, the criterion is suspended for agricultural products.

[11] However, although RoO model clusters such as the Pan-Euro or the NAFTA model emerge, details vary significantly from agreement to agreement and from product to product.

So far, the international trading system has followed an approach that tries to balance both views by including agriculture in multilateral and preferential trade agreements but with lower reduction commitments and a higher degree of flexibility than for other products.

The WTO Agreement on Agriculture covers three pillars – market access, domestic support, and export subsidies. Trade barriers other than tariffs are not permitted under normal circumstances, and maximum tariffs are determined for each product in each country. Exceptions and safeguards are allowed in emergency situations, such as to protect health or, to a certain extent, to protect domestic producers. Domestic support to farmers is possible, but such measures need to follow criteria so as to limit the effect on trade and production. The AoA emphasizes the importance of agriculture for food security and to protect the environment, but it does not directly refer to employment or labour standards. Only with regard to domestic support is reference made to rural development and, in one instance, to benefits for the rural community. Governments are, however, indirectly enabled to endeavour to maintain employment in the agricultural sector through permitted domestic support instruments such as decoupled income support.

Liberalization in PTAs goes beyond the level agreed in multilateral agreements. Almost 90 per cent of agricultural tariff lines, on average, are eliminated in PTAs. However, the degree of liberalization is significantly less than for industrial goods. Sensitive agricultural products are frequently excluded from liberalization, involve a longer implementation period, or are subject to safeguards. Typically, those sensitive products are domestically produced goods whose producers are less competitive, such as dairy farmers in Switzerland, maize farmers in Mexico, beef producers in Indonesia, and sugar producers in the EU. Domestic support, which is high mainly in developed countries, is distorting agricultural trade, but it is not addressed in PTAs.

In view of high distortions in agricultural trade, it has been argued that the AoA did little to liberalize the sector. Although the UR AoA was a big step toward integrating agriculture into the multilateral trading system, the importance of further liberalization and correction of certain imbalances is widely recognized and, indeed, has already been agreed in the UR AoA as a built-in agenda. However, amending the rules for agricultural trade in the WTO has proved to be very difficult due to the sensitivity of the sector in almost every country and to the opposing views, mainly of agricultural exporters, on one hand, and of less competitive importers, on the other.

In the negotiations employment issues have frequently been used to emphasize the importance of the sector for countries. How to deal with the "multifunctionality" of agriculture, i.e. its importance not only to produce agricultural products but also, for example, for rural development, employment creation, poverty reduction, and the protection of the environment, is a very controversial question. The issue is related to green-box support, since this type of support comprises measures intended to achieve objectives not directly related to agricultural production, such as providing benefits to rural communities, establishing social safety nets, and improving environmental conditions. However, for many countries this is not sufficient. Some countries have advocated the right to keep high tariffs on sensitive agricultural products and to use specific agricultural safeguard measures to protect local producers. Furthermore, the high amount of domestic support demonstrates the willingness of governments to pay for the mulifunctionality of agriculture.

Employment considerations, however, do not always have the highest priority. Often, larger and less labour-intensive producers benefit more from support measures than more labour-intensive, smaller producers. Furthermore, trade distortions can have a detrimental effect on other countries' employment interests, e.g. those of developing countries. To address important employment challenges, policy-makers need to prioritize employment considerations in international trade negotiations and complementary national policies.

ANNEXES

A.2.1 Examples of safeguard measures in PTAs

EU–CARIFORUM EPA

Chapter 5, Article 4

Food security

1. The Parties acknowledge that the removal of barriers to trade between the Parties, as envisaged in this Agreement, may pose significant challenges to CARIFORUM producers in the agricultural, food and fisheries sectors and to consumers and agree to consult with each other on these issues.

2. Where compliance with the provisions of this Agreement leads to problems with the availability of, or access to, foodstuffs or other products essential to ensure food security of a CARIFORUM State and where this situation gives rise or is likely to give rise to major difficulties for such a CARIFORUM State, that Signatory CARIFORUM State may take appropriate measures in accordance with the procedures laid down in paragraphs 7 (b) to (d), 8 and 9 of article 3 of chapter 2.

US–Peru

Article 2.18: Agricultural Safeguard Measures

1. Notwithstanding Article 2.3, a Party may apply a measure in the form of an additional import duty on an originating agricultural good listed in that Party's Schedule to Annex 2.18, provided that the conditions in paragraphs 2 through 8 are met. The sum of any such additional import duty and any other customs duty on such good shall not exceed the least of:

(a) the base tariff rate provided in the Schedule to Annex 2.3;

(b) the most-favored-nation (MFN) applied rate of duty in effect on the day immediately preceding the date of entry into force of this Agreement;

(c) the prevailing MFN applied rate of duty; or

(d) the level of duty described in subparagraph 2(c) of Appendix I to Peru's Schedule to Annex 2.3, if applicable.

(to be triggered by 130–150% of TRQ)

Bilateral safeguards only during the transition period and global standards apply (no double jeopardy).

A.2.2 Examples of provisions on export restrictions in PTAs

US–Peru

Article 2.8: Import and Export Restrictions

1. Except as otherwise provided in this Agreement, no Party may adopt or maintain any prohibition or restriction on the importation of any good of another Party or on the exportation or sale for export of any good destined for the territory of another Party, except in accordance with Article XI of the GATT 1994 and its interpretative notes, and to this end Article XI of the GATT 1994 and its interpretive notes are incorporated into and made a part of this Agreement, mutatis mutandis.

US–Peru

Article 2.11: Export Taxes

Except as otherwise provided in this Agreement, no Party may adopt or maintain any duty, tax, or other charge on the export of any good to the territory of another Party, unless the duty, tax, or charge is also adopted or maintained on the good when destined for domestic consumption.

EU–CARIFORUM EPA

Chapter 3, Article 1

Prohibition of quantitative restrictions

No import or export prohibitions or restrictions on originating imports or exports, other than customs duties and taxes, and fees and other charges provided for under Article 5 of chapter 1, whether made effective through quotas, import or export licenses or other measures, shall be maintained as of the entry into force of this Agreement. No new such measures shall be introduced. The provisions of this Article shall be without prejudice to the provisions of Article 1 and 2 of chapter 2.

A.2.3 Examples of export subsidy provisions in PTAs

US–Peru

Article 2.16: Agricultural Export Subsidies

1. The Parties share the objective of the multilateral elimination of export subsidies for agricultural goods and shall work together toward an agreement in the WTO to eliminate those subsidies and prevent their reintroduction in any form.

2. Except as provided in paragraph 3, no Party may adopt or maintain any export subsidy on any agricultural good destined for the territory of another Party.

EU–CARIFORUM EPA

Chapter 3, Article 3, Agricultural Export Subsidies

1. No Party or Signatory CARIFORUM State may introduce any new subsidy programme which is contingent upon export or increase any existing subsidy of this nature on agricultural products destined for the territory of the other Party.

2. With regard to any product as defined in paragraph 3 for which the CARIFORUM States have committed to the elimination of customs duties the EC Party undertakes to phase out all existing subsidies granted upon the exportation of that product to the territory of the CARIFORUM States. The modalities of such phasing out shall be decided by the CARIFORUM-EC Trade and Development Committee.

A.2.4 Example of provision to maintain preference margin

EU–CARIFORUM EPA

Chapter 5, Article 6

Traditional agricultural products

The Parties commit to undertake prior consultations on trade policy developments that may impact on the competitive positions of traditional agricultural products, including bananas, rum, rice and sugar, in the market of the EC Party.

The EC Party shall endeavour to maintain significant preferential access within the multilateral trading system for these products originating in the CARIFORUM States for as long as is feasible and to ensure that any unavoidable reduction in preference is phased in over as long a period as possible.

A.2.5 Example of development and agricultural cooperation in PTAs

EU–CARIFORUM EPA

Chapter 5, Article 7, Cooperation

1. The Parties acknowledge the importance of the agricultural, food and fisheries sectors to the economies of CARIFORUM States and of cooperating to promote the transformation of these sectors, with the aim of increasing their competitiveness, developing their capacity to access high quality markets and in view of their potential contribution to the sustainable development of the CARIFORUM States. They recognize the need to facilitate the adjustment of the agricultural, food and fisheries sectors and the rural economy, to the progressive changes brought about by this Agreement, while paying particular attention to small scale operations.

2. Subject to the provisions of Article 7 of Part I of this Agreement the Parties agree to cooperate, including by facilitating support, in the following areas:

(a) Improvement in the competitiveness of potentially viable production, including downstream processing, through innovation, training, promotion of linkages and other support activities, in agricultural and fisheries products, including both traditional and non traditional export sectors;

(b) Development of export marketing capabilities, including market research, both for trade between CARIFORUM States and between the Parties, as well as the identification of options for the improvement of marketing infrastructure and transportation, and the identification of financing and cooperation options for producers and traders;

(c) Compliance with and adoption of quality standards relating to food production and marketing, including standards relating to environmentally and socially sound agricultural practices and organic and non-genetically modified foods;

(d) Promotion of private investment and public–private partnerships in potentially viable production;

(e) Improvement in the ability of CARIFORUM operators to comply with national, regional and international technical, health and quality standards for fish and fish products;

(f) Building or strengthening the scientific and technical human and institutional capability at regional level for sustainable trade in fisheries products, including aquaculture; and

(g) The process of dialogue referred to in Article 5.

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3. TRADE AND AGRICULTURAL EMPLOYMENT LINKAGES IN GENERAL EQUILIBRIUM MODELLING

David Vanzetti[1] and Ralf Peters

3.1 INTRODUCTION

The agriculture sector in developing countries is often characterized by weak enforcement of regulations, low productivity, informality, and labour surplus. In contrast to manufacturing, agricultural production is tied to land, and the product tends to be quite substitutable from one exporter to the next. These facts have implications for the impact of trade and trade liberalization on agricultural employment and wages.

The weak enforcement of regulations implies that there are effectively often no minimum wage or labour standards. This means that agricultural wages are often relatively flexible downwards as well as upwards.

In developing countries the agricultural sector employs about 29 per cent of the labour force – 757 million workers – and yet it produces only 10 per cent of the output (UNCTADstat).[2] Productivity is low because the labour is relatively unskilled and the amount of capital used with labour is small. The contribution of agriculture to economy-wide productivity gains is disproportionately low (UNCTAD, 2010).

Because of the informal nature of the sector, it frequently contains surplus labour. However, unemployment is not obvious because it is disguised. Workers are underemployed rather than unemployed. They would work more intensely or longer if there were demand for their products. Often, jobs in agriculture are low-quality jobs in terms of low payment and bad working conditions.

Finally, primary agricultural production is tied to land. For most types of production, the land can be switched from one crop to another. Thus, a fall in wheat prices does not mean that wheat producers become unemployed. Instead, they often can switch to another crop within a season. Producers of tree crops such as rubber and coffee are not so flexible.

[1] David Vanzetti was employed by UNCTAD when writing the first draft.

[2] Agriculture includes hunting, forestry, and fishing (corresponds to International Standard Industrial Classification, Rev.3, divisions 01–05).

There are several reasons to consider the link between trade and agricultural employment. Trade is important in agriculture. More than 40 per cent of global production is exported[3] – a higher share than the one for goods and services – although with significant variation across products. In 2010 the value of agricultural trade constituted 9.2 per cent of world merchandise trade. Developing countries account for 38 per cent of world agricultural exports, an increase from 31 per cent in 2000, driven by increasing exports from Latin America. Agriculture as a source of export revenue is particularly important for many Latin American and sub-Saharan African countries, where agriculture often accounts for more than half of total export revenue (UNCTAD, 2011).

Agriculture is one of the most distorted sectors. While tariffs on non-agricultural products have been reduced to an average of 3 per cent and 13 per cent in developed and developing countries, respectively, most favoured nation (MFN) tariffs on agricultural goods average 34 per cent and 25 per cent, respectively (chapter 2 of this volume). In addition, agricultural subsidies contribute to the distortions.

Given the characteristics of agricultural trade, the purpose of this paper is to review the linkages between trade and employment using various modelling approaches. For trade policy analysis, three popular approaches are[4]:

- partial equilibrium models
- social accounting matrices and
- general equilibrium models.

Single-sector partial equilibrium models are inadequate because they do not capture the flow of labour from one sector to another. Social accounting matrices cover all sectors but lack behavioural equations. Computable general equilibrium (CGE) models combine intersectoral linkages and behavioural responses. However, their cost is loss of transparency and the need for more sophisticated programming. An inherent weakness of most CGE models to assess the effects of trade policy changes on employment is the closure of the model with respect to the labour market, assuming full employment and flexible wages.

This chapter discusses the three modelling approaches and their advantages as well as limitations to analyse the link between trade and employment in agriculture. By way of illustration we apply the well-known Global Trade Analysis Project (GTAP) CGE model to unilateral trade liberalization in three countries as well as to multilateral liberalization.[5] Different labour market assumptions are tested. In particular, we are interested to know whether trade liberalization might lead to unemployment or falling wages in the agricultural sector. Adjustments in individual agricultural sectors are high, but overall employment effects in agriculture are relatively small.

[3] Global value of production in US$ 3,274 billion (FAOstat) and total value of agricultural trade is US$ 1,362 billion (UNCTADstat, both 2010).

[4] Gibson (2011) provides an overview of main methodologies that have been used to address the link between trade and employment.

[5] The model is fully documented in Hertel and Tsigas (1996) and can be downloaded from http://www.gtap.org.

3.2 QUANTITATIVE MODELS

3.2.1 Partial equilibrium models

Partial equilibrium models tend to focus on one or a small number of sectors. Their strengths are simplicity and transparency. If labour and other factors are assumed to be used in fixed proportions to output, a simple model consisting of three equations – for supply, demand, and net trade – can be used to show the employment effects of a trade shock. However, results from partial equilibrium models tend to overstate the positive or negative effects of a trade shock because the expansion of a sector appears to have no consequences for other sectors, or, conversely, the contraction of a sector is not compensated for by increased employment elsewhere.

For example, consider a single market specifying demand (D), supply (S), exports (X), and imports (M) that respond to domestic prices (Pd). Without trade, the market clearing condition is that demand equals supply, D=S. With the opportunity to trade, however, production plus imports must equal consumption plus exports. If exports are a constant proportion of production, and domestic prices are linked to world prices, Pw, through a tariff, t, the system of equations can be written as:

$$D = f(Pd) \qquad (1)$$

$$S = g(Pd) \qquad (2)$$

$$X = h(S) \qquad (3)$$

$$M = D - S + X \qquad (4)$$

$$Pd = Pw + t \qquad (5)$$

If labour is used in fixed proportions to production, it is clear that a reduction in the tariff will reduce domestic prices, production, and employment. In this specification the increase in imports does not proportionally displace labour because there is an increase in consumption. The relationship between production and imports in response to a change in tariffs is given by the elasticities of supply and demand. Nonetheless, labour dismissed from the sector is not employed elsewhere. Conversely, if there is an increase in demand for labour, there is no offsetting reduction in another sector. A trade-induced fall in output in a labour-intensive sector is seen as worse for employment than a similar fall in output in a capital-intensive sector.

Examples of partial equilibrium models are the Agriculture Trade Policy Simulation Model (ATPSM) and the Global Simulation Model (GSIM). The former, developed by the Food and Agriculture Organization (FAO) and the United Nations Conference on Trade and Development (UNCTAD), has been used, for example, by Peters and Vanzetti (2004) to analyse Doha Round proposals in World Trade Organization (WTO) agriculture negotiations. The model includes many agriculture-specific or relevant features such as domestic support, export subsidies, and tariff rate quotas, but it does not explicitly include employment. Vanzetti and Nikolić (chapter 7) use the GSIM model to analyse regional and unilateral trade policy changes for specific products. Employment effects are calculated in proportion to changes in output.

3.2.2 Social accounting matrices

An approach that takes account of cross-sector linkages is to use an input–output (IO) table that shows the backward and forward linkages between all sectors of the economy. The IO table shows sales from each sector to all others. Conversely, the cost of production in each sector is disaggregated into purchases from other sectors, including labour, capital, and other primary factors. These factors can be disaggregated into as many sectors as the data permit. Labour can be divided, for example, by occupation or skills levels. With the inclusion of additional data such as savings and investment, IO tables can be enhanced to become so-called social accounting matrices (SAMs). These can be used to show the impact of a change in final demand – including exports, for example – on production and hence on the use of the various inputs, including labour. The key equation is:

$$X = AX + D \quad (6)$$

where X is a vector of output, A is a matrix of coefficients that describes the use of inputs used in the production of outputs in each sector, and D is final demand. Since D includes imports and exports as well as consumption, a change in imports can be seen to affect output and hence labour use. In this framework an increase in imports fully displaces domestic production, causing an increase in unemployment. Likewise, an increase in exports pulls surplus labour into employment.

SAMs have the advantage of transparency, a point emphasised by Ernst and Peters (2011) in a paper examining the Indonesian economy. Such models assume fixed coefficients, and so a given amount of production requires given levels of the various inputs. There is no substitution between inputs as output expands or contracts or as relative input prices change. If lower output leads to less employment and lower wages, firms cannot respond by employing more labour and less capital. These assumptions may be adequate for small changes, but they are less convincing for larger trade shocks.

3.2.3 Computable general equilibrium models

General equilibrium models (CGEs) take different forms, but the common features are coverage of the whole economy, with scarce endowments (land, labour, and capital) constraining production and income, which in turn constrain expenditure and consumption. CGE models usually involve large databases with linkages between sectors through SAM tables. Global models link countries through trade flows. As with partial equilibrium models, but absent from SAMS, CGEs contain behavioural equations. This implies consumers and producers respond to price changes, and it allows firms to employ more or less labour depending on relative prices. However, including behavioural equations raises the issue of what these parameters (elasticities) should be, and, since these relationships are the heart of the model, their value is sometimes contentious. CGE models usually have a macro component, with the trade balance and investment and savings taken into account.

An important structural identity is the requirement that the current account offsets the capital account, that is, savings minus investment equal exports minus imports:

$$S\text{–}I = X\text{–}M \qquad (7)$$

Because this is an identity, at least one of these variables must be determined endogenously, inside the model. This is referred to as the “macroeconomic closure”, the choice of variables as exogenous or endogenous. Usually, saving is fixed to income, which implies that investment determines the trade balance. This is important because policy-makers are keen to know whether trade liberalization will lead to, or worsen, a trade deficit. The trade deficit, X–M, can be fixed in the model, and this is a reasonable assumption if countries maintain a flexible exchange rate. In that case saving and investment must move in proportion.

Many models are neo-classical in nature, implying perfect competition, cost minimization by firms, and utility maximization by consumers. In practice, this means that prices clear markets. Of particular relevance to this paper, this implies that there is no unemployment or, at least, no change in employment. However, a simple change in closure can specify a labour market with fixed wages and variable employment. This is most relevant where surplus labour exists, as is the case in many developing countries.[6]

There are other approaches to modelling the labour market. On the supply side, micro-simulation based on individual household data may be useful. On the demand side, substitution possibilities between different types of labour have been considered. As for labour market coordination, several wage-forming mechanisms and involuntary unemployment models have been integrated into CGE models, including efficiency wages, bargaining, and minimum wage models.[7] The specification of the labour market depends on the research question to be addressed. For example, if the distribution effects of trade liberalization are to be analysed, micro data at the household level are desirable. Micro-simulation provides greater detail but at the cost of greater data collection and complexity. Micro-simulation is more commonly applied to single-country CGE models than to global models.

Thus, CGE models combine the behavioural responses of partial equilibrium models with the intersectoral coverage of SAMs. As such, they are often the preferred approach for trade policy analysis.

3.2.3.1 The demand for labour

The demand for labour, as for any other factor of production, depends on the demand for the goods and services that labour can produce. Neglected in the discussion so

[6] Kurzweil (2002) shows that in general models with variable employment lead to higher welfare gains from trade liberalization than those with fixed employment and variable wages, mainly because of a more efficient resource allocation and diminished unemployment.

[7] Boeters and Savard (2012) provide an overview of labour market modelling approaches in CGE models.

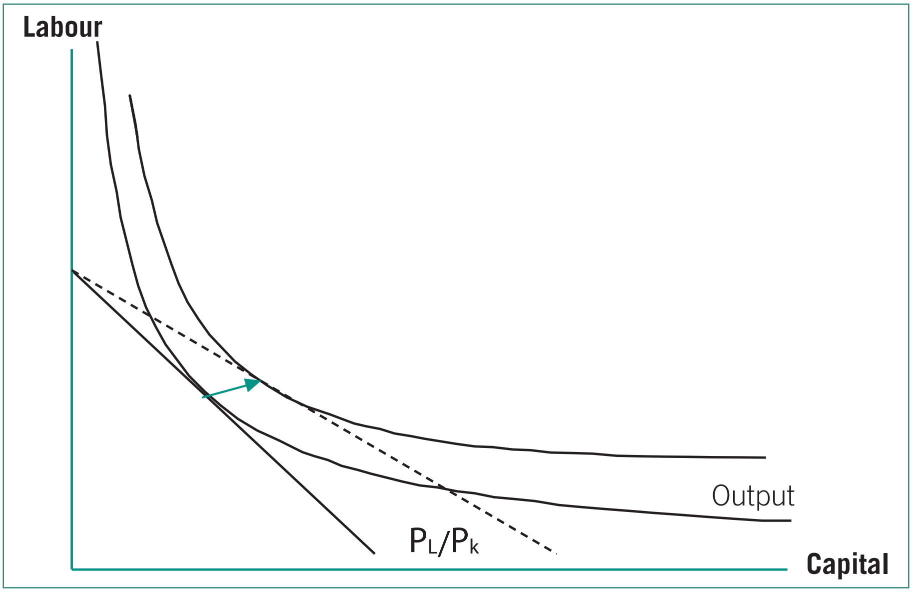
far is the substitutability between labour and capital (figure 3.1) or, more specifically, between different types of labour. The substitution between labour and other factors of production can be defined in an aggregate production function linking output (Y) to the amount of capital (K) and labour (L) employed, thus:

$$Y = AK^{a} L^{1-a};\ 0 < a < 1 \qquad (8)$$

where A is an overall productivity parameter and a and $1-a$ are the elasticities of output with respect to capital and labour, respectively. In this specification the relationship between labour and output is non-linear, with increasing amounts of labour needed to produce a given increase in output, assuming capital is fixed. The curvature, or degree of non-linearity, is given by the parameter α.

Equation 8 can be extended to three or more factors of production. In the GTAP model labour is divided into skilled and unskilled. Land and natural resources are additional factors.

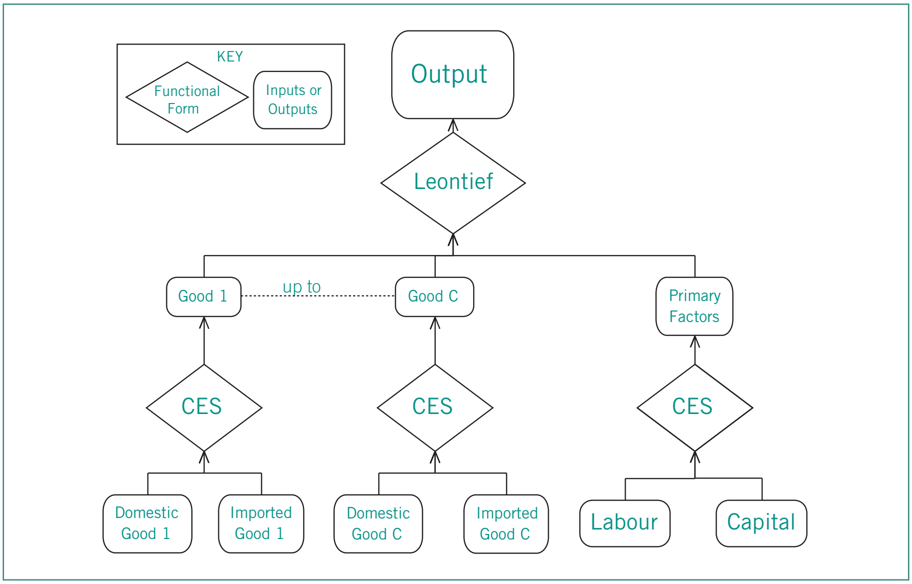
Figure 3.1: Trade-off between labour and capital



P_L/P_K is the price of labour relative to the price of capital.

As illustrated in figure 3.2, in GTAP output is a function of a bundle of primary factors (land, capital, and labour) plus a bundle of domestic and imported intermediate inputs, such as fuel and fertilizer. The primary factor composite and the intermediate good composite each have a constant elasticity of substitution (CES) functional form. All industries have the same structure, but the proportions of inputs vary. Only

Figure 3.2: Structure of production function in GTAP



CES = constant elasticity of substitution

agriculture uses land, for example. The bundle of primary factors and the bundle of intermediate inputs are combined using a constant elasticity of substitution functional form. Decision-making is in stages. The first stage is to decide how much to produce; this determines the amount of primary factors and intermediate inputs. The second stage is to determine the proportion of land, labour, and capital and the source (domestic or imported) of the intermediate goods.

In GTAP the demand in region *r* for use of endowment *i* in industry *j* is given by:

$$qfe(i,j,r)=qva(j,r)-ESUBVA(j)*[pfe(i,j,r)-pva(j,r)] \qquad (9)$$

where *qfe* is the change in demand for the endowment, *qva* is the change in the value added composite, *pfe* is the change in the price of the endowment, *pva* is the change in the price of the value added composite, and *ESUBVA* is the elasticity of substitution. This last parameter comes into play when there is a change in the prices of capital and labour. In these circumstances it is reasonable to expect a change in the capital–labour ratios. Estimates for the elasticity of substitution between factors vary by type of agricultural commodity, as shown in table 3.1. These estimates are common across all regions. The low elasticity for primary agriculture suggests that capital and labour ratios are not sensitive to price, and, thus, changes in output (*qva* in equation 9) are a good guide to changes in use of all factors (*qfe* in equation 9). This conclusion does not hold for processed agriculture, where there is greater flexibility.

Table 3.1: Elasticities of primary factor substitution in the GTAP model

Product	**Elasticity**
Primary agriculture	0.26
Processed agriculture	1.12

Source: GTAP version 8 database.

Primary factors are combined with intermediate inputs to produce output. Intermediate inputs are normally assumed to be used in fixed proportions, but alternatively can be determined by relative prices, as shown in equation 10.

$$qf(i,j,r) = qo(j,r) - ESUBT(j) * [pf(i,j,r) - ps(j,r)] \quad (10)$$

where *qf* is the change in demand for commodity *i* for use by *j* in region *r*, *qo* is the change in industry output, *ESUBT* is elasticity of substitution among composite intermediate inputs to production, *pf* is the change in firms' price for the commodity, and *ps* is the change in the supply price of the commodity. Parameter *ESUBT* is normally zero, but in one of the scenarios in Section 3.3.1 we change its value to 1 for all agricultural sectors.

While the elasticities of substitution determine how capital, labour, and intermediate inputs respond to a change in relative prices, the initial flows data show the current levels of use of each input to production. Assuming there is no change in the prices of capital and labour, a change in output will lead to a change in employment in proportion to the labour–output ratio. The ratio shows the value of labour relative to total output at market prices (excluding taxes and subsidies). For most primary products labour contributes about 30–40 per cent of the costs. In agriculture wages are low, and so the ratios tend to understate the number employed. Table 3.2 shows labour–output ratios in different agricultural sectors in five countries. For example, around one third of the cost of paddy rice production in Indonesia is attributable to labour. Processed goods tend to use relatively less labour and more capital and intermediate goods. Bangladesh appears to have lower labour–output ratios than Indonesia, a more developed country. This reflects the low cost of labour in Bangladesh.

Other factors of production include land and capital. The capital–labour ratios for agriculture in these five countries are shown in table 3.3. These data, from the GTAP database, were derived from the National Accounts. The first row, for example, shows that capital accounts for 6 per cent of the value of output of paddy rice in Indonesia, 10 per cent in Bangladesh, and so on. This table can be used to predict employment in agriculture, given the simplifying assumption that capital, land, and labour are used in fixed proportions to produce any level of output. The processing industries tend to use more capital. They also use more intermediate inputs, in which capital and labour also are embodied. For example, beef uses 7 per cent labour, 7 per cent capital, and 75 per cent cattle. The production of cattle in turn uses 30 per cent labour (as shown in table 3.2). This is not taken into account in the data in table 3.3, but it is in general equilibrium simulations, to which we turn next.

Table 3.2: Labour–output ratios in agriculture in five countries

Product	Code	Indonesia	Bangladesh	Guatemala	Mexico	South Africa
Primary agriculture						
Paddy rice	pdr	0.35	0.22	0.33	0.39	0.17
Wheat	wht	0.06	0.12	0.19	0.18	0.10
Cereal grains nec	gro	0.36	0.26	0.29	0.36	0.14
Vegetables, fruit, nuts	v_f	0.38	0.23	0.26	0.34	0.16
Oilseeds	osd	0.33	0.14	0.34	0.09	0.15
Sugar cane, sugar beet	c_b	0.32	0.19	0.39	0.35	0.12
Plant-based fibres	pfb	0.38	0.19	0.29	0.13	0.08
Crops nec	ocr	0.33	0.20	0.38	0.30	0.20
Cattle, sheep, goats, horses	ctl	0.30	0.11	0.27	0.17	0.13
Animal products nec	oap	0.21	0.18	0.22	0.27	0.09
Raw milk	rmk	0.25	0.11	0.29	0.10	0.12
Wool, silk-worm cocoons	wol	0.19	0.00	0.23	0.15	0.07
Forestry	frs	0.29	0.02	0.14	0.47	0.05
Fishing	fsh	0.21	0.04	0.08	0.03	0.10
Processed agriculture						
Meat: cattle, sheep, goats, horse	cmt	0.07	0.15	0.06	0.07	0.04
Poultry and other meats	omt	0.37	0.16	0.10	0.23	0.04
Vegetable oils and fats	vol	0.24	0.03	0.18	0.16	0.06
Dairy products	mil	0.14	0.15	0.17	0.03	0.10
Processed rice	pcr	0.07	0.02	0.35	0.69	0.01
Sugar	sgr	0.12	0.23	0.18	0.31	0.04
Food products nec	ofd	0.16	0.07	0.14	0.23	0.12

nec=not elsewhere categorized
Source: GTAP version 8 database.

Table 3.3: Capital–output ratios in agriculture in five countries

Product	Code	Indonesia	Bangladesh	Guatemala	Mexico	South Africa
Primary agriculture						
Paddy rice	pdr	0.06	0.10	0.17	0.24	0.26
Wheat	wht	0.01	0.06	0.10	0.12	0.15
Cereal grains nec	gro	0.06	0.12	0.15	0.23	0.22
Vegetables, fruit, nuts	v_f	0.06	0.11	0.14	0.21	0.26
Oilseeds	osd	0.06	0.07	0.18	0.07	0.24
Sugar cane, sugar beet	c_b	0.05	0.09	0.21	0.22	0.19
Plant-based fibres	pfb	0.06	0.09	0.15	0.09	0.13
Crops nec	ocr	0.06	0.09	0.20	0.19	0.31
Cattle, sheep, goats, horses	ctl	0.05	0.05	0.15	0.13	0.21
Animal products nec	oap	0.04	0.08	0.12	0.18	0.14
Raw milk	rmk	0.04	0.05	0.15	0.08	0.18
Wool, silk-worm cocoons	wol	0.03	0.00	0.13	0.09	0.10
Forestry	frs	0.44	0.34	0.05	0.08	0.28
Fishing	fsh	0.31	0.18	0.23	0.46	0.16
Processed agriculture						
Meat: cattle, sheep, goats, horse	cmt	0.07	0.08	0.07	0.01	0.02
Poultry and other meats	omt	0.24	0.09	0.12	0.34	0.02
Vegetable oils and fats	vol	0.17	0.12	0.22	0.40	0.08
Dairy products	mil	0.09	0.08	0.20	0.06	0.06
Processed rice	pcr	0.08	0.14	0.12	0.17	0.02
Sugar	sgr	0.13	0.00	0.29	0.35	0.13
Food products nec	ofd	0.18	0.21	0.27	0.04	0.10

nec=not elsewhere categorized
Source: GTAP version 8 database.

A standard assumption in GTAP is that labour is mobile between sectors within a country and within a skill group. This includes, for example, the possibility that unskilled labour that became unemployed in an agricultural sector can be employed in the services or industrial sectors. This assumption can be changed to analyse the impact of less adjustable labour market structures on the effect of trade liberalization on employment.

3.2.3.2 Trade liberalization and labour demand

The effect of trade liberalization on employment and wages in agriculture depends on changes in the demand for such labour-intensive goods. Because protection of one specific product in a country increases output and employment of that product in that country, removing the protection will lead to a decrease. At the same time, however, falling prices following the removal of tariffs will lead to an increase in consumption. The increase in consumption, coupled with the fall in domestic production, creates a gap that is filled by increased imports. Therefore, employment typically falls in sectors where tariffs are reduced, as production shifts from one country to another. To maintain a balance of trade, exports need to increase to match any increase in imports following trade liberalization. This means employment is likely to increase in exports industries. The net effect depends on the labour intensity of the import and export industries.

Labour intensity in production varies from country to country and product to product. If tariffs on a more labour-intensive product are removed while tariffs remain on less labour-intensive products, total employment in the agricultural sector will fall. This is a composition effect, whereupon the demand for labour falls because of a change in the composition of production.

Trade liberalization may also have indirect effects on employment in agriculture, e.g. prices for intermediate goods can change, and this can affect the relative use of primary and intermediate factors.[8] Furthermore, trade may have an impact on growth, which has a further impact on demand for food products. A relatively sophisticated model is needed to capture the indirect effects.

3.2.3.3 Limitations of CGE modelling

In applying CGE models to questions on trade in agriculture and employment, several limitations ought to be kept in mind. Limitations that apply generally to CGE trade analysis include data and parameter limitations as well as simplifications and assumptions relating to the structure of the model. For example, no specific data are available on non-tariff measures. As tariffs are reduced, these other impediments are likely to play a greater role. Parameters are often not estimated for the particular model or level of aggregation. Armington elasticities, measuring the degree of substitutability between domestic and various foreign products, are not specific at the country or product aggregation level. Regarding the model, it is generally assumed that there is one representative firm per sector per country. However, the new trade theory and corresponding empirical evidence suggest that the size and the *ex ante*

[8] Since intermediate goods are again produced using labour, this effect is similar to the productivity effect.

productivity of enterprises matter when trade is liberalized. Furthermore, most CGE applications are static, with no account taken of dynamic gains relating to technology, competition, and productivity growth. Nor is account taken of the one-off costs of structural adjustment, such as temporary unemployment. Dynamic models exist, but many assumptions regarding the growth path have to be made with a high degree of uncertainty.

Another limitation is that, when there is no initial trade – for example, due to prohibitively high tariffs – trade liberalization does not generate any flows in CGE models. Careful aggregation of regions and sectors can minimize this problem. However, aggregation creates problems of its own by hiding the distortions between differing tariffs within a sector. Laborde et al. (2011) develop an approach that addresses the deficiencies stemming from aggregating and uses trade-weighted average distortions. Although their approach does not solve the problem with zero initial trade, it makes use of the availability of trade data, which are more detailed than consumption and production data, by using different aggregators. The result is that welfare gains are significantly higher than those measured in analysis using aggregated data.

A limitation that relates more specifically to trade liberalization and employment in agriculture is the diversity of production processes and the informality of the labour force. Industrial-type capital-intensive production and labour-intensive smallholder production, often at a subsistence level, co-exist, often in the same sector in the same country. The effect of trade liberalization is likely to differ greatly between the two types of production. This is difficult to capture in CGE models. An approach to overcome this limitation is to link a global CGE model with country-specific micro data. Hertel and Winters (2005) take this approach, attempting to assess the impact of trade liberalization negotiations on poverty in the developing world by following the effect of global shocks, through their effects on prices, trade, production, and earnings, right down to the household level. Vanzetti and Oktaviani (2012, chapter 7 in this volume) link a disaggregated country-specific CGE model with the global GTAP model. Sinha (2011) discusses the effects of trade on the informal economy and the opportunities for and limitations of such analysis in CGE models. The objective of this strand of analysis has been to assess distribution effects between the formal economy and the informal economy rather than to refine the assessment of the effect of trade liberalization on employment in a sector as a whole.

In GTAP all data including employment are in value terms. Thus, information about the initial number or the change in the number of workers in agriculture is not directly available. If trade liberalization results in a contraction of labour demand in a high-wage country by US$1,000, for example, and an expansion of the same amount in a low-wage country, global employment increases. Agricultural value added per worker, an indicator for wages, varies from a few hundred US$ in, for example, many African countries to values around $50,000 in countries such as Canada, the United States of America, and many European countries (WDI, 2012).

An issue stemming from the agricultural negotiation process is that often the countries themselves can select at a later stage, based on certain criteria, which products are deemed sensitive and thus exempt from (full) liberalization. The special treatment given to sensitive products weakens the level of ambition and the potential gains, but it can have positive effects for domestic producers. Since the actual selection is not known *ex ante,* different approaches to identifying the sensitive products have been taken. For example, Anderson et al. (2006a) select products according to the tariff revenue forgone through implementation of the tariff reduction formula proposed in the draft modalities text (WTO, 2008); Vanzetti and Peters (2011), according to the percentage difference between bound and applied rates in developing countries; and Laborde and Martin (2011), according to a political economy approach. Furthermore, the binding overhang is particularly large in agriculture, and so reduction commitments in multilateral negotiations on bound rates do not reflect actual cuts in applied rates.

3.3 ILLUSTRATIVE SCENARIOS

3.3.1 Illustrative scenario; unilateral liberalization

To illustrate the impact of different features of a general equilibrium model, we run a trade liberalization scenario with different parameters and labour market closures. The Standard scenario is unilateral liberalization of all agriculture import tariffs in Indonesia, Bangladesh, and Guatemala using the version 8 database of GTAP. The variations of this scenario involve the different assumptions listed in table 3.4.

The first scenario, Standard, is the standard neo-classical closure in which it is assumed that all factors of production are employed but are mobile between sectors. Scenario 2, Fixed, is the Keynesian closure, where surplus unskilled labour exists and wages are fixed. Scenario 3, Primary, shows the effects of increased mobility between factors of production, including between unskilled and skilled labour, and Scenario 4, Intermediates, illustrates the effects of greater substitution between primary factors and intermediates. The elasticity is normally zero, but here it is changed to 1. This relaxes the assumption that intermediates need to be used in fixed proportion to capital and labour.

Table 3.4: Labour market assumptions

Scenario	**Description**
Standard	Standard closure, with fixed total employment a nd variable wages
Fixed	Fixed real wages for unskilled labour
Primary	Standard closure, with doubling of elasticity of substitution between primary factors. This is parameter ESUBVA in equation 9.
Intermediates	Standard closure, with substitution between intermediate inputs. This is parameter ESUBT in equation 10.

Results

The simulated changes in real wages under the different assumptions are shown in table 3.5. In each case the changes in real wages are positive, except where real wages of unskilled labour are held fixed. Real wages increase because imports become cheaper. A second observation is that the changes in skilled and unskilled wages are about the same. Unilateral liberalization in agriculture does not lead to an increase in demand for skilled as opposed to unskilled labour. Land rents decrease, however, in the liberalizing countries by about 1.5 per cent. In so far as total income from agricultural activities for (small) farmers is a mixture of wage and land rent, some may be worse off.

Employment in the agricultural sector is decreasing in all scenarios. This occurs particularly because liberalization occurs in agriculture only. Liberalization in all sectors might result in an increase in agricultural employment if there are larger cuts in industrial sectors. With agricultural liberalization only, agricultural imports increase when markets are opened, and imports replace some domestic production. In Bangladesh employment in the agriculture sector decreases by almost 2 per cent in the Standard scenario. Employment increases in non-agriculture sectors, however. In the Fixed scenario, with fixed wages, the increase in non-agriculture employment more than offsets losses of employment in the agriculture sector. In the Fixed scenario the total quantity of unskilled labour employed increases by 0.45 per cent in Indonesia, 1.37 per cent in Bangladesh, and 0.78 per cent in Guatemala (table 3.5), similar to the increases in real wages for skilled labour (table 3.6). As expected, fixing real wages boosts employment, as the increase in demand for this type of labour is channelled into a quantity change rather than a price change. The assumption of fixed wages also holds down the cost of production, making the country more competitive.

In the Primary scenario policies that increase the substitutability between primary factors, such as skilled and unskilled labour, or capital and land, have little impact on wage changes. If anything, the real wage change rates are slightly reduced, for example in the Indonesian case from 0.30 to 0.24 per cent (table 3.6).

Table 3.7 shows changes in output and employment of unskilled labour in a sensitive agricultural sector in each country. Indonesia has a tariff of 22 per cent on

Table 3.5: Simulated percentage changes in unskilled employment

	Indonesia			Bangladesh			Guatemala		
	Agri	**N-ag**	**Total**	**Agri**	**N-ag**	**Total**	**Agri**	**N-ag**	**Total**
Standard	–0.51	0.14	0	–1.96	0.31	0	–0.57	0.17	0
Fixed	–0.25	0.65	0.45	–1.20	1.77	1.37	–0.28	0.95	0.78
Primary	–0.44	0.12	0	–2.12	0.34	0	–0.49	0.15	0
Intermediates	–0.35	0.10	0	–2.06	0.33	0	–0.36	0.11	0

Agri=agriculture; N-ag=non-agriculture
Source: GTAP simulations.

Table 3.6: Simulated percentage changes in real wages

	Indonesia		Bangladesh		Guatemala	
	Unskilled	**Skilled**	**Unskilled**	**Skilled**	**Unskilled**	**Skilled**
Standard	0.30	0.30	0.83	0.85	0.42	0.46
Fixed	0	0.41	0	1.15	0	0.64
Primary	0.24	0.26	0.79	0.72	0.39	0.39
Intermediates	0.25	0.29	0.81	0.83	0.41	0.44

Source: GTAP simulations.

sugar imports from its major supplier; Bangladesh has a tariff of 17 per cent on sugar imports from South Asia; and Guatemala has a tariff of 22 per cent on imports of maize (Cereal grains nec) from the US.

While holding wages fixed reduces production costs in the case of increasing demand, the absence of wage flexibility lessens adjustment in the economy. For this reason the simulated changes in output are less in the Fixed scenario than in the Standard scenario, where the total quantity of unskilled labour is fixed.

The change in employment is closely associated with the change in output in the sector. Fixing real wages has little impact on the change in employment in a specific sector in Indonesia; the impact is more noticeable in Bangladesh. Increasing the mobility of primary factors lessens the reduction in output, as a change in the mix of capital and labour can make the sector more competitive. The reduction in output is less in the Primary scenario than in the Standard scenario. By contrast, increasing the mobility of intermediates increases the reduction in output because primary factors can move more readily into other sectors.

There is a trade-off between efficiency and adjustment costs. Greater flexibility leads to a more efficient outcome but also requires greater adjustment in the short run. As table 3.8 shows, the Primary scenario, where primary factors are assumed to be more substitutable, shows greater allocative efficiency gains than the Standard

Table 3.7: Simulated percentage changes in output and employment of unskilled labour in sensitive sectors

	Indonesia		Bangladesh		Guatemala	
	Output	**Employment**	**Output**	**Employment**	**Output**	**Employment**
Standard	–14.19	–16.63	–6.97	–8.28	–4.14	–4.49
Fixed	–13.82	–15.74	–5.15	–4.87	–3.73	–3.72
Primary	–14.92	–18.60	–7.16	–8.84	–4.20	–4.75
Intermediates	–13.46	–14.91	–5.95	–8.56	––3.24	–3.47

Note: "Sugar" in Indonesia and Bangladesh and "Cereal grains nec" in Guatemala.
Source: GTAP simulations.

Table 3.8: Simulated changes in allocative efficiency ($m)

	Indonesia	Bangladesh	Guatemala
Standard	81	26	12
Fixed	134	102	17
Primary	100	50	15
Intermediates	90	45	12

Source: GTAP simulations.

scenario. However, improving the mobility of intermediate inputs appears to have little or no impact on efficiency. The two other important components of welfare are terms-of-trade effects and endowment (employment) effects. The terms-of-trade effect is negative in unilateral liberalization. In the Standard scenario it is greater than the allocative efficiency effect, so that the total welfare effect is negative in all three countries. In the Fixed scenario the endowment effect, resulting from higher total employment of unskilled workers, is positive and large in each of the three countries, so that the total welfare effect is positive.

The employment effects vary more than the change in output when substitution between factors of production is assumed. Table 3.9 shows the percentage change in use of unskilled labour in each of the agricultural sectors in Guatemala for two sce-

Table 3.9: Simulated percentage changes in employment of unskilled workers in Guatemala by sectors

Product	Standard	Fixed
All agriculture	–0.57	–0.28
Paddy rice and processed rice	–1.06	–1.34
Wheat	1.92	1.70
Other cereals	–4.20	–4.38
Oilseeds	0.50	0.22
Vegetable oils and fats	10.06	9.57
Sugar	0.77	0.32
Vegetables and fruit	–0.38	–0.57
Other crops	1.60	1.37
Livestock	–0.12	–0.37
Ruminant meat	–0.70	–1.20
Non-ruminant meat	–16.71	–17.18
Other processed agriculture	0.48	–0.10
Non-agriculture	0.17	0.95

Source: GTAP simulations.

narios. There are decreases of more than one per cent in rice, other cereals, and meat. Other agricultural sectors expand significantly. More importantly, however, the assumption of either variable or fixed wages makes a sizeable difference to the change in total and non-agricultural employment, although not much for the agricultural sectors. This highlights not only the assumption of a surplus of unskilled labour, but also the need for a labour market that enables the unemployed to find work.

3.3.2 Illustrative scenario: multilateral liberalization

Unilateral trade liberalization in agriculture only leads to a decrease in employment in that sector. When lowering barriers to agricultural trade, negotiators want to ensure that "gains" from higher levels of exports of other goods and services, due to better access to other countries' markets, compensate for the "pain" of higher levels of imports. The WTO's Doha Round of multilateral trade negotiations in agriculture aims at substantial improvements in market access, reductions, with a view to phasing out, of all forms of export subsidies, and substantial reductions in trade-distorting domestic support. Special and differential treatment provisions are integral parts of all elements of the negotiations.[9] After a decade of negotiations, the Doha Round is in stalemate, and its future is uncertain. Agriculture was for most of the time at the centre of attention and controversy (UNCTAD, 2011). Agriculture is a politically sensitive sector in almost all countries and important for food security as well as employment, especially in developing countries. This section illustrates the possibilities and limitations of CGE models to assess the impact of multilateral liberalization on employment. In contrast to unilateral liberalization, multilateral liberalization provides access for increased exports, thus making the increase in imports easier to tolerate.

The draft modalities text for agriculture in the Doha Round negotiations includes detailed provisions on market access, domestic support, and export competition. The exceptions and special provisions for individual countries and country groups are many; analysing these specific provisions would shed more light on the effects of such special provisions than on the general effect of multilateral trade negotiations. Several studies have analysed specific provisions, e.g. Vanzetti and Peters (2011) and Jean et al. (2006). Here, the liberalization scenario assessed is based on the overall average cuts that would result from the Doha Round as proposed in the current draft modalities texts for agriculture. Laborde and Martin (2011) show the impact of the draft modalities text for agriculture (WTO, 2008) on applied tariffs. Thus, the overall level of ambition is in line with the draft modalities text, reflecting the most likely politically feasible outcome of multilateral trade negotiations in agriculture.

Proposed tariff cuts are higher in developed countries than in developing countries. This results from the special and differential treatment principle as well as from the fact that negotiations are on bound rates, where developing countries have a

[9] For detailed information on the Doha Round negotiations on agriculture, see chapter 2 of this book and references therein. Also, Martin and Mattoo (2011) provide a comprehensive overview of the Doha Round.

Table 3.10: Multilateral liberalization scenarios

Scenario	Tariff reduction	Trade-distorting domestic support	Labour market
Standard	Developed: –33% Developing: –10% LDC: no change	Developed: –55% Developing: no change	Fixed quantity of unskilled labour
Variable	Developed: –33% Developing: –10% LDC: no change	Developed: –55% Developing: no change	Adjustment in both wages and employment
Fixed	Developed: –33% Developing: –10% LDC: no change	Developed: –55% Developing: no change	Fixed wages of unskilled labour

higher binding overhang. Applied rates are reduced by 33 per cent in developed countries and 10 per cent in developing countries. Trade-distorting domestic support is reduced by 55 per cent in developed countries, and export subsidies are eliminated.[10] The least developed countries (LDCs) are exempt from reduction commitments.

As with the unilateral liberalization scenarios, we assess the implications of different labour market assumptions. Three scenarios are simulated: the Standard scenario, where the number of workers is fixed and wages adjust to clear the labour market; a Variable scenario, where both wages and employment adjust in approximately equal shares to changes in demand; and the Fixed scenario, where wages are fixed and all adjustment is through higher or lower employment (table 3.10).

Studies using general equilibrium models to assess the effect of trade liberalization on employment usually find relatively small effects (table 3.11). This is partly the consequence of the labour market assumption, where unemployment is often not explicitly modelled. Where employment is not fixed, developing countries appear to benefit in terms of employment in agriculture, while initially protected developed countries tend to lose employment in that sector.

Results

Global agricultural trade increases by 2 per cent in the Standard and Variable scenarios and by 2.2 per cent in the scenario with fixed wages (table 3.12). Behind the average changes are some significant country- and product-specific changes. For example, exports of meats from the USA to Japan increase by 26 per cent for ruminant meat and 36 per cent for non-ruminant meat. All countries increase their exports, except Bangladesh, the European Union (EU), and Mexico. Japan's exports are very low for all product groups, and so the positive change in total exports from Japan starts from

[10] Blandford and Josling (2011) analyze the potential effect of the proposal on domestic support reduction of the draft modalities text for agriculture (WTO, 2008) on applied rates of domestic support in the EU and the United States.

Table 3.11: Overview of selected studies assessing the effect of trade liberalization

	Labour market	**Scenario**	**Employment**
Anderson et al. (2006a) Linkage model	Recursive dynamic model with exogenous labour supply growth; labour markets clear with flexible prices	"Scenario 7" agriculture and non-agriculture market access (NAMA) liberalization; tiered formula with tariff cuts between 35 and 75 per cent in agriculture, no cuts in LDCs	Employment rate decreases by –0.7% in developed countries and increases by 0.1% in developing countries compared with baseline (world –1.0%); full liberalization: developed, –1.6%; developing, +0.2% (world: –2.1%)
Decreux and Fontagné (2006) MIRAGE model	Production factors fully employed; negative shocks absorbed by changes in prices	"Standard scenario", agriculture liberalization only; 36% reduction of tariffs	Employment losses in EU, Japan, USA of about 2–3 per cent; gains in sub-Saharan Africa and South America of about 2–3 per cent. Countries affected by erosion of preferences and changes in relative prices lose in terms of welfare.
Polaski (2006) Carnegie model	Separated rural labour and urban skilled and unskilled labour; rural employment has flexible wages; migration between rural and unskilled urban (where wages are fixed)	"Hong Kong" scenario, reduction of all distortions by 36 per cent in developed countries and 24 per cent in developing countries; LDCs exempt	Employment in developing countries +0.76% (agriculture +1.46%); in developed countries, +0.08% (agriculture –1.74%)[11]

a very low base; it is driven by higher exports of other processed agriculture products. Exports increase most for competitive agricultural producers. The most competitive country groups are other developed countries, which include Australia, Canada, and New Zealand, all Cairns group members; and Latin America, with e.g. Argentina and Brazil. Exports from China, North Africa and the Middle East, and the United States also increase disproportionately, while exports from Bangladesh, the EU, and Mexico decline. The decline in the EU is caused mainly by reduced subsidies. Bangladesh and Mexico as well as African LDCs, where export growth is disproportionately low, are negatively affected by preference erosion.

[11] Agriculture employment changes calculated as simple average from corresponding sectors.

Table 3.12: Estimated percentage changes in agricultural exports and imports under multilateral trade liberalization scenarios

	Standard		Variable		Fixed	
	Exports	**Imports**	**Exports**	**Imports**	**Exports**	**Imports**
European Union	–1.7	0.6	–1.7	0.6	–0.8	0.6
United States	4.2	2.1	4.2	2.1	3.7	2.2
Japan	6.0	6.9	6.0	6.9	5.5	7.0
Other developed	8.9	7.5	9.0	7.6	8.8	7.6
China	6.7	1.6	6.7	1.6	6.2	1.6
Indonesia	2.9	1.4	2.9	1.4	2.7	1.4
Bangladesh	–1.4	–0.1	–1.4	–0.1	–1.6	–0.1
Guatemala	0.7	0.7	0.7	0.7	–0.3	0.7
Mexico	–1.1	0.2	–1.1	0.2	–1.3	0.2
South Africa	3.2	1.2	3.2	1.2	2.3	1.3
South-East Asia	3.1	1.9	3.1	1.9	2.8	1.9
South Asia	2.7	4.8	2.7	4.9	2.2	4.9
Eastern Europe and West Asia	2.9	1.5	2.9	1.5	2.1	1.5
Central America	3.1	1.8	3.1	1.9	2.9	1.9
Latin America	5.3	2.4	5.3	2.5	4.7	2.5
North Africa and Middle East	7.2	2.0	7.2 2	.0	6.8	2.0
Sub-Saharan Africa, non-LDC	2.2	1.6	2.2	1.6	2.1	1.6
Sub-Saharan Africa, LDC	0.3	–0.1	0.3	–0.1	0.1	–0.1
World	2.0	2.0	2.0	2.1	2.2	2.1

Source: GTAP simulation.

Imports increase in all regions except Bangladesh and sub-Saharan LDCs. Being exempt from trade liberalization, these countries do not reduce tariffs. Slightly rising world food prices lead to lower imports. The increase in imports to other countries is mainly modest, at around 1 per cent to 3 per cent. Imports of Japan and other developed countries increase by about 7 per cent. Broadly, the changes in imports and exports are similar in each country. The reason is that there is no alternative use for land and limited alternative use for labour in other sectors. Therefore, CGE models predict that trade liberalization leads to shifts in the composition of agricultural trade and production rather than a complete move into industrial goods and services production. Indeed, the average changes in exports and imports hide greater changes in the composition of trade and production despite the moderate change in tariffs. Imports of rice to Japan, for example, increase by 120 per cent.

Table 3.13: Impact on output in agriculture under the multilateral trade liberalization scenarios

	Standard	Variable	Fixed
	(% change)	(% change)	(% change)
European Union	–0.92	–0.91	–0.91
United States	0.32	0.33	0.33
Japan	–2.21	–2.20	–2.19
Other developed	0.77	0.86	0.94
China	0.16	0.17	0.17
Indonesia	0.30	0.30	0.30
Bangladesh	–0.03	–0.03	–0.03
Guatemala	0.30	0.31	0.32
Mexico	–0.15	–0.15	–0.15
South Africa	0.35	0.36	0.37
South-East Asia	0.56	0.57	0.58
South Asia	–0.18	–0.16	–0.14
Eastern Europe and West Asia	0.11	0.11	0.12
Central America	0.12	0.14	0.15
Latin America	1.28	1.28	1.29
North Africa and Middle East	0.44	0.47	0.49
Sub-Saharan Africa, non-LDC	0.13	0.16	0.19
Sub-Saharan Africa, LDC	0.13	0.12	0.12

Source: GTAP simulation.

In these scenarios very few countries experience large aggregated reductions in output (table 3.13). Most significant are the reductions in the relatively highly protected EU and Japan. Changes in particular sectors, however, can be very high, up to 50 per cent. There is a shift of production from developed countries to developing countries – or, rather, from less competitive agricultural producers to more competitive producers. Competitive developed-country agricultural producers such as Australia and New Zealand, for example, benefit, while some developing countries are worse off. In developed countries total output is expected to decrease by 0.5 per cent, while in developing countries total production would increase by 0.3 per cent. Global output is expected to decrease slightly due to a reduction of production subsidies.

Changes in output result in changes of a similar magnitude in unskilled employment in the agriculture sector (tables 3.13 and 3.14). The assessed impact on employment is relatively small. Employment in agriculture decreases in one-third of the countries and increases in the other two-thirds. The greatest drop, of about 2.5 per cent, occurs in Japan, and the greatest increase, of about 1.25 per cent, is in Latin America. Variation in agricultural employment is very similar in the countries under each scenario, indicating that the impact of trade liberalization on employment in specific sectors is not very sensitive to the assumption concerning whether adjustment is through wages or total national employment. Employment in agriculture in developed countries decreases (by –0.56 per cent to –0.62 per cent), while in developing countries it increases (by 0.25 per cent to 0.28 per cent). Where total employment can adjust, it increases in almost all regions except Bangladesh and sub-Saharan African LDCs. This reflects a fall in demand for labour-intensive goods produced in these countries. Where agricultural employment decreases, surplus labour finds jobs in the industry and services sectors.

Globally, the estimated value of labour costs in agriculture decreases by a range of –0.06 to –0.1 per cent following implementation of the Doha Round (table 3.14). This does not mean that CGE results predict that multilateral trade liberalization along the level of ambition of the Doha Round leads to a decrease in global employment in agriculture. In developed countries the value of labour costs in agriculture decreases by US$3 billion, and in developing countries it increases by $2 billion. Since labour costs are significantly higher in developed countries than in developing countries, this shift would imply an increase in total employment if developed-country wages are 50 per cent higher than developing-country wages. Since the difference in wages is, in fact, much greater,[12] the shift of production from the North to the South implies that, globally, agricultural employment increases. Since wages vary within the groups of developed and developing countries and even between sectors, adding up values to indicate changes in countries or country groups is problematic. More specific data in CGE models or linked labour satellites would be needed to yield more detailed information about the impact of trade liberalization on employment, for example, by occupation or location.

The impact of trade liberalization on total employment in a country depends on the structure of the labour market. If the supply of labour is fixed, as in the Standard scenario, all the adjustment occurs through changes in wages. An increase in demand leads to an increase in wages. In the Fixed scenario changes in wages are very small and follow the direction of changes in employment (table 3.15).

Effects on tariff revenues are small and can change in either direction. Lower tariffs suggest lower tariff revenue, but rising imports lead to a larger base and thus can lead to higher tariff revenues. Typically, tariff revenues from agriculture are lower than revenues from non-agricultural products, since trade in agriculture is only about 10 per cent of total merchandise trade.

[12] The average wage in agriculture in the USA, for example, is US$1,909 and in Mexico, US$198 per month (ILO Laborstat).

Table 3.14: Impact on unskilled employment under the multilateral trade liberalization scenarios

	Standard		Variable		Fixed	
	Agriculture (% change)	Total (% change)	Agriculture (% change)	Total (% change)	Agriculture (% change)	Total (% change)
European Union	–1.03	0	–1.02	0.01	–1.02	0.02
United States	0.34	0	0.35	0.01	0.37	0.03
Japan	–2.52	0	–2.49	0.05	–2.45	0.10
Other developed	0.10	0	0.28	0.29	0.45	0.58
China	0.20	0	0.20	0.00	0.20	0.00
Indonesia	0.38	0	0.38	0.00	0.39	0.01
Bangladesh	–0.01	0	–0.02	–0.01	–0.02	–0.02
Guatemala	0.04	0	0.06	0.03	0.07	0.06
Mexico	–0.12	0	–0.12	0.00	–0.12	0.00
South Africa	0.38	0	0.40	0.02	0.41	0.04
South-East Asia	0.64	0	0.66	0.05	0.69	0.09
South Asia	–0.13	0	-0.09	0.08	–0.05	0.15
Eastern Europe and West Asia	0.12	0	0.13	0.02	0.14	0.04
Central America	0.12	0	0.16	0.06	0.19	0.13
Latin America	1.24	0	1.25	0.03	1.27	0.06
North Africa and Middle East	0.21	0	0.25	0.08	0.30	0.15
Sub-Saharan Africa, non-LDC	0.07	0	0.11	0.06	0.15	0.12
Sub-Saharan Africa, LDC	0.09	0	0.08	0.00	0.08	–0.01
Developed countries	–0.62	0	–0.59	0.05	–0.56	0.10
Developing countries	0.25	0	0.27	0.02	0.28	0.05
World	–0.10	0	–0.08	0.05	–0.06	0.09

Source: GTAP simulation.

The global welfare effects are positive in all three scenarios, as shown in table 3.16. If labour is in surplus, the increase in employment has a significant effect on national welfare. Countries not liberalizing may experience welfare losses, if they are significant importers of agricultural goods, since world prices of agricultural goods would increase slightly following liberalization. In addition, preference erosion can lead to negative effects.

Table 3.15: Estimated impact on real wages of unskilled labour under the multilateral trade liberalization scenarios

	Standard	Variable	Fixed
	(% change)	(% change)	(% change)
European Union	0.01	0.01	0
United States	0.01	0.01	0
Japan	0.05	0.02	0
Other developed	0.30	0.15	0
China	0.00	0.00	0
Indonesia	0.01	0.01	0
Bangladesh	–0.01	–0.00	0
Guatemala	0.04	0.02	0
Mexico	0.00	0.00	0
South Africa	0.02 0	.01	0
South-East Asia	0.06	0.03	0
South Asia	0.11	0.05	0
Eastern Europe and West Asia	0.03	0.01	0
Central America	0.07	0.04	0
Latin America	0.03	0.02	0
North Africa and Middle East	0.10	0.05	0
Sub-Saharan Africa, non-LDC	0.10	0.05	0
Sub-Saharan Africa, LDC	–0.01	–0.00	0

Source: GTAP simulation.

Annual welfare impacts for each region are divided into allocative efficiency, endowment, and terms-of-trade effects. Allocative efficiency effects refer to how well resources are allocated within a country or region and reflect the variations in tariffs and other taxes within the economy. If these effects are negative, it means that the policy changes result in resources moving into the more protected sectors. With partial liberalization this is often the outcome in non-participating countries, but it also can occur in the liberalizing countries. In the Variable scenario the allocative efficiency increases in all regions except Bangladesh and LDCs in sub-Saharan Africa.

The second component of welfare is changes in the use of an endowment. This refers to the change in the use of unskilled labour, which is endogenous in the Variable and Fixed scenarios. The endowment effect is a major contributor to the positive welfare gains in these scenarios. The global welfare effect increases from US$15 billion

Table 3.16: Impact on welfare under the multilateral trade liberalization scenarios, in US$m

	Standard	Variable	Fixed
European Union	4 714	5 242	5 652
United States	839	1 690	2 359
Japan	2 258	3 046	3 808
Other developed	4 272	9 291	14 317
China	379	367	332
Indonesia	88	102	120
Bangladesh	–9	–12	–16
Guatemala	2	5	8
Mexico	–14	–4	10
South Africa	30	49	70
South-East Asia	372	497	624
South Asia	527	870	1 220
Eastern Europe and West Asia	95	455	767
Central America	92	175	256
Latin America	1 238	1 539	1 823
North Africa and Middle East	–36	81	203
Sub-Saharan Africa, non-LDC	60	131	206
Sub-Saharan Africa, LDC	–7	7	25
World	14 900	23 530	31 784

Source: GTAP simulation.

in the Standard scenario to US$32 billion in the Fixed scenario, mainly due to the endowment effect (table 3.16).

The third component of welfare is terms of trade. This refers to the changes in the ratio of export to import prices. The terms of trade sum to zero globally, as a rise in the price of exports in one country corresponds to a rise in import prices in another. An improvement in one country's terms of trade often reflects improvements in market access. The terms-of-trade effects are negative and large in most developed regions. They are positive for LDCs in sub-Saharan Africa and in the Variable and Fixed scenarios compensate for the losses stemming from the other welfare components.

The highest benefits from multilateral trade liberalization in agriculture come from import tariff reductions (about 65 per cent of total welfare gains). The reduction and/or elimination of domestic support and export subsidies contribute to the benefits but account for only about 11 per cent and 3 per cent of the global gains, respectively.

Anderson et al. (2006b) and Peters (2006) confirm that increasing agricultural market access has much more potential to generate welfare gains than reduction of trade-distorting domestic support and export subsidies. The fact that reduction commitments on trade-distorting domestic support are made from bound levels, which are mostly well above current spending, contributes to this result. Export subsidies have been extensively used during the 1990s but since have dwindled to very low levels.

3.4 CONCLUSION

Trade liberalization in agriculture has an impact on employment in that sector through changes in output. Productivity effects can also affect employment. Traditional more labour intensive production can be replaced by more capital and energy intensive production or vice versa. The effect of trade on employment through indirect effects such as economic growth or income effects is likely to be positive but slight. The key factor is the ability to move labour from one sector to another. Keeping factors of production fully employed is important.

Several techniques can be used to quantify trade and employment effects. They include partial equilibrium models, social accounting matrix analysis, and CGE models. The former two are less demanding in terms of data and construction. Partial equilibrium models are flexible enough to focus on a particular sector and are best used when the linkages between sectors are not of interest. A social accounting matrix is transparent and easy to use and understand. CGE models, however, address several shortcomings such as linkages between the sectors or missing behavioural assumptions such as substitution between capital and labour when relative prices change.

CGE models are often the preferred choice to analyse the effects of trade liberalization. GTAP or similar models using the same database, such as Mirage (Centre d'Etudes Prospectives et Information Internationale) or Linkage (World Bank), have been used frequently to assess the effects on developing countries of liberalizing the agricultural sector. Few analytical studies analyse the employment effects directly and in great detail. Often, simple labour market assumptions are made, and the lack of data on employment per sector complicates potential analysis of the labour market implications. A crucial assumption is whether adjustment occurs in wages, which is the default assumption, or employment. Real wages and employment are found to be not very sensitive neither to the substitutability between primary factors of production nor to the substitutability of intermediate inputs. However, the ability to utilize all resources fully, including labour, is important; welfare effects can vary significantly, with higher gains when labour surplus is assumed. The results highlight the advantage of a functioning labour market that can readily adjust to trade shocks and mobilize additional labour if demanded.

Unilateral liberalization in agriculture leads to less employment in that sector but can lead to an overall increase in employment in a country; real wages increase. Multilateral liberalization in agriculture shifts employment from the more protected North, especially the EU, Japan, and few other developed countries, to the South.

Employment in agriculture in developing countries as a group is expected to increase as a result of liberalization of agricultural trade. Effects within the group of developing countries vary, with higher gains in employment in more competitive agricultural producers such as Latin America. Total employment, i.e. agriculture, industry, and services employment, increases in most countries as a result of increases in global output. Whether the increased demand for labour is reflected in higher wages or in more employment depends on the functioning of the labour market. With full employment, wages must rise, raising the cost of production and choking off demand.

Since data on the volume of employment is not included in GTAP, it is difficult to assess the impact on the number of workers in agriculture. However, due to expanding values of labour in developing countries and lower labour costs per worker, the analysis indicates that global employment would increase as a result of agricultural trade liberalization. The positive effect predicted by CGE models such as GTAP is, however, quite small.

Global annual welfare gains are positive at between US$15 billion and US$32 billion, depending on the assumed structure of the labour market. Typically, a larger share of the welfare gain accrues in developed countries, as these countries experience greater tariff reductions and consequently their consumers benefit from lower prices. Their taxpayers may also benefit from the lowering of subsidies. Welfare gains in developing countries are positive, too, and these countries also benefit from higher employment, output, and exports. Losses in tariff revenue are usually negligible, since the revenue from agricultural trade is relatively low. Special attention needs to be paid to some specific countries – some of the poorest and most vulnerable – which may be adversely affected by rising import bills and preference erosion. If this attention is provided and corresponding complementary measures are taken, multilateral agricultural liberalization can have a positive employment and development impact. A higher level of ambition than the one that has been assessed here, which broadly follows the Doha Round, would lead to greater gains and losses, with higher global welfare gains and greater specialization in the production of goods in which countries have a comparative advantage. The latter may be a concern in terms of food security and dependence on food imports. This has not been discussed here.

Several limitations of CGE modelling should be kept in mind. Good-quality data and precisely estimated parameters are important. Data aggregation to, for example, 57 sectors, as in GTAP, can be problematic, especially if certain products are excluded from liberalization. Furthermore, simplifying assumptions such as perfect competition are made. The dynamic effects in the modelling, including not only the gains from investment and technology transfer but also the cost of moving resources from one sector to another, are usually ignored. Dynamic models need to make strong assumptions about growth expectations. Therefore, the results are not objective facts, providing unambiguous numerical measures of the value or risks of liberalization, and they should not be reported as such (Ackerman and Gallagher, 2008). However, when these limitations are kept in mind and are reported, and results are interpreted carefully, CGE models are useful tools to better understand the complex potential effects of trade liberalization on employment.

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4. ECONOMIC REFORMS AND AGRICULTURE IN BANGLADESH: ASSESSMENT OFIMPACTS USING ECONOMY-WIDE SIMULATION MODELS

Selim Raihan

4.1. INTRODUCTION

Agriculture is a major economic activity in Bangladesh. It currently employs about 50 per cent of the country's labour force and contributes about 20 per cent of the country's gross domestic product (GDP). It is increasingly becoming established in the economic literature that the development of a growing economy depends critically on the development of the agricultural sector (Andriesse et al., 2007; World Bank, 2008). In Bangladesh about 70 per cent of poor people live in the rural areas, and these poor people are concentrated in the agricultural sector. Hence, alleviation of poverty requires reducing poverty among farmers in the rural areas.

Growth in the agricultural sector has important links with the overall economy through various channels. First, agriculture provides a crucial supply of raw materials to many non-agricultural sectors. Second, consumption of agricultural commodities has important implications for the poverty of households in both rural and urban areas. Rice constitutes a major share in the expenditures of the poorer households. Therefore, the demand for and supply of agricultural commodities, especially food items, and their prices greatly influence the welfare of poor households. Third, the rural sector is the dominant source of supply of unskilled labour to the economy.

Crop production is the main agricultural sub-sector, accounting for about 14 per cent of the country's GDP. There are a number of crops produced in Bangladesh. Rice is the most important by far. It is the staple food of 160 million people and the major source of livelihood for 13 million farm households in the country. The dependence of poor people on cereals (rice and wheat) for their consumption is clearly illustrated by the fact that in Bangladesh the poorest 40 per cent of rural households, in terms of income, spend nearly 52 per cent of their budget on output from the crop sector, with 35 per cent going to rice and wheat alone. The corresponding numbers for the urban areas are 42 percent and 25 percent, respectively. Even the wealthiest 10 per cent of households spend significant proportions of their budgets on crop sector output in both the rural and urban areas.

Bangladesh is the fourth largest rice-producing country in the world and also happens to be the fourth biggest rice-consuming country. Because of huge domestic consumption, the country is, in fact, a net rice-importing country. There are other agricultural crops (e.g. wheat, potato, lentils, vegetables, spices, tea), the domestic demand for which is met partly by production at home and partly by imports. As for agricultural exports, Bangladesh is a large exporter of jute. The country also exports fish, shrimp, and vegetables.

Agriculture has taken centre stage in multilateral trade negotiations over the past 25 years. Despite major progress in improving the rules for trade, the overall achievement, in terms of increasing market access for agricultural goods, was considered "disappointing" at the end of the Uruguay Round (Martin and Winters, 1996). Although, under the World Trade Organization (WTO) Agreement on Agriculture, members committed to carrying out reforms, not much progress has so far been made to open markets further. Nevertheless, agriculture continues to be an active area of negotiation. While the modalities for future liberalization in the sector are being negotiated, the potential implications arising from such liberalization have drawn much attention. It is argued that global agricultural trade liberalization would benefit a number of developing countries that have clear comparative advantage in the sector. However, not all developing countries are net exporters of agricultural products, and many of them actually depend on the world market for their supplies. Thus, global agricultural trade liberalization would have important implications for the Bangladesh economy as a net importer of agricultural products.

Under bilateral trading arrangements, there is scope for increased bilateral trade in agricultural products. For example, under the India–Bangladesh bilateral free trade agreement (FTA), Bangladesh's market access in India for its agricultural exports is likely to increase, while imports of agricultural products from India are likely to increase as well. Therefore, preferential liberalization in agricultural trade has important implications both for imported and for exported agricultural commodities. Increased market access for agricultural exports from Bangladesh under such trade agreements may lead to a rise in production and employment in those export-oriented sectors; whereas domestic import liberalization of the agricultural sector may dampen domestic output and employment in the import-competing agricultural sectors.

Thus, growth in the domestic agricultural sector does not rely only on domestic policies and programmes; global and regional trade policies also have important implications for this sector. Moreover, a variety of economic policies and programmes, such as domestic fiscal policies, import policies, and programmes for growth in agricultural productivity, also affect the development of the agricultural sector in an economy.

This study explores the links between major economic policy reforms and growth in the agricultural sector in Bangladesh. Overall, this study seeks to explore how economic policy reforms affect the agricultural sector in Bangladesh in terms of output, imports, exports, and employment. The study explores three trade liberalization scenarios (a global agricultural trade liberalization scenario under a WTO–Doha agreement, a Bangladesh–India bilateral FTA, and unilateral agricultural trade liberalization), one fiscal policy scenario (a rise in agricultural subsidies), and one technological change scenario (a rise in agricultural productivity).

The paper is organized as follows: section 4.2 discusses the methodology of the study; section 4.3 presents and analyses the structure of the Bangladesh economy; section 4.4 discusses the issues of economic reforms in Bangladesh and the simulation scenarios; section 4.5 presents the scenarios considered in the Bangladesh computable general equilibrium (CGE) model; section 4.6 presents the results from the Bangladesh CGE model; and section 4.7 discusses policy implications and conclusions.

4.2 METHODOLOGY

This study uses the Global Trade Analysis Project (GTAP) global general equilibrium model and a national CGE model to explore employment effects in Bangladesh under different scenarios. For the global agricultural trade liberalization and Bangladesh–India bilateral FTA scenarios, the scenarios are first run in the GTAP model. The changes in demand for exports, export prices, and import prices, as obtained from the GTAP model, are matched to the 41 social accounting matrix (SAM) sectors of Bangladesh. For the subsidy and productivity scenarios, the shocks are introduced directly to the CGE model and subsequent macro, sectoral, and meso implications are explored. The CGE simulation produces percentage changes in labour demand. These are then used to compute changes in employments, using an employment satellite matrix.

4.2.1. The GTAP Model

The global CGE modelling framework of the GTAP (Hertel, 1997) is a useful tool for the ex ante analysis of the economic and trade consequences of multilateral or bilateral trade agreements. The GTAP model is a comparative static model, based on neoclassical theories.[1] The GTAP model is a linearized model, and it uses a common global database for CGE analysis. The model assumes perfect competition in all markets, constant returns to scale in all production and trade activities, and profit maximizing behaviour by firms and utility maximizing behaviour by households. The model is solved using the GEMPACK software (Harrison and Pearson, 1996).

In the GTAP model each region has a single representative household, known as the regional household. The income of the regional household is generated through factor payments and tax revenues (including export and import taxes) net of subsidies. The regional household allocates expenditure to private household expenditure,

[1] Full documentation of the GTAP model and the database can be found in Hertel (1997).

government expenditure, and savings according to a Cobb–Douglas per capita utility function.[2] Thus, each component of final demand maintains a constant share of total regional income.

The private household buys commodity bundles to maximise utility, subject to its expenditure constraint. In the GTAP model the constrained optimizing behaviour of the private household is represented by a constant difference of elasticity (CDE) expenditure function. The private household spends its income on consumption of both domestic and imported commodities and pays taxes. The consumption bundles are constant elasticity of substitution (CES) aggregates of domestic and imported goods, where the imported goods are also CES aggregates of imports from different regions. Taxes paid by the private household include commodity taxes for domestically produced and imported goods and income tax net of subsidies.

The government also spends its income on domestic and imported commodities, and it collects taxes. Taxes consist of commodity taxes on domestically produced and imported commodities. Like the private household's, government consumption is a CES composite of domestically produced and imported goods.

The GTAP model considers the demand for investment in a particular region as savings. In a multi-country setting, the model is closed by assuming that regional savings are homogenous and contribute to a global pool of savings. This global savings is then allocated among regions for investment in response to changes in the expected rates of return in different regions. If all other markets in the multi-regional model are in equilibrium, if all firms earn zero profits, and if all households are on their budget constraint, such a treatment of savings and investment will lead to a situation in which global investment must equal global savings, and Walras' Law will be satisfied.

In the GTAP model producers receive payments for selling consumption goods and intermediate inputs both in the domestic market and to the rest of the world. Under the zero profit assumption employed in the model, these revenues must be precisely exhausted by spending on domestic intermediate inputs, imported intermediate inputs, factor income, and taxes paid to the regional household (taxes on both domestic and imported intermediate inputs and production taxes net of subsidies).

The GTAP model postulates a nested production technology, with the assumption that every industry produces a single output, and constant returns to scale prevail in all markets. Industries have a Leontief production technology to produce their outputs. Industries maximize profits by choosing two broad categories of inputs – namely, a composite of factors (value added) and a composite of intermediate inputs. The factor composite is a CES function of labour, capital, land, and natural resources. The intermediate composite is a Leontief function of material inputs, which are in turn a CES composite of domestically produced goods and imports. Imports come from all regions.

[2] Savings enter into the static utility function as a proxy for future consumption.

Table 4.1: GTAP commodity aggregation in the present study

Sector codes	Constructed broad sectors consistent with SAM sectors of Bangladesh	GTAP sectors included
CRC	Cereal crop sectors	Paddy rice; other cereal grains; wheat
CMC	Commercial crops	Vegetables, fruit, nuts; oilseeds; sugar cane, sugar beet; plant- based fibres; other crops
LIV	Livestock rearing and poultry rearing	Cattle, sheep, goats, horses; other animal products
SHP	Fishing	Fishin
FST	Forestry	Forestry
RCE	Rice milling	Processed rice
FOD	Grain milling and food processing	Raw milk; meat: cattle, sheep, goats, horse; other meat products; vegetable oils and fats; dairy products; sugar; other food products
LEA	Leather industry	Leather products
CLT	Cloth milling	Textiles
RMG	Woven and knit ready-made garments	Wearing apparel
CIG	Cigarette industry	Beverages and tobacco products
FUR	Furniture industry	Wood products
PRN	Paper, printing, and publishing	Paper products, publishing
PET	Petroleum	Petroleum, coal products
CHE	Chemical industry	Chemical, rubber, plastic products
MET	Metal	Ferrous metals; other metals; metal products
MIS	Toiletries, pharmaceuticals, fertilizer, Industry glass industry, earth-ware and clay industry, cement, miscellaneous industries	Wool, silk-worm cocoons; motor vehicles and parts; other transport equipment; machinery and equipment; other manufactures; other mineral products
MNQ	Mining and quarrying	Coal; oil; gas; other minerals
CON	Construction	Construction
ELW	Electricity and water	Electricity; water
GDT	Gas extraction and distribution	Gas manufacture, distribution
TRD	Wholesale and retail trade	Trade
TRN	Transport	Other transport; sea transport; air transport
PUB	Public administration, defence, health services, education services	Public administration, defence, health, and education
BNK	Bank, insurance, and real estate	Other financial services; insurance; dwellings
COM	Communication and information technology and e-commerce	Communication
OSR	Hotel and restaurant and other services	Other business services, recreation, and other services

SAM=social accounting matrix; GTAP=Global Trade Analysis Project
Source: GTAP Database 7.1.

Table 4.2: GTAP region aggregation in the present study

Aggregated regions	Comprising regions
Bangladesh	Bangladesh
India	India
Pakistan	Pakistan
Sri Lanka	Sri Lanka
Rest of South Asia	Bhutan, Maldives, Nepal
Thailand	Thailand
Other developed countries	Other developed countries excluding North America and EU-25
Other developing countries	Other developing countries excluding India, Pakistan, Sri Lanka, and Thailand
Least developed countries	Other least developed countries
North America	Canada, Mexico, United States of America
EU-25	European Union
ROW	Rest of the world

GTAP=Global Trade Analysis Project
Source: GTAP Database 7.1

The GTAP model employs the Armington assumption, which makes it possible to distinguish imports by their origin and explains intra-industry trade of similar products. Following the Armington approach, the import shares of different regions depend on relative prices and the substitution elasticity between domestic and imported commodities.

Version 7 of the GTAP database uses 2004 as the base year. Several pre-simulations are conducted to update the base year to reflect the situation in 2007, using updated national economic and trade data and updated protection data. GTAP data on regions and commodities are aggregated to meet the objectives of this study. Version 7 of the GTAP database covers 57 commodities, 107 regions/countries, and 5 factors of production. The current study has aggregated 57 commodities into 27 and 129 regions into 12, as shown in tables 4.1 and 4.2, respectively. In the GTAP database each industry produces one commodity. Given the focus of the present study on Bangladesh, other South Asian countries and other least developed countries have been considered as separate countries/regions (table 4.2).

4.2.2. The CGE model for the Bangladesh economy

All trade liberalization scenarios are run in a CGE framework. The advantage of this is that it traces the price effects of the exogenous shock. In an increasingly market-oriented economy, the variations in prices may be the most important sources of re-allocation of resources among competing activities, which then may alter the factorial income and, hence, the distribution of personal income. A SAM prepared for the year 2007 serves as the consistent and comprehensive database for the above-mentioned exercises.

The Bangladesh CGE model is built using the Partnership for Economic Policies (PEP) standard static model.[3] In the Bangladesh CGE model, a representative firm in each industry maximizes profits subject to its production technology. The sectoral output follows a Leontief production function. Each industry's value added consists of composite labour and composite capital, following a CES specification. Different categories of labour are combined following a CES technology with imperfect substitutability between different types of labour. Composite capital is a CES combination of the different categories of capital. It is assumed that intermediate inputs are perfectly complementary. They are combined following a Leontief production function.

Household incomes come from labour income, capital income, and transfers received from other agents. Subtracting direct taxes yields household's disposable income. Household savings are a linear function of disposable income, which allows the marginal propensity to save to differ from the average propensity.

Corporate income consists of its share of capital income and of transfers received from other agents. Deducting business income taxes from total income yields the disposable income of each type of business. Likewise, business savings are the residual that remains after subtracting transfers to other agents from disposable income.

The government draws its income from household and business income taxes, taxes on products and on imports, and other taxes on production. Income taxes for both households and businesses are described as a linear function of total income. The current government budget surplus or deficit (positive or negative savings) is the difference between its revenue and its expenditures. The latter consists of transfers to agents and current expenditures on goods and services.

The rest of the world receives payments for the value of imports, part of the income of capital, and transfers from domestic agents. Foreign spending in the domestic economy consists of the value of exports and transfers to domestic agents. The difference between foreign receipts and spending is the amount of rest-of-the-world savings, which are equal in absolute value to the current account balance but are of opposite sign.

The demand for goods and services, whether domestically produced or imported, consists of household consumption demand, investment demand, demand by government, and demand as transport or trade margins. It is assumed that households have Stone–Geary utility functions (from which derives the Linear Expenditure System). Investment demand includes both gross fixed capital formation (GFCF) and changes in inventories.

Producers' supply behaviour is represented by nested constant elasticity of transformation (CET) functions. On the upper level aggregate output is allocated to individual products; on the lower level the supply of each product is distributed be-

[3] See www.pep-net.org.

tween the domestic market and exports. The model departs from the pure form of the small-country hypothesis. A local producer can increase his share of the world market only by offering a price that is advantageous relative to the (exogenous) world price. The ease with which his share can be increased depends on the degree of substitutability of the proposed product for competing products; in other words, it depends on the price-elasticity of export demand. Commodities demanded on the domestic market are composite goods, combinations of locally produced goods and imports. The imperfect substitutability between the two is represented by a CES aggregator function. Naturally, for goods with no competition from imports, the demand for the composite commodity is the demand for the domestically produced good.

The system requires equilibrium between the supply and demand of each commodity on the domestic market. The sum of supplies of every commodity made by local producers must equal domestic demand for that locally produced commodity. Finally, supply to the export market of each good must be matched by demand.

Also, there is equilibrium between total demand for capital and its available supply. However, the model works with two different assumptions in line with the features of two categories of labour in the Bangladesh economy. Thus, the model assumes a flexible wage rate for skilled labour and a fixed wage rate for unskilled labour.

4.3. STRUCTURE OF THE BANGLADESH ECONOMY

Table 4.3 presents the structure of the Bangladesh economy in 2007. Column 1 shows the sectoral shares of total value added. The share of agriculture in total value added is 19.88 per cent, with cereal and commercial crops the leading sub-sectors. The share of industry is 18 per cent, and the sub-sectors with high shares are rice milling, woven ready-made garments (RMG), and knit RMG. The share of the services sector (including construction) is 62.12 per cent, and the leading services sub-sectors are wholesale and retail trade, construction, and other services.

Column 2 of table 4.3 shows export orientation by sector. The woven and knit RMG sectors are more than 80 per cent export-oriented. The other major export-oriented sectors are jute, leather, information technology (IT), public administration and defence, fishing, and the furniture and fertilizer industries.

Bangladesh's export basket is highly concentrated, as is evident from the fact that woven and knit RMG account for about 74 per cent of total exports (column 3 of table 3). The share attributable to fishing is 5.3 per cent. Leather and miscellaneous industries constitute 1.7 and 6.9 per cent of total exports, respectively. In the services sector public administration and defence constitute 5 per cent of total exports, while the IT sector has a very low share, only 0.16 per cent.

Column 4 of table 4.3 suggests that the major import-oriented sectors are the chemical industry, petroleum, fertilizer industry, paper, printing and publishing industry, miscellaneous industry, toiletries, cloth milling, and yarn. As shown in column 5, the sectors with high import shares are miscellaneous industry, petroleum, food

Table 4.3: Structure of the Bangladesh economy in 2007 as reflected in the Social Accounting Matrix, 2007[4]

Sectors	**1 Vi/TV**	**2 Ei/Oi**	**3 Ei/TE**	**4 Mi/Oi**	**5 Mi/TM**	**6 TAR**
Agriculture	19.88	–	6.47	–	10.00	–
Cereal crop sectors	7.44	0.00	0.00	4.91	2.44	6.33
Commercial crops	4.53	2.73	1.13	26.03	7.56	5.53
Livestock rearing	1.45	0.01	0.00	0.01	0.00	6.78
Poultry rearing	0.90	0.00	0.00	0.58	0.06	15.09
Fishing	4.03	9.77	5.11	0.07	0.03	33.35
Forestry	1.54	0.00	0.00	0.00	0.00	0.00
Industry	18.00	–	86.43	–	76.32	–
Rice milling	3.09	0.03	0.02	1.22	0.70	6.23
Grain milling	0.36	0.08	0.01	0.11	0.01	24.28
Food processing	1.24	0.93	0.36	29.58	8.07	12.07
Leather industry	0.39	23.42	1.73	4.45	0.23	11.74
Yarn	0.03	42.21	0.38	508.65	3.18	18.23
Cloth milling	1.72	0.00	0.00	17.97	3.79	27.43
Woven RMG	2.39	91.71	37.61	11.68	3.36	21.27
Knitting	3.26	90.49	36.37	1.29	0.36	1.17
Toiletries	0.00	5.92	0.02	166.71	0.32	31.97
Cigarette industry	0.09	1.79	0.10	2.49	0.10	30.40
Furniture industry	0.21	28.38	1.13	31.16	0.87	16.31
Paper, printing, and publishing industry	0.06	4.99	0.05	209.81	1.51	20.76
Pharmaceuticals	0.34	2.22	0.15	20.03	0.96	2.05
Fertilizer industry	0.05	42.01	0.31	328.09	1.71	4.04
Petroleum	0.05	14.14	0.43	654.70	13.91	16.63
Chemical industry	0.11	12.04	0.28	395.22	6.49	14.62
Glass industry	0.04	5.86	0.05	33.97	0.20	21.03
Earth-ware and clay industry	0.19	0.06	0.00	14.46	0.31	7.22
Cement	0.16	0.28	0.02	6.70	0.39	11.07
Metal	0.96	3.38	0.76	16.10	2.53	14.12
Miscellaneous industry	2.08	25.20	6.87	145.63	27.89	14.40
Mining and quarrying	1.19	0.06	0.01	0.52	0.05	20.12
Services	62.12	–	7.11	–	13.68	–
Construction	8.42	0.00	0.00	0.00	0.00	0.00
Electricity and water generation	0.89	0.00	0.00	0.00	0.00	0.00
Gas extraction and distribution	0.28	0.00	0.00	0.00	0.00	0.00
Wholesale and retail trade	14.63	0.00	0.00	0.00	0.00	0.00
Transport	9.44	1.32	0.83	18.46	8.20	0.00
Health service	2.30	0.00	0.00	0.00	0.00	0.00
Education service	2.63	0.00	0.00	0.00	0.00	0.00
Public administration and defence	2.84	21.32	5.08	13.27	2.22	0.00
Bank, insurance, and real estate	1.63	1.29	0.16	15.41	1.35	0.00
Hotel and restaurant	0.70	0.00	0.00	0.00	0.00	0.00
Communication	1.32	3.34	0.32	2.29	0.16	0.00
Information technology and e-commerce	0.07	29.65	0.16	7.57	0.03	0.00
Other services	16.98	0.49	0.54	1.33	1.03	0.00
Total	**100.00**	**–**	**100.00**	**–**	**100.00**	**–**

Note: Vi=sectoral value added, TV=total value added, Ei=sectoral export, Oi=sectoral output, TE=total export, Mi=sectoral import, TM=total import, TAR=tariff rate, RMG=ready-made garments. All figures are expressed in percentages.
Source: Social accounting matrix of Bangladesh for 2007.

[4] Annex 4.1 provides a brief description of the accounts of the SAM; annex 4.2 shows the mapping of 41 SAM sectors with the original 86 SAM sectors.

Table 4.4: Sectoral employment numbers and shares from the employment satellite matrix, 2006

Sectors	Number		% share in total of category		
	UL	SL	UL	SL	UL + SL
Agriculture	21 411 425	834 575	48.65	25.06	46.99
Cereal crop sectors	13 165 730	9 270	29.91	0.28	27.83
Commercial crops	3 239 420	1 580	7.36	0.05	6.85
Livestock rearing	20 775 57	356 443	4.72	10.70	5.14
Poultry rearing	1 562 291	238 709	3.55	7.17	3.80
Fishing	943 285	151 715	2.14	4.56	2.31
Forestry	423 142	76 858	0.96	2.31	1.06
Industry	489 2210	375 810	11.12	11.29	11.13
Rice milling	248 550	450	0.56	0.01	0.53
Grain milling	10 590	3 910	0.02	0.12	0.03
Food processing	245 770	21 130	0.56	0.63	0.56
Leather industry	91 960	7 040	0.21	0.21	0.21
Yarn	61 420	6 580	0.14	0.20	0.14
Cloth milling	650 190	23 810	1.48	0.72	1.42
Woven RMG	1 008 370	103 630	2.29	3.11	2.35
Knitting	93 170	4 830	0.21	0.15	0.21
Toiletries	14 990	2 010	0.03	0.06	0.04
Cigarette industry	121 660	7 340	0.28	0.22	0.27
Furniture industry	946 720	19 280	2.15	0.58	2.04
Paper, printing, and publishing industry	89640	28 360	0.20	0.85	0.25
Pharmaceuticals	54 700	9 300	0.12	0.28	0.14
Fertilizer industry	38540	10 460	0.09	0.31	0.10
Petroleum	7 460	2 540	0.02	0.08	0.02
Chemical industry	113 060	13 940	0.26	0.42	0.27
Glass industry	5 700	2 800	0.01	0.08	0.02
Earth-ware and clay industry	243 920	3 000	0.55	0.09	0.52
Cement	37 100	2 900	0.08	0.09	0.08
Metal	190 540	29 460	0.43	0.88	0.46
Miscellaneous industry	615 460	72 540	1.40	2.18	1.45
Services	17 706 829	2 119 371	40.23	63.65	41.88
Construction	1 453 000	71 000	3.30	2.13	3.22
Electricity and water generation	48 510	11 490	0.11	0.35	0.13
Gas extraction and distribution	4 770	3 230	0.01	0.10	0.02
Mining and quarrying	2 700	500	0.01	0.02	0.01
Wholesale and retail trade	7 035780	72 220	15.99	2.17	15.01
Transport	3 316 660	29 540	7.54	0.89	7.07
Health service	61 920	272 080	0.14	8.17	0.71
Education service	247 020	1 058 980	0.56	31.80	2.76
Public administration and defence	784 890	96 110	1.78	2.89	1.86
Bank, insurance, and real estate	291 529	216 471	0.66	6.50	1.07
Hotel and restaurant	695 680	16 320	1.58	0.49	1.50
Communication	136 380	1 620	0.31	0.05	0.29
Information technology and e-commerce	4 250	4 750	0.01	0.14	0.02
Other services	3 626 440	265 560	8.24	7.98	8.22
Total	**44 010 464**	**3 329 756**	**100.00**	**100.00**	**100.00**

Note: UL=unskilled labour, SL=skilled labour, RMG=ready-made garments.
Source: Employment satellite matrix (data from Labour Force Survey 2005–06).

processing, and commercial crops. Finally, column 6 presents the import tariff rates of the respective sectors. The leading protected sectors (the sectors with the highest tariff rates) are fishing, toiletries, cigarette industry, cloth milling, grain milling, woven RMG, glass industry, paper, printing and publishing industry, mining and quarrying, yarn, petroleum, furniture industry, poultry raising, chemical industry, miscellaneous industry, and metal.

Table 4.4 presents the structure of employment in the economy of Bangladesh. Even though the agricultural sector contributes less than 20 per cent to total value added (table 4.3), it accounts for nearly 47 per cent of the total employed labour force of the country. The shares of the industry and services sectors in the total employed labour force are 11.1 per cent and 41.9 per cent, respectively.

4.4 BANGLADESH'S TRADE AND AGRICULTURAL POLICIES

4.4.1. Global agricultural trade liberalization under a potential WTO Doha agreement

Agricultural trade liberalization is likely to affect the current pattern of global production and trade of many agricultural commodities in Bangladesh. Price increases following liberalization will be, on the whole, welfare-enhancing for a net exporting country, while for a net importing country this will be translated into a terms-of-trade shock with adverse welfare consequences. In light of anticipated price increases, concerns have been expressed about the effects on food security and poverty in countries dependent on food imports. However, since tariff reduction and removal of subsidies are two inherent components of global agricultural trade liberalization, they should be considered simultaneously in assessing welfare consequences. While tariff reductions may depress prices, subsidy cuts will tend to exert an opposite effect. The net result will depend on the relative strength of these two differing forces.

In World Trade Organization (WTO) terminology, subsidies in general are categorized into "boxes", which are given the colours of traffic lights: green (permitted), amber (slow down – i.e. to be reduced), and red (forbidden) (see chapter 2 of this volume). In agriculture things are, as usual, more complicated. The Agreement on Agriculture has no red box, although domestic support exceeding the levels of the reduction commitments in the amber box is prohibited, and there is a blue box for subsidies tied to programmes that limit production. Also, there are exemptions for developing countries, which are sometimes called a Special and Differential (S&D) box, including provisions in Article 6.2 of the agreement.

While the Uruguay Round Agreement on Agriculture made some significant progress on rules of trade in agriculture by replacing quantitative restrictions with tariffs and by specifying initial commitments on the reduction of tariffs and subsidies, the momentum could not be maintained under subsequent WTO-sponsored negotiations. Domestic support to agriculture in the developed countries has not come down since the implementation of the commitments of the Uruguay Round began in 1995 (Naik, 2005). Although, in the Doha Ministerial Declaration, member countries vowed to achieve substantial improvements in market access through phasing-out of all forms of export subsidies and substantial reductions in trade-distorting domestic support (WTO, 2001, paragraph 13), no major breakthrough has been made since the conclusion of the Hong Kong Ministerial Conference, held in December 2005. While members are still negotiating modalities for further liberalization, consensus has been reached only on abolishing all export subsidies by 2013 (WTO, 2005, paragraph 6).[5] In fact, export subsidies constitute a very insignificant portion of the total domestic support measures given to agriculture in the developed countries.

Despite the lack of progress related to agricultural liberalization in the post-Uruguay Round period, there is no denying that, since most agricultural commodities have long been the most protected commodities in world trade, any significant liberalization in this sector is likely to have huge welfare implications. How future global agricultural trade liberalization will affect the livelihood of and food security in poor developing countries that depend on food imports is, therefore, of great concern.

It is important to note that, at the WTO, Bangladesh, as a least developed country, is not bound to undertake any liberalization in its domestic agricultural sector in terms of tariff cuts or subsidy withdrawal. There are concerns, however, that reduction in agricultural domestic support measures by developed and developing countries might have important implications for net food-importing countries such as Bangladesh. Several studies predict that, with the elimination of export and production subsidies, prices of agricultural commodities in general are likely to increase (Beghin et al., 2002; Diao et al., 2001; Dimaranan et al., 2003; Elbehri and Leetmaa, 2002; Francois et al., 2003; Hertel et al., 2000; van Meijl and van Tongeren, 2001). As a net importer of cereal crops, Bangladesh would experience a rise in import prices of cereal crops. However, Bangladesh would also experience a rise in export prices of some of its commercial crops.

4.4.2. Bilateral free-trade agreement between Bangladesh and India

Bangladesh has entered into several regional free trade agreements and is in the process of signing bilateral FTAs with a number of countries. In recent years interest in regional economic integration has increased in South Asia. With the stalemate of the WTO negotiations, the interest in regional trading arrangements may increase further. Regional integration in South Asia gained momentum in 1995 with the signing of the South Asian Association for Regional Cooperation (SAARC) Preferential Trading Arrangement (SAPTA). In early 2004 the SAARC member countries, including Bangladesh, agreed to form the South Asian Free Trade Area (SAFTA), which came into force on 1 July 2006. Bangladesh is also a member of the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), comprising countries from South Asia and South-East Asia. Recently, Bangladesh has been negotiating with India and Malaysia for bilateral FTAs.

[5] In the case of cotton, export subsidies by the developed countries were supposed to be abolished in 2006.

Any FTA deal has two important aspects: the market access aspect (the export side) and the trade liberalization aspect (the import side). Like their effects on prices, the employment effects of these two aspects usually work in different directions. While increased exports may create new employment in the export-oriented sectors, increased imports, due to liberalization of trade, may reduce employment in the sectors that compete with imports. The net effect may depend on the relative strength of these two effects.

The bilateral FTA that Bangladesh and India are now negotiating will allow tariff-free trade between these two South Asian countries. Despite the fact that there is a South Asian Free Trade Area (SAFTA), progress in SAFTA has been quite slow. This slow pace has propelled certain member countries, such as India and Bangladesh, to negotiate bilateral FTAs. The Bangladesh–India bilateral FTA deal is supposed to increase the market access of Bangladesh's export products in India and increase import flows from India to Bangladesh. Since 1996–97 Indian exports to Bangladesh have been growing at 9.1 per cent annually, above the general rate of growth of India's total merchandise exports (8.4 per cent). However, India's imports from Bangladesh over the same period have grown on average at only 3 per cent annually, compared with average growth of its total imports of 9.2 per cent. Consequently, Bangladesh's bilateral trade deficit with India has been increasing rapidly, on average at about 9.5 per cent annually.

4.4.3. Unilateral agricultural trade liberalization

Trade liberalization also affects sectoral allocation of resources, factor returns, and, thus, the poverty of households. In Bangladesh trade liberalization has been one of the major policy reforms during the 1990s and 2000s. There are debates over the impacts of further liberalization of trade on increases in efficiency, enhancing the performance of the export sectors, and poverty in Bangladesh.

Trade policy from 1972 through 1980 consisted of significant import controls. During the 1980s moderate import liberalization took place. In 1984 the import policy regime changed significantly with the abolition of the import-licensing system; imports were permitted against letters of credit (L/C). Since 1986 there have been significant changes in the contents and structure of the import procedures and the Import Policy Orders (IPOs). Before 1986 the IPOs contained a lengthy Positive List of importable goods. In 1986 the Positive List was replaced by two lists – the Negative List (for banned items) and the Restricted List (for items importable under certain prescribed conditions). Imports of any items outside the lists were allowed. These changes might be considered significant moves towards import liberalization, since no restrictions were then imposed on the import of items that did not appear in the IPOs. To increase the stability and certainty of trade policy, IPOs with relatively longer periods replaced the previous practice of issuing import policy annually. Since 1990 the Negative and Restricted Lists of importables have been combined into one list, namely the Consolidated List (Raihan, 2007).

The range of products subject to import bans or restrictions has been curtailed substantially, from as high as 752 in 1985–86 to only 63 in 2003–06. Import restrictions have been imposed for trade-related reasons (i.e. to provide protection to domestic industries) and for non-trade reasons (e.g. to protect the environment, public health and safety, or security).

Beginning in the late 1980s, the tariff regime has been increasingly liberalized. Between 1991–92 and 2004–05 the unweighted average tariff rate fell from 70 per cent to 13.5 per cent. Much of this reduction was achieved by lowering the maximum rate. In 1991–92, the maximum tariff rate was 350 per cent; by 2004–2005 the maximum rate had come down to only 25 per cent. The number of tariff bands was 24 in the 1980s, was 18 in the early 1990s, and is only 4 at present. The percentage of duty-free tariff lines more than doubled between 1992–93 and 1999–2000 (from 3.4 per cent to 8.4 per cent). Bangladesh has no tariff quotas, seasonal tariffs, or variable import levies. All these reforms have greatly simplified the tariff regime and helped streamline customs administration procedures. The drastic reduction in unweighted tariff rates during the 1990s also lowered import-weighted tariff rates. The import-weighted average tariff rate declined from 42.1 per cent in 1990–91 to 13.8 per cent in 1999–2000 and, further, to 11.48 per cent in 2003–04.

Import-weighted average tariff rates for agricultural products (HS code 01 to HS code 15) are presented in table 4.5. Within the HS codes 01, 05, 07, 08, 09, 11, 12, 13, and 15, there have been significant cuts in tariff rates between 2002 and 2007.

Table 4.5: Import-weighted tariff rates on agricultural products in Bangladesh

HS code	Product name	2002	2003	2004	2005	2006	2007
01	Live animals	17.36	8.69	10.38	11.47	11.47	11.45
02	Meat and edible meat offal	25.04	22.51	22.55	25.00	25.00	25.00
03	Fish and crustaceans, molluscs, and other aquatic invertebrates	24.98	32.47	29.82	24.85	24.85	24.85
04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	26.94	26.89	25.43	23.57	23.57	23.46
05	Products of animal origin, not elsewhere specified or included	23.05	21.08	16.35	13.69	13.69	13.31
06	Live trees and other plants; bulbs, roots, and the like; cut flowers and ornamental foliage	2.34	1.70	2.42	2.29	2.29	2.11
07	Edible vegetables and certain roots and tubers	8.09	10.71	10.52	7.88	7.88	6.87
08	Edible fruit and nuts; peel of citrus fruits or melons	34.21	28.55	28.56	24.87	24.81	25.25
09	Coffee, tea, maté, and spices	34.98	30.76	28.34	8.63	20.81	18.52

Table 4.5: Import-weighted tariff rates on agricultural products in Bangladesh *(continued)*

HS code	Product name	2002	2003	2004	2005	2006	2007
10	Cereals	4.34	12.64	6.85	4.56	5.48	4.57
11	Products of the milling industry; malt; starches; insulin; wheat gluten	11.18	10.92	9.62	2.49	7.79	6.88
12	Oilseeds and oleaginous fruits; miscellaneous grains, seeds, and fruit; industrial or medicinal plants; straw and fodder	5.40	7.31	3.76	0.17	0.13	0.12
13	Lac; gums, resins, and other vegetable saps and extracts	15.98	10.27	8.88	7.72	7.37	6.37
14	Vegetable plaiting materials; vegetable products not elsewhere specified or included	16.97	16.72	18.02	23.79	15.42	15.40
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	15.46	22.65	9.09	6.22	6.24	5.26

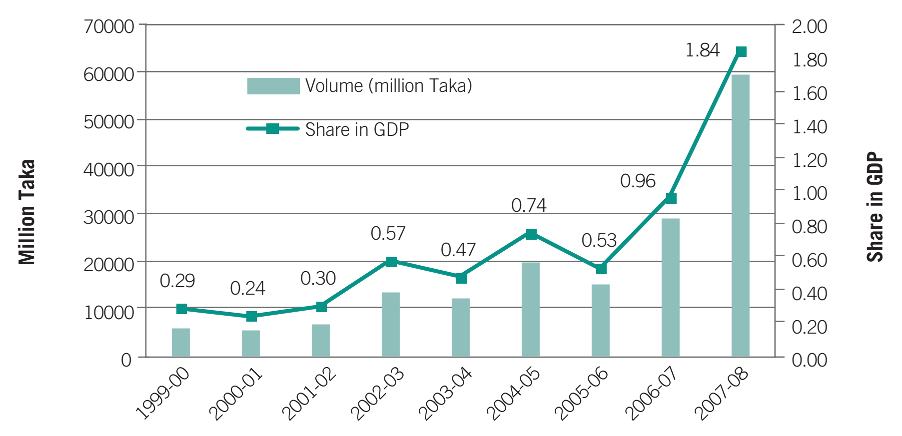
Source: Calculated from UN COMTRADE.

4.4.4 Agricultural production subsidy policy

The government's subsidy policy towards agriculture affects the production pattern in the agricultural sector and the livelihood of the people involved in this sector. In addition, an increased allocation of subsidy to the agricultural sector affects the pattern of overall allocation of resources among different sectors in the economy. In Bangladesh subsidies for the agricultural sector have been prominent, and there has been an increased allocation of subsidies to agriculture over time.

In general, economic theory holds that subsidies distort the market and produce inefficiencies. However, there are a number of cases in which governments have opted for subsidies with a view to achieving an equitable and "efficient" solution of economic problems. The Bangladesh government allocates a significant portion of its fiscal budget each year to subsidies. The total amount of government subsidies in 2006–07 was 28.95 billion taka, which was a 93 per cent increase over the amount in the previous period. This trend continued in 2007–08, when the amount rose again, by about 105 per cent to 59.29 billion taka (figure 4.1). These dramatic increases can be attributed mainly to the rapid rise in the international prices of food, fuel, and fertilizer, which are three of the main sectors receiving government subsidies.

Figure 4.1: Government subsidies, Bangladesh: volume and share of gross domestic product (GDP), 1999–2008



Source: Ministry of Finance, Government of Bangladesh.

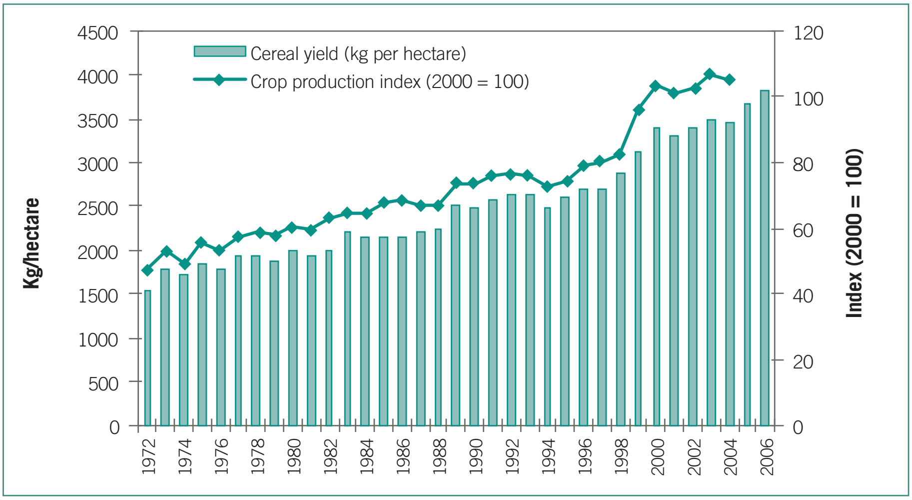
Table 4.6: Share of Bangladesh government subsidies by sector, 1998–2008

Items	**1998–99**	**1999–2000**	**2000–01**	**2001–02**	**2002–03**	**2003–04**	**2004–05**	**2005–06**	**2006–07**	**2007–08**
Food	60.39	61.84	60.08	49.50	30.51	25.44	22.16	18.20	14.02	12.41
Rural electrification	2.31	1.36	1.53	1.18	0.59	0.67	0.41	0.53	0.28	0.13
Jute goods	18.78	22.13	18.22	19.21	3.70	5.88	5.08	5.00	3.45	2.87
Export subsidy	0.00	0.09	0.00	0.00	53.05	49.87	33.05	36.24	24.61	18.55
Fertilizer and other agricultural activities	12.25	14.02	19.28	29.55	12.09	16.87	39.03	39.67	35.92	65.78
Others	6.26	0.57	0.88	0.57	0.05	1.27	0.28	0.37	21.71	0.26
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Finance, Government of Bangladesh.

As the total amount of subsidies has increased hugely, the share received by various sectors as a portion of the total amount of subsidies provided has changed significantly over the past decade. As seen in table 4.6, fertilizer and other agricultural subsidies made up about 12.2 per cent of total subsidies in 1998–99, but in 2007–08 this sector accounted for the lion's share of subsidies, at about 65.8 per cent. Export subsidies were nil or negligible until 2002–03, when this sector suddenly received about 53 per cent of all subsidies. In 2007–08 this sector received 18.6 per cent of total subsidies. The shares of food and jute products have shrunk considerably over the years, while that of rural electrification, which was a small portion to begin with, has increased.

Figure 4.2: Cereal yield (kg per hectare) and crop production index



Data source: World Development Indicators of World Bank

4.4.5 Agricultural productivity

In Bangladesh food security is linked to the increased production of cereal crops, especially rice. Therefore, a rise in productivity in the agricultural sector affects not only agricultural production but also the pattern of allocation of resources between agricultural and non-agricultural sectors and households' income and poverty.

Productivity in Bangladeshi agriculture has increased quite significantly over the last three decades or so. Figure 4.2 suggests that there has been a remarkable increase in cereal yield in terms of kg per hectare during this time. In 1972 cereal yield was around 1,500 kg per hectare. Yield had increased to about 3,800 kg per hectare by 2006. This rise in productivity has resulted in increased crop production during this period. The crop production index (considering 2000 as the base) was less than 50 in 1972 but reached 105 in 2004.

However, further increases in agricultural productivity remain crucial to ensuring food security in Bangladesh. The productivity of agriculture depends on various factors such as the use of high yielding varieties (HYV), improved management practices, efficient use of irrigation water, pest management, and soil health management. Other related factors that affect the productivity of agriculture include research and technological innovation for increased productivity, seed production and supply systems, efficient use of inputs, reduction in yield gap, crop diversification, adoption of integrated crop production technologies, farm mechanization, and subsidies to agriculture. Further increases in agricultural productivity are constrained by a number of challenges. These include climate change consequences such as global warming and sea-level rise, soil degradation, pest infestation, lack of infrastructure and power supply, rapid population growth, and the scarcity of land, among others.

4.5 SCENARIOS CONSIDERED IN THE BANGLADESH CGE MODEL

Doha Agriculture: Using the GTAP model, we simulate a moderate Doha scenario for agricultural liberalization under which developed countries cut their agricultural tariffs by 36 per cent and the developing countries cut theirs by 24 per cent. Furthermore, both the developed and developing countries reduce domestic agricultural subsidies by one-third and completely eliminate agricultural export subsidies. As discussed above, understanding the impact on the Bangladesh economy of liberalization of global agricultural trade is important, as Bangladesh is a net importer of some major agricultural products. Table 4.7 provides the GTAP results for changes in export demand, export prices, import prices, and imports under this scenario. The GTAP simulation results project a rise in export demand for agricultural products. Also, import prices of major agricultural and food products would rise, and their imports would fall. These changes in export demand, export prices, import prices, and imports are introduced as shocks in the Bangladesh CGE model.

Table 4.7: Impacts of Doha Agriculture scenario on export demand, export price, import price and imports (% change from the base value)

Sectors	Export demand	Export price	Import price	Imports
Cereal crops	85.3	0.68	3.35	–6.38
Commercial crops	4.94	0.58	0.88	–0.8
Livestock and poultry	0.19	0.57	0.7	–0.32
Fishing	2.12	–0.01	–0.02	–0.05
Rice milling	11.57	0.45	3.85	–8.09
Food processing	–0.76	0.4	0.41	–0.11
Leather industry	–1.45	0.31	0.11	0.19
Cloth milling	–0.5	0.2	0.12	–0.06
Woven and knit ready-made garments	–0.33	0.14	0.06	0.17
Cigarette industry	0.02	0.18	0.17	–0.04
Furniture industry	0.15	0.04	0.06	–0.06
Paper, printing, and publishing	0.02	0.04	0.04	–0.06
Petroleum	–0.01	0.04	0.04	0.01
Chemical industry	0.09	0.05	0.07	–0.02
Metal 0.02 0.04 0.03 0.03				
Miscellaneous industry	–0.02	0.04	0.04	–0.01
Mining and quarrying	0.07	0.03	0.04	0
Transport	0.11	0.03	0.04	–0.06
Public administration, defence, health service, education service	0.1	0.03	0.04	0
Financial service	0.02	0.04	0.03	–0.03
Communication	0.04	0.03	0.04	–0.02
Other services	0.04	0.04	0.05	–0.05

Source: GTAP simulation results.

Bangladesh–India Bilateral FTA: Using the GTAP model, we simulate a bilateral free trade agreement scenario in which Bangladesh and India bring their bilateral tariffs to zero. Table 4.8 provides the GTAP results for changes in export demand, export prices, import prices, and imports under this scenario. Under this FTA scenario there would be some increases in export demand, but there would be considerable increases in imports for most agricultural and industrial products. These changes in export demand, export prices, import prices, and imports are introduced as shocks in the Bangladesh CGE model.

Table 4.9 shows the changes in overall sectoral tariff rates due to the FTA between Bangladesh and India. These changes in tariff rates are introduced as shock in the Bangladesh CGE model while running the simulation for the Bangladesh–India bilateral FTA.

Unilateral Agricultural Trade Liberalization: A scenario of domestic agricultural trade liberalization is run in which Bangladesh cuts tariffs on all agricultural sectors by 50 per cent. Understanding the impact of this scenario on the Bangladesh economy

Table 4.8: Impacts of Bangladesh–India Bilateral FTA on export demand, export price, import price, and imports (% change from the base value)

Sectors	Export demand	Export price	Import price	Imports
Cereal crops	3.63	–0.64	0.19	1.35
Commercial crops	15.52	–0.54	0.09	6.13
Livestock and poultry	4.19	–0.53	0.01	–1.97
Fishing	1.28	–0.46	0.22	27.26
Rice milling	1.71	–0.34	0.23	58.95
Food processing	4.41	–0.55	0.05	2.97
Leather industry	4.89	–0.49	0.01	1.86
Cloth milling	6.02	–0.7	0.05	12.8
Woven and knit ready-made garments	7.14	–0.98	0.12	44.22
Cigarette industry	2.82	–0.16	0.02	2.63
Furniture industry	9.67	–0.25	0.03	10.61
Paper, printing, and publishing	4.7	–0.54	0.03	6.29
Petroleum	23.81	–1.46	0	1.94
Chemical industry	25.71	–0.63	0.03	4.26
Metal	37.15	–0.76	0.05	9.94
Miscellaneous industry	3.3	–0.21	0.02	3.18
Mining and quarrying	417.41	–1.23	0.02	5.1
Transport	–0.41	0.12	–0.01	–0.48
Public administration, defence, health service, education service	–0.62	0.16	0	–0.68
Financial service	–1.86	0.49	0	0.48
Communication	–1.41	0.37	0	0.24
Other services	–0.55	0.14	0	–0.35

Source: GTAP simulation results.

Table 4.9: Change in overall sectoral tariff rates in Bangladesh due to the FTA between Bangladesh and India (% change from the base value)

Sectors	% change in overall tariff rates
Cereal crops	–44.70
Commercial crops	–57.65
Livestock and poultry	–0.66
Fishing	–85.20
Food processing	–16.21
Leather industry	–10.37
Cloth milling	–28.73
Woven and knit ready-made garments	–68.21
Cigarette industry	–12.83
Furniture industry	–23.31
Paper, printing, and publishing	–26.64
Petroleum	–18.06
Chemical industry	–29.67
Metal	–40.70
Miscellaneous industry	–20.95
Mining and quarrying	–35.56

Source: Calculated from GTAP simulation results.

is important, as there are debates in the policy arena with respect to further liberalization of trade in the agricultural sectors in Bangladesh. As noted, over the last two decades the trade in the cereal crop sub-sector has been highly liberalized. However, there are still some significant protections on the commercial crop, livestock, and poultry sub-sectors.

Agricultural Production Subsidy Policy: In this scenario the existing subsidies in agricultural sectors are increased by 25 per cent. As discussed before, over the years allocation of subsidies towards the agricultural sector has increased quite significantly. This scenario will help us understand the allocation and efficiency effects of the increased amount of subsidies in the agricultural sector.

Agricultural Productivity: A scenario that includes a 10 per cent rise in total factor productivity in the cereal crop sector is considered. Raising agricultural productivity in general, and increasing the productivity in the cereal crop sector in particular, has been one of the major development agendas of the government. This scenario will help to explore the economy-wide impacts of such an increase in productivity in the cereal crop sector.

4.6 RESULTS FROM THE BANGLADESH CGE MODEL

4.6.1 Macroeconomic effects

The macroeconomic effects of the five scenarios are reported in table 4.10. Under the Doha agricultural trade liberalization scenario, there would be a small positive impact on real GDP. The consumer price index (CPI) would rise, and aggregate consumption would also rise slightly. There would be negative but small impacts on overall imports and exports. The return to all factors except unskilled labour would rise; the largest rise would be in the return to land.[6]

Under the bilateral FTA between Bangladesh and India, there would be a reduction in real GDP, the consumer price index would fall, consumption would rise, and both imports and exports would rise. Returns of all factors of production would rise, with the largest rise in the return to skilled labour.

The unilateral liberalization of agricultural trade would lead to a small reduction in real GDP. The CPI would fall, and so would aggregate consumption. Imports and exports would rise. The returns to all factors would fall, with largest fall in the return to land.

The macroeconomic effects of increased agricultural subsidy would include a reduction in real GDP. The CPI would fall, and aggregate consumption would rise.

Table 4.10: Macroeconomic effects of five simulations (% change from the base value)

Variable	Doha Agriculture	Bangladesh–India Bilateral FTA	Unilateral Agricultural Trade Liberalization	Agricultural Production Subsidy	Agricultural Productivity
Real gross domestic product	0.05	–0.58	–0.19	–0.09	0.52
Consumer price index	0.19	–0.23	–0.34	–0.11	–0.96
Aggregate consumption	0.01	0.91	–0.07	0.12	0.61
Imports	–0.19	2.92	0.05	–0.02	–0.35
Exports	–0.17	3.80	0.49	0.03	–0.03
Return to unskilled labour	0.00	0.00	0.00	0.00	0.00
Return to skilled labour	0.17	1.13	–0.38	0.03	0.10
Return to capital	0.13	0.74	–0.34	–0.02	0.30
Return to land	0.56	0.30	–0.90	0.26	–3.84

Source: Bangladesh CGE Model.

[6] The return to unskilled labour remains unchanged because of the assumption that unskilled wages are fixed.

There would be a small reduction in imports and a small increase in exports. Among the factors, the return to land would increase the most. The return to capital would fall.

The rise in productivity of cereal crop production would lead to a rise in real GDP. The CPI would fall, and consumption would rise. Imports would fall, and so would exports, by a small amount. The return to land would fall substantially because of the rise in the productivity of the cereal crop sector.

4.6.2 Sectoral effects

The sectoral price and volume effects of the Doha agriculture scenario are reported in table 4.11. Prices of all products would rise. The increases would be largest for agricultural and food products. In general, agricultural sub-sectors and some industrial and services sub-sectors would expand. Also, imports would decline in some agricultural and rice milling sub-sectors. There would be some increase in exports of some agricultural products, while exports of most of the manufacturing sub-sectors would decline slightly.

Table 4.11: Effects on sectoral prices and volumes of Doha Agriculture simulation (% change from the base value)

Sectors	PD	PC	PE_ FOB	PL	PVA	O	M	DD	E	Q
Cereal crop	0.29	0.44	13.59	0.29	0.29	0.41	−5.73	0.41	28.81	0.10
Commercial crop	0.26	0.40	1.40	0.27	0.37	0.27	−1.01	0.21	2.48	−0.06
Livestock rearing	0.18	0.18	0.81	0.18	0.10	0.03	−1.00	0.03	1.28	0.03
Poultry rearing	0.19	0.19	0.08	0.19	0.10	0.00	0.39	0.00	−0.23	0.01
Shrimp farming and fishing	0.08	0.08	0.37	0.08	0.12	0.16	0.66	0.10	0.69	0.10
Forestry	0.11	0.11	n.a.	0.11	0.12	0.10	n.a.	0.10	n.a.	0.10
Rice milling	0.30	0.34	2.61	0.30	0.10	−0.01	−6.73	−0.01	4.66	−0.10
Grain milling	0.24	0.24	0.10	0.24	0.11	−0.03	0.45	−0.03	−0.30	−0.02
Food processing	0.16	0.23	0.12	0.16	0.11	0.14	−0.31	0.14	0.07	0.03
Leather industry	0.21	0.20	−0.10	0.21	0.10	−0.22	0.09	−0.09	−0.64	−0.08
Yarn industry	0.35	0.16	0.32	0.35	0.10	−0.60	−0.17	−0.58	−0.63	−0.21
Cloth milling	0.11	0.12	0.04	0.11	0.10	−0.04	−0.05	−0.04	−0.18	−0.05
Woven RMG	0.17	0.11	0.10	0.17	0.10	−0.24	0.07	−0.13	−0.25	0.00
Knit RMG	0.26	0.24	0.14	0.28	0.11	−0.31	0.30	−0.09	−0.33	−0.04
Toiletries	0.10	0.04	0.05	0.09	0.12	−0.04	0.12	−0.04	−0.10	0.07
Cigarette industry	0.19	0.20	0.18	0.11	0.12	0.07	−0.04	0.07	0.20	0.06
Furniture industry	−0.07	−0.03	0.42	−0.07	0.12	0.60	0.11	0.35	1.24	0.27
Paper, printing, and publishing industry	0.10	0.06	0.12	0.09	0.11	−0.02	0.07	−0.03	0.03	0.04
Pharmaceuticals	0.13	0.11	0.05	0.12	0.12	0.02	0.24	0.03	−0.10	0.06

Table 4.11: Effects on sectoral prices and volumes of Doha Agriculture simulation (% change from the base value) *(continued)*

Sectors	**PD**	**PC**	**PE_ FOB**	**PL**	**PVA**	**O**	**M**	**DD**	**E**	**Q**
Fertilizer industry	0.15	0.02	0.05	0.15	0.12	0.02	0.38	0.10	–0.09	0.34
Petroleum	0.10	0.08	0.04	0.09	0.13	0.00	0.06	0.01	–0.08	0.06
Chemical industry	0.08	0.08	0.29	0.08	0.12	0.09	0.06	0.05	0.42	0.06
Glass industry	0.11	0.08	0.04	0.10	0.11	0.01	0.21	0.02	–0.09	0.08
Earth-ware and clay industry	0.12	0.10	0.04	0.11	0.12	0.06	0.26	0.06	–0.07	0.09
Cement	0.11	0.10	0.01	0.11	0.12	0.14	0.33	0.14	–0.03	0.15
Metal	0.11	0.10	0.03	0.11	0.11	0.06	0.21	0.07	–0.07	0.09
Miscellaneous industry	0.15	0.08	0.05	0.15	0.11	–0.07	0.17	–0.02	–0.21	0.11
Mining and quarrying	0.11	0.11	0.23	0.11	0.13	0.10	0.23	0.10	0.30	0.10
Construction	0.10	0.10	n.a.	0.10	0.10	0.12	n.a.	0.12	n.a.	0.12
Electricity and water generation	0.12	0.12	n.a.	0.12	0.13	0.05	n.a.	0.05	n.a.	0.05
Gas extraction and distribution	0.13	0.13	n.a.	0.13	0.13	0.03	n.a.	0.03	n.a.	0.03
Trade	0.12	0.12	n.a.	0.12	0.13	0.02	n.a.	0.02	n.a.	0.02
Transport	0.10	0.09	0.09	0.10	0.10	0.01	0.11	0.01	–0.01	0.03
Health service	0.12	0.12	n.a.	0.12	0.15	0.01	n.a.	0.01	n.a.	0.01
Education service	0.14	0.14	n.a.	0.14	0.16	–0.04	n.a.	–0.04	n.a.	–0.04
Public administration and defence	0.13	0.12	0.14	0.13	0.15	–0.11	0.04	–0.11	–0.11	–0.09
Bank, insurance. and real estate	0.14	0.12	0.13	0.13	0.15	0.03	0.20	0.03	0.02	0.06
Hotel and restaurant	0.18	0.18	n.a.	0.18	0.11	0.01	n.a.	0.01	n.a.	0.01
Communication	0.15	0.15	0.18	0.13	0.14	0.02	0.16	0.02	0.10	0.02
Information technology	0.15	0.14	0.07	0.15	0.14	–0.04	0.24	–0.01	–0.14	0.02
Other services	0.09	0.09	0.16	0.09	0.09	0.06	0.12	0.06	0.17	0.06

Note: PD=price of local product (including all taxes and margins); PC=purchaser price of composite commodity (including all taxes and margins); PE_FOB=FOB price of exported commodity; PL=price of local product (excluding all taxes on products); PVA=price of industry value added; O=production; M=import; DD=domestic demand; E=export; Q=composite commodity demand; RMG=ready-made garments; n.a.=not available.

Source: Bangladesh CGE model.

The effects of the Bangladesh–India bilateral FTA on sectoral prices include a rise in domestic prices of agricultural commodities and a fall in prices in both the industrial and services sub-sectors (table 4.12). There would be increased imports in almost all sub-sectors. The sub-sectors with high import penetration would experience contraction. There would be a rise in major export categories such as woven and knit ready-made garments and leather, and these sectors would expand.

Table 4.12: Effects on sectoral prices and volumes of Bangladesh–India FTA simulation (% change from the base value)

Sectors	**PD**	**PC**	**PE_ FOB**	**PL**	**PVA**	**O**	**M**	**DD**	**E**	**Q**
Cereal crop	0.20 0	.07	0.36	0.21	0.28	0.27	5.86	0.27	0.57	0.54
Commercial crop	0.08	-0.60	2.71	0.08	0.28	-0.27	5.87	-0.41	4.89	0.95
Livestock rearing	0.30	0.30	0.55	0.30	0.58	0.38	1.04	0.38	0.87	0.38
Poultry rearing	0.14	0.14	-0.04	0.14	0.59	0.47	0.76	0.47	0.12	0.48
Shrimp farming and fishing	0.51	0.48	0.16	0.52	0.73	0.07	62.67	0.14	–0.58	0.20
Forestry	0.42	0.42	n.a.	0.42	0.67	–0.77	n.a.	–0.77	n.a.	–0.77
Rice milling	0.21	0.21	0.09	0.21	0.61	0.66	0.61	0.66	0.41	0.66
Grain milling	0.25	0.25	–0.03	0.25	0.65	0.65	1.15	0.65	0.09	0.65
Food processing	–0.02	–0.46	0.53	–0.02	0.67	0.10	3.18	0.09	1.09	0.86
Leather industry	–0.08	–0.15	0.74	–0.08	0.58	1.19	2.67	0.84	2.34	0.95
Yarn industry	–0.06	0.05	–0.75	–0.06	0.62	2.25	2.58	2.78	1.51	2.60
Cloth milling	–0.01	–1.25	1.29	–0.01	0.62	–0.44	11.57	–0.44	1.89	1.74
Woven RMG	–5.12	–10.50	0.22	–5.20	0.63	4.15	8.24	–5.05	4.96	3.22
Knit RMG	–1.13	–1.07	0.40	–1.19	0.65	4.32	0.68	1.65	4.60	1.53
Toiletries	–0.66	–0.24	–0.60	–0.57	0.72	1.25	0.22	1.25	1.20	0.53
Cigarette industry	–0.15	–0.31	0.41	–0.08	0.70	0.78	6.23	0.77	1.66	0.94
Furniture industry	–1.33	–2.08	1.68	–1.33	0.68	1.56	3.54	–0.03	5.54	1.16
Paper, printing, and publishing industry	–0.55	–4.09	1.83	–0.54	0.68	–4.03	3.13	–4.24	–0.11	1.09
Pharmaceuticals	–0.55	–0.46	–0.54	–0.51	0.69	1.13	0.20	1.13	1.08	0.97
Fertilizer industry	0.45	0.07	0.36	0.45	0.71	–0.63	0.23	–0.56	–0.72	0.12
Petroleum	–1.49	–3.06	–0.42	–1.37	0.76	–0.65	1.32	–0.89	0.84	1.09
Chemical industry	–1.28	–3.78	6.22	–1.27	0.69	–1.87	0.98	–3.56	10.02	0.23
Glass industry	0.07	0.05	–0.04	0.07	0.68	0.27	0.40	0.28	0.08	0.32
Earth–ware and clay industry	0.33	0.28	0.32	0.31	0.69	–0.67	–0.11	–0.67	–0.65	–0.59
Cement	0.44	0.41	0.83	0.43	0.71	–2.34	–1.59	–2.34	–1.64	–2.29
Metal	–0.51	–1.28	9.26	–0.50	0.67	–2.30	5.47	–2.93	14.88	–1.62
Miscellaneous industry	–0.26	–2.09	1.15	–0.26	0.65	–1.34	2.33	–1.98	0.54	0.98
Mining and quarrying	0.45	0.40	45.59	0.45	0.79	–1.54	10.74	–1.61	91.92	–1.53
Construction	0.06	0.06	n.a.	0.06	0.59	–1.73	n.a.	–1.73	n.a.	–1.73
Electricity and water generation	0.04	0.04	n.a.	0.04	0.77	0.53	n.a.	0.53	n.a.	0.53
Gas extraction and distribution	0.69	0.69	n.a.	0.69	0.77	0.25	n.a.	0.25	n.a.	0.25
Trade	0.41	0.41	n.a.	0.41	0.78	0.56	n.a.	0.56	n.a.	0.56
Transport	0.38	0.30	0.01	0.38	0.62	0.39	1.17	0.40	–0.19	0.52
Health service	0.49	0.49	n.a.	0.49	0.89	0.25	n.a.	0.25	n.a.	0.25
Education service	0.61	0.61	n.a.	0.61	1.01	–0.09	n.a.	–0.09	n.a.	–0.09
Public administration and defence	0.73	0.62	0.42	0.73	0.97	–0.75	0.52	–0.65	–1.14	–0.48

Table 4.12: Effects on sectoral prices and volumes of Bangladesh–India FTA simulation (% change from the base value) *(continued)*

Sectors	PD	PC	PE_ FOB	PL	PVA	O	M	DD	E	Q
Bank, insurance and real estate	0.76	0.66	0.13	0.73	0.91	–0.22	0.97	–0.21	–1.16	–0.05
Hotel and restaurant	0.22	0.22	n.a.	0.22	0.66	0.50	n.a.	0.50	n.a.	0.50
Communication	0.80	0.78	0.40	0.67	0.83	–0.03	1.06	–0.02	–0.46	0.00
Information technology	0.77	0.69	0.34	0.77	0.83	–0.20	1.23	0.00	–0.68	0.12
Other services	0.43	0.43	0.05	0.42	0.51	0.23	0.91	0.23	–0.37	0.24

Note: PD=price of local product (including all taxes and margins); PC=purchaser price of composite commodity (including all taxes and margins); PE_FOB=FOB price of exported commodity; PL=price of local product (excluding all taxes on products); PVA=price of industry value added; O=production; M=import; DD=domestic demand; E=export; Q=composite commodity demand; RMG=ready-made garments; n.a.=not available.

Source: Bangladesh CGE model.

The sectoral effects of unilateral trade liberalization are reported in table 4.13. Sectoral prices would fall, with the greatest impacts on agricultural products. Imports of agricultural products would increase, and this would result in the contraction of the agricultural sub-sectors. Also, overall industrial and services sectors would contract.

Table 4.13: Effects on sectoral prices and volumes of Domestic Agricultural Trade Liberalization simulation (% change from the base value)

Sectors	PD	PC	PE_ FOB	PL	PVA	O	M	DD	E	Q
Cereal crop	–0.45	–0.57	–0.10	–0.45	–0.48	–0.40	–5.73	–0.40	0.30	–0.14
Commercial crop	–0.57	–1.03	–0.08	–0.57	–0.62	–0.72	–1.01	–0.75	0.24	0.17
Livestock rearing	–0.36	–0.36	–0.13	–0.36	–0.26	–0.06	–1.00	–0.06	0.40	–0.06
Poultry rearing	–0.38	–0.42	–0.12	–0.38	–0.27	–0.16	0.39	–0.16	0.35	–0.07
Shrimp farming and fishin	–0.32	–0.33	–0.11	–0.32	–0.30	–0.03	0.66	–0.07	0.35	–0.04
Forestry	–0.27	–0.27	n.a.	–0.27	–0.31	–0.37	n.a.	–0.37	n.a.	–0.37
Rice milling	–0.43	–0.47	–0.16	–0.44	–0.26	–0.05	–6.73	–0.05	0.49	0.01
Grain milling	–0.37	–0.39	–0.14	–0.37	–0.27	–0.06	0.45	–0.07	0.41	–0.04
Food processing	–0.31	–0.24	–0.12	–0.31	–0.28	0.04	–0.31	0.03	0.37	–0.11
Leather industry	–0.29	–0.28	–0.13	–0.29	–0.24	0.05	0.09	–0.02	0.27	–0.05
Yarn industry	–0.85	-0.09	–0.88	–0.85	–0.24	1.82	–0.17	1.84	1.78	0.43
Cloth milling	–0.24	–0.20	–0.15	–0.24	–0.24	0.15	–0.05	0.15	0.30	0.07
Woven RMG	–0.29	–0.12	–0.22	–0.30	–0.25	0.43	0.07	0.31	0.45	–0.03
Knit RMG	–0.55	–0.48	–0.33	–0.58	–0.26	0.61	0.30	0.19	0.65	0.07
Toiletries	–0.20	–0.07	–0.10	–0.17	–0.31	0.06	0.12	0.05	0.19	–0.17
Cigarette industry	–0.44	–0.43	–0.09	–0.25	–0.30	–0.12	–0.04	–0.13	0.17	–0.14
Furniture industry	–0.27	–0.19	–0.14	–0.27	–0.29	0.12	0.11	0.06	0.28	–0.10

Table 4.13: Effects on sectoral prices and volumes of Domestic Agricultural Trade Liberalization simulation (% change from the base value) *(continued)*

Sectors	PD	PC	PE_ FOB	PL	PVA	O	M	DD	E	Q
Paper, printing, and publishing industry	−0.23	−0.07	−0.16	−0.22	−0.28	0.21	0.07	0.20	0.31	−0.09
Pharmaceuticals	−0.25	−0.20	−0.09	−0.23	−0.30	−0.07	0.24	−0.08	0.18	−0.15
Fertilizer industry	−0.32	−0.05	−0.17	−0.32	−0.31	0.17	0.38	0.05	0.34	−0.44
Petroleum	−0.14	−0.02	−0.07	−0.12	−0.34	0.06	0.06	0.04	0.14	−0.16
Chemical industry	−0.23	−0.04	−0.15	−0.22	−0.30	0.18	0.06	0.16	0.30	−0.18
Glass industry	−0.24	−0.18	−0.10	−0.24	−0.29	−0.05	0.21	−0.07	0.19	−0.20
Earth–ware and clay industry	−0.27	−0.24	−0.04	−0.26	−0.29	−0.30	0.26	−0.30	0.09	−0.37
Cement	−0.26	−0.24	0.08	−0.25	−0.31	−0.76	0.33	−0.76	−0.17	−0.79
Metal	−0.25	−0.22	−0.01	−0.25	−0.28	−0.40	0.21	−0.42	0.02	−0.49
Miscellaneous industry	−0.34	−0.11	−0.15	−0.34	−0.27	0.04	0.17	−0.05	0.29	−0.46
Mining and quarrying	−0.28	−0.28	−0.01	−0.28	−0.34	−0.47	0.23	−0.47	0.02	−0.48
Construction	−0.24	−0.24	n.a.	−0.24	−0.25	−0.62	n.a.	−0.62	n.a.	−0.62
Electricity and water generation	−0.29	−0.29	n.a	−0.27	−0.34	−0.10	n.a	−0.10	n.a	−0.10
Gas extraction and distribution	−0.33	−0.33	n.a.	−0.33	−0.34	−0.05	n.a.	−0.05	n.a.	−0.05
Trade	−0.27	−0.27	n.a.	−0.27	−0.30	−0.04	n.a.	−0.04	n.a.	−0.04
Transport	−0.24	−0.21	−0.11	−0.24	−0.26	0.01	0.11	0.00	0.22	−0.06
Health service	−0.29	−0.29	n.a.	−0.29	−0.35	−0.02	n.a.	−0.02	n.a.	−0.02
Education service	−0.31	−0.31	n.a.	−0.31	−0.36	0.10	n.a.	0.10	n.a.	0.10
Public administration and defence	−0.33	−0.28	−0.23	−0.33	−0.35	0.33	0.04	0.29	0.46	0.22
Bank, insurance and real estate	−0.33	−0.28	−0.11	−0.32	−0.35	−0.11	0.20	−0.12	0.22	−0.19
Hotel and restaurant	−0.38	−0.38	n.a.	−0.38	−0.26	−0.02	n.a.	−0.02	n.a.	−0.02
Communication	−0.38	−0.37	−0.13	−0.32	−0.33	−0.04	0.16	−0.05	0.26	−0.06
Information technology	−0.36	−0.33	−0.17	−0.36	−0.33	0.12	0.24	0.02	0.34	−0.03
Other services	−0.23	−0.23	−0.06	−0.22	−0.22	−0.14	0.12	−0.14	0.12	−0.15

Note: PD=price of local product (including all taxes and margins); PC=purchaser price of composite commodity (including all taxes and margins); PE_FOB=FOB price of exported commodity; PL=price of local product (excluding all taxes on products); PVA=price of industry value added; O=production; M=import; DD=domestic demand; E=export; Q=composite commodity demand; RMG=ready-made garments; n.a.=not available.

Source: Bangladesh CGE model.

Due to an increased subsidy in the agricultural sector, prices of agricultural commodities would fall and a very small effect on the prices of industrial and services sub-sectors would be observed (table 4.14). The prices of value added would be increased most for the agricultural sub-sectors. Production in agricultural sub-sectors would increase, while some industrial and services sub-sectors would contract.

Table 4.14: Effects on sectoral prices and volumes of Agricultural Subsidy Policy simulation (% change from base value)

Sectors	PD	PC	PE_ FOB	PL	PVA	O	M	DD	E	Q
Cereal crop	–0.28	–0.28	–0.06	–0.01	0.13	0.27	0.26	0.27	0.17	0.27
Commercial crop	–0.14	–0.16	0.02	0.07	0.17	0.05	0.20	0.05	–0.06	0.09
Livestock rearing	–0.06	–0.06	–0.04	–0.06	–0.01	0.07	–0.04	0.07	0.11	0.07
Poultry rearing	–0.09	–0.09	–0.05	–0.09	–0.01	0.08	–0.09	0.08	0.15	0.08
Shrimp farming and fishing	–0.28	–0.28	–0.08	–0.11	0.00	0.17	–0.06	0.16	0.23	0.16
Forestry	–0.03	–0.03	n.a.	–0.01	–0.02	–0.19	n.a.	–0.19	n.a.	–0.19
Rice milling	–0.32	–0.32	–0.12	–0.16	–0.01	0.29	–0.03	0.29	0.37	0.29
Grain milling	–0.24	–0.24	–0.09	–0.11	0.00	0.23	0.01	0.23	0.27	0.23
Food processing	–0.03	–0.02	–0.03	–0.03	0.00	0.10	0.04	0.10	0.10	0.08
Leather industry	–0.01	–0.01	–0.02	–0.01	–0.01	0.04	0.04	0.05	0.03	0.05
Yarn industry	–0.13	–0.01	–0.12	–0.12	0.00	0.25	0.02	0.25	0.25	0.04
Cloth milling	–0.01	0.00	–0.01	–0.01	0.00	0.04	0.03	0.04	0.02	0.03
Woven RMG	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.02
Knit RMG	–0.02	–0.02	–0.03	–0.02	0.00	0.05	0.03	0.06	0.05	0.06
Toiletries	0.00	0.00	–0.01	0.00	–0.01	0.03	0.03	0.03	0.02	0.03
Cigarette industry	–0.01	–0.01	–0.02	–0.01	–0.01	0.06	0.05	0.06	0.04	0.06
Furniture industry	–0.01	–0.01	–0.01	–0.01	–0.01	0.01	–0.01	0.01	0.01	0.00
Paper, printing, and publishing industry	0.00	0.00	–0.02	0.00	–0.01	0.05	0.05	0.05	0.03	0.05
Pharmaceuticals	–0.01	–0.01	–0.02	–0.01	–0.01	0.06	0.04	0.06	0.04	0.06
Fertilizer industry	0.02	0.00	–0.04	0.02	–0.01	0.13	0.20	0.17	0.07	0.20
Petroleum	0.00	0.00	–0.01	0.00	–0.02	0.02	0.02	0.02	0.01	0.02
Chemical industry	0.00	0.00	0.01	0.00	–0.01	–0.05	–0.06	–0.05	–0.02	–0.06
Glass industry	–0.01	0.00	0.00	0.00	–0.01	0.00	–0.01	0.00	0.00	0.00
Earth–ware and clay industry	–0.01	–0.01	0.04	–0.01	–0.01	–0.17	–0.18	–0.17	–0.08	–0.17
Cement	0.00	0.00	0.13	0.00	–0.01	–0.51	–0.52	–0.51	–0.27	–0.51
Metal	–0.01	–0.01	0.08	–0.01	–0.01	–0.31	–0.33	–0.32	–0.16	–0.32
Miscellaneous industry	–0.02	–0.01	0.02	–0.02	0.00	–0.11	–0.17	–0.13	–0.04	–0.16
Mining and quarrying	–0.01	–0.01	0.08	–0.01	–0.01	–0.30	–0.31	–0.30	–0.15	–0.30
Construction	–0.01	–0.01	n.a.	–0.01	–0.01	–0.39	n.a.	–0.39	n.a.	–0.39
Electricity and water generation	–0.01	–0.01	n.a.	–0.01	–0.01	0.04	n.a.	0.04	n.a.	0.04
Gas extraction and distribution	–0.01	–0.01	n.a.	–0.01	–0.02	0.04	n.a.	0.04	n.a.	0.04
Trade	0.00	0.00	n.a.	0.00	0.00	0.04	n.a.	0.04	n.a.	0.04
Transport	0.00	0.00	–0.01	0.00	0.00	0.04	0.03	0.04	0.03	0.04
Health service	0.00	0.00	n.a.	0.00	0.00	0.04	n.a.	0.04	n.a.	0.04
Education service	0.01	0.01	n.a.	0.01	0.02	0.02	n.a.	0.02	n.a.	0.02
Public administration and defence	0.01	0.01	0.00	0.01	0.02	–0.01	0.00	0.00	–0.01	0.00

Table 4.14: Effects on sectoral prices and volumes of Agricultural Subsidy Policy simulation (% change from base value) *(continued)*

Sectors	PD	PC	PE_ FOB	PL	PVA	O	M	DD	E	Q
Bank, insurance and real estate	0.00	0.00	0.01	0.00	0.01	−0.05	−0.05	−0.05	−0.03	−0.05
Hotel and restaurant	−0.07	−0.07	n.a.	−0.07	0.00	0.09	n.a.	0.09	n.a.	0.09
Communication	0.00	0.00	0.00	0.00	0.00	−0.02	−0.02	−0.02	−0.01	−0.02
Information technology	0.00	0.00	−0.01	0.00	0.00	0.02	0.02	0.02	0.01	0.02
Other services	−0.01	−0.01	−0.01	−0.01	−0.01	0.01	0.00	0.01	0.01	0.01

Note: PD=price of local product (including all taxes and margins); PC=purchaser price of composite commodity (including all taxes and margins); PE_FOB=FOB price of exported commodity; PL=price of local product (excluding all taxes on products); PVA=price of industry value added; O=production; M=import; DD=domestic demand; E=export; Q=composite commodity demand; RMG=ready-made garments; n.a.=not available.

Source: Bangladesh CGE model.

The rise in the productivity of the cereal crop sub-sector would reduce the domestic prices of most of the agricultural and food products and would raise the prices of industrial and services products because of reallocation of demand (table 4.15). The largest fall in the domestic price would be observed for the cereal crop sub-sector, which would also lead to a fall in the domestic price of rice milling by a large margin. The cereal crop sub-sector would experience the largest expansion. Also, other agricultural sub-sectors and food sub-sectors such as rice and grain milling would experience an expansion. Imports will fall in all these sub-sectors. The industrial and services sub-sectors would experience some expansion.

Table 4.15: Effects on sectoral prices and volumes of Agricultural Productivity simulation (% change from base value)

Sectors	PD	PC	PE_ FOB	PL	PVA	O	M	DD	E	Q
Cereal crop	−7.56	−7.23	−3.84	−7.64	−10.77	3.73	−11.51	3.73	12.45	2.95
Commercial crop	−1.54	−1.22	−0.86	−1.56	−2.51	1.21	−1.96	1.17	2.62	0.48
Livestock rearing	−0.79	−0.79	−0.39	−0.79	0.21	0.36	−1.22	0.36	1.17	0.36
Poultry rearing	−1.62	−1.61	−0.76	−1.62	0.22	0.57	−2.66	0.57	2.33	0.55
Shrimp farming and fishing	0.15	0.15	0.09	0.15	0.20	−0.14	0.17	−0.13	−0.26	−0.13
Forestry	0.19	0.19	n.a	0.19	0.27	−0.21	n.a.	−0.21	n.a.	−0.21
Rice milling	−4.07	−4.03	−2.23	−4.10	0.18	2.96	−5.31	2.96	7.01	2.85
Grain milling	−2.72	−2.72	−1.48	−2.73	0.17	1.92	−3.58	1.92	4.57	1.91
Food processing	−0.03	−0.03	0.00	−0.03	0.19	−0.05	−0.12	−0.06	0.00	−0.07
Leather industry	0.02	0.02	0.04	0.02	0.17	−0.09	−0.06	−0.10	−0.07	−0.09
Yarn industry	−0.97	−0.10	−0.88	−0.97	0.13	1.69	−0.14	1.62	1.78	0.01

Table 4.15: Effects on sectoral prices and volumes of Agricultural Productivity simulation (% change from base value) *(continued)*

Sectors	PD	PC	PE_ FOB	PL	PVA	O	M	DD	E	Q
Cloth milling	0.07	0.06	0.08	0.07	0.13	–0.19	–0.07	–0.19	–0.17	–0.17
Woven RMG	0.13	0.05	0.12	0.13	0.15	–0.23	0.01	–0.22	–0.24	–0.07
Knit RMG	–0.13	–0.12	–0.07	–0.14	0.16	0.14	–0.23	0.02	0.15	–0.01
Toiletries	0.11	0.04	0.10	0.10	0.23	–0.20	–0.03	–0.20	–0.20	–0.08
Cigarette industry	0.16	0.16	0.09	0.09	0.23	–0.18	–0.02	–0.18	–0.19	–0.18
Furniture industry	0.14	0.10	0.14	0.14	0.21	–0.26	–0.01	–0.26	–0.27	–0.18
Paper, printing, and publishing industry	0.14	0.04	0.06	0.14	0.20	–0.01	0.25	0.00	–0.13	0.18
Pharmaceuticals	0.09	0.08	0.08	0.09	0.22	–0.16	0.00	–0.15	–0.16	–0.13
Fertilizer industry	0.49	0.07	–0.27	0.49	0.25	1.36	2.85	1.94	0.55	2.71
Petroleum	0.09	0.01	0.03	0.08	0.29	0.01	0.17	0.02	–0.07	0.15
Chemical industry	0.14	0.02	0.12	0.14	0.22	–0.22	0.03	–0.22	–0.24	–0.01
Glass industry	0.16	0.12	0.14	0.16	0.20	–0.26	0.03	–0.26	–0.28	–0.17
Earth–ware and clay industry	0.19	0.16	0.16	0.18	0.22	–0.27	0.06	–0.27	–0.31	–0.22
Cement	0.16	0.15	0.18	0.15	0.25	–0.40	–0.13	–0.40	–0.36	–0.38
Metal	0.15	0.13	0.13	0.15	0.19	–0.22	0.05	–0.22	–0.26	–0.18
Miscellaneous industry	0.05	0.02	0.05	0.05	0.17	–0.11	–0.02	–0.11	–0.11	–0.04
Mining and quarrying	0.20	0.20	0.16	0.20	0.26	–0.25	0.10	–0.25	–0.32	–0.25
Construction	0.16	0.16	n.a.	0.16	0.19	–0.28	n.a.	–0.28	n.a.	–0.28
Electricity and water generation	0.22	0.22	n.a.	0.21	0.27	–0.04	n.a.	–0.04	n.a.	–0.04
Gas extraction and distribution	0.27	0.27	n.a.	0.27	0.28	–0.19	n.a.	–0.19	n.a.	–0.19
Trade	0.14	0.14	n.a.	0.14	0.16	0.63	n.a.	0.63	n.a.	0.63
Transport	0.15	0.13	–0.05	0.15	0.18	0.41	0.66	0.41	0.10	0.45
Health service	0.17	0.17	n.a.	0.17	0.20	–0.02	n.a.	–0.02	n.a.	–0.02
Education service	0.13	0.13	n.a.	0.13	0.13	–0.16	n.a.	–0.16	n.a.	–0.16
Public administration and defence	0.11	0.10	0.08	0.11	0.13	–0.12	0.07	–0.11	–0.16	–0.08
Bank, insurance and real estate	0.14	0.12	0.03	0.14	0.18	0.12	0.34	0.12	–0.05	0.15
Hotel and restaurant	–0.76	–0.76	n.a.	–0.76	0.15	0.37	n.a.	0.37	n.a.	0.37
Communication	0.22	0.21	0.10	0.18	0.20	–0.06	0.24	–0.06	–0.20	–0.05
Information technology	0.20	0.18	0.14	0.20	0.20	–0.22	0.12	–0.19	–0.28	–0.16
Other services	0.17	0.17	0.09	0.17	0.17	–0.06	0.21	–0.05	–0.18	–0.05

Note: PD=price of local product (including all taxes and margins); PC=purchaser price of composite commodity (including all taxes and margins); PE_FOB=FOB price of exported commodity; PL=price of local product (excluding all taxes on products); PVA=price of industry value added; O=production; M=import; DD=domestic demand; E=export; Q=composite commodity demand; n.a.=not available; RMG=ready-made garments; n.a.=not available.

Source: Bangladesh CGE model.

4.6.3. Effects on households

Table 4.16 reports the effects of the five scenarios on households' income and real consumption. Under the Doha agricultural trade liberalization scenario, all categories of households would experience a rise in income. However, the rises in incomes of rural non-farm households and urban high-educated households are smaller than the rise in CPI. This results in a reduction in real consumption by these categories of households. The other categories of households, however, would experience some very small increases in real consumption.

In the case of the Bangladesh–India FTA scenario, all the household categories would experience a rise in income and real consumption. In rural areas the poorer households would experience a larger rise in real consumption than would other groups.

Under the unilateral agricultural trade liberalization scenario, incomes would fall for all categories of households. All household categories would also experience a fall in real consumption. Rural small farmers, rural large farmers, and urban low-educated households would experience the larger fall in real consumption.

Under the scenario of increased agricultural subsidy, there would be increases in income and real consumption. In rural areas large farmers would experience the largest rise in income and real consumption.

All household categories except the rural large farmers would increase real consumption due to a rise in total factor productivity in the cereal crop sector. The rural large farmers would incur a large loss in income because of the deep fall in the return to land. This fall in income would be greater than the fall in CPI, so rural large farmers would experience a drop in real income.

Table 4.16: Effects on household income and real consumption (% change from the base value)

	Doha Agricultural		**Bangladesh–India FTA**		**Unilateral Agriculture Trade Liberalization**		**Agricultural Production Subsidy**		**Agricultural Productivity**	
Households	Y	RC	Y	RC	Y	RC	Y	RC	Y	RC
Rural landless	0.18	0.00	0.75	1.03	−0.41	−0.06	0.01	0.12	−0.26	0.79
Rural marginal farmers	0.20	0.01	0.69	0.92	−0.43	−0.08	0.02	0.14	−0.45	0.70
Rural small farmers	0.23	0.04	0.64	0.84	−0.47	−0.11	0.03	0.15	−0.76	0.35
Rural large farmers	0.30	0.09	0.59	0.79	−0.55	0.18	0.08	0.21	−1.36	−0.12
Rural non-farm	0.18	−0.01	0.68	0.90	−0.40	-0.05	0.00	0.12	−0.25	0.87
Urban low education	0.22	0.05	0.69	0.92	−0.45	−0.13	0.02	0.11	−0.64	0.11
Urban high education	0.17	−0.01	0.83	1.00	−0.38	−0.04	0.00	0.09	−0.05	0.66

Note: Y=income; C=real consumption.
Source: Bangladesh CGE model.

4.6.4 Effects on employment

Table 4.17 reports the effects of Doha agricultural trade liberalization on sectoral employment. In the case of unskilled labour, there would be an expansion of employment for overall agricultural, industrial, and services sectors. However, there would be loss of employment for skilled labour in these three broad sectors. The total employment of unskilled labour would increase by 172,871 (0.39 per cent), while total employment of skilled labour would decline by 6,299 (0.19 per cent). The major employment-generating sub-sectors for unskilled labour would be cereal crop and commercial crop. In contrast, some of the leading export-oriented manufacturing industries, such as woven and knit ready-made garments and leather, would experience falls in employment of unskilled labour. Employment of skilled labour would decline in most of the sub-sectors.

Table 4.17: Effects on employment of Doha Agriculture simulation

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Cereal crop sectors	106 633	46	0.81	0.50
Commercial crops	26 215	8	0.81	0.50
Livestock rearing	3 170	–554	0.15	–0.16
Poultry rearing	2 067	–419	0.13	–0.18
Fishing	2 483	–68	0.26	–0.05
Forestry	1 044	–47	0.25	–0.06
Rice milling	243	–1	0.10	–0.21
Grain milling	8	–9	0.08	–0.23
Food processing	598	–14	0.24	–0.06
Leather industry	–111	–30	–0.12	–0.43
Yarn	–316	–54	–0.51	–0.82
Cloth milling	296	–62	0.05	–0.26
Woven ready-made garments	–1 486	–471	–0.15	–0.45
Knitting	–196	–25	–0.21	–0.52
Toiletries	10	–5	0.07	–0.24
Cigarette industry	223	–9	0.18	–0.13
Furniture industry	6 733	77	0.71	0.40
Paper, printing, and publishing industry	77	–63	0.09	–0.22
Pharmaceuticals	74	–16	0.14	–0.17
Fertilizer industry	55	–17	0.14	–0.17
Petroleum	6	–6	0.08	–0.23
Chemical industry	232	–14	0.20	–0.10

Table 4.17: Effects on employment of Doha Agriculture simulation *(continued)*

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Glass industry	7	–5	0.12	–0.19
Earth-ware and clay industry	428	–4	0.18	–0.13
Cement	95	–2	0.26	–0.05
Metal	322	–41	0.17	–0.14
Miscellaneous industry	183	–202	0.03	–0.28
Mining and quarrying	5	–1	0.20	–0.11
Construction	3 359	–55	0.23	–0.08
Electricity and water generation	70	–19	0.14	–0.16
Gas extraction and distribution	6	–6	0.13	–0.18
Wholesale and retail trade	8 880	–131	0.13	–0.18
Transport	3 852	–57	0.12	–0.19
Health service	73	–515	0.12	–0.19
Education service	193	–2 431	0.08	–0.23
Public administration and defence	27	–292	0.00	–0.30
Bank, insurance and real estate	417	–357	0.14	–0.16
Hotel and restaurant	743	–33	0.11	–0.20
Communication	172	–3	0.13	–0.18
Information technology and e–commerce	3	–12	0.06	–0.25
Other services	5 978	–380	0.16	–0.14
Agriculture	141 611	–1 035	0.66	–0.12
Industry	7 486	–973	0.15	–0.26
Services	2 3774	–4 291	0.13	–0.20
Total	**172871**	**–6299**	**0.39**	**–0.19**

Note: UL=unskilled labour; SL=skilled labour.
Source: Bangladesh CGE model and employment satellite matrix.

In the case of the Bangladesh–India FTA, there would be a rise in total employment for unskilled labour by 325,661 (0.74 per cent) and a loss in employment for skilled labour by 41,828 (1.26 per cent) (table 4.18). In the agricultural sector employment of unskilled labour would expand in the cereal crop, livestock, and poultry sub-sectors. In the industrial sector major employment-generating sub-sectors would be the woven ready-made garments and furniture sub-sectors.

Table 4.18: Effects on employment of Bangladesh–India FTA simulation

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Cereal crop sectors	66 416	–139	0.50	–1.50
Commercial crops	–664	–32	–0.02	–2.02
Livestock rearing	22 296	–3 365	1.07	–0.94
Poultry rearing	18 812	–1 947	1.20	–0.82
Fishing	6 276	–2 039	0.67	–1.34
Forestry	217	–1 495	0.05	–1.95
Rice milling	3 105	–3	1.25	–0.77
Grain milling	130	–31	1.23	–0.79
Food processing	1 708	–278	0.69	–1.31
Leather industry	1 634	–18	1.78	–0.25
Yarn	1 715	49	2.79	0.74
Cloth milling	565	–455	0.09	–1.91
Woven ready–made garments	47 722	2 738	4.73	2.64
Knitting	4 578	136	4.91	2.82
Toiletries	280	–3	1.87	–0.16
Cigarette industry	1 710	–45	1.41	–0.62
Furniture industry	20 736	29	2.19	0.15
Paper, printing, and publishing industry	–3 092	–1 525	–3.45	–5.38
Pharmaceuticals	963	–25	1.76	–0.27
Fertilizer Industry	9	–206	0.02	–1.97
Petroleum	–22	–58	–0.29	–2.28
Chemical industry	–1 416	–449	–1.25	–3.22
Glass industry	50	–32	0.88	–1.14
Earth-ware and clay industry	–114	–61	–0.05	–2.04
Cement	–636	–107	–1.71	–3.68
Metal	–3 272	–1 084	–1.72	–3.68
Miscellaneous industry	–4 724	–1 993	–0.77	–2.75
Mining and quarrying	–28	–15	–1.04	–3.01
Construction	–16 237	–2 195	–1.12	–3.09
Electricity and water generation	494	–115	1.02	–1.00
Gas extraction and distribution	35	–41	0.73	–1.28
Wholesale and retail trade	82 643	–610	1.17	–0.84
Transport	32 409	–307	0.98	–1.04
Health service	522	–3 182	0.84	–1.17
Education service	1 663	–14 149	0.	–1.34
Public administration and defence	–191	–1 941	–0.02	–2.02

Table 4.18: Effects on employment of Bangladesh–India FTA simulation *(continued)*

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Bank, insurance, and real estate	1 229	–3 426	0.42	–1.58
Hotel and restaurant	7 434	–155	1.07	–0.95
Communication	763	–23	0.56	–1.45
Information technology and e-commerce	17	–77	0.39	–1.61
Other services	29 928	–3 152	0.83	–1.19
Agriculture	113 352	–9 018	0.53	–1.08
Industry	71 601	–3 437	1.46	–0.91
Services	140 708	–29 373	0.79	–1.39
Total	**325 661**	**–41 828**	**0.74**	**–1.26**

Note: UL=unskilled labour; SL=skilled labour.
Source: Bangladesh CGE model and employment satellite matrix.

Under a unilateral agricultural trade liberalization scenario, there would be a large loss of employment of unskilled labour in the agricultural, industrial, and services sectors (table 4.19). However, the employment of skilled labour would increase slightly. The total employment of unskilled labour would fall by 280,386 (0.64 per cent), while that of skilled labour would rise by 346 (0.01 per cent). Greatest job losses for unskilled labour would occur in the cereal crop and commercial crop sub-sectors.

Table 4.19: Effects on employment of Domestic Agricultural Trade Liberalization simulation

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Cereal crop sectors	–138 874	–70	–1.05	–0.75
Commercial crops	–51 132	–20	–1.58	–1.28
Livestock rearing	–8 136	–306	–0.39	–0.09
Poultry rearing	–7 919	–481	–0.51	–0.20
Fishing	–2 905	–3	–0.31	0.00
Forestry	–3 241	–355	–0.77	–0.46
Rice milling	–811	0	–0.33	–0.02
Grain milling	–35	–1	–0.33	–0.02
Food processing	–588	14	–0.24	0.07
Leather industry	–200	6	–0.22	0.09
Yarn	975	125	1.59	1.90
Cloth milling	–513	54	–0.08	0.23

Table 4.19: Effects on employment of Domestic Agricultural Trade Liberalization simulation

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Woven ready-made garments	1 871	511	0.19	0.49
Knitting	335	32	0.36	0.67
Toiletries	–36	1	–0.24	0.06
Cigarette industry	–5 18	–9	–0.43	–0.12
Furniture industry	–1 651	25	–0.17	0.13
Paper, printing, and publishing industry	73 –	64	–0.08	0.23
Pharmaceuticals	–208	–7	–0.38	–0.07
Fertilizer industry	–62	15	–0.16	0.15
Petroleum	–15	3	–0.20	0.11
Chemical industry	–149	24	–0.13	0.17
Glass industry	–19	–1	–0.34	–0.04
Earth-ware and clay industry	–1 479	–9	–0.61	–0.30
Cement	–402	–23	–1.08	–0.78
Metal	–1 301	–111	–0.68	–0.38
Miscellaneous industry	–1 376	60	–0.22	0.08
Mining and quarrying	–20	–2	–0.75	–0.45
Construction	–13 244	–431	–0.91	–0.61
Electricity and water generation	–183	–8	–0.38	–0.07
Gas extraction and distribution	–16	–1	–0.33	–0.03
Wholesale and retail trade	–21 028	5	–0.30	0.01
Transport	–8 691	13	–0.26	0.04
Health service	–183	31	–0.29	0.01
Education service	–451	1 312	–0.18	0.12
Public administration and defence	386	342	0.05	0.36
Bank, insurance, and real estate	–1 129	–176	–0.39	–0.08
Hotel and restaurant	–1 848	7	–0.27	0.04
Communication	–430	0	–0.32	–0.01
Information technology and e-commerce	–7	7	–0.16	0.15
Other services	–15 081	–293	–0.42	–0.11
Agriculture	–212 207	–1 234	–0.99	–0.15
Industry	–6 274	773	–0.13	0.21
Services	–61 905	808	–0.35	0.04
Total	**–280 386**	**346**	**–0.64**	**0.01**

Note: UL=unskilled labour; SL=skilled labour.
Source: Bangladesh CGE model and employment satellite matrix.

Under the scenario of increased agricultural subsidy (table 4.20), there would be a rise in overall employment of unskilled labour by 69,129 (0.16 per cent) because of greater employment generation in the agricultural sectors. In the industrial and services sectors, there would be a small loss of jobs. Employment of skilled labour would decrease slightly – by 494 (0.01 per cent). Employment of unskilled labour would increase in the major agricultural sub-sectors.

Table 4.20: Effects on employment of Agricultural Subsidy Policy simulation

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Cereal crop sectors	60 401	40	0.46	0.44
Commercial crops	9 830	4	0.30	0.28
Livestock rearing	1 027	97	0.05	0.03
Poultry rearing	937	90	0.06	0.04
Fishing	1 425	195	0.15	0.13
Forestry	–922	–185	–0.22	–0.24
Rice milling	687	1	0.28	0.25
Grain milling	23	8	0.21	0.19
Food processing	197	12	0.08	0.06
Leather industry	26	0	0.03	0.01
Yarn	150	15	0.24	0.22
Cloth milling	195	2	0.03	0.01
Woven ready–made garments	–61	–29	–0.01	–0.03
Knitting	39	1	0.04	0.02
Toiletries	1	0	0.00	–0.02
Cigarette industry	43	1	0.04	0.01
Furniture industry	–119	–7	–0.01	–0.03
Paper, printing, and publishing industry	28	3	0.03	0.01
Pharmaceuticals	19	1	0.03	0.01
Fertilizer industry	37	8	0.10	0.07
Petroleum	–2	–1	–0.02	–0.05
Chemical industry	–83	–13	–0.07	–0.10
Glass industry	–1	–1	–0.02	–0.04
Earth-ware and clay industry	–464	–6	–0.19	–0.21
Cement	–201	–16	–0.54	–0.56
Metal	–628	–104	–0.33	–0.35
Miscellaneous industry	–747	–104	–0.12	–0.14
Mining and quarrying	–9	–2	–0.33	–0.36
Construction	–5 981	–308	–0.41	–0.43
Electricity and water generation	–1	–3	0.00	–0.02
Gas extraction and distribution	0	–1	0.00	–0.02

Table 4.20: Effects on employment of Agricultural Subsidy Policy simulation *(continued)*

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Wholesale and retail trade	2 295	7	0.03	0.01
Transport	836	1	0.03	0.00
Health service	17	14	0.03	0.01
Education service	67	53	0.03	0.01
Public administration and defence	7	–21	0.00	–0.02
Bank, insurance, and real estate	–171	–175	–0.06	–0.08
Hotel and restaurant	551	9	0.08	0.06
Communication	–45	–1	–0.03	–0.06
Information technology and e-commerce	0	–1	0.00	–0.02
Other services	–274	–79	–0.01	–0.03
Agriculture	72 697	242	0.34	0.03
Industry	–870	–233	–0.02	–0.06
Services	–2 697	–503	–0.02	–0.02
Total	**69 129**	**–494**	**0.16**	**–0.01**

Note: UL=unskilled labour; SL=skilled labour.
Source: Bangladesh CGE model and employment satellite matrix.

A rise in productivity in the cereal crop sub-sector would lead to a fall in employment of unskilled labour (table 4.21). The employment losses in the cereal and commercial crop sub-sectors would be very large. Therefore, although employment would increase in the industrial and services sectors, the net employment effect for unskilled labour would be negative; the overall employment of unskilled labour would fall by 1,045,770 (2.38 per cent). However, there would be a net positive effect – although much smaller – on the employment of skilled labour, by 4,420 (0.13 per cent).

Table 4.21: Effects on employment of Agricultural Productivity simulation

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Cereal crop sectors	-1 094 406	–777	–8.31	–8.38
Commercial crops	–83 801	–42	–2.59	–2.66
Livestock rearing	13 727	2 074	0.66	0.58
Poultry rearing	13 955	1 943	0.89	0.81
Fishing	1 102	58	0.12	0.04
Forestry	717	70	0.17	0.09
Rice milling	7 984	14	3.21	3.13
Grain milling	228	81	2.15	2.07
Food processing	473	24	0.19	0.11

Table 4.21: Effects on employment of Agricultural Productivity simulation *(continued)*

	Change in number		% change from base value	
Sectors	**UL**	**SL**	**UL**	**SL**
Leather industry	129	4	0.14	0.06
Yarn	1 140	117	1.86	1.78
Cloth milling	–218	–27	–0.03	–0.11
Woven ready–made garments	–370	–119	–0.04	–0.12
Knitting	312	12	0.33	0.26
Toiletries	15	0	0.10	0.02
Cigarette industry	140	3	0.11	0.04
Furniture industry	161	–12	0.02	–0.06
Paper, printing, and publishing industry	234	52	0.26	0.18
Pharmaceuticals	79	6	0.14	0.07
Fertilizer industry	659	171	1.71	1.63
Petroleum	28	8	0.38	0.30
Chemical industry	87	0	0.08	0.00
Glass industry	1	–2	0.01	–0.07
Earth-ware and clay industry	66	–2	0.03	–0.05
Cement	–25	–4	–0.07	–0.15
Metal	61	–14	0.03	–0.05
Miscellaneous industry	719	28	0.12	0.04
Mining and quarrying	2	0	0.07	–0.01
Construction	–241	–67	–0.02	–0.10
Electricity and water generation	149	26	0.31	0.23
Gas extraction and distribution	8	3	0.17	0.09
Wholesale and retail trade	57 535	533	0.82	0.74
Transport	21 381	167	0.64	0.57
Health service	140	402	0.23	0.15
Education service	–77	–1 159	–0.03	–0.11
Public administration and defence	142	–58	0.02	–0.06
Bank, insurance, and real estate	946	532	0.32	0.25
Hotel and restaurant	3 908	79	0.56	0.48
Communication	240	2	0.18	0.10
Information technology and e-commerce	1	–3	0.02	–0.05
Other services	6 900	297	0.19	0.11
Agriculture	–1 148 706	3 326	–5.36	0.40
Industry	11 904	340	0.24	0.09
Services	91 032	754	0.51	0.04
Total	–1 045 770	4 420	–2.38	0.13

Note: UL=unskilled labour; SL=skilled labour.
Source: Bangladesh CGE model and employment satellite matrix.

4.7 POLICY IMPLICATIONS

This study considers several scenarios for economic reforms at the global, regional, and domestic levels that have important implications for the agricultural sector and the overall economy of Bangladesh. The scenarios are related to global agricultural trade liberalization under a potential WTO Doha agreement, a bilateral FTA between Bangladesh and India, unilateral agricultural trade liberalization, an agricultural production subsidy policy, and growth in agricultural productivity.

Global agricultural trade liberalization under a WTO–Doha agreement would lead to a rise in prices of agricultural products in the global market as well as in the domestic market. As a result there will be some positive effects on the sectoral production and employment in the agricultural sector in Bangladesh. In particular, the cereal crop sub-sector would expand, and also this sector would generate significant new employment of unskilled labour. However, this scenario could also raise some concerns for the households that are net consumers and therefore likely to be adversely affected by the rise in food prices.

The policy implication that emerges from the global agricultural trade liberalization scenario is that government would have to facilitate the smooth marketing operations of agricultural products in the market so that the farmers, not the middlemen, receive the maximum benefits of higher prices on their produces. Therefore, enforcing competition policy and laws would be very important. At the same time, the government's safety net programme should address the problem of poorer households, which are likely to be burdened by high food prices. This study finds that the rural non-farm households, a significant part of which are poor, would experience a fall in real consumption. This is because rural non-farm households are not food producers, and they rely completely on the market for cereal crops and other agricultural food. Therefore, any price hike that would not be sufficiently counteracted by a rise in incomes would lead to declines in real consumption in these households. Bangladesh, being a net food-importing country, should negotiate at the WTO for some compensatory measures.

A Bangladesh–India bilateral FTA would result in limited expansion in the agricultural sectors. There would be expansion of the export-oriented manufacturing sectors. Although most of the import-competing sectors would contract, the expansion of the agricultural and export-oriented sectors would be large enough to produce net employment generation. The government needs to take into consideration sectoral effects when pursuing any bilateral FTA deal with any country. It is very important to identify clearly which sectors are likely to gain and which are likely to lose. For the sake of losing sectors, policy-makers may want to consider a strategic and slower pace of trade liberalization. Also, these sectors could receive temporary fiscal support.

Domestic agricultural trade liberalization would increase imports of agricultural products. This would result in the contraction of the agricultural sectors. Overall, industrial and services sectors would contract also. There would be a large employment loss for unskilled labour, especially in the cereal crop, commercial crops, livestock rearing, poultry rearing, and fishing sub-sectors. Therefore, in the case of domestic agricultural trade liberalization, the government would need to be careful. The agenda of agricultural trade liberalization needs to be consistent with the broad agenda of trade liberalization in other sectors of the economy. The major protected sub-sectors in agriculture are poultry and fishing. These two sectors have, in fact, grown over the last decade under significant trade protection. Any trade liberalization agenda for these sectors would need to be designed strategically.

A rise in subsidies to agricultural sectors would increase production in these sectors, while some industrial and services sectors would contract. Overall employment of unskilled labour would increase because of greater employment generation in the agricultural sectors and lesser loss in employment in the industrial and services sectors. Jobs for skilled labour would be lost, however. A rise in subsidies to agricultural sectors would also provide extra incentives for investing in agriculture. However, it should also be kept in mind that such subsidies put a heavy burden on government's exchequer. Therefore, phased reduction of such subsidies would be warranted. To be effective, such subsidies need to be used judiciously. Subsidies in Bangladesh are often wrongly targeted, and therefore the actual objective of the subsidies is not achieved. Enhancing agricultural productivity, improving marketing opportunities, and ensuring effective implementation of competition policies and laws also can encourage producers to increase agricultural production, and at less cost to the government.

Finally, a rise in total factor productivity in the cereal crop sector would lead to a great expansion of that sub-sector. Rice milling and grain milling would expand as well. Imports would fall in all these sectors. The industrial and services sectors would expand somewhat. Overall, the agricultural sector would experience a large loss of jobs for unskilled labour. Therefore, even though employment would increase in the overall industrial and services sectors, the net employment effect on unskilled labour would be negative. However, there would be a net positive effect on the employment of skilled labour. It appears that a rise in total factor productivity in the cereal crop sector would cost jobs in the agricultural sector but increase jobs in other sectors. Therefore, it is very important that, while investing in agricultural research to raise agricultural productivity, the policy-makers take measures to promote industrialization to absorb the labour released from the agricultural sectors. Promotion of rural non-farm productive activities can be very useful for the absorption of labour released from the crop sector.

ANNEX 4.1: THE BANGLADESH SOCIAL ACCOUNTING MATRIX

This study uses the latest available social accounting matrix (SAM) of Bangladesh, which is for the year 2007. The 2007 SAM identifies economic relationships through four types of accounts: (i) production activity and commodity accounts for 41 sectors; (ii) four factors of productions with two different types of labour and two types of capital; (iii) current account transactions between four main institutional agents – household-members and unincorporated capital, corporations, government, and the rest of the world; and (iv) two consolidated capital accounts, distinguished by public and private origins, to capture the flows of savings and investment. The 2007 SAM has 86 sectors, which have been aggregated to 41 sectors for this analysis; annex 4.2 presents the mapping. The disaggregation of activities, commodities, factors, and institutions in the 41-sector SAM are shown in the following table.

Disaggregation and description of Bangladesh SAM accounts

Set	Description of elements
Commodities (41)	
Agriculture (6)	Cereal crop; commercial crop; livestock rearing; poultry rearing; fishing; forestry
Manufacturing (22)	Rice milling; grain milling; food products; leather industry; yarn industry; cloth industry; woven ready-made garments; knit ready-made garments; toiletries; cigarette and bidi industry; furniture industry; paper, printing, and publishing industry; pharmaceuticals; fertilizer industry; petroleum; chemical industry; glass industry; earth-ware industry; cement; metal industry; miscellaneous industry; mining and quarrying
Services (13)	Construction; electricity and water generation; gas extraction and distribution; wholesale and retail trade; transport; health service; education service; public administration and defence; bank, insurance, and real estate; hotel and restaurant; communication; information technology and e-commerce; other services
Factors of production (4)	
Labour (2)	Labour unskilled; labour skilled
Capital (2)	Capital; land
Current institutions (11)	
Households (7)	Rural: landless; agricultural marginal; agricultural small; agricultural large; non-farm Urban: households with low educated heads; households with highly educated heads
Others (3)	Government; corporations; rest of the world
Capital institution (1)	
Consolidated capital account (1)	

Source: The Bangladesh social accounting matrix, 2007.

ANNEX 4.2: MAPPING AND CLASSIFICATION SCHEME IN THE SOCIAL ACCOUNTING MATRIX OF BANGLADESH, 2007

Activity-commodity (N=41)	Activity-commodity (N=86)
Cereal crop sectors	Paddy cultivation, wheat cultivation, other grain cultivation
Commercial crops	Jute cultivation, sugarcane cultivation, potato cultivation, vegetable cultivation, pulses cultivation, oilseed cultivation, fruit cultivation, cotton cultivation, tobacco cultivation, tea cultivation, spice cultivation, other crop cultivation
Livestock rearing	Livestock rearing
Poultry rearing	Poultry rearing
Fishing	Shrimp farming, fishing
Forestry	Forestry
Rice milling	Rice milling
Grain milling	Grain milling
Food processing	Fish processing, oil industry, sweetener industry, tea product, salt refining, food processing
Leather industry	Tanning and finishing, leather industry
Yarn	Yarn industry
Cloth milling	Cloth milling, handloom cloth, dyeing and bleaching
Ready-made garments	Ready-made garments
Knitting	Knitting
Toiletries	Toiletries
Cigarette industry	Cigarette industry, bidi industry
Furniture industry	Saw and plane, furniture industry
Paper, printing, and publishing	Paper industry, printing, and publishing
Pharmaceuticals	Pharmaceuticals
Fertilizer industry	Fertilizer industry
Petroleum	Petroleum
Chemical industry	Basic chemical, chemical industry
Glass industry	Glass industry
Earth-ware and clay industry	Earth-ware industry, clay industry
Cement	Cement
Metal	Basic metal, metal manufactures
Miscellaneous industry	Machinery and equipments, transport equipments, baling, jute fabrication, miscellaneous industry
Construction	Urban building, rural building, power plant building, rural road building, port road railway building, canal/dyke/other buildings
Electricity and water	Electricity and water
Gas extraction and distribution	Gas extraction and distribution
Mining and quarrying	Mining and quarrying
Wholesale and retail trade	Wholesale trade, retail trade
Transport	Air transport, water transport, land transport, railway transport, other transport
Health service	Health service
Education service	Education service
Public administration & defence	Public administration and defence
Bank, Insurance, and real estate	Bank, insurance, and real estate
Hotel and restaurant	Hotel and restaurant
Communication	Communication
Information technology and e-commerce	Information technology and e-commerce
Other services	Housing service, professional service, entertainment, other services

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5. IMPACT OF AGRICULTURAL TRADE ON EMPLOYMENT IN BENIN

Bio Goura Soulé, Epiphane Adjovi, and Ir Faridath Aboudou

5.1 INTRODUCTION

Benin, with an estimated gross domestic product (GDP) per capita of US$1,600 in 2010,[1] is among the world's least developed countries. The main features of Benin's trade are:

1. Poor diversification of export goods as three types of commodities dominate:
   a. Cotton and cottonseed
   b. Other agricultural and forestry products (cashew nuts, pineapple, cassava, tobacco, timber, vegetable oil (soya, palm oil, copra))
   c. Fish and shellfish
2. Most imports are for final consumption. There has been a marked increase in imports over the past ten years.
3. There has been an "informalization" of activity, in particular in trade with Nigeria. Re-export is a major component of tertiary activities in general and trade in particular.[2]

The past two decades have been marked by several efforts to liberalize markets. These efforts have been based on three main pillars of economic policy: the adoption of structural adjustment programmes (SAP), accession to the World Trade Organization (WTO), and integration into regional economic groups (the West African Economic and Monetary Union (WAEMU) and the Economic Community of West African States (ECOWAS)).

[1] http://www.indexmundi.com/fr/benin/produit_interieur_brut_(pib)_par_habitant.html

[2] Re-export occurs when a country imports consumer goods in an amount that far exceeds domestic demand and then exports the surplus to a third country.

The growth in regional and international trade has considerably affected jobs and working conditions. The role of trade as an engine of growth and development has been sufficiently documented in the economics literature. Increased trade in agricultural products is seen as a route to development in poor countries in general and as particularly important for sub-Saharan African countries (Dupaigre et al., 2008). Several studies have shown that a 1 per cent increase in agricultural exports could raise the economic growth rate of some countries by about 0.5–1.8 per cent.

The International Food Policy Research Institute (IFPRI) has found that rural incomes outside the agricultural sector grew by more than US$2 for each additional US$1 in sales of agricultural goods outside the rural areas, including in local, regional, and international markets. In other words, a sustained increase in income generated directly by agricultural cash crops translates into an overall increase in income in the local economy at least twice as great. We need to be aware of and understand these effects in order to have a solid basis for framing and implementing effective promotion and job creation policies and strategies.

Issues concerning the effects of trade and trade reform on jobs have been at the heart of debate on economic policy in recent years. Clearly, trade reforms affect jobs, and yet the literature on trade and jobs demonstrates that it is difficult to establish the effect of trade reform on employment. Analysis must cover numerous interrelated factors.

This chapter seeks to assess the impact of agricultural trade and trade reforms on jobs in Benin. Its findings show that trade can bring both job creation and job losses. The estimates show that some trade liberalization policies contribute (albeit weakly) to job creation. However, accompanying measures should be introduced to strengthen that effect and to mitigate job insecurity over the long term. This chapter first considers Benin's economy, trade flows, and the employment situation in the country. The second part describes the methodology and analyses the results of simulations.

5.2 ECONOMIC IMPORTANCE OF THE AGRICULTURAL SECTOR

Agriculture is an essential part of Benin's economy. Its importance is shown in three areas: its contribution to the national economy, the proportion of the labour force employed in the agricultural sector, and the importance of local farming in the population's food security. What is more, agriculture is one of the main sectors supporting the country's export potential, which is important for debt servicing and for funding imports of consumer and intermediate goods.

Agriculture accounts for about 36 per cent of GDP. It provides over 80 per cent of official export earnings; cotton in particular contributes 13.5 per cent to export earnings.[3] The main challenge facing agriculture is to play its economic role

[3] http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/Country_Notes/2011/Full/B%C3%A9nin_long.pdf

more effectively in boosting the productivity of all factors of production, thereby providing the necessary resources to promote industry.

The agricultural sector is the main source of employment. Over 48 per cent of Benin's labour force works in this sector despite the low pay and arduous work. The challenge for agricultural employment is to increase farmers' incomes by raising their productivity.

For food security agriculture plays a significant role in the country's food supply given the importance of subsistence farming and the role of domestic food markets in feeding urban populations. Domestic production meets about 60 per cent of the population's food needs.[4]

5.2.1 General characteristics of the sector

Small-scale farms dominate Benin's agricultural sector. In 2008 the sector contained about 550,000 farms. They are spread across eight agro-ecological areas. Most are small family farms that grow a variety of crops and often raise a small number of livestock (poultry, small ruminants, or pigs). The average size of the small-scale farms is estimated to be 1.7 hectares, and on average each supports seven people. About 34 per cent of the farms are smaller than 1 hectare. Only 5 per cent of the farms in the south and 20 per cent in the north of Benin are larger than 5 hectares. Of the total 11 million hectares of available land, a little less than 60 per cent is suitable for farming.[5]

Despite the prevalence of small-scale family farms, there are now some initiatives from private developers to establish modern farms, bringing greater investment in the land, perennial crops (oil palms, cashew and fruit trees, citrus fruit, and mangoes) and intensive poultry farming. The investment structure means that these farms will be located both in peri-urban and rural areas. However, these initiatives currently are few, mainly because of water management difficulties, the small size of the local market, and the absence of a suitable funding policy tailored to this type of agriculture.

In addition to crop production, Benin also has a coastline of about 125 kilometres and two lake and river systems, comprising the Ouémé, Mono, and Couffo rivers and the Niger basin and its tributaries. The main economic activity in these areas is small-scale fishing (sea and lake fishing) and some fish farming (*acadja*,

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[4] Global vulnerability analysis of food security and nutrition (Analyse Globale de la Vulnerabilite, de la Securite Alimentaire et de la Nutrition – AGVSAN) was carried out to discover the current extent of food insecurity, malnutrition, and households' survival strategies, with a view to better definition and planning of state intervention. AGVSAN is based on an analysis of data collected in November and December 2008 from 4,176 rural and urban household and key respondents in 348 villages and neighbourhoods in 12 departments of the country. An analysis of secondary data was carried out before the survey.

[5] These statistics are taken from a report made under the aegis of the Mécanisme Africain d' Evaluation par les Pairs (MAEP) as part of the work on the National Agricultural Investment Programme (PNIA/ECOWAP/PDDAA).

fish holes, and some modern fish farming techniques that are beginning to be disseminated).

Two methods of livestock production are used: (i) an extensive pastoral system (large cattle and small ruminants) located in the north and to a lesser extent in the centre and on the plateau, and (ii) peri-urban production (poultry, small ruminants, rabbits) and sedentary farming of small herds of three to five animals, usually small ruminants. The agri-pastoral system is more developed in the north of Benin, with the use of draught animals and recovery of dung to fertilize the land.

The main sources of household energy are still wood and charcoal. This has led to a drastic reduction in primary and secondary forest cover. It is estimated that, nationally, about 70,000 hectares of vegetation cover are lost per year (PSRSA, 2010).

In rural areas land ownership usually follows a traditional system, with smallholdings supporting individual families, that does not favour intensive farming. A modern system of land tenure is being tested with the introduction of the rural land plan under new land legislation. This legislation is a prerequisite for promoting and safeguarding investments in agriculture.

In total, agricultural production uses a considerable amount of natural resources:

- Only 17 per cent (i.e. around 1,375,000 hectares) of available agricultural land is cultivated annually, with 60 per cent of that used for the main food crops. Of 60,000 hectares available in lowland areas, only 7,000 hectares (i.e. 11 per cent) is used. There are 1,500 hectares of cleared land under partial cultivation and 20,000 hectares of riverbanks that could be cultivated.
- Benin has a huge hydrographic network, comprising 2,000 hectares of rivers, 1,900 hectares of lakes, and a lake system of over 2,800 hectares.[6]

Despite its natural advantages, Benin's agriculture faces the following constraints:

- Natural: Benin's agriculture remains vulnerable to the vagaries of the weather. Floods at times but low rainfall at others negatively affect agricultural production.
- Structural: There are huge regional differences in the distribution of arable land. Moreover, land management systems drastically reduce its fertility.
- Economic: Agricultural earnings remain low and vary between US$100 and US$300 per rural household. Therefore, farms are under-capitalized because of the lack of general investment, and they suffer particularly from under-investment in improving soil fertility.

[6] See ReSAKSS/IFPRI (2010).

- Shortcomings in agricultural policies: No strategic agricultural legislation, despite the existence of several documents that are quite clear about the policy actions needed and their assessment; a mismatch between the tax regime for farms and the absence of inducements for agricultural entrepreneurship; a lack of organization of the supply chain for agricultural inputs (outside the cotton sector); unsuitability of the systems of agricultural credit and finance; a system of agricultural cooperation that is out of date; a traditional system of land tenure that does not encourage investment in farming; and the absence of any insurance scheme that covers risks in the agriculture sector.

5.2.2 The agricultural sector's impact on society and employment

Most jobs in the agricultural sector are informal. The agriculture census by the Ministry of Rural Development recorded 1,973,895 active farmers in 1992, which was 61.82 per cent of the total agricultural population.[7] According to the General Census on Population and Housing (RGPH3) in 2002 conducted by the *Institut National de Statistique et de l'Analyse Economique du Bénin* (INSAE), the population of Benin was 6,769,914 inhabitants, with a working population of 2,830,876.[8] Of the working population, 47.1 per cent worked in the agricultural sector (farming, livestock, fishing and forestry, including farm labourers). As agriculture currently accounts for more than 48 per cent of the working population, the sector remains the main source of work for the labour force, well ahead of the retail and wholesale sector (27.2 per cent of the working population) and the other non-farm sectors (16.5 per cent of the working population).

The RGPH3 data indicate that the majority of the male population works in the agricultural sector – 60.2 per cent of the male labour force. Agriculture employs 35.9 per cent of women in the labour force. It is necessary, however, to put the relatively small number of women in agriculture into context. The agricultural census of 1992 found that women constituted the majority of workers in the agricultural sector (1,050,783 women and 923,111 men), and casual observation shows that they are present in high numbers in processing and marketing of agricultural produce (particularly food crops) and as the main source of labour in rural family farming. It is possible that the RGPH3 did not count these typically female activities among agricultural activities. This shows the need for conceptual coordination between the Ministry of Agriculture and INSAE to obtain a more accurate picture of women's participation in agricultural activities.

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[7] As defined by the Analysis, Forecasting and Synthesis Direction of the Beninese Ministry of Rural Development (DAPS/MDR), the total agricultural population includes both workers who are in employment and those who are unemployed.

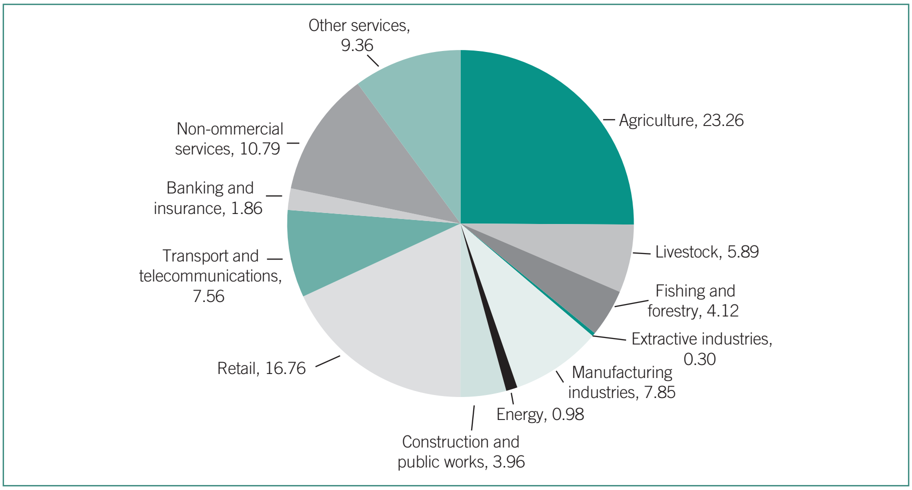
[8] See INSAE (2002, pp. 23-24).

5.2.3 Contribution of the agricultural sector to Benin's economy

Not only is agriculture the country's largest employer, but it is also its main source of wealth creation (figure 5.1).

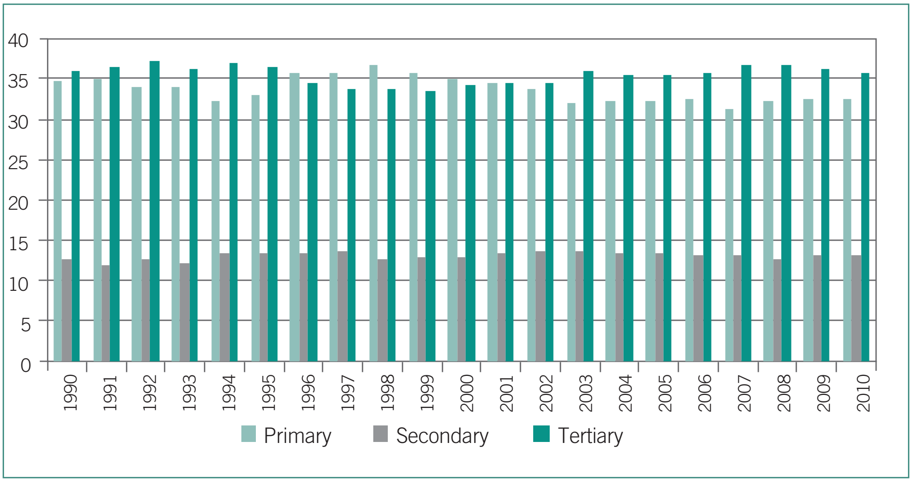
Crop production (excluding forestry) contributes significantly to GDP. Its annual average contribution to GDP is 23.3 per cent, while the sub-sectors "livestock" and "fishing and forestry" account for 5.9 per cent and 4.1 per cent, respectively.

Figure 5.1: Average percentage contribution of sectors to gross domestic product, Benin, 1990–2010



Source: calculated from INSAE data.

Figure 5.2: Primary sector contribution to GDP (percentage), Benin, 1990–2010



Source: calculated from INSAE data.

As figure 5.2 shows, the tertiary sector makes the largest contribution to GDP, followed by the primary sector and then the secondary sector. The primary sector contributed an average of 34 per cent of GDP between 1990 and 2010. It peaked at 36.6 per cent in 1998. However, since 2000 the primary sector's contribution to GDP has dropped from 34.9 per cent to 32.4 per cent in 2010. Crop production accounts for more than 70 per cent of agricultural GDP.

5.3 AGRICULTURE AND FOREIGN TRADE

The overall structure of Benin's foreign trade has changed little despite the reforms enacted in recent years, particularly the establishment of the Common External Tariff within WAEMU in 2000. Benin has a very small share of regional and international trade in goods and services. Benin's shares in world trade have fallen in recent years despite the increase of 44 per cent in the value of Benin's trade recorded between 1998 and 2010. Benin accounts for less than 1 per cent of world exports. However, imports from the regional and international markets grew by 96 per cent between 1998 and 2010. The main reasons are the re-export trade, on one hand, and changes in population structure and consumer habits, on the other. The statistics used in this section are calculated on the basis of data from INSAE, the Autonomous Port of Cotonou, and the Ministry of Agriculture, Livestock and Fisheries (MAEP).

5.3.1 Imports

Benin remains dependent on imports of food, manufactured goods, and hydrocarbons. Food imports are dominated by about 20 groups of products that account for around 88.5 per cent of Benin's total registered purchases. Some products are high performers – for example, rice, sugar, vegetable oil, wheat flour, meat, milk, alcoholic drinks, and building materials and equipment. In 2010 imports to Benin reached 750 billion CFA francs. Imports increased by 6.1 per cent in 2010 over 2009 compared with an increase of 9.7 per cent in 2009. The growth in imports in 2010 came mainly from purchases of food products, semi-finished goods, energy products, and capital goods. Consumer goods account for more than one-third of imports.

5.3.2 Exports

There is little diversity in Benin's exports, and the value added in exported goods is minimal. Benin's sales on the international and regional markets are mainly of agricultural produce and re-exports. Despite fluctuations in the world price, cotton remains the main export. Other export crops, such as palm oil, cashews, and pineapple, account for no more than 10 per cent of export sales. Exports were worth CFA Fr 588.3 billion in 2010, which was an increase of 4.6 per cent over 2009 (OECD, 2011).

Cotton

Cotton accounts for over 80 per cent of Benin's commodity exports (81 per cent in accumulated value between 2000 and 2008). For several years cotton's share of total exports, excluding re-export, has decreased, falling from 46.3 per cent in 1998 to 34 per cent in 2008. Cotton is vital to the health of Benin's exports because it so dominates the country's export trade. Cotton contributes 4.6 to 8 per cent of GDP and accounts for between 14 and 24 per cent of GDP in the agricultural sector. Gross earnings distributed to farmers reached on average nearly 60 billion CFA francs before subtracting the cost of inputs at 34 billion CFA francs. The cotton industry provides over one million direct agricultural jobs in rural areas and nearly 3,000 jobs in the secondary sector, because most of the fabric manufacturing industry is based on cotton, with 18 ginning plants, 5 textile mills, and 2 mills producing refined cotton oil. Amongst the other activities linked to cotton production, the main one being the import and distribution of inputs, turnover is on average 25 billion CFA francs per year, or 42 per cent of producers' gross income and 74 per cent of income net of the cost of inputs.

Cashew

Cashew is the country's second export after cotton. Export earnings did not exceed CFA Fr 12.4 billion between 2000 and 2008. Income to farmers was CFA Fr 11.4 billion in 2000. This more than doubled by 2008, when it reached CFA Fr 24.4 billion. Income generated by small-scale and industrial value added chains (VAC) is high. The price per kilo of roasted nuts is CFA Fr 3,000 via the small-scale VAC and CFA Fr 6,000 via the industrial VAC. The export of raw and roasted cashew nuts benefits 180,000 to 250,000 agricultural labourers and 15,000 employees. It contributes between 7 and 12 per cent of agricultural GDP. Thus, processing offers an opportunity to boost economic growth if production methods on the farm are improved.

Pineapple

The pineapple industry is an emerging sector. Pineapple contributes about 0.06 per cent on average to Benin's GDP. Although official exports are low (they account for 1 per cent of production, estimated at an average of 100,000 tons), considerable amounts are exported via informal cross-border trade (ICT). It is estimated that 30 per cent of the production is exported to neighbouring countries – Nigeria, Niger, and Togo, in particular, via informal flows. This means that about 70 per cent of the production is sold cheaply on the domestic market and consumed locally. As the pineapple sector is poorly organized, it is difficult to estimate the number of jobs it creates. Agricultural earnings are calculated, on the basis of market price, to be CFA Fr 7.56 billion. The pineapple sector employs a high number of women in the fresh fruit trade in the south of the country.

Oil palm

The oil palm was Benin's main source of exports until the mid-1970s. Since then palm oil products have become less competitive on the international market with the arrival of new producer countries in southern Asia and Brazil and the surge in production in neighbouring countries such as Nigeria and Côte d'Ivoire.

Shea nut

Farmers earned CFA Fr 11.4 in 2000 from the shea nut. The industry is poorly organized. It employs mainly women in rural areas; about half of women in the harvesting areas are involved in gathering and processing the nut. Exports from 2000 to 2008 totalled more than CFA Fr 15.2 billion in value. The industry's contribution to Benin's GDP is around 0.37 per cent. Income to rural populations is estimated to be CFA Fr 7.3 billion per year.

Shrimp

The shrimp export industry is an emerging sub-sector of the fishing industry that is little developed in Benin. The total of shrimp exports was less than CFA Fr 10 billion between 2000 and 2008. One possible barrier to the development of the shrimp export industry is the difficulty of complying with product standards demanded by international markets. Small-scale fishing is the major source of landed catch, supplying the local shrimp market. However, no serious survey has been carried out to assess the income generated and the jobs created in this industry. The industry contributes little to GDP given that the fishing industry as a whole is estimated to add only 0.51 per cent.

5.3.3 Trading partners

Benin's main export markets are Africa and Asia (particularly India), followed by the European Union (EU). Trade with partners in the West African Economic and Monetary Union (WAEMU) and the Economic Community of West African States (ECOWAS) has developed in recent years because of regional trade policies. However, Benin is more of a market outlet for products from several countries than a source of supply. Indeed, only 5.13 per cent of Benin's exports and 13.5 per cent of its imports are with WAEMU countries (Soulé, 2004). Nigeria is an important partner because it is the destination of several goods transiting through the port of Cotonou, even if most bilateral trade is not officially recorded. A great deal of the data on Benin's external trade remains unknown to state institutions because of the size of informal trading circuits.

5.4 TRADE POLICIES

Economic integration is today an important part of development policy in Africa. As part of this process, West African countries have entered into several commitments as part of both their sub-regional and international economic integration. To this end Benin has agreed to the establishment of a trade liberalization programme within ECOWAS and the adoption of a common trade policy within WAEMU, whilst remaining supportive of the multilateral trading system. Benin has also embarked on an integration process with the African Union (AU) and the Community of Sahel and Saharan States (CEN-SAD).

Since 1996 WAEMU has progressively liberalized intra-community trade and advocated a common trade policy. Benin is also a member of ECOWAS; its members grant each other preferential treatment for the same products as under the WAEMU arrangements that began on 1 January 2004 and the customs union in place since 2007. As an Africa-Caribbean-Pacific (ACP) country, Benin is actively negotiating an Economic Partnership Agreement (EPA) with the EU.[9] It is also eligible for trade preferences granted by the US under the African Growth and Opportunity Act (AGOA) and the EU initiative "Everything but Arms". Benin is part of the Joint Integrated Technical Assistance Programme (JITAP) and recently joined the integrated framework. However, it has little penetration in the multilateral trade system.

Of all these agreements and arrangements, economic integration under WAEMU is the most advanced. WAEMU has sectoral policies in the name of a customs union based on the removal of all tariff and non-tariff barriers to community trade and the establishment of a Common External Tariff (CET). The CET is now the main instrument of trade policy in Benin.

5.4.1 Common External Tariff

WAEMU's CET was adopted on 28 November 1997, and it came into force on 1 January 2000. It constitutes Benin's external fiscal backbone. The CET comprises five customs levies, some of which are permanent and some, temporary.

The permanent duties include:

- customs duties at four rates, depending on the product category:
  - 0 per cent for category 0, consisting of essential social products on a restrictivelist (medicines, condoms, books, newspapers, etc.);
  - 5 per cent for category 1, which includes goods of primary necessity, basic commodities, capital goods, and specific inputs;
  - 10 per cent for category 2, which includes inputs other than those covered under category 1 and semi-finished goods;
  - 20 per cent for category 3, which covers goods for final consumption and other products not covered elsewhere.

[9] The African, Caribbean and Pacific Group of States (ACP) is an organisation created by the Georgetown Agreement in 1975. It is composed of 79 African, Caribbean and Pacific states, with all of them, save Cuba, signatories to the Cotonou Agreement, also known as the «ACP-EC Partnership Agreement», which binds them to the European Union. There are 48 countries from sub-Saharan Africa, 16 from the Caribbean and 15 from the Pacific.

- The Community Solidarity Levy (CSL) of 1 per cent, which is used to offset the shortfall in customs income, to boost structural funds, and to cover the operating costs of the Union.

Temporary duties include the following:

- Decreasing Protection Tax (DPT), a supplementary protection mechanism to provide temporary (four-year) compensation for a considerable drop in tariff protection arising from implementation of the CET. It covers industrial and agri-industrial goods in specific economic sectors. The minimum rate is set at 10 per cent and the maximum at 20 per cent based on an agreed trigger threshold.
- The Special Import Tax (SIT), a mechanism to smooth variations in international prices for community production. It applies to agricultural products. Its operation is linked to a trigger price calculated on the basis of a comparison of international prices of the appropriate products and their import prices (cif). A flat rate of 10 per cent applies.

One of the expected consequences of the CET has been an increase in intra-community trade in the WAEMU area. This should lead to an increase in imports into Benin from other WAEMU countries and an increase in trade from Benin to those countries. The estimates in the following sections will provide information on how trade has changed since the introduction of the CET.

5.4.2 ACP–EU Economic Partnership Agreement (EPA)

Benin is one of the ACP countries with which the EU has signed a partnership agreement, which provisionally came into force on 1 March 2000. Trade provisions are among the mechanisms for cooperation between ACP countries and the EU. The agreement allows industrial products and processed agricultural produce from the ACP countries into the EU duty-free on a non-reciprocal basis. WTO members granted a waiver from EU obligations under Article I:1 of GATT 1994 (regarding most-favoured-nation (MFN) treatment) for the period from 1 March 2000 to 31 December 2007, the date on which the new trade arrangement compatible with WTO rules was to be concluded. Under the Cotonou Agreement these arrangements would take the form of an EPA between the EU and various regional groupings. The EU began the negotiating process on 27 September 2002. The first phase took place between all the ACP countries and the EU and covered horizontal issues of interest to all parties. The second phase began with the start of negotiations with the Economic and Monetary Community of Central Africa (CEMAC) on 4 October 2003, and negotiations with the countries of West Africa, represented by ECOWAS in cooperation with WAEMU, began on 6 October 2003. The EU believes that negotiation of an EPA will strengthen regional integration within ECOWAS. The EU supports the participation of West African countries through a capacity-building programme. ECOWAS has also obtained funding from the European Development

Fund (EDF) for surveys on the impact of the EPA on the economies of member states. One of the consequences of the establishment of a free trade area between the EU and West African countries at the end of the transitional period – in 2020 at the latest – and the removal of customs duties on products of EU origin covered by the EPA will be the loss of tariff income. ECOWAS member states have asked the EU to make financial provision for this loss during the transitional period. During the ECOWAS ministerial meeting held in Accra in April 2003, ministers asked the EU to provide additional resources to allow the West African region to meet the cost of economic adjustment.

5.4.3 Other reforms

In addition to these two major reforms, Benin implemented the WTO Agreement on customs valuation as of 1st January 2003 – that is to say, two years after the end of the transitional period that permitted deferral of the application of the agreement on WTO customs valuation. This implementation uses transaction value and does not apply the reference values permitted under WAEMU rules. Despite the use of computer technology for customs clearance and the modernization of customs services since 2001, it appears that some difficulties persist regarding the length and cost of customs formalities. WAEMU adopted a Community Anti-dumping Code that came into force on 1 July 2004.

The government may use tax relief, import subsidy, or export prohibitions to manage crises as part of its economic policy. That is why Benin has banned the export of cottonseed, non-processed teak, and wood charcoal to ensure sufficient supply to local industries. In 2008 Benin used import subsidies and banned export of food crops to deal with increases in food prices.

The value added tax (VAT) is 18 per cent for most goods and services, and excise duty of 1 to 20 per cent is levied on local consumption of some untaxed products. Benin grants tax breaks to producers under the terms of the Investment Code and the establishment of the industrial export processing zone; rules cover the use of domestic products or those from a national source and allow priority to nationals for job vacancies. Moreover, WAEMU permits derogation of the Common External Tariff for importing inputs that are taxed at a higher rate than some finished goods (generally of a social nature). To safeguard consumers, the authorities have controlled the prices of some sensitive products, such as bread, school supplies, cement, and oil products, and of some essential utilities, such as electricity and water.

5.5 EMPLOYMENT SITUATION

Surveying the impact on jobs of the reforms in agricultural trade requires first an analysis of trends in the labour market in the context of multiple free trade agreements. Both supply and demand in the labour market need consideration.

The labour market in Benin remains depressed. In 2007, according to the findings of the Integrated Modular Survey on Household Living Standards carried out by INSAE, although the labour force participation and the unemployment rates were 53 percent and 0.7 percent, respectively, the under-employment rate was 70.5 per cent.

5.5.1 Trends in the labour force

The findings of RGPH3 show that in Benin the labour force in 2002 numbered 2,830,876 people, of whom 1,396,468 were women (49.3 per cent) and 1,434,408 were men (50.7 per cent). The labour force grew from 1,114,053 to 2,085,446 between 1979 and 1992, and then to 2,830,876 in 2002. Some 61 per cent of the labour force is under age 35, and older workers – those over age 60 – now account for only 8.4 per cent of the labour force (table 5.1).

More than one-third (38 per cent) of the working population lives in urban areas, while 62 per cent live in rural areas (table 5.2). The rural areas are home to 65 per cent of those working in the informal sector, while the urban areas have 80 per cent of the formal sector (77.7 per cent of the state formal sector and 82.3 per cent of the private formal sector). Compared to 2002, the Population and Health Survey (PHS) of 2006 found no change in this distribution. There is increasing urbanization, fuelled by the exodus of youth from rural areas to the towns, but it does not appear to affect the structure of labour supply as most of the youth have moved to pursue an education in urban training institutions.

Table 5.1: Distribution (%) of labour force of Benin by gender and age group, 2002

	Total population	**Men**	**Women**
10–14 years	8.7	8.5	9.0
15–19 years	11.5	10.7	12.4
20–24 years	13.5	12.0	15.0
25–29 years	14.8	14.2	15.5
30–34 years	12.1	12.6	11.5
35–39 years	10.0	10.5	9.7
40–44 years	7.8	8.3	7.3
45–49 years	5.8	6.2	5.3
50–54 years	4.8	5.2	4.4
55–59 years	2.5	2.8	2.3
60–64 years	3.0	3.2	2.9
60 years and over	8.4	9.2	7.6

Source: INSAE. RGPH3, 2002.

Table 5.2: Distribution (%) of labour force by job status and residence, Benin, 2002

Status of occupation	Urban location	Rural location
Total	37.6	62.4
Informal sector	35.1	64.9
State formal sector	77.7	22.3
Private formal sector	82.3	17.7
Total formal sector	80.0	20.0
Seeking first job	73.6	26.4
Other unemployed	75.9	24.1

Source: INSAE. RGPH3, 2002.

5.5.2 Patterns and trends in employment

From the labour force statistics given in the previous section, we know that between 1992 and 2002 there was in increase of 745,430 people in the labour market, which would be an average increase of 74,543 per year. In the same period, the employed population grew from 2,053,130 to 2,811,753, for an average annual increase of 75,862 workers. As shown in table 5.3, new jobs came mostly in retail (51.2 per cent), agriculture (18.4 per cent), and artisanal industries (12.2 per cent). Much of this job expansion has come from own-account employment.

The unemployed in 2002 numbered 19,123. Of these, 56 per cent were seeking their first job and 44 per cent had previously had a job. It is mostly men who are unemployed – 68 per cent men compared with 32 per cent women in 2002.

Table 5.3 Employed population by sector of activity, Benin, 1992 and 2002

Sector	2002 (a)	1992 (b)	Difference (a–b)	Share (%)
Agriculture, hunting and fishing	1 274 379	1 147 746	126 633	18.4
Mining industries	37 017	661	36 356	5.3
Manufacturing industries	244 312	160 406	83 906	12.2
Water, electricity, gas	1 832	1 176	656	0.1
Building, public works	68 881	51 655	17 226	2.5
Retail, catering and hotels	784 930	432 501	352 429	51.2
Transport and communication	92 012	52, 837	39 175	5.7
Banking and insurance	3 632	3 106	526	0.1
Other services	196 394	164 544	31 850	4.6
Unclassified	108 364	38 496	69 868	
All activities (excluding unclassified)	2 703 389	2 014 632	688 757	100

Source: INSAE. RGPH3, 2002.

The population that was not in the labour force at the third population census numbered 1,445,280, of whom 61 per cent were women and 39 per cent, men. Of these, 51 per cent lived in rural areas and 49 per cent, in urban centres. Among the women, slightly over one of every two runs a household. Among men, nearly nine of every ten are pupils or students, compared with only three of every ten women.

5.5.3 The labour force at work

Most of the labour force at work is in the informal sector. This sector employs 95 per cent of the working population. The formal sector accounts for only 5 per cent, divided evenly between the public sector (2.6 per cent) and the private (2.4 per cent) sector. The informal sector comprises 88 per cent of the working population in urban areas and 98 per cent in rural areas.

Nearly half of the working population are in agricultural occupations: 48.5 per cent are farmers, live-stockers, or fishers (table 5.4). In other occupations, retail and sales workers account for 27.3 per cent of the working population, and non-agricultural labourers or artisans, for 16.6 per cent.

There are considerable differences in the distribution of jobs between men and women. Agriculture predominates in men's employment, accounting for 60.5 per cent of men's jobs, while agriculture accounts for just 36.2 per cent of women's jobs. Women are most active in commerce, at 48.9 per cent, compared with 6.4 per cent among men. This pattern did not change much between 2002 and 2006. According to the findings of the Population and Health Survey of 2006, 51 per cent of working women were in the commerce and services sector, while 37 per cent worked in agriculture. By comparison, the agricultural sector employed 52 per cent of working men, while 19 per cent worked in commerce and services.

Table 5.4: Distribution (%) of working population by profession and gender, Benin, 2002

Profession	Total	Men	Women
Total	100.0	100.0	100.0
Scientific professions	3.0	4.3	1.6
Directors and managers	0.1	0.2	0.0
Administrative personnel	0.4	0.5	0.2
Retail and sales	27.3	6.4	48.9
Specialist service providers	3.7	2.9	4.5
Farmers, livestock farmers, fishers	48.5	60.5	36.2
Non-agricultural manual workers	16.6	24.6	8.3
Sundry workers	0.5	0.7	0.2

Source: INSAE. RGPH3, 2002.

Between 1979 and 2002 the proportion of women working as farmers, livestockers, and fishers has dropped – from 61 per cent in 1979 to 56 per cent in 1992 and 36.2 per cent in 2002; most have moved into trade, sales, or other services.

The labour market is dominated by the informal sector, where 95 per cent of the population works (table 5.5). 70 per cent of the working population are own-account workers, 17 per cent are family workers, and 5 per cent are in training. Only 5.5 per cent of the working population receives a salary. Over 90 per cent of employers, own-account workers, family workers, and trainees are in the informal sector. In contrast, 80 per cent of those with permanent contracts are in the formal sector, while temporary contracts are divided between the formal and informal sectors at 40 per cent and 60 per cent, respectively.

A comparison of data from the General Censuses on Population and Housing in 2002 and 1992 shows that there was an increase in the proportion of own-account workers (70 per cent in 2002 against 61 per cent in 1992) and decreases in the share of family workers (17% in 2002 against 25% in 1992) and trainees (5% in 2002 against 7% in 1992) while the proportion of employees with contracts has remained stable at around 5.5%. This increase in the proportion of own-account workers and the stability of the proportion of employees with contracts reflects difficulties in creating jobs in the formal private sector and continued reliance on the state as a provider of jobs. Furthermore, the fall in the proportion of family workers and trainees reflects a lower labour force participation rate among youth and a lengthening of schooling.

According to INSAE's most recent surveys, covering 2006 and 2007, the main features of the labour market are:

- stability of the informal sector's employment share (95.6 per cent of the market in 2006 compared with 95.2 per cent in 2007);

Table 5.5: Distribution (%) of working population between informal and formal sectors, by professional status, Benin, 2002

Professional status	Informal sector	Formal sector	Share of working population
Total	95.1	4.9	100
Employer	91.7	8.3	1.6
Own-account	98.8	1.2	70.2
Permanent contract	20.0	80.0	3.6
Temporary contract	60.2	39.8	1.9
Cooperative member	84.7	15.3	0.2
Family workers	99.4	0.6	17.0
Trainee	97.4	2.6	5.2
Other	92.4	7.6	0.3

Source: INSAE. RGPH3, 2002.

- the increase in administrative jobs, from 1.9 per cent of the job market in 2006 to 2.9 per cent in 2007 because of new hires;
- stability of the employment share of state enterprises (1.1 per cent in 2006, 1 per cent in 2007);
- loss of jobs in private companies in the formal sector (1.1 per cent of the market in 2006 compared with 0.2 per cent in 2007);
- increase in jobs in associations (non-governmental organizations and civil society) (0.4 per cent of the market in 2006, 0.7 per cent in 2007).

The (official) unemployment rate as defined by the International Labour Office (ILO) fluctuates between 1 and 3 per cent, with an appreciable drop in 2006–07 mainly because of the opening of large public works, a major recruitment drive for teachers, and the enrolment of unemployed graduates into military service. However, the most recent available under-employment rates were 53.2 in 2006 and 29 per cent in 2007.

Despite longer schooling, the working population in Benin remains poorly educated: 68.5 per cent of the working population have no schooling (47 per cent in urban areas and 80 per cent in rural areas), 18.8 per cent have received only primary schooling; 10.3 per cent secondary schooling; and 1.3 per cent higher education (table 5.6). More men than women have some education – 41 per cent of men compared with 22 per cent of women. Those working in the informal sector are more likely to have no education than those in the formal sector; 85 per cent of farmers and 74 per cent of those in trade have no education. Among non-agricultural labourers and artisans, 34.2 per cent have received no schooling, 44 per cent have attended only primary school, and 20.5 per cent have secondary-level schooling. High per-

Table 5.6: Distribution (%) of working population by education levels and professional status, Benin, 2002

Professional status	Primary schooling	Secondary schooling	Tertiary schooling	No schooling	Undeclared
Total	18.8	10.3	1.3	68.5	1.1
Employer	18.4	14.2	3.4	62.5	1.6
Own-account	18.4	8.9	0.3	71.4	1
Permanent contract	13.3	56.2	21.3	6.6	2.6
Temporary contract	24	41.1	9.8	23.6	1.5
Cooperative member	20	16.2	2.7	59.8	1.4
Family workers	11.3	1.5	0	86	1.1
Trainee	51.4	13.7	0.1	33.9	1
Other	20.3	12.7	2.3	63.3	1.5

Source: INSAE. RGPH3, 2002.

centages of employers (62.5 per cent), own-account workers (71.4 per cent), and family workers (86 per cent) have received no formal education. Most people working in scientific professions and administration have a secondary education (58 per cent). There is, therefore, high potential demand for capacity-building in education at all levels to increase productivity.

5.6 GENERAL EQUILIBRIUM ANALYSIS OF THE IMPACT OF AGRICULTURAL TRADE ON JOBS

A general equilibrium model is used in this section to assess the effects of agricultural trade on jobs. This method of analysis has been chosen because computable general equilibrium (CGE) models have several structural advantages. The first is their ability to capture and integrate – data permitting – a sufficiently broad cross-section of economic activity. The second is that they are better suited to performing *ex ante* analysis. The third is that micro-economic behaviour of underlying agents can be specified, taking into account heterogeneity among agents and equilibrium constraints. The usefulness and relevance of CGE modelling to this subject have been demonstrated by many recent assessments on the effect of trade liberalization on diverse economies.

5.6.1 Methodology

The methodology involves conducting and analysing simulations based on a CGE model applied to data from the 2007 Integrated Modular Survey on Household Living Standards (EMICOV),[10] in order to calculate poverty indicators. The CGE model used in this survey draws mainly on the model developed by the Partnership for Economic Policy (PEP-1-1).[11]

5.6.1.1 The model

A detailed description of the model and its main blocs of equations can be found in the annex (A5.8). The model divides the Benin economy into:

[10] This survey was conducted by the Institut National de l'Analyse Economique et de la Statistique (INSAE). The Integrated Modular Survey is a national survey that includes several modules pertaining to the living standards of households, including employment and unemployment. In theory, the «employment» module is annual. In practice, however, its frequency can vary from every two to three years. The survey uses standard ILO concepts. It is based on a random sample of 18,000 households identified by stratified sampling in 77 communes in Benin. The most recent survey was carried out in 2010, but the findings are not yet available.

[11] The PEP Standard Computable General Equilibrium Model Single Country, Static Version PEP. Available at: http://www.pep-net.org/programs/mpia/pep-standard-cge-models/pep-1-1-single-country-static-version/.

- 17 production sectors: food agriculture, industrial and export agriculture, other agriculture, agri-food industry, artisanal agri-food, cotton ginning, modern textile industry, artisanal textile industry, water and electricity, other modern industries, other artisanal industries, other services, transport and communications, banking and commerce, education, health, and other public administration;
- four categories of households: urban male-headed household, rural male-headed household, urban female-headed household, and rural female-headed household.

The choice made in categorizing households reflects the data available. More detailed information would have allowed us to take more adequate account of gender. However, given the disaggregation of income sources and types of expenditure, the approach chosen provides fairly accurate details on gender. Sectors with many women were identified using the General Company Survey (Recensement Général des Entreprises). They are artisanal agri-food, artisanal textile industry, and other artisanal industries.

The model also identifies six types of taxation (i.e., tax on production, VAT, indirect taxes, direct taxes, import duties, and export duties) that are part of public income paid into the government's accounts.

The model distinguishes between skilled workers (with at least the school-leaving certificate, Brevet d'Etude du Premier Cycle) and unskilled workers (level below the school-leaving certificate).

The model goes beyond the standard labour-market assumption in CGE modelling of full employment. It incorporates an unemployment rate for each type of worker (skilled and unskilled) based on Savard and Adjovi (1998).

5.6.1.2 Data

Benin has a fairly long tradition in using CGE models and creating social accounting matrices. The data used for this study are essentially drawn from national sources. The social accounting matrix (SAM) used in this study was developed by INSAE for 2003.

CGE models also use other parameters, in particular: income elasticity of product demand, Frisch parameters, marginal propensity to save, substitution elasticity between capital and labour, elasticity of substitution between imported and local goods, transformation elasticity between external sales (exports) and domestic sales, and elasticity of external demand. These parameters are taken from previous models designed for Benin, from literature on CGE models, and from empirical studies of other developing economies.[12]

[12] Annabi et al. (2006) provide details on CGE parameters.

Table 5.7: Distribution (%) of factor income by type of household, Benin, 2003

	Unskilled labour	Skilled labour	Capital
Urban	31.74	62.65	38.55
Rural	68.26	37.35	61.45
Total	100.00	100.00	100.00

Source: Benin social accounting matrix 2003

Finally, poverty indicators require knowledge of income and expenditure flows in households covered by the survey. This study uses data from the EMICOV study.[13]

5.6.2 Characteristics of households and sectors

Before the simulations are analysed, the employment and income characteristics of households and the sectoral use of factors are studied using the social accounting matrix for Benin in 2003. This sheds light on how these variables will behave under the test conditions of the simulation.

5.6.2.1 Household income source

Sources of income differ widely between rural and urban locations (table 5.7). While urban households provide more skilled labour, those in rural areas provide more unskilled labour.

Using these findings, we expect impacts on skilled workers to occur mostly in the urban areas. Conversely, it is the rural areas that bear the brunt of impacts on unskilled work. Regarding capital, it is generally rural populations that are the main owners of this factor of production. However, this needs to be put into context because the social accounting matrix does not isolate land as a factor; instead, land is considered as capital.

5.6.2.2 Use of factors by sector

The productive sectors use factors of production (mainly capital and labour). The sectors can be described in terms of the proportions of these different factors of production that are used (table 5.8). A general analysis of all productive sectors shows the following:

- There is little wage employment in the agricultural sector because the return to capital dominates this sector (98.83 per cent on average).
- The service sectors (transport and communication, banking) and industrial sectors (other modern industries, modern textiles, agri-food) rely most on capital.
- The non-tradable service sectors such as education, public health, and administration are the largest users of unskilled labour (85 per cent of production).

[13] Enquête Modulaire Intégré sur les Conditions de Vie des Ménages (Integrated Modular Survey on Household Living Standards).

Table 5.8: Distribution (%) of factor income by sector, Benin, 2003

	Unskilled work	Skilled work	Capital
Food agriculture	0.95	0.05	99.00
Industrial agriculture	2.01	0.10	97.88
Other agriculture	0.37	0.02	99.61
Agri-food industry	29.63	5.43	64.95
Artisanal agri-food	4.95	0.91	94.14
Cotton ginning	10.18	1.86	87.95
Modern textile industry	36.56	6.67	56.77
Craft textile industry	4.34	0.79	94.87
Water and electricity	9.59	6.52	83.90
Other modern industries	36.78	6.74	56.48
Other artisanal industries	20.31	3.72	75.97
Other services	8.53	8.34	83.13
Transport and communication	26.39	10.71	62.90
Banking	9.64	25.07	65.29
Education	85.00	15.00	0.00
Health	85.00	15.00	0.00
Public administration	85.00	15.00	0.00
Total	**13.56**	**5.77**	**80.68**

Source: Benin social accounting matrix 2003.

5.6.3 Analysis of simulations

Current negotiations and the government's trade policy adjustments and reforms could have considerable effects on the agricultural sector, foreign trade, and the distribution of income and jobs. Simulations were undertaken to study these different effects. They consider the following measures:

1. the signing of EPAs with the EU: complete removal of customs duties on imports from the EU;
2. prohibition on the export of cottonseed: discontinuation of cottonseed exports;
3. establishment of the ECOWAS Common External Tariff;
4. import subsidies via tax relief during economic crises: removal of customs duties on agricultural products.

5.6.3.1 EPA trade provisions

The total or partial removal of customs duties on products originating in Europe should in principle increase imports from EU countries to the detriment of other countries and domestic supply. Therefore, signing an EPA without accompanying measures could jeopardize some Beninese companies exposed to competition from EU products. Under these circumstances, the risks of company closures could reduce the number of jobs and wage levels.

Effects on production

- Removal of customs duties on products of EU origin is not beneficial to Benin's producers; it causes GDP to drop by 3.01 per cent. This trend is more marked in the sectors most vulnerable to competition from European products, particularly the industrial sectors. In fact, the "other modern industries" sector, modern textile industries, and the agri-food industry are the most affected, with reductions of 11.30, 2.63 and 1.73 per cent, respectively. The impact on other agricultural-related sectors is relatively weak, well below 1 per cent (see annex table A5.1).
- The administrative sectors, export sectors (export agriculture and cotton ginning), and artisanal sectors are far less vulnerable to European competition, and they generally experience growth. This is the case with the three administrative sectors, with rates above 4 per cent; ginning, at 1.74 per cent; and water and electricity, at 1.53 per cent. We can therefore conclude at this juncture that the EPA will not adversely affect export-oriented industries (see annex table A5.1).

Effects on foreign trade

- The developments observed within productive sectors are due to import substitution, particularly by imports from the EU. Value of total imports rises by 1.39 per cent (see annex table A5.2). The removal of customs duties only covers imports from the EU, which benefits from increased volumes (+20.62 per cent). Imports from other countries drop by more than 21 per cent.
- In this model the current account balance is assumed to be fixed. The net increase in imports leads to a rise in exports (+1.57 per cent) (see annex table A5.3).

Effects on income and household consumption expenditure

- Nominal income of all agents (i.e., government, firms, and households) decreases under this scenario (see annex table A5.4). The largest drop (minus 32.12 per cent) is seen in public income. For the other agents the figures are around minus 3 per cent. For the government this decrease arises from the loss of customs earnings following the removal of customs duties on EU products. For households the drops in income come from the shrinking of wages and earnings on capital. The trends observed in these two categories of earnings arise essentially because of the variation in wage rates and capital yields. However, because of the drop in the consumer price index (CPI), household consumption improves by more than 3 per cent and slightly favours rural homes over urban (see annex table A5.5).

Effects on employment

- As production contracts, wage levels and capital returns adjust downwards. Changes in labour demand differ considerably among sectors. Export-oriented sectors (i.e., industrial agriculture and ginning) and artisanal agri-food (low levels of export) see a considerable rise in demand for labour compared with other sectors (see table 5.9). Demand for labour drops more markedly in other modern industries and other agricultural activities.

Table 5.9: Simulation results: Impact on employment

	Variation in employment %			
Sectors	**EPA**	**BanCottonExp**	**CET**	**AgTariffDrop**
Food agriculture	–1.90	–3.83	0.68	–7.30
Industrial agriculture	24.71	–48.38	–10.81	3.73
Other agriculture	–16.40	–0.05	10.02	–24.82
Agri-food industry	-4.94	8.79	2.41	1.77
Artisanal agri-food	12.44	–4.41	-6.40	9.62
Cotton ginning	14.76	–65.65	–6.83	4.62
Modern textile industry	–6.07	6.65	3.14	1.33
Craft textile industry	5.19	–6.15	–2.68	–2.94
Water and electricity	9.57	2.61	-4.42	2.32
Other modern industries	–25.18	2.19	12.68	–0.29
Other artisanal industries	2.15	–2.34	–0.97	–1.86
Other services	–8.42	–0.25	3.81	–1.86
Transport and communication	7.64	–0.83	–3.55	0.04
Banking	–3.29	–0.27	1.47	-0.76
Education	4.09	1.83	–1.89	1.36
Health	5.21	1.66	–2.38	1.28
Public administration	4.15	1.82	–1.92	1.35
Total	**–0.02**	**–0.02**	**–1.92**	**1.35**

Notes:

EPA	EPA trade provisions
BanCottonExp	Ban on cottonseed exports
CET	Common External Tariff
AgTariffDrop	Reduction of customs tariffs on agricultural products

- The increase in unemployment and the reduction in wages (see annex tables A5.6 and A5.7) leads to an overall reduction in the wage bill, which to some extent explains the drop in household expenditure.

Overall, signing EPAs without appropriate accompanying measures will have an adverse effect on production and on public income. It would nevertheless boost household final consumption if price reductions are passed onto consumers. The decrease in production would cause a contraction in employment and a reduction in total earnings from wage drops.

5.6.3.2 Ban on cottonseed exports

The purpose of the ban on cottonseed exports is to assure the mills that process the product (mainly oil mills) secure access to the raw materials they need to operate at full capacity. One can therefore conclude that the purpose of this measure is to: 1) boost production in these factories, and 2) thereby improve the job situation in this sector.

Effects on production

- The simulation results suggest that the objective of increasing production in the vegetable oil sector is met to some extent. The ban results in a rise in output, amounting to 3.76 per cent, for the agri-industry sector that produces edible oils. However, this positive effect is not enough to trigger positive growth in the economy as a whole. In fact, the simulation results show a contraction in GDP. The contraction of overall GDP is essentially caused by the poor performance in the cotton-ginning sector, which produces cottonseed among other products. This sector's value added drops by 11.43 per cent, and industrial agriculture's drops 1.35 per cent (see annex table A5.1) as a result of the export embargo, which discourages the production of cottonseed.

Effects on foreign trade

- The export embargo on cottonseed causes a nearly 10 per cent drop in the value of export sales of ginning products (cotton fibre and cottonseed), contrary to the intention of the policy (see annex table A5.3). One observes a slight reduction in the total value of exports (minus 0.27 per cent), although the exports of some products increase.

- In all, imports drop by 2.57 per cent. This downward trend is observed in all tradeable sectors (see annex table A5.2).

Effects on income and household consumption expenditure

- Following reductions in wages and capital returns, we observe a reduction in the wage bills of both unskilled and skilled labour (see annex tables A5.6 and A5.7). This is followed by a contraction of household and company income. The reduction in the CPI (minus 3.91 per cent) is not enough to induce higher household consumption levels. In fact, consumption drops by 1.31 per cent for urban households and 1.32 per cent for rural households (see annex table A5.5). Given the reductions in household and firm income, government income also drops (see annex table A5.4).

Effects on employment

- Sectors such as agri-industry, modern textiles, and to some extent water and electricity and other modern industries take on more workers to cover their labour needs. The number of additional workers recruited is not enough to offset the job losses seen in other sectors, however. Thus, this simulation shows an increase in unemployment too (see table 5.9).

In sum, the agri-food industry (including edible oils) benefits from the simulated measure. Overall, however, we observe a drop in the rate of economic growth. The dynamism of some sectors of activity is insufficient to maintain employment at its initial level.

5.6.3.3 Common External Tariff

The ECOWAS Common External Tariff is slightly different from the WAEMU tariff that currently applies in Benin. One of its innovations is a rate category called the 5th band, which is taxed at 35 per cent. Generally speaking, the ECOWAS CET should in principle bring greater tariff protection. In fact, the simple and weighted nominal tariff protection rates (NPR) will rise by 35 per cent. This change should affect activity in the productive sectors, foreign trade, and the distribution of income and jobs.

Effects on production

- Overall, implementing the ECOWAS CET boosts production because of the additional protection this measure brings. There is a decrease in imports (-0.50 per cent) (see annex table A5.2) and a very slight improvement in production (0.06 per cent) (see annex table A5.1). The sectors that benefit the most are other modern industries, the modern textile industry, and the agri-food industry.

Effects on foreign trade

- The increase in customs duties that the ECOWAS CET will introduce is generally unfavourable to imports. Although the effect appears to be very slight. Because of the model closure selected for external accounts, exports evolve in the same direction as imports: total export sales drop by 2.19 per cent (see annex table A5.3). This reduction affects all exporting sectors except for industrial agriculture.

Effects on income and household consumption expenditure

- Upward pressure on production leads to a general rise in wage rates (see annex tables A5.6 and A5.7). Together, with an increased demand for labour, this brings a marked improvement in households' nominal income (see annex table A5.4).
- Urban households are the main beneficiaries of the measure (1.54 per cent increase in consumption expenditure for urban households and 1.49 per cent for rural households) (see annex table A5.5). However, these increases are mitigated by inflationary pressure.

Effects on employment

- Each sector reacts differently to the increase in wages. Despite the change, modern industrial sectors, other agriculture, and other service sectors react with increased demand for labour (see table 5.9). This additional demand absorbs or even exceeds the number of workers released in other productive sectors. This measure therefore absorbs some of the unemployed and increased overall wages to workers.

5.6.3.4 Reduction of customs tariffs on agricultural products

The Beninese authorities took the decision to reduce tariffs on agricultural products with a view to reducing the strong inflationary pressure at the time. They expected a slight decrease in customs income because the increased volume of imports was not expected to compensate for the reduction in tariff income. The simulation results show that, if the measure is implemented effectively, it should meet its target, i.e. bringing down the level of inflation. Indeed, both the CPI and the GDP deflator go down – 3.48 and 3.14 per cent, respectively. Similarly, public income is reduced significantly, by about 5 per cent, because of the drop in income from all taxes.

Effects on production

- The measure involves removing a customs duty on agricultural products only, so the effects on production are mixed. Overall, production levels remain nearly constant. However, production contracts in two of the three agricultural sectors and in several other sectors (see annex table A5.1).

Effects on foreign trade

Reducing customs duties on agricultural products has a positive impact on imports in the food agriculture sector. Imports in the food agriculture, industrial agriculture, and other agriculture sectors grow by 71.50, 15.82, and 32.89 per cent, respectively (see annex table A5.2). However, imports in other sectors drop. In general, there is a slight increase, of 0.39 per cent, in imports. Exports see a greater increase of 1.66 per cent. This increase comes largely from the «other agriculture» sector (see annex table A5.3).

Effects on income and household consumption expenditure

- Reducing customs duties on agricultural products has an adverse overall effect on and workers' wages (see annex tables A5.6 and A5.7). The incomes of government, firms, and households fall (see annex table A5.4). Table A5.5 in the annex shows that the effect on both rural and urban household consumption is negative under this scenario, although the falling CPI mitigates this trend.

Effects on employment

- The effect on employment of reducing customs duties on agricultural products varies across sectors. The biggest drops in demand for labour are in the sector "other agriculture"(minus 24.82 per cent) and food agriculture (minus 7.30 per cent). Demand for labour increases the most in the artisanal agri-food sector (9.62 per cent) but also rises in the sector "industrial agriculture" and the agri-food industry (see table 5.9).
- At the same time, production in the artisanal industries and the "other services" sector respond by reducing demand for labour, which frees workers for employment in other productive sectors. The net effect of this measure is an overall increase in employment.

5.7 CONCLUSIONS

Analysis of the simulation results under four scenarios shows the following regarding agricultural trade and employment:

1. Scenario 1 (EPA with the EU): Output changes across different sectors are mainly due to their replacement by imports, particularly those from the EU. Export-oriented sectors (i.e., industrial agriculture and ginning) but also the artisanal agri-food sector see a considerable rise in demand for labour compared with other sectors.
2. Scenario 2 (Ban on cottonseed exports): Export sales of output from the cotton ginning industry (cotton fibre and cottonseed) fall by about 10 per cent. Sectors such as agri-industry, modern textiles, and to some extent the utilities and also the "other modern industries" sectors take on more workers to meet their increased labour needs.
3. Scenario 3 (Common External Tariff): The increase in customs duties that the ECOWAS CET will introduce is generally unfavourable to imports. The "other modern industries", "other agriculture", and "other services" sectors respond with greater demand for labour;
4. Scenario 4 (Agricultural tariff reduction): Overall, production levels remain nearly constant. However, production contracts in two of the three agricultural sectors and several other sectors. The "other agriculture" sector sees the greatest reduction in demand for labour (about 24 per cent). Demand for labour increases most in the artisanal agri-food sector (9.62 per cent).

Finally, the scenario «Ban on cottonseed exports» creates the greatest increase in labour demand in the agri-food industry sector. Regarding the scenario «EPA with the EU», its positive impact is felt most in the artisanal agri-food and industrial agriculture sectors. The food agriculture and "other agriculture" sectors are the agricultural sectors that benefit most under the scenario «Establishment of the ECOWAS common external tariff». The scenario "Agricultural tariff reduction" increases labour demand more in the artisanal agri-food sector than in other agricultural sectors.

ANNEXES

Table A5.1: Production performance under various trade policy scenarios, Benin

	Variation in output %			
Sectors	**EPA**	**BanCottonExp**	**CET**	**AgTariffDrop**
Food agriculture	–0.02	–0.05	0.01	–0.07
Industrial agriculture	0.50	–1.35	–0.23	0.08
Other agriculture	–0.07	0.00	0.04	–0.10
Agri-food industry	–1.73	3.76	0.84	0.62
Artisanal agri-food	0.72	–0.34	–0.38	0.55
Cotton ginning	1.74	–11.43	–0.83	0.55
Modern textile industry	–2.63	3.59	1.35	0.58
Craft textile industry	0.27	–0.39	–0.14	–0.15
Water and electricity	1.53	0.57	–0.72	0.37
Other modern industries	–11.30	1.12	5.44	–0.13
Other artisanal industries	0.53	–0.72	–0.23	–0.45
Other services	–1.43	–0.08	0.64	–0.32
Transport and communication	2.82	–0.34	–1.32	0.01
Banking	–1.14	–0.14	0.51	–0.27
Education	4.10	2.39	–1.89	1.36
Health	5.23	2.17	–2.38	1.28
Public administration	4.17	2.38	–1.92	1.36
Total	**–0.014**	**–0.02**	**0.06**	**0.02**

Table A5.2: Import performance under various trade policy scenarios, Benin

	Variation in imports %			
Sectors	**EPA**	**BanCottonExp**	**CET**	**AgTariffDrop**
Food agriculture	40.06	–8.94	–17.26	71.50
Industrial agriculture	15.25	–43.48	–7.67	15.82
Other agriculture	16.44	–5.35	–8.51	32.89
Agri-food industry	8.02	–3.92	–3.57	–2.01
Modern textile industry	16.53	–3.35	–6.04	–1.62
Water and electricity	–3.27	–1.78	1.57	–1.21
Other modern industries	–3.17	–0.97	1.02	–2.01
Other services	–19.85	–5.70	10.37	–6.07
Transport and communication	–9.54	–5.63	4.77	–3.97
Total	**1.39**	**–2.57**	**–0.50**	**0.39**

Notes:

EPA	EPA trade provisions
BanCottonExp	Ban on cottonseed exports
CET	Common External Tariff
AgTariffDrop	Reduction of customs tariffs on agricultural products

Table A5.3: Exports

Sectors	Variation in exports %			
	EPA	BanCottonExp	CET	AgTariffDrop
Food agriculture	2.87	3.86	–1.27	4.82
Industrial agriculture	–1.34	22.57	0.68	0.11
Other agriculture	9.64	2.28	–4.71	14.09
Agri-food industry	5.26	4.06	–2.41	1.25
Artisanal agri–food	3.07	4.22	–1.44	3.81
Cotton ginning	1.86	–9.92	–0.89	0.57
Modern textile industry	9.20	3.48	–4.01	0.95
Other modern industries	7.27	1.20	–3.15	0.70
Other artisanal industries	10.10	1.28	–4.41	1.06
Other services	6.66	2.04	–2.90	1.94
Transport and Communication	6.12	1.81	–2.77	1.47
Total	**1.57**	**–0.27**	**–2.19**	**1.66**

Table A5.4: Income

Sectors	Variation in income %			
	EPA	BanCottonExp	CET	AgTariffDrop
Government	–32.12	–0.81	15.67	–5.49
Firms	–3.84	–3.95	1.86	–3.49
Households	–3.13	–2.00	10.45	–3.13

Table A5.5: Consumption

Sectors	Variation in consumption %			
	EPA	BanCottonExp	CET	AgTariffDrop
Urban	3.49	–1.31	1.54	–3.14
Rural	3.55	–1.32	1.49	–3.13
Total	**3.53**	**–1.31**	**1.54**	**–3.13**

Notes:

EPA	EPA trade provisions
BanCottonExp	Ban on cottonseed exports
CET	Common External Tariff
AgTariffDrop	Reduction of customs tariffs on agricultural products

Table A5.6: Wages of unskilled labour

Sectors	Variation in wages %			
	EPA	BanCottonExp	CET	AgTariffDrop
Food agriculture	–2.08	–3.83	–0.96	1.61
Industrial agriculture	24.48	–48.38	–12.27	–7.34
Other agriculture	–16.56	–0.05	8.23	–2.01
Agri-food industry	–5.52	8.78	0.92	–24.86
Artisanal agri–food	11.75	–4.42	–7.76	3.68
Cotton ginning	14.06	–65.65	–8.18	–3.09
Modern textile industry	–6.64	6.64	1.64	1.13
Craft textile industry	4.55	–6.15	–4.09	1.18
Water and electricity	7.84	2.59	–5.40	1.21
Other modern industries	–25.64	2.18	11.05	–2.35
Other artisanal industries	1.53	–2.35	–2.41	–0.45
Other services	–10.19	–0.28	2.90	–1.48
Transport and communication	6.42	–0.84	–4.73	1.21
Banking	–5.99	–0.31	0.98	1.91
Education	3.47	1.82	–3.32	4.46
Health	4.59	1.65	–3.80	–0.25
Public administration	3.54	1.81	–3.35	9.45
Total	**–1.52**	**–2.13**	**0.76**	**–1.41**

Table A5.7: Wages of skilled labour

Sectors	Variation in wages %			
	EPA	BanCottonExp	CET	AgTariffDrop
Food agriculture	1.80	–3.78	0.68	2.63
Industrial agriculture	29.41	–48.35	–10.81	–6.42
Other agriculture	–13.25	0.01	10.02	–1.03
Agri-food industry	–1.77	8.85	2.41	–24.11
Artisanal agri-food	16.19	–4.37	–6.40	4.72
Cotton ginning	18.59	–65.63	–6.83	–2.12
Modern textile industry	–2.93	6.70	3.14	2.14
Craft textile industry	8.70	–6.10	–2.68	2.19
Water and electricity	12.12	2.65	–4.42	2.22
Other modern industries	–22.68	2.24	12.68	–1.37
Other artisanal industries	5.56	–2.29	–0.97	0.55
Other services	–6.62	–0.22	3.81	–0.49
Transport and communication	10.64	–0.79	–3.55	2.22
Banking	–2.26	–0.26	1.47	2.93

Table A5.7: Wages of skilled labour *(continued)*

	Variation in wages %			
Sectors	**EPA**	**BanCottonExp**	**CET**	**AgTariffDrop**
Education	7.58	1.88	–1.89	5.50
Health	8.74	1.71	–2.38	0.75
Public administration	7.64	1.87	–1.92	10.54
Total	**–3.75**	**–2.16**	**1.79**	**–1.99**

Notes:

EPA	EPA trade provisions
BanCottonExp	Ban on cottonseed exports
CET	Common External Tariff
AgTariffDrop	Reduction of customs tariffs on agricultural products

A5.8: The Benin CGE model

The CGE model used for the simulations in this study is an adaptation of the PEP–1-1 model, which has been developed and fully documented by the Partnership for Economic Policy (http://www.pep-net.org/). This section contains a description of the Benin CGE model's main equations. This description considers the main blocs of CGE models: production–employment, income–demand, foreign trade, and price and closure. The indices used are *i* for goods, *j* for sectors, *h* for household types and *tr* for tradeable goods.

Production

A distinction is drawn between production in the administrative sector and in non-administrative sectors. For these two categories, production is represented by a Leontief-type function relating value added and intermediate consumption:

$$VA_j = v_j XST_j$$

and

$$CI_j = io_j XST_j$$

where:

CI_j = *total intermediate consumption j*
VA_j = *value added of j*
XST_j = *aggregated sectoral production*
io_j = *Leontief coefficient for CI*
v_j = *Leontief coefficient for VA*

The value added of the non-administrative sectors is given as a nested Constant Elasticity of Substitution (CES) function, with a CES function at the first level including the factors "skilled labour" and "unskilled labour" and another CES function at the second level including the factor "composite labour" and capital.

$$VA_j = B_j^{VA}\left[\beta_j^{VA} LDC_j^{-\rho_j^{VA}} + \left(1-\beta_j^{VA}\right) KD_j^{-\rho_j^{VA}}\right]^{\frac{-1}{\rho_j^{VA}}}$$

where:

KD_j = *sectoral demand for capital by j*
LDC_j = *sectoral demand for composite labour*
β_j^{VA} = *distributive parameter*
B_j^{VA} = *scale parameter of scale*
ρ_j^{VA} = *CES elasticity parameter*

The maximization of profit under the constraint of the value-added function produces optimal demand for labour and capital. Capital is assumed to be specific to each sector.

$$LDC_j = \left[\frac{\beta_j^{VA}}{1-\beta_j^{VA}} \; \frac{R_j}{WC_j}\right]^{\sigma_j^{VA}}$$

where:

R_j = *sectoral return to capital by j*
WC_j = *sectoral wage rate of composite labour*
σ_j^{VA} = *CES elasticity parameter*

Every production sector uses intermediate inputs. Total intermediate consumption (C_i) of the sector is given by a Leontief function over intermediates C_{ij} consumed by i from each sector j.

Demand and income

Demand is broken down into household demand, government demand, investment demand, and intermediate demand. The household demand functions are derived from utility functions of the LES (Linear Expenditure System) type. Minimal consumption is estimated using estimates of income elasticity and the Frisch parameter.

$$C_{i,h}PC_i = C_{i,h}^{MIN}PC_i + \gamma_{i,h}^{LES}(CTH_h - \sum_{i,j} C_{ij,h}^{MIN}PC_{ij}$$

where:

$C_{i,h}$ = *consumption of commodity i by the household h*
$C_{i,h}^{MIN}$ = *minimum consumption of commodity i by the household h*
PC_i = *price of consumption of composite good i*
$\gamma^{LES}{}_{i,h}$ = *share of good i in consumption of household h*
CTH_h = *total consumption by household h*

The government consumes the totality of all categories of administrative goods. Demand for capital investment is fixed in value. Household income comprises the remuneration of the factors, dividends, and transfers received from other agents. Firm earnings comprise a proportion of the earnings on capital and transfers from agents. Finally, government income comes from tax receipts and transfers from other agents.

Prices

International export and import prices considered in the model are exogenous and determined in the world market such that:

$$PM_{tr} = (1 + ttic_{tr} + ttva_{tr})(1 + ttim_{tr})e.PWM_{tr}$$

where:

$ttic_{tr}$ = indirect taxes on consumption
$ttva_{tr}$ = value added taxes
$ttim_{tr}$ = taxes on imports
e = nominal exchange rate
PWM_{tr} = international price of imported goods

$$PE_{tr} = \frac{ePWE_{tr}}{\left(1 + te_{tr}\right)}$$

where:

te_{tr} = taxes on exports
e = taxes on imports
PWE_{tr} = international price of exported goods

The production price of goods sold locally or for export is the weighted average of local market and export prices:

$$P_{tr} = \frac{\left(PL_{tr}D_{tr} + PE_{tr}EX_{tr}\right)}{XS_{tr}}$$

where:

PL_{tr} = price of local production
D_{tr} = demand for local goods
PE_{tr} = price of local production
EX_{tr} = demand for local goods
XS_{tr} = total production

The price of composite goods (local and imported) is the weighted average of the prices of the two components:

$$PC_{tr} = \frac{\left(PD_{tr}D_{tr} + PM_{tr}M_{tr}\right)}{Q_{tr}}$$

where:

PD_{tr} = price of products for local market
D_{tr} = demand for local goods
PM_{tr} = price of imports
M_{tr} = demand for imported goods
Q_{tr} = total demand on the domestic market $(D + M)$

The price index is an index of the cost of value added:

$$PINDEX = \sum_{j} \delta_j PV_j$$

$$PV_j = \frac{P_j XS_j - \sum_{tr} PC_{tr} DI_{tr,j}}{VA_j}$$

External trade

External trade is modelled using the Armington (1969) hypothesis for a small open economy. World prices are, therefore, exogenous. To recall, the Armington hypothesis postulates that local products only imperfectly substitute for imported goods. This means that internal demand is for a composite good that is broken down into domestic and imported goods. Demands for imports and domestic goods are derived as a CES function:

$$Q_m = B_m^M \left[\beta_m^M IM_m^{-\rho_m^M} + (1+\beta_m^M) DD_m^{-\rho_m^M}\right]^{\frac{-1}{\rho_m^M}}$$

where:

Q_m = *demand quantity of composite good m*
IM_m = *import of good m*
DD_m = *domestic demand for local good i*
${\beta_m}^M$ = *distributive parameter*
${B_m}^M$ = *parameter of scale*
${\rho_m}^M$ = *CES elasticity parameter*

Determining the demand for domestic goods and imports thus depends on the relative prices of the goods and consumer preferences:

$$IM_m = \left[\frac{\beta_m^M}{1-\beta_m^M}\frac{PD_m}{PM_m}\right]^{\sigma_m^M} DD_m$$

For exports the domestic producer maximizes earnings from domestic and external sales under the constraint of the constant elasticity of transformation (CET) function.

$$XS_{j,x} = B_{j,x}^X \left[\beta_{j,x}^X EX_{j,x}^{\rho_{j,x}^X} + \left(1-\beta_{j,x}^X\right) DS_{j,x}^{\rho_{j,x}^X}\right]^{\frac{1}{\rho_{j,x}^X}}$$

The trade off between supply one's production on the domestic or export market is a function of the elasticity of transformation, relative prices, and distribution parameters.

$$EX_{j,x} = \left[\frac{1-\beta_{j,x}^X}{\beta_{j,x}^X}\frac{PE_x}{PL_x}\right]^{\sigma_{j,x}^X} DS_{j,x}$$

Modelling of the labour market

The model does not assume that there is full employment. Following Savard and Adjovi (1998), it incorporates an unemployment rate specific to each type of worker (skilled and unskilled).

$$LS(l) = \sum_j LD_j(l) + Un(l) * LS(l)$$

Unemployment for each type (indexed by *l)* of worker depends on the comparison that the workers make between the current wage rate and the base wage rate.

$$Un(l) = \left({}^{w(l)}\!/_{w_o(l)}\right)^{\varepsilon} * Uno(l)$$

where:

l = an index for the type of worker (skilled or unskilled)

Un(l) = the unemployment rate for worker type l

Un(l) = the base-period unemployment rate for worker type l

w(l) = the wage rate for worker type l

w(l) = the base-period wage rate for worker type l

ε = the elasticity that measures the sensitivity of unemployment to a change in the wage rate

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6. FOREIGN TRADE AND AGRICULTURAL EMPLOYMENT IN GUATEMALA

Luis Linares, Pedro Prado, and Raquel Zelaya[1]

6.1 INTRODUCTION

Agriculture is the prime source of employment in Guatemala with one of every three workers being employed in the sector. The effect of trade policy on agricultural employment is therefore likely to be an important determinant of the socio-economic consequences of trade in Guatemala.

In this chapter several aspects of the relationship between trade and agricultural employment in Guatemala are discussed. This includes a description of the situation of agricultural employment; an analysis of trade in agricultural products; a description of changes in trade policy including the ratification of recent trade agreements; a quantitative analysis of the effects of trade on agricultural employment and a description of legal and institutional aspects relevant for employment in the sector.

When characterizing employment in the agricultural sector, a comparison is made with workers in other sectors. Income and education levels among agricultural workers are discussed and so is the role of female employment in the sector. Importantly, the use of data from the Instituto Guatemalteco de Seguridad Social (IGSS) allows us to provide a picture of the role of social security coverage in the agricultural sector.

The analysis of trade data pays specific attention to the evolution of traditional export products like bananas, coffee and sugar. The recent increase in non-traditional manufacturing exports is also analysed and a separate analysis is undertaken of the evolution of Guatemala's export concentration both in terms of product and in terms of geographical concentration.

[1]The authors, who are staff members of the Asociación de Investigación y Estudios Sociales (ASIES), would like to acknowledge the collaboration of Orlando Monzón and Rubén Darío Narciso on this study.

Last but not least, labour regulation relevant for agricultural workers is described in a section that looks at both the national and international legal framework. Different stakeholders are discussed with a particular focus on the role of unions in the sector.

6.2 AGRICULTURAL EMPLOYMENT IN GUATEMALA

6.2.1 Characterization of the agricultural worker

Agriculture is the prime source of employment in Guatemala, as shown in table 6.1. Data from the 2006 National Living Conditions Survey[2] (Encuesta Nacional de Condiciones de Vida, or ENCOVI) show that one of every three workers is employed in agriculture. Despite this, the agriculture sector, at 12 percent, is not the biggest contributor to the Gross Domestic Product (GDP),[3] reflecting the fact that the average productivity of the agricultural sector in Guatemala is low.

Table 6.1: Percentage distribution of workers by economic sector (both sexes), Guatemala, 2006

Economic sector	Percentage
Agricultural	33.8
Mining and quarrying	0.1
Industrial	15.8
Electricity and water	0.2
Construction	6.5
Retail	22.7
Transport and communications	2.9
Financial services	3.2
Public administration and national defence	2.1
Education	4.0
Health and social services	8.4
Organizations and extraterritorial entities	0.2

Source: Authors' calculation from ENCOVI 2006 data.

Most agricultural workers are male, while in activities such as retail, education, and social services, female participation is greater than male, as shown in table 6.2.

[2] Carried out by the National Institute of Statistics (Instituto Nacional de Estadísticas, or INE) (INE, 2006). This database was provided free of charge to the research centres of Guatemala once the results of the survey were presented.

[3] The contribution of agriculture to the GDP was obtained from the World Bank's World Development Indicators for the year 2006. According to information from the Banco de Guatemala, the greatest contributor to GDP during 2001–2006 was the manufacturing sector, which was responsible for 18.8% of GDP.

Table 6.2: Percentage of female workers by economic sector, Guatemala, 2006

Economic sector	Percentage
Agricultural	18
Mining and quarrying	3
Industrial	49
Electricity and water	11
Construction	2
Retail	57
Transport and communications	9
Financial services	27
Public administration and national defence	24
Education	67
Health and social services	77
Organizations and extraterritorial entities	39

Source: Authors' calculation from ENCOVI 2006 data.

Other notable characteristics of the agricultural work force, shown in tables 6.3 and 6.4, respectively, are that one third consists of smallholders. Two-thirds of the agricultural work force are employees and one-third of them are less than 20 years old. On average, agricultural workers work six hours a day.

Table 6.3: Number and percentage distribution of people by occupation in the agricultural sector, Guatemala, 2006

Occupation	Number of people	Percentage
Employee	1,229,212	67
Smallholder	576,626	32
Employer	20,892	1
Total	1,826,730	100

Source: Authors' calculation from ENCOVI 2006 data.

Table 6.4: Percentage distribution of agricultural workers by age group, Guatemala, 2006

Age range	Percentage
10 to 20	34
21 to 40	32
41 to 60	23
61 or more	11

Source: Authors' calculation from ENCOVI 2006 data.

ENCOVI 2006 reported that there were 996,361 boys, girls, and teenagers (niños, niñas, y adolescentes, or NNA) working: This was approximately 21% of the total population aged 5 to 18. Of the NNA workers 67% lived in rural areas and 55% were occupied in agriculture and related activities. Some 64% of NNAs employed in agriculture were unpaid family workers. ENCOVI 2006 also reports that 11% of NNAs were illiterate.

Guatemala is a country with important socio-economic difficulties, as various indicators, such as the Human Development Index (HDI), report. One reason for this is the large number of people living in poverty. Since agriculture is the main source of employment generation and plays an important role in the country's economic activity, it is important to know the conditions of poverty that agricultural workers endure.

As table 6.5 shows, three of every four workers in the agricultural sector live in poverty, and one of every four lives in extreme poverty. This shows that in Guatemala agriculture generates low incomes and in most cases does not provide the means to satisfy basic needs. Responding to an ENCOVI question, 95 per cent of agricultural workers said that they would take an additional job if available – a testament to the low incomes that they now earn.

Table 6.5: Percentage distribution of agricultural workers by level of poverty,[4] Guatemala, 2006

Level of poverty	Percentage
Extreme poverty	26
Poverty	49
Above the poverty line	25

Source: Authors' calculation from ENCOVI 2006 data.

Table 6.6: Percentage distribution of agricultural workers by income range, Guatemala, 2006

Range of monthly income		
In Guatemalan Quetzales (GTQ)	In US$	Percentage
0 to 1,523.80 (minimum wage)	0 to 211.35	92.9
1,523.81 to 3,047.60	211.36 to 422.69	5.8
3,047.61 to 4,571.40	328.96 to 492.42	0.5
4,571.40 or more	492.43 or more	0.9

Source: Authors' calculation from ENCOVI 2006 data.

[4] The per capita values for the poverty line in 2006 were as follows: extreme poverty, Guatemalan Quetzales (GTQ) 3,206.00 (approximately US$ 421); poverty, GTQ6,574.00 (approximately US$ 865).

Table 6.7: Percentage distribution of agricultural workers by educational level,[5] Guatemala, 2006

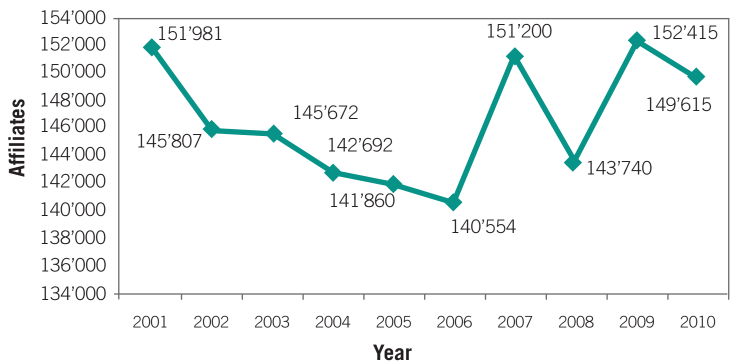
Educational level	Percentage
None	38.3
Primary	53.9
Basic	4.9
Diversified	1.6
Bachelor	0.4
Postgraduate	0.0

Source: Authors' calculation from ENCOVI 2006 data.

One indication that agricultural workers lack sufficient income to satisfy their own and their families' basic needs is that many earn less than the minimum wage.[6] In 2006, for example, 93 per cent of agricultural workers earned less than the minimum wage. In addition, as table 6.7 shows, the great majority of agricultural workers have no education or low levels of schooling, which is the main obstacle to moving to better employment.

With respect to social protection, figure 6.1 shows the number of agricultural workers affiliated to the Guatemalan Institute of Social Security (Instituto Guatemalteco de Seguridad Social, or IGSS) over the first decade of the century.

Figure 6.1: Number of agricultural workers affiliated to the IGSS, 2001–2010



Source: Authors' calculation from IGSS data.

[5] In Guatemala primary education lasts for six years (usually between 7- to 12-year-olds); middle, or secondary education is comprised of two levels, the basic level of three years (usually 13- to 15-year-olds); and the diversified level, of two or three years (usually 16- to 18-year-olds).

[6] The minimum wage for agricultural workers for 2006, in accordance with Governmental Agreement No. 640–2005, was established at GTQ 1,523.80 (US$ 200.50) per month.

Table 6.8: Comparison of numbers affiliated to social insurance as reported by ENCOVI 2006 and IGSS, 2006

	ENCOVI	IGSS	Difference (%)
IGSS agricultural affiliates	93,759	140,554	33
Total IGSS affiliates	981,539	1,026,405	7
Mean wage (US$) in agriculture	203.30	185.02	9

Source: Authors' calculation from IGSS and ENCOVI 2006 data.

All workers affiliated to the IGSS are deemed to be in the formal sector. In 2006 the number of agricultural workers affiliated to the IGSS was 140,544, while the total number of employees, both formal and informal, in the agricultural sector was 1,229,212. Thus, only 11.4 per cent of Guatemala's agricultural workers were in the formal sector.

The number of agricultural workers affiliated to the IGSS generally decreased over the 10-year period, particularly in the earlier years, followed by fluctuation in the later years. With the information available, it cannot be determined if the decrease between 2001 and 2006 reflects an exodus from the agricultural sector to other sectors of the economy, or if there was a shift from the formal to the informal agricultural sector. From 2001 to 2006 the contribution of agriculture to GDP declined from 15% to 11%.[7]

Since ENCOVI asked about IGSS affiliation, it is possible to compare the results of this question with the records of the social insurance agency, as is done in table 6.8 for 2006.

The sizeable difference in numbers for the agricultural sector may be due to the inclusion in the IGSS statistics but not in the ENCOVI statistics, of agribusiness workers (sugar mills, coffee mills, and other similar activities), one of the main economic activities of Guatemala. Additionally, ENCOVI 2006 was carried out in June, while the IGSS data reflect the yearly pattern of affiliations.

According to ENCOVI 2006 data, only 5.2 per cent of agricultural workers – employees and smallholders –were affiliated to the IGSS. The lack of periodic employment surveys rules out observation of the behaviour of the entire agricultural sector; only agricultural workers with access to the social insurance system can be tracked.

According to ENCOVI 2006 data, only 7.7 per cent of agricultural workers have a contract, while 82 per cent receive neither *bono catorce* nor *anguinaldo*.[8] Receipt of these bonuses contributes to defining the formality of the employer–employee relationship.

[7] http://data.worldbank.org/indicator (accessed 03/05/12).

[8] *Bono catorce* and *Aguinaldo* are two types of bonuses, equivalent to the normal monthly wage of the worker, under decrees numbers 42–92 and 76–78, respectively.

6.2.2 Characterization of the agricultural employer

Employers in the primary sector include owners and stockholders of companies, regardless of their size; the definition excludes both non-owning managers of these companies and smallholders. In contrast to the agricultural workers, only one of every five employers lives in poverty. This disparity can be attributed to the gap between the incomes of agricultural employers and employees.[9]

Specifically, ENCOVI 2006 found that the mean monthly wage of an agricultural worker is GTQ890.00 (US$117.11), while the mean monthly profit that an employer receives is GTQ5,310.00 (US$698.68). In other words, employers earn six times as much as employees.

According to ENCOVI 2006 approximately nine of every ten agricultural employers are male. Most are 41 years or older.

6.2.3 Governmental and non-governmental entities that support agro-export activities

Among the governmental entities that support firms seeking to expand into international markets are the Ministry of Agriculture, Animal Husbandry and Alimentation (MAGA by its acronym in Spanish), and the Ministry of Economy of Guatemala (MINECO by its acronym in Spanish). Since 2006 MINECO, through its Business Centre (Centro de Negocios):

> *supports the micro, small and medium firms in Guatemala with the promotion, marketing and access to information to firms seeking to internationalize, expand and achieve significant business links, including to export their products and/or services outside of Guatemala.*[10]

AGEXPORT is a private trade entity that groups and supports agro-export firms in Guatemala by promoting the growth of exports based on competitiveness. For example, Cuatro Pinos Cooperative, which has specialized in the export of fresh vegetables such as snow peas, string beans, and zucchini, among others, is a member of AGEXPORT.[11] The cooperative has around 580 members, of which the majority are smallholders. Its objective is to:

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[9] For the employed population ENCOVI 2006 employs the following categories: employees (who are divided into private and public), employers (agricultural and non-agricultural), independent workers (agricultural and non-agricultural), and unpaid workers. The main difference between employers and independent workers is that the latter do not have employees under their supervision.

[10] From the Ministerio de Economía (MINECO) website, at: http://www.mineco.gob.gt/Espanol/Centro+de+Informacion+y+Expo-Negocios (accessed 03/05/12).

[11] Cooperatives are nonprofit organizations of people (not of capital) seeking the social and economic betterment of its members through common effort. In Guatemala they are governed by the legislation contained in Decree No. 82–78.

…organize the production of vegetables for export, provide field-level extension, input supply, and assist in the harvesting, sorting and storage of products. It has also been carrying out its own exports to European and US markets. (Santacoloma and Suarez, 2005)

6.3 FOREIGN TRADE OF AGRICULTURAL PRODUCTS

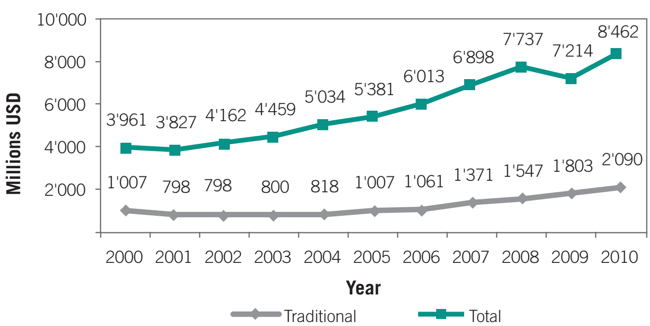
6.3.1 Evolution of traditional exports

Traditional exports – coffee, sugar, bananas, and cardamom[12] – accounted for 20.5 per cent on average of total exports from 2000 to 2010, according to information from the Banco de Guatemala. However, during the first half of the period, the overall share of traditional products decreased to a minimum of 16.2 per cent in 2004, as reflected in figure 6.2. During the second half of the decade traditional agriculture's share in total exports increased because of the rise in the international prices of agricultural products, especially coffee.

Among traditional export products, coffee is Guatemala's biggest export, followed by sugar and bananas. In 2000 coffee accounted for 14.5 per cent of Guatemalan exports. This was a peak, however. Over the decade 2000–2010 coffee accounted for 8.0 per cent of Guatemalan exports, as illustrated in figure 6.3.

Sugar represented on average 5.3 per cent of all Guatemalan export over the period 2000-2010, with sugar exports being higher than average in 2009 and 2010. Banana exports averaged a share of 4.9 per cent over the decade, while cardamom exports had a share of 2.3 per cent.

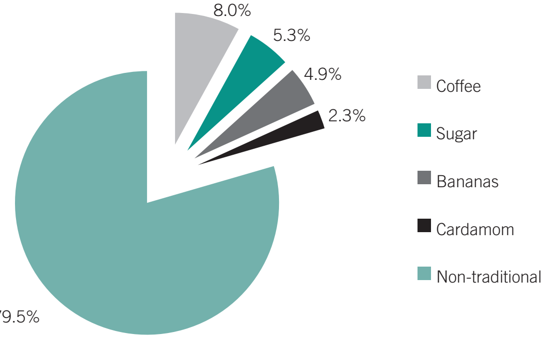
Figure 6.2: Trends in traditional agricultural exports and total exports, Guatemala, 2000–2010



Source: Authors' calculation from Banco de Guatemala data.

[12] Coffee, sugar, bananas, and cardamom are deemed the traditional export products. The remaining exports are considered non-traditional, and they include both agricultural and non-agricultural products. Examples of non-traditional agricultural products are rubber, snow peas, broccoli, zucchini, cantaloupe, mango, and peppers.

Figure 6.3: Average annual shares of exports, Guatemala, 2000–2010



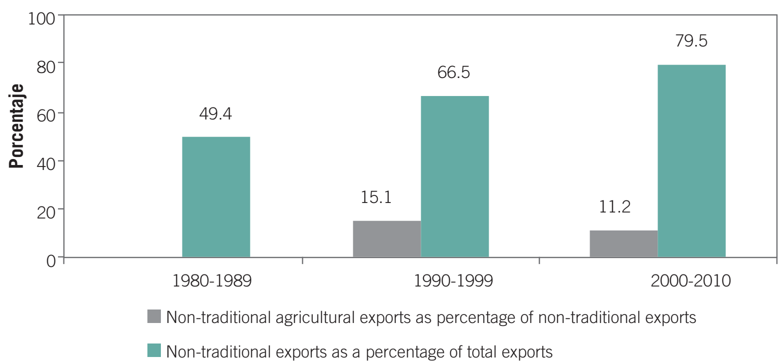
Source: Authors' calculation using Banco de Guatemala data.

6.3.2 Evolution of non-traditional exports

The share of non-traditional products in total exports has been increasing over the past three decades. Figure 6.4 shows that in the 1980s non-traditional products accounted for 49 per cent of all exports. During the 1990s they grew to nearly 67 per cent. During the last decade non-traditional products represented 79 per cent of total exports, thus demonstrating sustained growth for the last three decades.

While as a whole non-traditional exports are accounting for an increasing share of total exports, non-traditional agricultural products are becoming less important. Between the last two decades, the share of non-traditional agricultural products as a percentage of total non-traditional exports decreased from 15.1 per cent to 11.2 per cent. This can be explained by the increase in exports of textiles and apparel, boosted by government incentives.

Figure 6.4: The role of non-traditional exports, Guatemala, 1980–2010



Note: No data was available for 1980-1989 for non-traditional agricultural exports as a percentage of exports.
Source: Authors' calculation using Banco de Guatemala data.

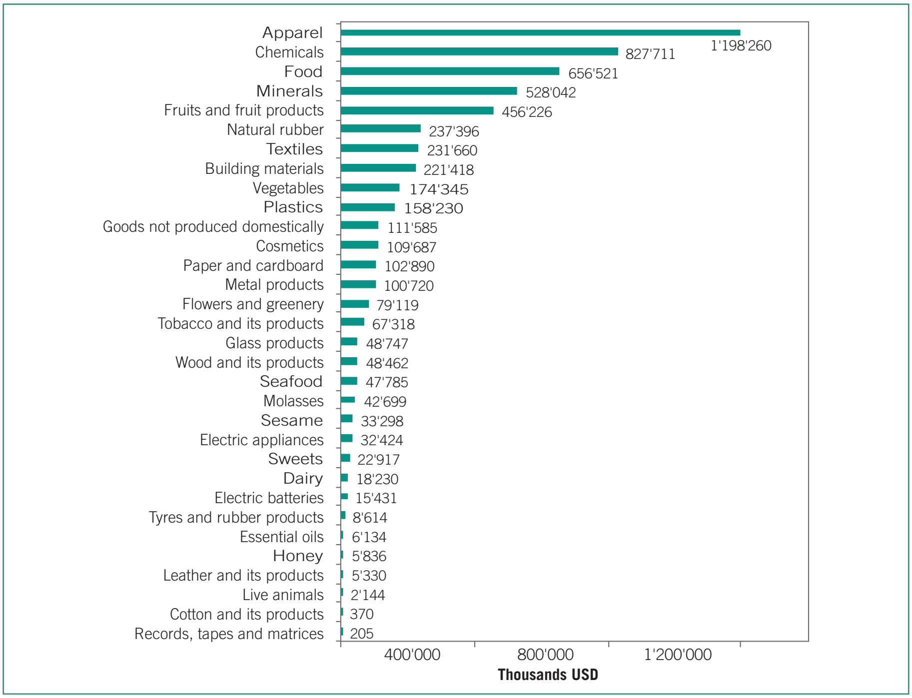
Growth of non-traditional products as a share of total exports could be attributable to the commercial openness of the recent years, which has allowed more transactions involving new products sent to other countries. Other reasons may be that this growth reflects an increase in world demand, the reduction of tariffs in importing countries, and Guatemala's increasing ability to satisfy this demand. This last explanation receives support from the increase in the literacy rate in Guatemala, which has provided the labour market with workers who produce better quality non-traditional exports.

Speaking of flower exports in Latin America, the Economic Commission for Latin America and the Caribbean (ECLAC) states:

> *The factors with the most influence on the international trade of fresh flowers are production costs, tariffs, phytosanitary controls in the importing countries, and technological advances, especially in transport and preservation, as well as the cultivation of new varieties. (*Kouzmine, 2000, p.22)

In addition, the growth of non-traditional exports can be attributed to public policies encouraging the diversification of markets and products and fostering domestic and foreign investment. Amongst these policies it is worth mentioning the Export and Maquila Promotion Act (Decree No. 29–89) and the Free Zone Act (Decree No. 65–89). Figure 6.5 shows the export values for non-traditional products in 2010.

Figure 6.5: FOB value of non-traditional exports, Guatemala, 2010



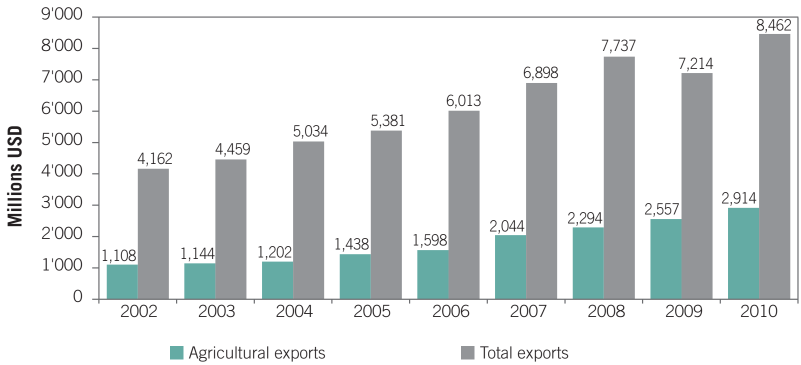
Source: Banco de Guatemala.

6.3.3 Agricultural exports

Guatemala's agricultural exports are mainly its traditional export products (i.e. coffee, sugar, bananas, and cardamom) but also include non-traditional agricultural products. From 2002 to 2010 Guatemala's agricultural exports grew from US$1,108 million to US$2,914 million – an average yearly growth rate of 13%, as shown in figure 6.6.

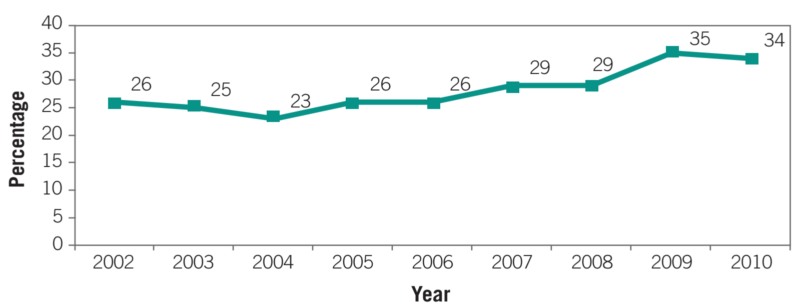
On average, one of every three dollars in Guatemalan exports comes from agricultural products, as shown in figure 6.7. In 2009 there was a spike in the share of agricultural exports. In that year the total value of exports decreased due to the international economic crisis, while agricultural exports slightly increased their export value.

Figure 6.6: Evolution of agricultural exports and of total exports, Guatemala, 2002–2010



Source: Authors' calculation using Banco de Guatemala data.

Figure 6.7: Agricultural exports as a percentage of total exports, Guatemala, 2002–2010

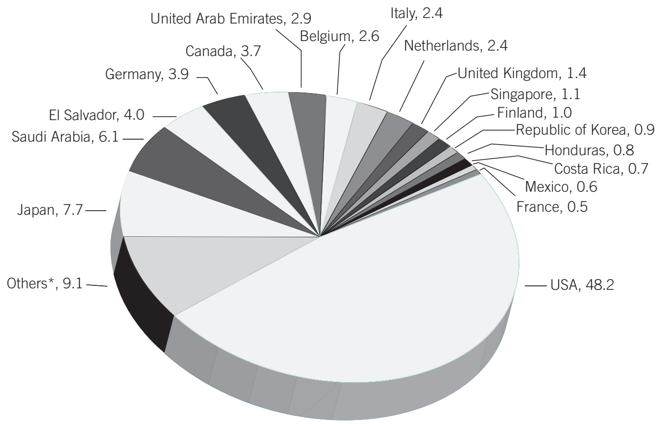


Source: Authors' calculation using Banco de Guatemala data.

6.3.4 Main destinations for agricultural exports

Figure 6.8 shows the main destinations for Guatemalan agricultural exports, ordered from highest to lowest shares.

Figure 6.8: Main destinations for Guatemalan agricultural exports (in percentages), 2010



*Includes countries with shares of less than 0.5% each.
Source: Authors' calculation using Banco de Guatemala data.

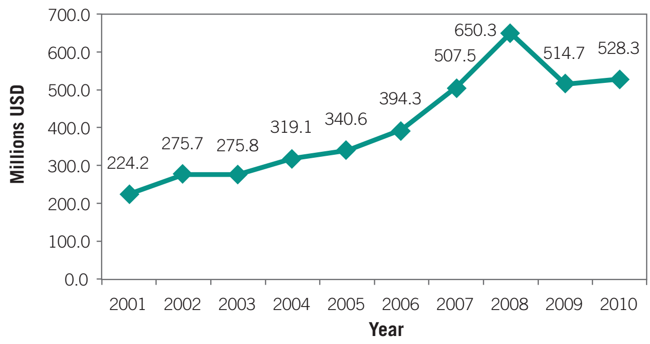
In this context, it is important to highlight the importance of the United States as a destination market for Guatemalan agricultural exports. The dependence on U.S. demand should probably be considered a weakness, in particular taking into account that the role of other export markets is significantly smaller. Central America, for instance, only absorbs 5.8 per cent of Guatemalan agricultural exports according to information from the Banco de Guatemala. This indicates that it would be important for Guatemala to diversify its exports in terms of destination markets.

6.3.5 Evolution of agricultural imports

Agricultural imports into Guatemala have grown in the previous decade, as figure 6.9 highlights, although they experienced a decrease in 2009, caused by the world crisis that emerged from the USA. However, imports appear to have returned to their normal trend and now continue to grow. This slight increase in imports has coincided with an improvement in economic conditions worldwide, accompanied by an overall increase in production.

All of Guatemala's agricultural imports come from the USA, Mexico, and Central America. In 2010 these imports amounted to 4.5% of total imports.

Figure 6.9: Trend in agricultural imports, Guatemala, 2001–2010



Source: Authors' calculation using Banco de Guatemala data.

6.4 TRADE AGREEMENTS SIGNED BY GUATEMALA THAT INCLUDE RULES ON AGRICULTURAL PRODUCTS

6.4.1 The policy of trade liberalization

Beginning in the mid-1990s Guatemala signed trade agreements with several countries and regions. This policy incrementally pursued wider market access for Guatemalan products, as well as promoting the export of products that traditionally had not been exported. These objectives were in line with the trade liberalization that the international markets were experiencing. For Guatemala trade liberalization has led to a larger role for non-traditional export as a share of total exports.

Trade liberalization has been consistent and has endured throughout various administrations. For example, negotiations for the Dominican Republic–Central America–Unites State Free Trade Agreement (DR–CAFTA) began under the government of President Alfonso Portillo (2000–2004), and its subscription and ratification took place under the administration of President Oscar Berger (2004–2008).

6.4.2 Dominican Republic–Central America–United States Free Trade Agreement

The DR–CAFTA, ratified in 2006, is one of the most important trade agreements for Guatemala, as trade between Central America and the USA accounts for nearly 70 per cent of the region's total international trade.

The objectives of the treaty, established in Chapter 1, are the following:

(a) encourage expansion and diversification of trade between the Parties;

(b) eliminate barriers to trade in, and facilitate the cross-border movement of goods and services between the territories of the Parties;

(c) promote conditions of fair competition in the free trade area;

(d) substantially increase investment opportunities in the territories of the Parties;

(e) provide adequate and effective protection and enforcement of intellectual property rights in each Party's territory;

(f) create effective procedures for the implementation and application of this Agreement, for its joint administration, and for the resolution of disputes; and

(g) establish a framework for further bilateral, regional, and multilateral cooperation to expand and enhance the benefits of this Agreement.

Although the negotiation, subscription, and ratification of this treaty generated much controversy, five years after its entry into force only few studies exist that analyse its effects on Guatemala's economy and, specifically, its effects on employment.

Surveys carried out by the Asociación de Investigación y Estudios Sociales (ASIES) of the textile and apparel industries reveal that DR–CAFTA's impact has not been homogenous. The textile industry says that it is benefiting from the agreement, while the apparel industry has a different perception, considering the agreement not as beneficial as expected. The opinion survey states:

> *When differentiating by industry, the textile industry is the greatest beneficiary. This can be explained by the rule of origin negotiated for some inputs. 86% of the sample said that the impact has been positive, while only 47% of the apparel industry believes it has been beneficial.* (ASIES, 2006)

Chapter III of the Agreement, National Treatment and Market Access for Goods, has several sections: a) National treatment; b) Tariff elimination; c) Special regimes; d) Non-tariff measures; e) Other measures; f) Agriculture; g) Textiles and apparel; and h) Institutional provisions. The section on agriculture includes the administration and implementation of tariff-rate quotas, agricultural safeguard measures, sugar compensation mechanisms, consultations on trade in chicken, the agriculture review commission, the committee on agricultural trade, and subsidies to agricultural exports.[13]

According to research carried out by ASIES (2006) on DR–CAFTA's tariff elimination schedule,

> *DR–CAFTA seeks to consolidate the benefits granted under the Caribbean Basin Initiative (CBI): some benefits were expanded and relatively long tariff reduction periods were given to* sensitive products – *staple grains, beef and dairy: non-linear reductions with a period of grace for those products, the establishment of tariff-rate quotas for sensitive products, the establishment of an agricultural safeguard for some of these products and the exclusion of a reduced group of products like sugar from the USA and white maize for Guatemala.*

[13] This last section indicates that the parties share the common objective of the multilateral elimination of export subsidies for agricultural goods and work together towards an agreement in the WTO to eliminate those subsidies and prevent their reintroduction in any form.

Agricultural products account for the biggest share of trade with the USA. DR-CAFTA grants most Central American agricultural and agro-industrial products immediate access to the USA. This access may be beneficial for Guatemalan fresh, chilled, and frozen fruits and vegetables, seeds, spices and grains that may have potential niche markets (ASIES, 2006).

However, some Guatemalan agricultural products will not have immediate access to the US market, among them beef, cotton, tobacco, and peanuts, which will eventually enter the market through a tariff-rate quota in 15 to 20 years (ASIES, 2006).

As for the agricultural products most consumed by Guatemalans – maize, beans, and rice – these were subject to different treatment in the negotiation of the agreement. This is, for instance, the case for maize that represents the main component of the Guatemalan population's diet (Pingali, 2001). Yellow maize is mainly used as an industrial input and was allocated a liberalization period of ten years. White maize, instead, is mainly used for human consumption and was pretty much left out of the agreement as it was allocated a tariff-rate quota of 20,000 metric tons (MT), with an annual growth of 2% (ASIES, 2006).[14]

Some agricultural products, such as sugar, cheese, ice cream, milk, fluid cream, sour cream, and other dairy products, are subject to tariff-rate quotas when exported under DR-CAFTA. In the case of sugar, Guatemala negotiated quotas starting with 32,000 MT duty-free in year 1, reaching 49,820 MT in year 15, and, starting from the 15th year, the quota increases by 940 MT per year.[15]

Cheese exported from Guatemala to the USA is exempt from duty as long as the specified amounts are not surpassed. For the first year there is a 500 MT tariff-rate quota; as of the 10th year, there will be a 776 MT tariff-rate quota, and from year 20 the amount is unlimited. The same is true for other dairy products, starting with 250 TM in the first year and no limit from 20 years on.

As for imports, tariff-rate quotas were negotiated for agricultural products that come to Guatemala from the USA, such as beef, pork, cheese, powdered milk, ice cream, butter, other dairy products, yellow corn, maize, paddy and milled rice, and chicken quarters.

It should be noted that agricultural safeguard measures were included. This provision allows one of the parties to modify preferences temporarily for products of national interest by raising the tariff of the tariff-rate quotas. By the 14th year of the treaty, a Commission of Agricultural Revision will be established to assess the effects of trade liberalization and the possible extension of these safeguards.

[14] Tariff-rate quotas are set at a specific quantity of an import that is fully or partially exempt from paying customs duties for a certain period.

[15] With regards to sugar in other treaties, the free trade agreement (FTA) with Mexico, for example, Chapter IV, covers the agricultural sector, and in Annex 4–11 it deals specifically with trade in sugar between Guatemala and Mexico. Preferential conditions for sugar will be granted by the Sugar Analysis Committee that sets preferential conditions each year, on a case-by-case basis, upon request of one of the parties. If a party has been an exporter in a given year, that party is not eligible for the same preference in the following year.

More generally, DR-CAFTA establishes the possibility that, and sets out the conditions under which, some of the parties can use the special agricultural safeguard (SAE by its acronym in Spanish), which is automatic and lasts for one calendar year. This safeguard allows each country to limit temporarily the imports of an agricultural product, if these have increased to an amount that would threaten or damage domestic production, in accordance with what has been established by the WTO. Among the products eligible for this measure are chicken, fluid milk, cheese, powdered milk, butter, ice cream, other dairies, pork, milled and paddy rice, whole beans, vegetable oil, peppers, tomatoes, fresh potatoes, high fructose corn syrup, and onions.

The agreement clearly calls for the elimination of any agricultural export subsidy and establishes the endeavours that both parties will pursue to eliminate the subsidies on a multilateral level. However, no reference is made to domestic production subsidies and other policies to support agricultural production. As a result, production subsidies and other sectoral policies in support of agriculture, have a tendency to create asymmetries between the parties (Rodrigues, 2006).

With regards to investment, the Agreement in Chapter X specifically sets out rules to increase legal security. Likewise, it has a section relating to settling disputes between the investor and the State.

6.4.3 Other trade agreements signed by Guatemala

The Central American General Treaty of Economic Integration was signed in 1960 by El Salvador, Guatemala, Honduras, and Nicaragua. Costa Rica subscribed in June 1962. This treaty may be the most important commercial agreement for Guatemala since it is part of a bigger project of social, economic, and political integration, the System of Central American Integration (Sistema de Integración Centroamericana, or SICA).[16] The General Treaty was modified by the Guatemala Protocol to The Central American General Treaty of Economic Integration, of 1993, which adapted the treaty to the international context and the institutions created by the Tegucigalpa Protocol.

Another important step in the integration process was the approval, in June 2004, of the General Framework for the Negotiation of the Central American Customs Union. In January 2000, El Salvador and Guatemala approved the Convention Framework for the Establishment of a Customs Union between El Salvador and Guatemala, given the options granted under the Guatemala Protocol.

As for the achievements of the integration process, on the commercial side there has been a growth of intraregional trade. As shown in table 6.9, intraregional trade has grown considerably since the signing of the General Treaty of Integration in 1960. This growth stopped in the early 1980s because of the economic crisis known

[16] SICA was established by the Tegucigalpa Protocol to the Constitution of the Organization of Central American States (Organización de Estados Centroamericanos, or ODECA)) on 13 December 1991. The original constitution of ODECA was signed on 14 October 1951 by Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua.

Table 6.9: Central American trade- intraregional and with the rest of the world (RoW), 1960-2010 (in millions of US$)

Year	Intraregional	RoW
1960	30	409
1970	286	812
1980	1 129	3 315
1986	413	3 460
1993	1 160	3 979
2000	2 617	8 895
2010	5 902	16 241

Source: SIECA, 2012. http://www.sieca.int/Publico/CA_en_cifras/CA_EVOLUCION_DEL_COMERCIO/Evolucion_1960-2010/CA_Evolucion_1960-2010.htm (accessed 16/08/12).

as the "lost decade", which was aggravated by the armed conflicts that hit El Salvador, Guatemala, and Nicaragua. Since the 1990s there has been a reactivation of intraregional trade, coinciding with the democratization process and the signing of the Guatemala and Tegucigalpa Protocols (Guerra Borges, 1997).

It is worth noting that the export statistics from the Secretaría de Integración Económica Centroamericana (SIECA), shown in table 6.9, do not include textile exports from the *maquilas* (free-trade zones where products are processed or manufactured from materials imported duty-free). Given that *maquila* exports play a more important role in trade with the rest of the world than in intraregional trade, the weight of intraregional exports in total exports is likely to be overvalued in Table 6.9. The Central American Common Market is nevertheless of great importance for all its parties, and its share of trade has been increasing. In 2010, it represented 11.2 per cent of Costa Rican exports, 35.5 per cent for El Salvador, 28.2 per cent for Guatemala, 22.7 per cent for Honduras, and 14.5 per cent for Nicaragua (Urrutia, 2011).

To mark its 50th anniversary in 2010, the Central American Bank of Economic Integration (Banco Centroamericano de Integración Económica, or BCIE) evaluated the economic integration process, highlighting among its achievements its endurance in the face of diversity and adversity. It also pointed out that the region is strategically located, with a common language, and has no ideological adversaries and that it has expanded its scope and geographical presence.[17] In addition, the report pointed out that it is the most successful process of integration in the developing world, for it is a completely free trade area, except for sugar and coffee. Moreover, the process is supported by both governments and civil society (BCIE, 2010).

Additionally, Guatemala has preferential trade agreements signed and in force with Chile, Colombia, the Dominican Republic, Mexico, Panama, and Taiwan;

[17] The geographical expansion refers to the incorporation into one or several spheres of the integration process of Belize, Panama, and the Dominican Republic.

and partial preferential agreements with Belize, Cuba, and Venezuela. Additionally, it is eligible for the Canadian and European Generalized System of Preference (GSP).

In the majority of these agreements, Guatemala has negotiated the reduction or elimination of tariffs for agricultural products. This is important because agricultural products are the ones that Guatemala exports the most. An example of this is the 2005 FTA with Taiwan, where tariff reductions were negotiated for coffee, sugar, cardamom, asparagus, capers, vegetable seeds, and other agricultural goods. Under the FTA with Chile, coffee, mangoes, and other tropical fruits enter Chilean territory duty-free.

6.4.4 Association Agreement between the European Union and Central America

On 29 June 2012 in Tegucigalpa, Honduras, a document was signed that formalizes the Association Agreement between the European Union (EU) and Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The signing of this document is the last administrative step that the governments must take; it finalizes the negotiating phase, which started in 2007. However, for the Agreement to enter into force, the Central American and European parliaments need to ratify it. It is expected that the Guatemalan parliament will do so by 2013.

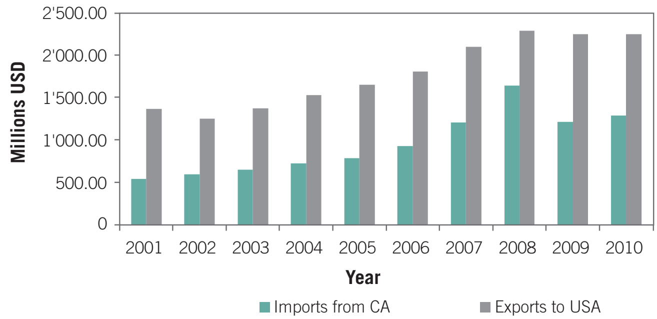
This is the first region-to-region agreement negotiated by the EU, and its content is based on three pillars: political dialogue, cooperation, and free trade. The agreement gives Central America the possibility of exporting with preferential access the following products, among others, to the EU: coffee, ethyl alcohol, cane sugar, cardamom, tobacco, ornamental greens, bananas, and molasses. In turn, Central America provides preferential access to European fertilizers, machinery and industrial equipment, cars, medicines, and petroleum products, among others. The EU grants immediate access to 60 per cent of the tariff headings, access in up to 10 years to an additional 17 per cent, and to 5.23 per cent under tariff-rate quotas. Central America grants immediate access to 34 per cent of the tariff headings, access in up to 15 years to an additional 36 per cent, access through tariff-rate quotas to 2.37 per cent, and no preferential access to 27.18 per cent.

The Agreement also includes provisions on trademark and other intellectual property rights (e.g. geographical indications, industrial designs, patents, and plant varieties) and provisions to safeguard these rights.

6.4.5 Trade of agricultural goods between Central America and the USA

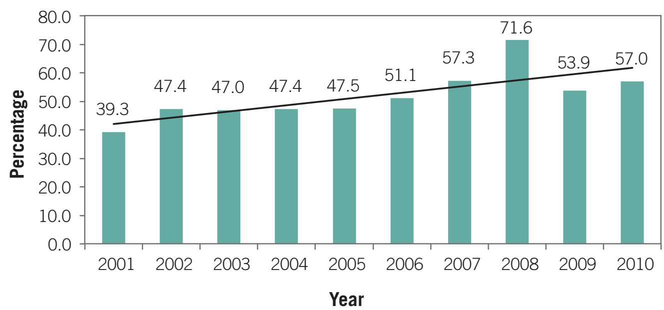
The balance of trade between Central America and the USA for agricultural products is in favour of Central America, as figure 6.10 shows. According to SIECA data, in 2010 the total value of Central American agricultural imports from the USA was US$ 1,282.71 million, while the total value of Central American agricultural exports to the USA was US$ 2,249.06 million.

Figure 6.10: Trend in foreign trade of agricultural products between Central America (CA) and the USA, 2001–2010



Source: Authors' calculation using data from Consejo Monetario Centroamericano.

Figure 6.11: Ratio of Central American agricultural imports from the USA to Central American agricultural exports to the USA, 2001–2010

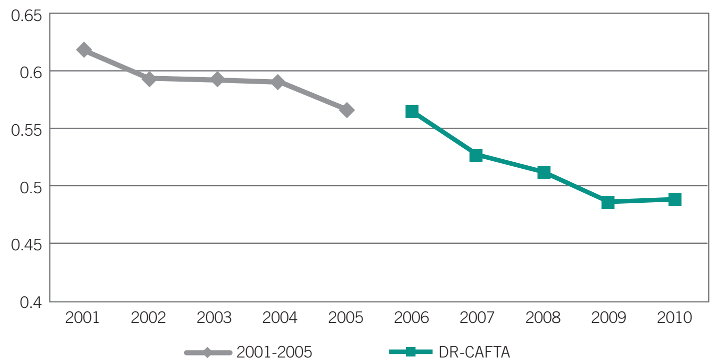


Source: Authors' calculation using data from Consejo Monetario Centroamericano.

The case of agricultural products is unique, for generally the balance of trade favours the USA. For example, SIECA data show that, for metal products and manufactures, Central America imports from the USA five times more than it exports to the USA. However, the trends in agricultural trade between the two regions show that Central America's imports are growing faster than its exports. Central America is demanding more agricultural products from the USA, not only in value but in share as well.

Agricultural products from the USA account for 6 per cent of the agricultural import market in Guatemala. In the period prior to the signing of the Agreement, the share was around 5.5 per cent; in the years after the ratification of DR–CAFTA in 2006 the share averaged 6.3 per cent.

Figure 6.12: Exports – Herfindahl Index, Guatemala, 2001–2010



Source: Authors' calculation using Banco de Guatemala data.

As figure 6.12 shows, Guatemala's exports became less concentrated in terms of products in the first decade of the 21st century. In 2001 the Herfindahl Index stood at 0.62, while in 2010 it had decreased to 0.49.[18] While the concentration of exports decreased throughout the decade, the decrease accelerated after DR–CAFTA came into force in 2006.

6.5 EFFECTS OF PREFERENTIAL TRADE AGREEMENTS ON AGRICULTURAL EMPLOYMENT IN GUATEMALA

6.5.1 Econometric model

6.5.1.1 Data

Guatemala has serious deficiencies regarding employment statistics. For example, information regarding the labour market in the past decade comes only from household surveys in 2004 and 2006. Furthermore, the findings of these two surveys are not comparable; the 2004 survey was an employment survey, whereas the 2006 survey was a survey of living conditions.

The lack of periodic statistical information makes it extremely difficult to construct a consistent historical series. This in turn hinders development of solid statistical models that would yield relevant results.

Due to the lack of more comprehensive information, the number of agricultural workers contributing to IGSS is used as the dependent variable and, as independent variables, the values of exports of traditional goods are used to determine the effects of foreign trade on agricultural employment. The data used for the dependent variable are those shown in figure 6.1.

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[18] The Herfindahl Index measures concentration. It is used here to determine export concentration. It was calculated by grouping products as follows: agricultural, livestock, mining, manufactures, and electricity. The grouping allowed calculation of the relative shares in total exports.

With the available information univariate[19] and bivariate[20] econometric models were constructed. They provide useful information on the effect of trade liberalization on formal agricultural employment and allow for analysis of the relationship between trade and employment before DR-CAFTA (2001–2005) and since (2006–2010).

6.5.1.2 Some results

The first model, the bivariate, assesses the change in the trend of formal agricultural employment after the entry into force of DR–CAFTA. The justification for looking only at this agreement is that, as noted (see specifically figure 6.8), trade in agricultural products between the USA and Central America accounts for more than 52 per cent of what Guatemala exports.

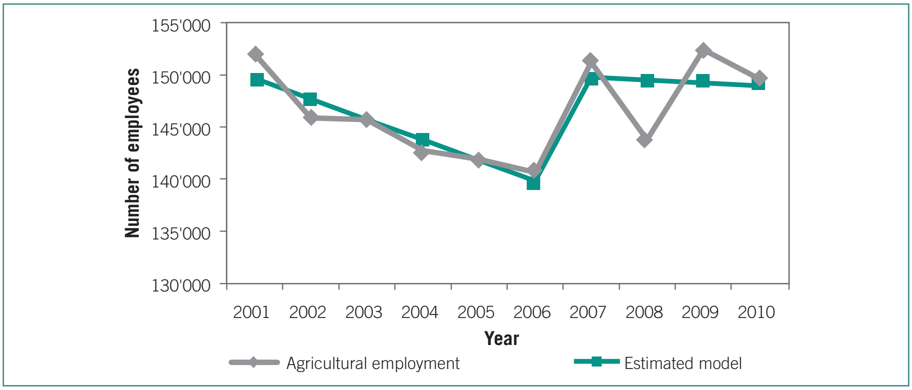
Specifically, the following model was run to determine if there is a change in the trend:

$$E_t = \beta_0 + \beta_1 t + \beta_2 Dt$$

Where E_t is the number of formal agricultural employees (according to IGSS data); t is time, and D is a dummy variable that takes the value of 1 for the years when DR–CAFTA was in force and 0 for the preceding years. The betas are the coefficients to be estimated.

The results of the model suggest that there was a change in the trend starting in 2006,[21] as seen in figure 6.13. Formal agricultural employment continued to decrease (except for the substantial increase between 2006 and 2007), but the slope of the decline was less steep than before DR–CAFTA (that is, the green line has a steeper negative slope for 2001–2006 than for 2007–2010).

Figure 6.13: Agricultural members of IGSS and modelled estimate of formal agriculturalemployment, Guatemala, 2001–2010



Source: Authors' calculation from IGSS data.

[19] Models with only one independent variable.

[20] Models with two independent variables.

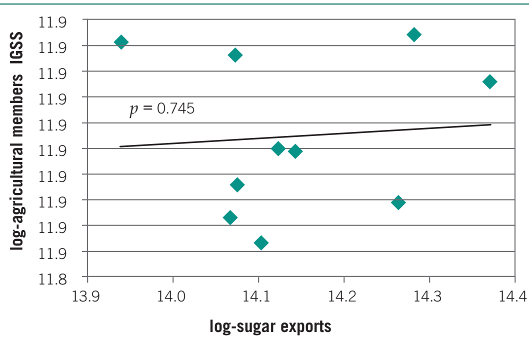
[21] The results of the regressions can be found in the Annex.

Next, we examined the relationship between formal agricultural employment and the volumes of traditional exports. Specifically, for each product (coffee, bananas, sugar, and cardamom), the following model was estimated:

$$\ln E_t = \beta_0 + \beta_1 \ln X_t,$$

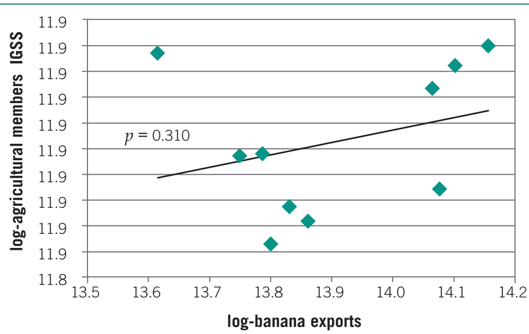
where E_t is the number of formal agricultural employees; X_t is the export volume for each product; and the betas are the coefficients to be determined. Natural logarithms were used to measure the elasticity of agricultural employment with the exports of each of the products. Figures 6.14 through 6.17 present scatter diagrams of these relationships (all the variables in logarithms) along with their respective statistical value of *p*.[22]

Figure 6.14: Relationship between membership of the IGSS in agriculture and sugar exports, Guatemala, 2001–2010, scatter diagram in logarithms



Source: Authors' calculation.

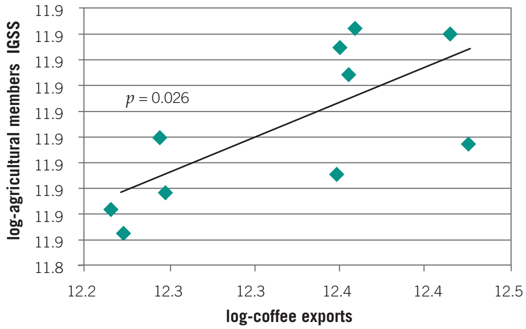
Figure 6.15: Relationship between membership of the IGSS in agriculture and banana exports, Guatemala, 2001–2010, scatter diagram in logarithms



Source: Authors' calculation.

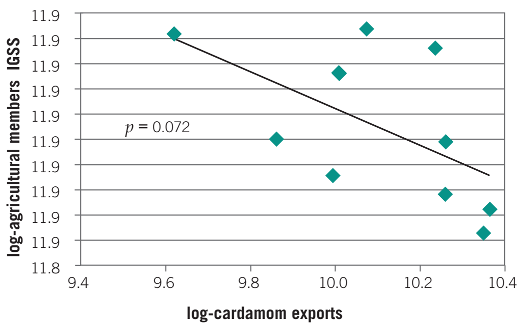
[22] A p-value above 10 per cent indicates that there is a probability above 10 per cent that the observed relationship between trade and employment is due to chance alone.

Figure 6.16: Relationship between membership of the IGSS in agriculture and coffee exports, Guatemala, 2001–2010, scatter diagram in logarithms



Source: Authors' calculation.

Figure 6.17: Relationship between membership of the IGSS in agriculture and cardamom exports, Guatemala, 2001–2010, scatter diagram in logarithms



Source: Authors' calculation.

From the estimates it can be inferred that formal agricultural employment is sensitive only to coffee exports and cardamom exports if a cut off rate of 10 per cent is used. The relationship is positive in the case of coffee and negative in the case of cardamom. For the other two variables, no relationship could be established. The results of the estimations provide the following scenario: The signing of DR–CAFTA improved formal employment by moderating the negative trend that this variable had exhibited during the first half of the decade. The agricultural export that most contributed to job creation was coffee.

6.5.2 Social Accounting Matrix

A social accounting matrix (SAM) is a broad framework of economic data that represents the economy of a nation. It is set out like a square matrix whose value lies in double entry bookkeeping; debits in any account are reflected along a row, while the credits for the same account are reflected in a column.

For the different national accounts, a SAM reports information on production, local and international demand, and the components of value added (i.e., wages, capital return). It includes households as an important component of the economy.

Because of their versatility, these types of matrices are used to determine the possible economic effects of public policies and external shocks. Additionally, the matrices are essential for the calibration of a computable general equilibrium (CGE) model, a tool that is increasingly being used for macroeconomic simulations.[23]

Constructing a SAM for a developing country is not an easy task; sufficient information must exist about production and consumption of goods and services, government income and its expenditure, balance of payments, and household incomes (all this with a high level of disaggregation). Furthermore, the availability of this information is not sufficient for the construction of a SAM; also, the information must be consistent, or else it is impossible to construct a balanced matrix.

6.5.2.1 Social Accounting Matrix Used

For this study a macroeconomic SAM and a microeconomic SAM were constructed, using the matrices developed by Cabrera et al. (2009) from the Instituto Centroamericano de Estudios Fiscales (ICEFI). However, to satisfy the objectives of the study, several changes were made to the SAMs published by the ICEFI. The main modification was to value transactions within the rows and columns of activities and products using 'basic prices'. This modification allows for a homogeneous valuation of intermediate and final demand for domestic products, as Pyatt and Thorbecke (1976) recommend. The formula for basic prices used is as follows:

> *Basic price = buyer's price − product taxes with subsidies deducted − commercialization margins − transport margins − public service (electricity, water, gas) margins.*

Table 6.10 presents the macroeconomic matrix used in this analysis.

[23] According to the document *Computable General Equilibrium: Description of the methodology (Equilibrio General Computado: Descripción de la metodología)* (Cicowiez and Di Gresia, 2008):

A general equilibrium model captures the interrelationships between different sectors of an economy, allowing for the analysis of direct and indirect effects because of an exogenous change in policy. This makes it an ideal tool to identify winners and losers after a policy change. In a general equilibrium analysis the entire economy is modeled, while in a partial equilibrium analysis only the situation of a particular market, assuming constant conditions in other markets of the economy, is analysed.

Table 6.10: Macroeconomic Social Accounting Matrix, Guatemala, in millions of Guatemalan Quetzales (GTQ), 2006

SAM	Activity primary sector	Activity industrial sector	Activity services sector	Commodity primary sector	Commodity industrial sector	Commodity services sector	Factor labour	Factor capital	Households	Firms	Government	Social services	Savings and investment	Change in inventory / stock	Taxes and soc. sec. contributions	Rest of the world	Total
Activity primary sector				55'458.40	0.0	128.2											55'586.60
Activity industrial sector				406.8	143'952.80	2'896.90											147'256.50
Activity services sector				166.3	642.2	272'479.70											273'288.20
Commodity primary sector	1'183.93	15'159.58	1'903.36						28'174.70				28.9	611.8		12'964.50	60'026.80
Commodity industrial sector	7'366.36	45'089.44	34'877.68						96'503.80		878.0	0.0	24'495.70	725.6		34'210.0	244'146.50
Commodity services sector	17'681.85	43'838.13	96'671.28						76'979.60		17'158.90	1'236.40	21'423.30	369.1		9'991.50	285'350.10
Factor labour	19'530.60	26'895.90	72'023.30													155.1	118'604.90
Factor capital	9'480.30	15'452.0	64'802.80														89'735.10
Households							118'576.20			73'661.10	5'224.0	967.7				30'600.90	229'029.90
Firms								89'699.80	3'859.20		1'303.40					1'848.50	96'710.90
Government								35.4	5'352.60	3'543.90					26'474.60	1'128.60	36'535.10
Social services															4'124.70		4'124.70
Savings and investment									11'749.30	13'164.40	9'420.0	1'920.60				11'400.0	47'654.40
Change in inventory/stock													1'706.50				1'706.50
Taxes and soc. sec. contributions	343.6	821.4	3'009.70	432.2	13'368.30	3'661.90			6'023.10	2'939.0							30'599.30
Rest of the world				3'563.0	86'183.30	6'183.50	28.7		387.5	3'402.50	2'550.80						102'299.20
Total	55'586.60	147'256.50	273'288.20	60'026.80	244'146.50	285'350.10	118'604.90	89'735.10	229'029.90	96'710.90	36'535.10	4'124.70	47'654.40	1'706.50	30'599.30	102'299.20	

For the products analysed, the values of intermediate inputs and factors of production (i.e. labour and capital) can be found in the SAM shown in table 6.11.

In table 6.11 it can be observed, for example, that, for the generation of GTQ 16,200 million (US$ 2,247 million) of agricultural products, GTQ 7 million (US$1 million) of cereals, GTQ 102 million (US$ 14 million) of sugar plants, and GTQ 75 million (US$ 10 million) of non-traditional crops are used, while the qualified workers in the informal sector receive GTQ 303 million (US$ 42 million) in wages and the

Table 6.11: Microeconomic Social Accounting Matrix, Guatemala, agriculture and Livestock Sector, in millions of Guatemalan Quetzales (GTQ), 2006

SAM	Activity agriculture	Activity livestock	Activity bananas	Activity coffee
Commodity traditional crops	0	0	0	0
Commodity bananas	0	0	0	0
Commodity coffee	0	0	0	0
Commodity cereals	7	3	0	0
Commodity sugar cane	102	0	0	0
Commodity non traditional crops	75	57	0	7
Commodity livestock	0	383	0	0
Commodity petroleum	0	0	0	0
Commodity mining	0	21	0	0
Commodity food	0	1'019	0	0
Commodity sugar	0	59	0	0
Commodity textiles	0	1	0	0
Commodity petroleum products	0	0	0	0
Commodity other manufactures	1'057	347	179	148
Commodity construction	0	238	12	0
Commodity hotels	0	0	0	0
Commodity education	0	0	0	0
Commodity health	0	0	0	0
Commodity other services	312	1'214	54	167
Commodity public administration	0	0	0	0
Labour qualified informal male	302.8	177.4	9.3	165.5
Labour qualified formal male	414.0	242.6	12.7	75.5
Labour qualified informal female	41.2	24.1	1.3	28.4
Labour qualified formal female	128.0	75.0	3.9	19.1
Labour non-qualified informal male	7'340.10	4'300.60	225.9	1'529.80
Labour non-qualified formal male	892.4	522.9	27.5	317.3
Labour non-qualified informal female	387.1	226.8	11.9	127.1
Labour non-qualified formal female	157.1	92.1	4.8	20.0
Capital	2'843.0	2'644.10	1'579.90	708.0
Taxes production activity	49.9	16.8	1.6	2.5
Taxes value added	0.0	0.7	0.0	0.0
Taxes imports	42.4	30.4	4.4	6.0
Taxes commodity	38.1	26.1	2.7	10.2
Taxes direct				
Social security contributions	43.5	37.8	36.8	21.9
Subsidies on commodities	0.0	0.0	0.0	0.0
Rest of the world	1'967.30	927.1	222.5	323.4
Total	16'199.70	12'686.20	2'390.30	3'677.0

Source: Authors' calculation.

qualified workers in the formal sector receive GTQ 414 million (US$ 57 million). Additionally, the employers receive GTQ 2,843 million (US$ 394 million), and the government receives through indirect taxes GTQ 50 million (US$7 million) and through import taxes GTQ 42 million (US$6 million). GTQ 1,967 million (US$ 134 million) in agricultural products is imported from the rest of the world.

6.5.2.2 Procedure for compiling the SAM

The starting point for compiling the SAM was assessing the structure and the information in the SAM produced by the ICEFI. The structure of the ICEFI SAM is based on National Accounts in the quadrants of economic information, with a focus on production and consumption.

The matrix consists of 13 activities, as listed in Table 6.12.For products the level of detail is greater; 20 products and services are included. In the quadrants of additional information, the matrix includes eight breakdowns of employment, i.e. reflecting payments to the factor labour, and one aggregate reflecting payment to the factor capital.

Additionally, the ICEFI SAM includes a quadrant for poverty analysis, breaking down households into six categories and government into two categories to allow for the analysis of social insurance. The matrix also has a quadrant for saving and investment, and, finally, it includes a quadrant broken down into taxes and employees' contributions to the social insurance programme. In summary, the ICEFI SAM is a matrix with a fiscal, poverty, and employment focus. This last characteristic favoured its use for the analysis, by means of a generalized Leontief model based on the SAM, of the impact that the DR–CAFTA has had on agricultural employment.

Table 6.12: Employment matrix, Guatemala, 2006

Activity	Qualified				Non-qualified				Total employed
	Formal sector		Informal sector		Formal sector		Informal sector		
	Male	Female	Male	Female	Male	Female	Male	Female	
Activity Agriculture and Livestock	38'253	4'525	15'168	2'593	1'173'217	276'421	92'342	13'432	1'615'952
Activity Coffee	3'869	542	2'308	286	112'228	27'269	18'820	1'190	166'512
Activity Mining	193	-	2'753	-	2'743	196	1'561	28	7'474
Activity Food	10'080	12'367	27'677	8'479	36'547	107'366	44'035	11'431	257'983
Activity Textiles	8'004	11'147	19'720	19'892	53'667	124'221	73'086	60'579	370'315
Activity Petroleum	933	263	3'855	8'057	1'676	2'216	3'750	3'911	24'661
Activity Other Manufactures	26'582	3'030	26'187	3'338	64'935	28'293	37'446	8'486	198'297
Activity Construction	22'725	847	24'618	3'307	211'814	475	87'679	1'215	352'681
Activity Hotels	4'753	12'123	12'941	8'168	8'650	77'695	13'876	12'527	150'733
Activity Education	5'230	9'474	62'086	127'506	511	1'224	5'360	7'970	219'361
Activity Health	1'920	4'310	19'085	31'893	1'826	9'528	2'545	10'317	81'424
Activity Other Services	122'065	116'034	218'992	102'375	351'733	704'338	151'406	25'341	1'792'283
Activity Public Administration	143	618	59'889	27'429	135	44	35'115	4'775	128'148

Source: Instituto Centroamericano de Estudios Fiscales (ICEFI).

Based on the relationships between tables 6.11 and 6.12, the labour requirements, expressed as a technical coefficient, were established for each activity by dividing the number of workers in the activity by the millions of GTQ produced each year, resulting in an employment ratio for each activity. This ratio, multiplied by the vector resulting from the shock in the agricultural sector, yields the number of jobs created, if positive, or the number of jobs lost, if negative.

6.5.2.3 Exogenous vector

To calculate the exogenous vector, the average annual growth in agricultural export volumes before and after DF–CAFTA was used. The average annual growth rates in the export volumes of coffee, sugar, and bananas before and after the Agreement are shown in table 6.13.

Table 6.13: Growth rates in volume of agricultural exports

Product	Average annual growth rate before DR–CAFTA (2000–2006)	Average annual growth rate after DR–CAFTA (2007–2011)
Coffee	–5.1	0.3
Sugar	2.0	11.6
Bananas	5.4	–0.2

Source: Authors' calculation from Banco de Guatemala data.

With this information the exogenous vector for exports was calculated, as shown in table 6.14:

Table 6.14: Exogenous vector for exports, Guatemala

SAM	Impact vector			
	Activity banana	Activity coffee	Activity food	Activity agriculture
Commodity traditional crops	–	–	–	–
Commodity bananas	–89	–	–	–
Commodity coffee	–	183	–	–
Commodity cereals	–	–	–	–
Commodity sugar cane	–	–	–	–
Commodity non traditional crops	–	–	–	234.40
Commodity livestock	–	–	–	–
Commodity petroleum	–	–	–	–
Commodity mining	–	–	–	–
Commodity food	–	–	–	–
Commodity sugar	–	–	208.81	–
Commodity textiles	–	–	–	–

Source: Authors' calculation

The information on imports shows that the impact vector is significant only for cereals, sugar, and non-traditional products. The behaviour of those imports was obtained using information from the Clasificación según Uso o Destino Económico (CUODE) specifically for the imports from the USA. The data reveal an average growth of 5.1 per cent for imports. The resulting impact of import growth was assumed to be negative on domestic production. The exogenous import vector was calculated and is shown in table 6.15.

Table 6.15: Exogenous vector for imports, Guatemala

SAM	Impact vectors		
	Commodity cereals	**Commodity non traditional crops**	**Commodity sugar**
Commodity traditional crops	–	–	–
Commodity bananas	–	–	–
Commodity coffee	–	–	–
Commodity cereals	–70.40	–	–
Commodity sugar cane	–	–	–
Commodity non traditional crops	–	–38.20	–
Commodity livestock	–	–	–
Commodity petroleum	–	–	–
Commodity mining	–	–	–
Commodity food	–	–	–
Commodity sugar	–	–	–0.67
Commodity textiles	–	–	–

Authors' calculation

6.5.2.4 Results of the SAM simulation

Taking into consideration, as shocks triggered by DR–CAFTA, the change in the growth of agricultural exports, the analysis finds that 25,900 agricultural jobs were created in 2006. This represents a 1.6 per cent growth in total agricultural employment. Also, 9,800 indirect jobs were created, which represents an increase of 0.3 per cent. On the other hand, according to the results of the simulation of the growth in agricultural imports, DR-CAFTA eliminated a total of 8,400 jobs annually, of which 6,900 were agricultural jobs and 1,500 were jobs in other sectors. Using results from both simulations and taking into consideration the unemployment rate of 3.5 per cent according to ENEI (2010), the overall impact of the Agreement on employment is still positive.

Relating the previous results to those from the econometric regression, it can be observed that DR–CAFTA improved formal agricultural employment in Guatemala. This is attributable partly to the increase in exports of coffee (the only product that had an effect on formal employment) and partly to other factors that indirectly affect agricultural employment that were not taken into consideration in this study, such as exports of non-traditional products.

As for impacts by sub-sector, the textile industry is one of the main beneficiaries of the Treaty; employment generated in this sector amounts to an increase in employment of 35.7 per cent. The services sector benefited from an even greater increase, of 37.5 per cent.

6.6 AGRICULTURAL LABOUR LEGISLATION AND TRADE UNIONS

6.6.1. Constitutional legislation

Guatemala has a well-developed labour legislation that regulates the relationship between employers and employees. In its discussion of the constitutions and labour codes of Central American countries, the so-called White Book (Libro Blanco) (Grupo de Trabajo, 2005) indicates that Guatemala's codes are fulfilling the fundamental obligations set out by the International Labour Organization (ILO).

Guatemalan labour legislation reflects the emphasis on protection of workers' rights that characterized Latin American labour legislation during the first decades of the 20th century. For Latin American labour law, the principle of protection or guardianship is basic and central. "Labour law must be protective or there is no reason for its existence," says a prominent Uruguayan labour lawyer (Ermida, 2011).

Starting in the 1970s, some reforms took place aiming to remove the rigidities that restrained competitiveness and job creation. These reforms, according to their promoters, made the legislation more flexible and reduced its protective nature.

However, a significant part of workers' rights law is found in the Constitution. Modifying the Constitution is difficult, and thus the protective nature has been preserved.

The 1985 Constitution, in Chapter II, "Social Rights", has a section devoted to labour (articles 101 to 106). Article 101, of the section on health, safety, and social assistance, has provisions relating to social insurance.

Article 102 lists 21 minimum social rights, on which labour legislation is based: free choice of employment; equal remuneration; regular adjustments of the minimum wage; limits on day, night, and mixed working hours; overtime compensation; paid weekly day off; annual bonus payment (13th month or Christmas wage); paid maternity leave of 85 days; minimum age for work; compensation of one month per year of service in the event of unjustified dismissal; and the right to organize unions, among others.

Other provisions in that section refer to the guardianship or protective character of labour laws; the right to employee strikes; the impossibility of renouncing rights granted by the law; the protection and encouragement of collective bargaining; and that the law will be interpreted *in dubio pro operario* (that is, in case of doubt, in a sense that favours the worker).

In addition, Article 4 of the individual rights chapter states that no person may be subjected to servitude. Article 69 is devoted to agricultural workers particularly, mandating that "jobs requiring the transfer of workers outside their communities should be protected by legislation to ensure the proper health, safety and welfare, to prevent wage payment contrary to the law, the disintegration of these communities and generally all discriminatory treatment".

Social insurance is recognized as a right and a public function, which is obligatory; financed jointly by the government, employers, and employees. Its application is the responsibility of the IGSS, an autonomous entity in whose management are representatives of both employers and employees.

6.6.2. International legislation

Domestic labour legislation is complemented and reinforced by the 72 international conventions on labour that Guatemala has ratified,[25]among them the eight conventions that the ILO considers fundamental (those relating to the elimination of forced labour, freedom to form unions and collective bargaining, elimination of discrimination, and the abolition of child labour) and four priority conventions (Convention 81 and 129 on labour inspection, 144 on tripartite consultation, and 122 on employment policy).

The following ratified conventions are particularly relevant for agricultural employment: C97 concerning migrant workers, C99 concerning the methods of determining the agricultural minimum wage, C101 concerning agricultural paid leave, C110 concerning plantations, and C141 concerning rural workers' organizations.

Another mechanism, derived from international agreements, that may contribute to better compliance with labour legislation is Chapter 16 (Labour) of DR–CAFTA. In Article 16.2 each party agrees not to "fail to effectively enforce its labour laws, through a sustained or recurring course of action or inaction, in a manner affecting trade between the Parties" and to recognize that "it is inappropriate to encourage trade or investment by weakening or reducing the protections afforded in domestic labour laws".

For the application of Chapter 16, "labour legislation" is intended to refer to labour rights as recognized internationally: a) the right of association; b) the right to organize and negotiate collectively; c) prohibition of the use of any form of forced or compulsory labour; d) a minimum age for the employment of children and the prohibition and elimination of the worst forms of child labour, and e) acceptable conditions of work with respect to minimum wages, hours of work, and occupational safety and health.

6.6.3 Labour Code

Legislation relating to labour is found in the Labour Code (Decree No. 1441). The code was issued in 1961. It has since been the object of many reforms. The most

[25] Article 46 of the Constitution establishes that, concerning human rights, the treaties and conventions ratified by Guatemala have preeminence over domestic laws. However, the Constitutional Court has pointed out that these international instruments do not have preeminence over constitutional provisions (Judgement of 31/10/2000 and Resolution No. 18–05–95).

profound of these reforms came in 1992 and 2002, with the objective of addressing the observations made by the Commission of Experts in Application of Conventions and Recommendations of the ILO.

The laws contained in the code, applicable to any work relationship and thus to agricultural activities, include the provision that all employment contracts are indefinite unless otherwise stated (although fixed-term contracts should remain an exception). Also, the contract may be verbal in the case of farming or ranching. In the absence of a written contract the terms affirmed by the employee are taken as true, unless proven otherwise.

Regarding collective negotiations, a collective agreement on working conditions takes a legal character in that its provisions must apply to all contracts, individual or collective, to which the employer is a party. Any employer that has more than 25 per cent of its employees affiliated with a union must negotiate a collective agreement when requested. To establish itself, a union must have at least 20 members. The workers that form the union may not be dismissed from the moment that they notify the General Labour Inspectors and for a 60-day period after the registration of the union.

Wages can be set per unit of time or task or as profit-sharing, and all workers are entitled to earn a minimum wage. The normal working hours may not exceed 8 hours per day or 48 hours a week, and paid leave cannot be less than 15 working days annually.

There are also rules for work subject to special regimes, which may have a lower or higher level of protection. One of these concerns agricultural workers and farmers. Article 139 states that the work done with the consent of the employer by women or children, as helpers or complementing the work performed by the head of a household, gives them the character of workers and entitles them to be considered bound to the employer by an employment contract. This provision aims to support workers who move, accompanied by their families, for the harvest of certain crops, especially coffee.

There are also rules to regulate the activity of representatives of employers or intermediaries to recruit workers. Also, Article 145 states that agricultural workers are entitled to living accommodations that meet the conditions for hygiene and sanitation laid down in the regulations.

6.6.4 Compliance with labour legislation

The biggest problem with labour legislation is non-compliance. Non-compliance is probably more common with labour law than with most other legislation. “By acting as a correction to reality, employment law is more exposed than others to non-compliance and needs assurance mechanisms to ensure its effectiveness, such as labour inspection, justice and specialized process, collective self-protection and possibly an application of criminal law to situations of noncompliance” (Ermida, 2011).

The poor performance of these mechanisms in Guatemala today allows a high level of impunity for employers in areas such as payment of minimum wages, social security coverage, health conditions and hygiene at work, the limit on hours of work, and, crucially, the right to freedom of association and collective negotiation.

According to 2010 data from ENEI, 74 per cent of rural employees and 96 per cent of labourers had a yearly income below the minimum wage for agriculture (GTQ 1930, or US$ 240). Only one of every six employees had a written contract, and 88.3 per cent of the economically active population was not covered by social insurance (Linares, 2012).

The non-compliance problem is recognized in the White Book: "Some of the major concerns that have been expressed about the region refer to the degree of compliance with laws relating to formation of trade unions, freedom of association and labour relations". The book adds that "closely linked with those concerns are aspects related to inspection and compliance" (Grupo de Trabajo, 2005).

After repeated complaints of non-compliance with the rights recognized in the Labour Chapter of DR–CAFTA, the Office of the United States Trade Representative requested in August 2011 the establishment of an arbitration panel, in accordance with the requirements set out in the Dispute Settlement chapter (Alvarez, 2011).

6.6.5 Trade unions in the agricultural sector

As mentioned before, the Constitution, the Labour Code, and international conventions grant the right to form unions and negotiate collectively. Unions may take the form of craft unions – made up of workers or employers in the same trade or profession – or of enterprise unions.

According to ENEI 2010 data, only 0.79 per cent of the economically active rural population and just 1.6 per cent of the entire economically active population belong to unions. The presence of trade unions in the agricultural sector is limited to the banana plantations in the department of Izabal, some coffee plantations in the departments of San Marcos and Quetzaltenango, and one sugar mill of the 12 that are active in the country. It can be assumed that the main reason for the low level of union membership are anti-union practices, open or subtle, that many companies use and the lack of effectiveness of the rules and institutions to guarantee the exercise of this fundamental right.

It is sometimes argued that many workers choose not to participate in unions because the institution itself is discredited. However, in a public opinion survey conducted by ASIES in the first half of 2012, 56 per cent of employees surveyed said that they considered unions to be good for workers, and 46 per cent said that they are good for society.

Due to the small number and size of unions, collective negotiation has limited coverage. For example, in 2008 the Ministry of Labour and Social Welfare approved 15 collective agreements, only three of which were in the agricultural sector (Linares, 2012).

The largest federations of agricultural unions are three. One is the Unión Guatemalteca de Trabajadores (UGT), which includes the Federación de Trabajadores Campesinos y Urbanos (FETRACUR), with five agricultural unions; the Central de

Trabajadores del Campo, with five unions; and the Federación de Trabajadores de Alimentos, Agroindustria y Similares (FESTRAS), with an agribusiness union.

The second consists of the unions affiliated to the International Trade Union Confederation (ITUC) and the Confederación Sindical de Trabajadores y Trabajadoras de las Américas (CSA), including the Central General de Trabajadores de Guatemala (CGTG), founded in 1999, with three agricultural unions; the Confederación de Unidad Sindical de Guatemala (CUSG), with three, including the Sindicato de Trabajadores Bananeros de Izabal (SITRABI), which is probably the union with the largest membership in the private sector, and the Unión Sindical de Trabajadores de Guatemala (UNSITRAGUA), with eight members including the Sindicato de Trabajadores del Ingenio Palo Gordo.

The third block is composed of the Movimiento Sindical, Indígena y Campesino de Guatemala (MSICG), which includes trade unions and peasant and indigenous sector groups set up as civil associations.

Added to this are the rural organizations dedicated to ensuring access to land, requesting legislation to promote rural development, and opposing the establishment of mines and hydroelectric power plants. These organizations have a great capacity for mobilization. They frequently organize marches that converge on the capital from across the country.

The three most important rural organizations, because of their ability to apply political pressure by mobilizing large groups of peasants, in chronological order of their founding, are: the Comité de Unidad Campesina (CUC), founded in 1979 and a victim of repression as a result of the armed conflict from 1960 to 1996; the Coordinadora Nacional de Organizaciones Campesinas (CNOC), which was founded in 1992 by the CUC in order to bind together the other peasant organizations; and the Coordinadora Nacional Indígena y Campesina (CONIC), which arose in 1992 as a division of the CUC. The two coordinating organizations (CNOC and CONIC) are composed of numerous grassroots organizations and of second level coordinating and alliance organizations (Menchú and Gamazo, 2012).

6.7 CONCLUSIONS AND RECOMMENDATIONS

6.7.1 Conclusions

This study has noted that the productivity of the domestic agricultural sector is very low. This economic activity employs many workers but generates little value added. One reason for this low productivity may be that workers have little education, which also results in very low incomes and a high level of poverty. In contrast, the average employer in the agricultural sector is not poor. Employers' incomes far surpass those of workers.

Another relevant fact is that the importance of the export of non-traditional products has grown in the last 20 years. Some possible reasons for this phenomenon are trade liberalization, tariff reduction, and increases in national production. Overall, export concentration – as measured by the Herfindahl index, has decreased since the signing of DR-CAFTA. Geographical concentration may have increased, though. More than half of agricultural exports go to the US and Central America, which could expose this sector to risks if sudden changes occurred in these markets. On the import side US agricultural products accounted for an average of 5.5 per cent of the Guatemalan market prior to the treaty and 6.3 per cent after its ratification.

Evidence suggests that the trend in agricultural formal employment changed after Guatemala ratified the DR–CAFTA in 2006. This change amounted to a reduction in the rate of decline in this type of employment compared with that experienced in the first half of the last decade. The volumes of exports of sugar, bananas, and cardamom were not related positively to the number of formal employees in the agricultural sector, and so the increase in employment in these sub-sectors must be due to factors other than the performance of these exports. In contrast, increases in coffee exports did appear to create greater formal agricultural employment.

Interestingly, although the volume of some agro-industry exports such as sugar increased significantly after implementation of DR–CAFTA, this improved performance has not translated into growth in formal agricultural employment in these sub-sectors. The growth in the volume of these exports could reflect the fact that these activities are intensive in the use of capital and not of labour.

Still, the signing of DR–CAFTA and its impact on the volume of traditional exports did generate jobs, mostly informal, leading to a net positive effect on overall employment in the simulations. The SAM methodology shows that exports of traditional products increased due to DR–CAFTA, and that this increase had a positive but not very significant effect on agricultural employment or employment in other sectors. Specifically, the increase in exports of traditional agricultural products following the ratification of DR–CAFTA created an estimated 25,900 or so new jobs.

At the same time, banana exports declined after DR–CAFTA came into force which, according to the SAM simulations, affected employment negatively in a number of agricultural sectors. Overall around 8,400 jobs were destroyed in agriculture which, taking into account the 25,900 jobs that were created, implies an estimated net increase of 17,500 jobs in the sector since Guatemala's entry into DR–CAFTA. Overall, therefore, the results of econometric modelling and of the SAM simulation are consistent in the sense that the effect of DR–CAFTA on agricultural employment has been modest.

Existing labour law covers the fundamental aspects of labour relations. Its main provisions are embodied in the Constitution. The laws are strongly protective of workers, consistent with the principles of Latin American labour law. Generally, the laws cover all workers, urban and rural, agricultural and in other sectors, and have provisions giving special protection to agricultural workers. Also, Guatemala has ratified many international labour conventions. Non-compliance with labour standards is widespread, however, in both the urban and rural sectors.

Trade union organization is weak due to the limited capacity of the authorities to ensure the effective respect of workers' rights to freedom of association and collective bargaining. Additionally, there is division among the unions, which hinders their ability to defend workers' rights and to influence public policy related to labour.

6.7.2 Recommendations

The limited statistical information on employment did not allow the construction of econometric models that would provide a clearer understanding of the relationship between trade and employment. It is recommended, therefore, to continue improving the national statistical system.

Information presented in this study shows that the number of workers affiliated to the social security system declined during the first decade of this century, despite population growth and substantial improvement in agribusiness exports. This decline shows how vulnerable this group of employees is. Well-directed actions need to improve monitoring and compliance with employers' obligation to enrol their employees in the social insurance programme.

Finally, due to DR–CAFTA's limited effects on formal agricultural employment, it may be desirable to implement other policies that promote the creation of decent jobs in agriculture. In this regard, the actions recommended in Chapter 3 of the Peace Accords (Acuerdo sobre Aspectos Socioeconómico y Situación Agraria de los Acuerdos de Paz) of 1996 could be useful.

ANNEX: RESULTS OF THE REGRESSIONS

Table 6.A.1: Change of trend model results

	Coefficients	Standard error	*p*
Constant	151 619.9	2 567.3	0.000
Tendency	–1 978.2	662.9	0.020
Cross effect	1 709.9	450.8	0.007

Dependent variable: formal agricultural employment
Number of observations: 10
$R^2 = 0.825$

Table 6.A.2: Agriculture employment – banana exports elasticities

	Coefficients	Standard error	*p*
Constant	137 843.38	8 160.121	0.000
Bananas	0.008	0.007	0.310

Dependent variable: formal agricultural employment
Number of observations: 10
$R^2 = 0.091$

Table 6.A.3: Agricultural employment – coffee exports elasticities

	Coefficients	Standard error	*p*
Constant	107 634.92	14 317.729	0.000
Coffee	0.173	0.063	0.026

Dependent variable: formal agricultural employment
Number of observations: 10
$R^2 = 0.499$

Table 6.A.4: Agricultural employment – cardamom exports elasticities

	Coefficients	Standard error	*p*
Constant	158 551.88	5 912.435	0.000
Cardamom	–0.480	0.231	0.072

Dependent variable: formal agricultural employment
Number of observations: 10
$R^2 = 0.3282$

Table 6.A.5: Agricultural employment – sugar exports elasticities

	Coefficients	**Standard error**	***p***
Constant	142 510.97	12 116.687	0.000
Sugar	0.002	0.008	0.745

Dependent variable: formal agricultural employment
Number of observations: 10
$R^2 = 0.0068$

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7. TRADE, PRODUCTIVITY, AND EMPLOYMENT LINKAGES IN INDONESIAN AGRICULTURE

Rina Oktaviani and David Vanzetti

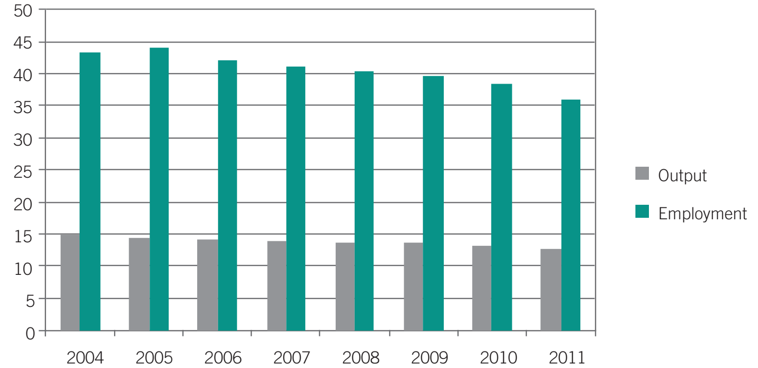
7.1 INTRODUCTION

Informality characterizes agricultural employment in Indonesia, as in other developing countries. Informal labour markets tend to be marked by the absence of regulations, low productivity, and underemployment or disguised unemployment. The absence of regulations implies that minimum wage and labour standards are relatively ineffective, although agricultural wages move with wage rates in the non-agricultural sector. Unpaid family work and child labour are also features of the agricultural sector. In contrast to manufacturing, agricultural production is tied to land, and the product tends to be very substitutable with the products of competing exporters in other countries. These facts have implications for the impact of trade and trade liberalization on employment and wages.

This chapter reviews the linkages between trade and employment in Indonesian agriculture and quantifies these links. In particular, we are interested in whether trade liberalization might increase unemployment or decrease wages in the Indonesian agricultural sector and in how effectively different labour market policies might introduce complementary approaches to improve outcomes for rural workers. Rather than limiting trade in an attempt to protect jobs, complementary approaches seek to improve the productivity of labour or to enhance the skills of workers to make them more employable and better able to move from declining to expanding industries.

In the remainder of this section, we describe the characteristics of the Indonesian labour market in agriculture and review previous trade shocks and their impact on employment. In the next section we look at alternative methodologies to assess employment impacts of policy changes and describe the use of general equilibrium models to analyse trade and employment issues. We then apply these models to several scenarios and analyse the findings. In the final section we discuss implications. The general conclusion is that the Association of Southeast Asian Nations (ASEAN)–China Free Trade Agreement (ACFTA) and a likely Doha Round outcome have a small beneficial effect on employment in agriculture, although some producers will be disadvantaged. Programmes to enhance labour productivity and skills are likely to prove beneficial as well.

Figure 7.1: Contribution of agricultural output and employment to the Indonesian economy (%)



Source: Indonesian Central Bureau of Statistics

The agricultural sector in Indonesia currently employs 36 per cent of the labour force, and yet in 2009 it produced only 14 per cent of the national output (CBS, 2010). Productivity remains low compared with other sectors in the economy, although in recent years agricultural output has been increasing faster than employment. In the years 2004 to 2009, agriculture's share of national output fell from 15 to 13.6 per cent (figure 7.1), while employment in the agricultural sector remained relatively stagnant in absolute terms.

Indonesia is becoming increasingly integrated into the world economy. Unlike many other developing countries, Indonesia has maintained a trade surplus, although this surplus has declined since 2007 (figure 7.2). The global financial crisis in 2008

Figure 7.2: Indonesian trade performance, 2005–2010

Source: Indonesian Central Bureau of Statistics reduced import demand from traditional markets such as the United States and the European Union, resulting in a massive decrease in the Indonesian trade balance. Afterwards, the global recovery and the implementation of ACFTA stimulated higher trade flows between ASEAN members and China. China is a significant source of imports to Indonesia. The bilateral data suggest that Indonesia faces a greater danger of a trade deficit than other ASEAN members, because of the large share of imports coming from China. Given Indonesia's current negative bilateral trade balance with China, it is feared that there will be an even bigger deficit as ACFTA is implemented, particularly in the agricultural sector. How the removal, through ACFTA, of protection on agricultural imports will affect the Indonesian agricultural sector has to be carefully assessed, given agriculture's crucial role in rural employment and poverty alleviation. A similar, although lesser, concern is the potential impacts of a Doha Round outcome.

When considering the likely employment effects of trade, one approach is to examine past episodes of liberalization and determine what happened to trade, employment, and wages. Econometric methods can help isolate cause and effect. However, varying lags make estimation difficult. Moreover, many variables are changing at the same time. These include foreign investment, technology, institutions, and macroeconomic shocks.

As industrial development progresses and the economy moves away from an agricultural to a more industrial and services-based economy, labour becomes scarce in the agricultural sector. The modern sector starts to absorb a significant share of the workforce, and, overall, real wages start to rise. There will be shifts from less to more capital- and skill-intensive industries, and at the same time the difference in wages between skilled and unskilled labour starts to narrow (Feridhanusetyawan, 1998). Studies showing a fall in employment in one sector are not very helpful. Policy-makers need to know the duration of unemployment and where the unemployed moved after leaving the declining industry.

Previous work on the response of the labour market in Indonesia to trade shocks relates to the Asian financial crisis of the late 1990s. Smith et al. (2002) use data from the National Labour Force Survey (SAKERNAS) and the Indonesian Family Life Survey (IFLS) to show that most of the adjustment in response to the large negative shock occurred through a fall in wages of between 35 and 40 per cent. This occurred for both males and females and for both rural and urban workers. By comparison, there was a relatively slight (0.3 per cent) fall in the number employed. The number of self-employed increased marginally, suggesting that wage earners who lost their jobs became self-employed. The average earnings of the self-employed also fell significantly – 67 per cent for urban males, although only 11 per cent for rural males. However, half of the self-employed males in the rural sector increased their earnings. Given the importance of the self-employed in the rural labour market, a focus on wage earners would be misleading. Smith et al. conclude that, contrary to commonly held views, the labour market proved remarkably flexible in response to the crisis. They do note, however, that the market appears more rigid for less skilled workers.

The Asian financial crisis was a large negative shock, affecting the whole economy. Trade shocks can equally well be positive, with an increase in demand for labour. In such circumstances it is interesting to know whether the adjustment occurs through higher wages or more employment. If full employment exists, the adjustment is likely to be through wages. If some unemployment exists, it is reasonable to expect adjustment primarily through quantity rather than prices.

Manning (2000) also concludes that flexible labour markets helped Indonesia deal with the 1997–98 crisis much better than anticipated. This flexibility meant that unemployment and the increase in poverty were much less than some had predicted. Manning also points to an increase in agricultural employment, driven by increasing prices for agricultural goods. Also, exportable commodities benefited from a dramatic fall in the exchange rate against most other countries.

Hill and Shiraishi (2007) note that today's labour market is in some respects less flexible than that of ten years ago. Minimum wages and severance pay entitlements have risen sharply, and employment regulations have become increasingly restrictive. Hill and Shiraishi contend that these developments have tended to encourage employment in the informal sector, where such requirements do not exist. Alisjahbana and Manning (2006) argue that the various measures to improve pay and conditions in the formal sector have had little impact on poverty. The poor are heavily concentrated in agriculture, which is largely informal and therefore little affected by such measures.

Meta-surveys of structural adjustment in the manufacturing sector (Matusz and Tarr, 1999) suggest that the one-off costs of adjustment are relatively low, especially in developing countries, where labour markets are more flexible. Akhmedov et al. (2005) sampled 53,000 enterprises in Russia and found that labour demand did not respond to the trade shocks that occurred between 1995 and 2002. They conclude, "Adjustment costs to expected trade liberalization in the form of changes in industrial labour demand should not be high" (p. 1). However, Francois et al. (2011) suggest that adjustment costs may be higher than previously thought. These studies focused on the industrial sector, however, rather than on agriculture, the sector of interest here.

Trade liberalization following the World Trade Organization (WTO), Asia–Pacific Economic Cooperation (APEC), and ASEAN Free Trade Area (AFTA) agreements caused some resource reallocations from primary sectors such as agriculture (paddy rice and other food crops) to manufacturing sectors (resource-based manufacturing), but these changes are difficult to discern amidst the rapid growth of the economy.

Policy-makers often think of employment as directly related to output. If this is correct, employment in agriculture can be predicted by looking at the effects of trade on output. Here the composition of trade matters. Employment will change if trade leads to a change in demand for labour-intensive versus capital-intensive goods.

A social accounting matrix (SAM) can be used to show the changes in demand for labour following a change in output. Table 7.1 shows the value of labour as a share of total output at market prices (excluding taxes and subsidies). For most primary products labour contributes about 10–30 per cent of the costs. Notable exceptions are rubber and tea. Livestock production, an activity often associated with poverty, has a relatively low labour share. Bear in mind that wages are low in agriculture, so the shares tend to understate the number employed compared with such shares in other sectors. The processing sector – for example, rice, flour, and sugar processing– seems to have lower labour shares in output. These industries may use more capital, but their output value also includes the cost of raw materials, such as paddy and cane sugar.

Table 7.1: Labour shares in the Indonesian economy (% of total output)

Sector	% share	Sector	% share
Primary products		**Processed products and services**	
Paddy	13.02	Food products	8.00
Maize	10.42	Vegetable oils and fats	12.09
Other cereals	10.11	Rice	4.46
Vegetables, fruit, nuts	16.41	Flour	9.20
Other crops	10.06	Sugar	8.68
Rubber	34.00	Other processed agriculture	10.07
Sugar cane	23.72	Beverages and tobacco	12.03
Coconut	14.39	Textiles and apparel	12.26
Oilseeds	17.48	Wood and paper products	11.36
Tobacco	18.95	Fertilizer and pesticides	24.49
Coffee	15.70	Chemicals	9.48
Tea	30.30	Refinery oil	15.09
Cloves	17.74	Rubber and plastics	9.43
Fibre crops	12.44	Cement	11.68
Other estate crops	11.11	Metal manufactures	6.18
Other agriculture	23.94	Machinery	8.17
Livestock	16.55	Transport equip	13.48
Ruminant meat	11.96	Manufactures	16.90
Non-ruminant meat	19.70	Utilities	26.52
Forestry	16.94	Construction	13.67
Fishing	14.52	Trade	15.45
Petrol and coal products	9.82	Hotels and restaurants	16.24
Other mining	28.67	Transport and communications	16.37
		Business services	15.28
		Services not elsewhere specified	36.72

Source: IndoLab database, calculated from 2008 input–output tables and 2005 social accounting matrix.

7.2 METHODOLOGY

Productivity in agriculture is low because labour is relatively unskilled (table 7.2) and the amount of capital used with labour is small (table 7.3). The IndoLab computable general equilibrium (CGE) model contains data on labour use by industry and household type for each of four occupation groups, namely, farmers, operators, administrators, and professionals. These four types of occupations are categorized as either unskilled (farmer and operator) or skilled (administrator and professional). The skill category classification depends mainly on the level of education.

The share of total employment in the agricultural sector for each type of occupation is shown in table 7.2. The number of workers employed in each sector is calculated from the value of wages divided by the wage rate. The value of wages comes from the Indonesian 2008 input–output tables and the 2005 social accounting matrix, while the wage data come from the National Labour Force Survey (SAKERNAS). The SAKERNAS wage data cover only nine sectors: agriculture; mining and quarrying; manufacturing; electricity, gas, and water; trade; hotel and restaurant; transportation and communications; finance; real estate, rent, and corporate services; and other services. Moreover, the wage data are not classified by occupation. Hence, the wages of farmers and operators are assumed to be identical in every agricultural sub-sector. This is a reasonable approximation because farmers and operators are considered unskilled labour. The wages of administrators and professionals in agriculture are assumed to be equal to their wages in the manufacturing sector. With data on value and wage rates, employment in the agricultural sector by occupation (farmer, operator, administrator, and professional) can be determined. Subsequently, we transform the information on employment by occupation (persons) into shares of each type of occupation in the agricultural sector. Table 7.2 shows that the agriculture sector employs mostly unskilled labour.

The agricultural sector in Indonesia is still labour-intensive, with low levels of technology. Table 7.3 shows that, for agriculture-based commodities, labour contributes more than capital to total costs. For example, in paddy production, 45 per cent of total costs are accounted for by labour and only 1 per cent by capital.

The national accounts data contain information on the formal or informal nature of employment (table 7.4). These data show that informal employment characterizes the agricultural sector. Because it is informal, the sector contains surplus labour. This fact reflects labour market segmentation, where formal jobs are scarce and workers outside the formal labour market are queuing for jobs while working involuntarily in low-productivity, informal employment. Rather than being unemployed, many workers are underemployed or working with low intensity. There is a strong link between informality and poverty; most of the working poor in Indonesia work informally, whether self-employed or as wage earners. Many of these people lack basic social protection, and they are locked into low-productivity activities, with few opportunities for economic mobility. Table 7.4 shows that the higher concentration of informal labour in the Indonesian agricultural sector represents farmers, particularly in small rural holdings. The data suggest that agricultural productivity could be en-

Table 7.2: Occupation types by sector in Indonesian agriculture

Sector	Proportionate share of employment by occupation				Total employment ('000 persons)
	Farmer	Operator	Administrator	Professional	
1 Paddy	0.995	0.004	0.000	0.000	3 242
2 Maize	0.995	0.004	0.000	0.000	1 146
3 Other cereals	0.972	0.027	0.001	0.000	434
4 Vegetables, fruit, nuts	0.972	0.027	0.001	0.000	4 722
5 Other crops	0.972	0.027	0.001	0.000	26
6 Rubber	0.969	0.027	0.003	0.001	1 770
7 Sugarcane	0.969	0.027	0.003	0.001	355
8 Coconut	0.969	0.027	0.003	0.001	390
9 Oilseeds	0.969	0.027	0.003	0.001	1 957
10 Tobacco	0.969	0.027	0.003	0.001	108
11 Coffee	0.969	0.027	0.003	0.001	244
12 Tea	0.952	0.044	0.003	0.001	44
13 Cloves	0.882	0.113	0.003	0.001	75
14 Fibre crops	0.970	0.025	0.003	0.001	13
15 Other estate crops	0.969	0.027	0.003	0.002	314
16 Other agriculture	0.952	0.044	0.003	0.001	758
17 Livestock	0.879	0.113	0.006	0.002	1 766
18 Ruminant meat	0.966	0.026	0.005	0.003	1 398
19 Non-ruminant meat	0.946	0.044	0.007	0.003	3 007
20 Forestry	0.850	0.102	0.040	0.009	553
21 Fishing	0.955	0.025	0.016	0.004	1 376

Source: IndoLab database, calculated from 2008 input–output tables and 2005 social accounting matrix.

hanced by improving the quality of labour by increasing farmers' education and skills. These options are examined later.

Labour surplus economies often have a large endowment of unskilled labour and an absence of sufficient operating capital and land. Typically, the level of technology is low. In developing countries such surplus labour has traditionally been found largely in the agricultural sector, concentrated especially in subsistence agriculture. Family farms, in many different configurations but in all of which income or output shares are determined via bargaining, characterize subsistence agriculture. In other words, a principle of sharing determines wages. This practice reflects the fact that, when high labour–land ratios are part of the initial conditions, workers with low marginal productivity cannot be dismissed or otherwise eliminated. However, unemployment is not obvious because it is disguised. Workers are underemployed

Table 7.3 Proportion of labour and capital in total input cost in Indonesian agriculture, 2008

Sector	Proportion of labour	Proportion of capital
1 Paddy	0.45	0.01
2 Maize	0.45	0.01
3 Other cereals	0.50	0.01
4 Vegetables, fruit, nuts	0.53	0.01
5 Other crops	0.49	0.01
6 Rubber	0.46	0.03
7 Sugarcane	0.41	0.04
8 Coconut	0.37	0.04
9 Oilseeds	0.32	0.03
10 Tobacco	0.29	0.02
11 Coffee	0.33	0.04
12 Tea	0.50	0.05
13 Cloves	0.43	0.05
14 Fibre crops	0.41	0.04
15 Other estate crops	0.34	0.03
16 Other agriculture	0.43	0.04
17 Livestock	0.41	0.09
18 Ruminant meat	0.26	0.06
19 Non-ruminant meat	0.30	0.07
20 Forestry	0.28	0.20
21 Fishing	0.21	0.08

Source: IndoLab database, calculated from 2008 input–output tables and 2005 social accounting matrix.

rather than unemployed. They would work more intensely or longer if there were more demand for their produce.

Finally, primary agricultural production is tied to land. For most types of production, land can be switched from one crop to another. Thus, a fall in sugar prices does not mean sugar producers become unemployed. They can switch to another crop, such as maize, within a season. Producers of tree crops such as rubber and coffee are not so flexible, however.

One approach to estimating changes in the use of labour in response to trade liberalization is to assume that labour use changes with output according to the share of labour in output. The labour–output ratios in table 7.4 are helpful in this regard. However, the limitation of this approach is that the labour–output ratios may not remain constant. If differential tariff changes lead to differing demand for labour-intensive and capital-intensive goods, the prices of capital and labour may change. In these circumstances it is reasonable to expect a change in the use of capital relative to labour. The question is: by how much? Estimates of the elasticity of substitution

Table 7.4: Shares of formal and informal labour supply in the Indonesian agricultural sector, 2008

Sector	Farmer			Operator			Administrator			Professional		
	Formal	Informal	Total supply (million Rp)	Formal	Informal	Total supply (million Rp)	Formal	Informal	Total supply (million Rp)	Formal	Informal	Total supply (million Rp)
1 Paddy	0.180	0.820	21 664	0.195	0.805	82	0.192	0.808	52	0.186	0.814	70
2 Maize	0.141	0.859	7 660	0.138	0.862	29	0.158	0.842	19	0.160	0.840	25
3 Other cereals	0.120	0.880	2 832	0.138	0.863	80	0.167	0.833	12	0.200	0.800	5
4 Vegetables, fruit, nuts	0.197	0.803	30 806	0.208	0.792	867	0.206	0.794	126	0.204	0.796	49
5 Other crops	0.135	0.865	170	0.200	0.800	5	0.000	1.000	1	0	0	0
6 Rubber	0.583	0.417	11 508	0.846	0.154	324	0.874	0.126	246	0.642	0.358	95
7 Sugarcane	0.406	0.594	2 308	0.723	0.277	65	0.776	0.224	49	0.474	0.526	19
8 Coconut	0.241	0.759	2 537	0.556	0.444	72	0.611	0.389	54	0.286	0.714	21
9 Oilseeds	0.375	0.625	12 721	0.702	0.298	359	0.746	0.254	272	0.438	0.562	105
10 Tobacco	0.476	0.524	704	0.800	0.200	20	0.800	0.200	15	0.500	0.500	6
11 Coffee	0.319	0.681	1 588	0.644	0.356	45	0.706	0.294	34	0.385	0.615	13
12 Tea	0.318	0.682	283	0.615	0.385	13	0.667	0.333	6	0.333	0.667	3
13 Cloves	0.264	0.736	447	0.586	0.414	58	0.636	0.364	11	0.250	0.750	4
14 Fibre crops	0.500	0.500	84	0.500	0.500	2	0.500	0.500	2	0.000	1.000	1
15 Other estate crops	0.200	0.800	2 040	0.456	0.544	57	0.514	0.486	37	0.217	0.783	23
16 Other agriculture	0.372	0.628	4 845	0.700	0.300	223	0.745	0.255	102	0.432	0.568	44
17 Livestock	0.470	0.530	10 420	0.901	0.099	1 340	0.855	0.145	495	0.927	0.073	177
18 Ruminant meat	0.470	0.530	9 067	0.900	0.100	241	0.854	0.146	350	0.929	0.071	182
19 Non-ruminant meat	0.470	0.530	19 105	0.901	0.099	881	0.854	0.146	721	0.927	0.073	423
20 Forestry	0.503	0.497	6 986	0.665	0.335	898	0.861	0.139	749	0.493	0.507	223
21 Fishing	0.468	0.532	24 919	0.846	0.154	664	0.697	0.303	640	0.485	0.515	229

Source: IndoLab database, calculated from 2008 input–output tables and 2005 social accounting matrix; Rp = Rupiah

Table 7.5 Elasticities of substitution

Product	Elasticity
Primary factors	0.5
Types of labour	0.0
Armington	Various (approximately 2)*

*The model uses the GTAP Armington estimates.
Source: IndoLab database.

between factors are shown in table 7.5.[1] An elasticity of 0.5 means that a 1 per cent change in the capital–labour price ratio leads to a one-half per cent change in the use of capital relative to labour. Low elasticity suggests that capital and labour ratios are not very sensitive to price, and, thus, changes in output are a good guide to changes in employment. There is no substitution between different types of labour; it is assumed that farmers do not become professionals or even operators, regardless of the changes in relative wages. This is indicated by the zero elasticity shown in table 7.5.

The Armington elasticity of substitution shows the willingness of consumers to switch between domestic and imported goods when import prices change. These estimates vary according to the extent to which products are differentiated, in the view of consumers, between countries of origin. Relatively homogeneous products such as sugar would be expected to be very substitutable and hence have a high Armington elasticity.

Given that use of capital and labour responds to some extent to changes in prices, it is useful to use a modelling approach that attempts to accommodate these changes. A computable general equilibrium (CGE) model is one such approach that combines input–output tables with responsiveness to prices.[2] It has several other advantages over simpler approaches. First, a CGE model is able to produce, factually and accurately, a more complete economic interpretation than a partial model can. For example, a rise in prices can turn a nominal wage increase into a real wage fall, reversing the policy implications. Second, it enforces consistency. For example, consumers cannot spend more than they earn, and producers cannot employ more workers than exist. Third, the impacts on various aspects, such as welfare, terms of trade, and the distribution of income and poverty, can be explored. The main disadvantage is the cost of developing the model and the loss in transparency. Since the authors have available a single-country CGE model with a focus on Indonesian agriculture, there is little reason to use a simpler approach. The model is described next.

[1] Unfortunately, these estimates are not specific to Indonesia but rather are those commonly used in general equilibrium modelling.

[2] A discussion of the relative merits of partial equilibrium modelling, social accounting matrices, and general equilibrium modelling approaches can be found in chapter 1 of this book.

7.2.1 The IndoLab CGE model

The Indonesian CGE model used here, IndoLab, is a variation of the well-known ORANI model, an updated version of the WAYANG general equilibrium model of the Indonesian economy (Warr, 1998), and INDOF, an Indonesian forecasting model (Oktaviani, 2001; Oktaviani, 2009). IndoLab expands the labour equation not only to include four types of labour (farmer, operator, administrator, and professional), but in addition each type of labour is further divided into paid and unpaid labour in rural and urban areas. It is important to include unpaid labour, especially for the agricultural sector. The model has recently been updated for this application.

The model is based on the 2008 Indonesian input–output (IO) tables and the 2005 social accounting matrix (SAM) published by the Indonesian Central Bureau of Statistics. Other data required for the general equilibrium model include various elasticity and other behavioural parameters. The elasticity parameters used in the model are the Armington elasticities, the substitution elasticities for labour and for primary factors, the export elasticities, and the demand–expenditure elasticities.

The SAM is used as base data for household and labour disaggregation. For labour data in particular, the IO data that cover all paid labour should be adjusted within the SAM to account for unpaid labour. This has been done by using the shares of paid labour, unpaid labour, and capital from the SAM to adjust the database. The IndoLab model includes 48 producer goods and services produced by 48 corresponding sectors. Of these, 25 sectors relate directly to agriculture. Many of the other sectors provide inputs into agricultural production. The microeconomic behaviour assumed is competitive profit maximization on the part of all firms and utility maximization by consumers. The markets for final outputs, intermediate goods, and factors of production are all assumed to clear at prices that are determined endogenously within the model.

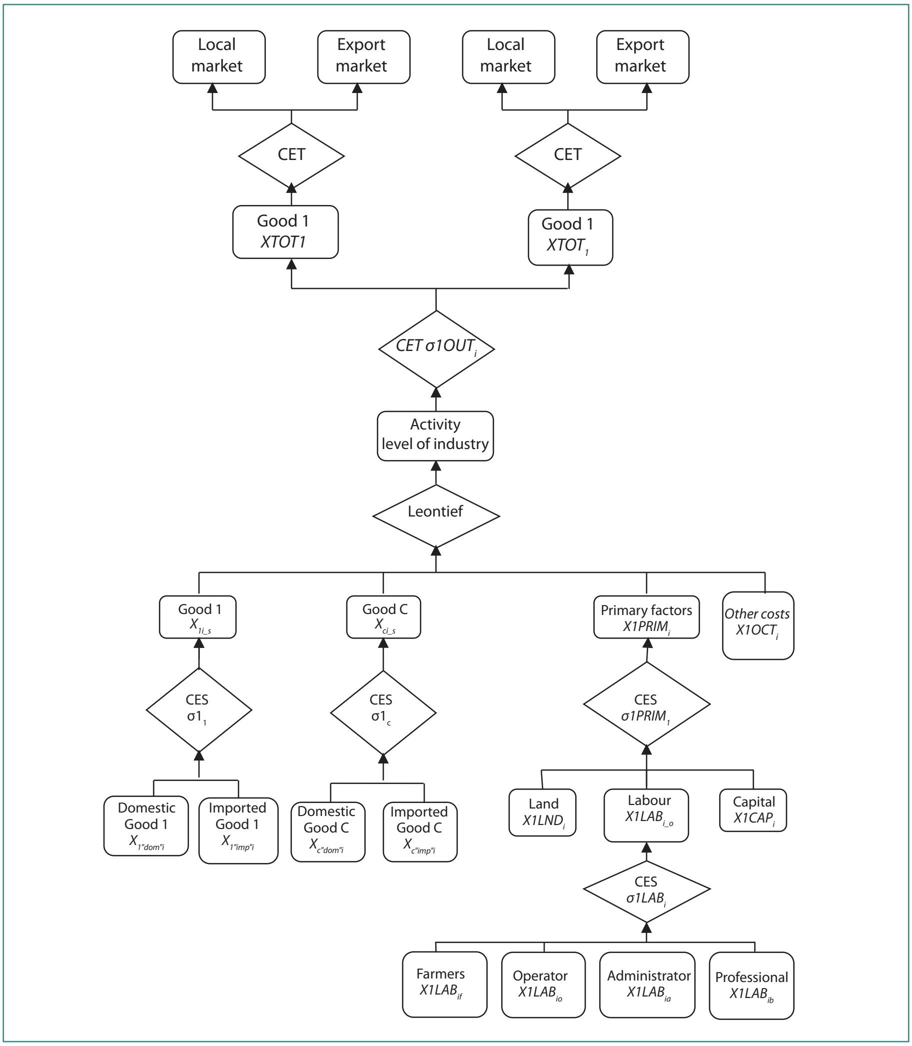
The nominal exchange rate between the rupiah and the US dollar can be thought of as being fixed exogenously. The role within the model of the exogenous nominal exchange rate is to determine, along with international prices, the nominal domestic price level. Exchange rates do not adjust to maintain a trade balance. Households are divided into ten different types (the same as in the SAM), and so implications about income distribution, poverty, and inequality can be drawn.

The structure of production in a given industry is depicted in figure 7.3. In the production process each industry can produce several commodities. Each industry selects inputs of primary factors (labour, capital, and land) and materials to minimize the cost of producing its output. Material (intermediate) inputs can be obtained domestically or imported. Key simplifying assumptions made in this production model include input–output separability and multi-stage decision-making. Producers first decide the level of output, then the level of inputs, and finally the source of inputs and the combinations of primary factors. Substitution between inputs is based on constant elasticity of substitution (transformation) production functions, except for the combining of intermediate goods and aggregate primary factors, a stage which uses the Leontief, or fixed proportions technology.

The assumption of input–output separability means that the production of a combination of products by an industry is not directly linked to the particular combination of inputs used (Blackorby et al., 1978). Similarly, product prices have no effect on input combinations except through their effect on the level of activity in the industry. This constitutes a substantial empirical simplification.

The multi-stage decision process implies that the demand for inputs at any given level can be expressed as a function of the prices of inputs at that level and need not be expressed as functions of the prices of inputs at lower levels in the

Figure 7.3: Production structure in the IndoLab CGE model



Note: CES=constant elasticity of substitution; CET= constant elasticity of transformation.

hierarchy. As indicated in figure 7.3, at the highest level of the input function, the commodity composites, a primary factor composite, and an "other cost" are combined using a Leontief, or fixed-proportions production function. In this production function there is no substitution among inputs. Detailed equations for each block can be seen in Wittwer (1999) and Oktaviani (2001).

This structure, together with further assumptions about firm behaviour and market structure, determines the demands for labour, other primary factors, and intermediate inputs and the supply of commodities by industry. The market structure is assumed to be competitive. That is, the representative firm for each industry/product has been modelled as if it were a price-taking, profit-maximizing firm, with prices determined so as to clear all markets. Production for own consumption, that is, self-sufficiency, can be treated as a farmer selling to himself or herself, but, if the transaction does not enter into the national accounts, it is not recorded. The demand for labour of a particular occupational type is proportional to the overall labour demand in the industry. It will depend on the price of the particular type of labour relative to the "average" price of labour in that industry. This occupational labour demand function is derived by minimizing the total cost of labour, subject to the CES aggregation function for labour (see Box 7.1).

Assumptions about factor mobility are important in CGE modelling. The equations and variables in the IndoLab CGE model, following the WAYANG model, allow labour and capital to be mobile between industries and the fixed quantity of land. The degree of mobility is determined by the elasticity of substitution between primary goods (labour and capital), which is assumed to be the same in all industries. This means that changes in wage rates and the price of capital will differ in different industries.

The model uses the standard closure that assumes that the supply of labour is fixed. This refers to the total supply of formal (paid) labour by households, the supply of informal (unpaid) labour supplied to agriculture sectors by household, and the supply of informal (unpaid) labour supplied to non-agricultural sectors by households.

In the trade liberalization scenarios, we first run a simulation with a global general equilibrium model, GTAP (Hertel, 1997), to determine the price changes that are then passed to the Indonesian general equilibrium model. This takes account of the interaction between Indonesia and the world economy. The GTAP model is linked with IndoLab, which is more detailed in terms of agricultural product, household, and labour aggregations. The concordance between the two models is shown in annex table A7.2.

We run two trade liberalization scenarios and four labour market policy scenarios. These are listed in table 7.6.

The first scenario is the ASEAN–China free trade agreement (ACFTA) with exemptions for highly sensitive products. In other words, all the existing 2007 tariffs on goods traded between ASEAN and China are removed, with the exception of the highly sensitive track tariffs, which are capped at 50 per cent. Each ASEAN member has a different list of exemptions. Indonesia has 47 exemptions, most notably

Box 7.1: Technical specification of demand for labour

Labour is classified into four occupations (farmer, operator, administrator, and professional). The equations for labour use (following Wittwer, 1999) are derived from the following optimization problem:

Choose inputs of occupation-specific labour, *X1LAB(i,o)*, to minimize total labour cost:

*∑(o,OCC, P1LAB(i,o)*X1LAB(i,o))*

where *P1LAB(i,o)* is the price of labour type *o* used in industry *i*, and *X1LAB(i,o)* is the quantity of various types of labour. The combination of labour making up *X1LAB_O(i)* is specified by a CES function:

X1LAB_O(i) = CES[All,o,OCC: X1LAB(i,o)]

Note that the problem is formulated in the levels of the variables. The solution of this problem, in percentage-change form, is given by the equations *E_x1lab* and *E_p1lab_o*. The first of the equations indicates that demand for labour type o is proportional to overall labour demand, *X1LAB_O*, and to a price term. In change form the price term is composed of an elasticity of substitution, *∑1LAB(i)*, multiplied by the percentage change in a price ratio, *[p1lab(i,o)–p1lab_o(i)]*, representing the wage of occupation o relative to the average wage for labour in industry *i*. Changes in the relative prices of the occupations induce substitution in favour of relatively low-cost occupations.

The percentage change in the average wage, *p1lab_o(i)*, is given by the second of the equations. This could be rewritten as:

*p1lab_O(i) = sum{o,OCC, S1LAB(i,o)*p1lab(i,o)}*

if *S1LAB(i,o)* were the value share of occupation o in the total wage bill of industry *i.* In other words, *p1lab_O(i)* is a Divisia index of the p1lab(i,o).

It is worth noting that, if the individual equations of *E_x1lab* were multiplied by corresponding elements of *S1LAB(i,o)* and then summed together, all price terms would disappear, giving:

*x1lab_O(i) = sum{o,OCC, S1LAB(i,o)*x1lab(i,o)}*

Hence, this is the percentage-change form of the CES aggregation function for labour.

Table 7.6: Trade liberalization and labour market scenarios

Scenario	Label	Description
1	FTA	ASEAN–China FTA, as negotiated
2	Doha	Likely Doha outcome
3a	Productivity Ag	Enhanced labour productivity in agricultural sector
3b	Productivity Non-Ag	Enhanced labour productivity in non-agricultural sector
4a	Skills Ag	Increased skilled labour force in agricultural sector
4b	Skills Non-Ag	Increased skilled labour force in non-agricultural sector

in chapters 10 (rice), 17 (sugar), 22 (alcohol), 64 (footwear), and 87 (motor vehicles) (ASEAN Secretariat, 2006). Indonesia is currently renegotiating its highly sensitive list. This involves removing some items and replacing them with others. Indonesia must obtain agreement from China before the list can be revised.[3] The base and final tariffs are shown in table 7.7.

China has 101 items on its highly sensitive list. The main items are in chapters 10 (rice), 11 (maize), 15 (oils), 17 (sugar), 24 (tobacco), 40 (rubber), 44 (wood products), 48 (paper products), 52 (cotton), and 87 (motor vehicles). Tariffs on these items are reduced, but not to zero.

From the perspective of Indonesian agriculture, the most significant tariffs, on rice and sugar, remain unchanged as a result of the agreement. The most significant reductions occur in beverages and tobacco, and textiles.

The second scenario, Doha, uses a likely WTO Doha outcome to determine the effects on Indonesian agriculture. The Doha negotiations have not yet been completed. The reforms are taken from the chairman's draft modalities paper of December 2008 (WTO, 2008a; WTO, 2008b). For agriculture the modalities call for linear cuts within bands. For developing countries such as Indonesia, the bands are the following ranges of tariff rates: 1) 0 to 29 per cent, 2) 30 to 79 per cent, 3) 80 to 129 per cent, and 4) 130 per cent and above. Within these four bands, the cuts are 33, 38, 43, and 47 per cent, respectively, with the higher initial tariffs attracting higher percentage cuts. Countries can select four per cent of their products as sensitive, subject to a cut of only one-third of the formula. It is not known which products each of the WTO member countries might chose as sensitive. The approach used here to model the scenario is to select the four per cent of products that have the highest tariff revenue. Tariff revenue is the product of the applied tariff rate and the trade flow. For Indonesia the sensitive products of greatest significance include sugar (HS codes 170199, 170111, and 170112), mixtures of odoriferous substances (330210), food preparations not elsewhere specified (210690), rice (100630), spirits (220820), and wheat (100190). A more detailed list appears in annex table A7.1.

For non-agricultural products in the Doha Round, the modalities call for tariff reductions based on the so-called Swiss formula. This is a non-linear formula that reduces higher tariffs by a greater proportion than lower tariffs. The formula also specifies a maximum final tariff, which for developed countries is 8 per cent. For developing countries the choice is between maximum tariffs of 20, 22, and 25 per cent. Countries that choose the more stringent parameter, i.e. 20 or 22, can designate 5 or 10 per cent of their products for more lenient treatment of tariff reductions. Here, Indonesia is assumed to choose 22 per cent, and 10 per cent of its industrial tariffs are reduced by half the cuts specified in the formula.

[3] To date, these negotiations have not been successful.

Table 7.7 Base and final Indonesian and Chinese bilateral tariffs

	Indonesian tariffs on imports from China (%)		Chinese tariffs on imports from Indonesia (%)	
Sector	**Base**	**Final**	**Base**	**Final**
Rice	20.0	20.0	0	0
Other cereals	1.2	0	0	0
Oilseeds	4.9	0	5.2	0
Vegetable oils and fats	0.7	0	2.6	0
Sugar	35.1	35.0	7.0	0
Vegetables, fruit ,and nuts	5.0	0	7.4	0
Other crops	4.7	0	7.2	0
Livestock	4.7	0.1	2.9	0
Forestry	5.1	0	5.8	0
Fishing	4.9	0	2.8	0
Petroleum and coal products	2.3	0	0.8	0
Ruminant meat	5.2	0.1	6.2	0
Non-ruminant meat	4.9	0	3.8	0
Other processed agriculture	5.8	0	6.8	0
Beverages and tobacco	28.3	2.3	11.6	0
Textiles and apparel	10.2	0.3	7.1	0
Chemicals	5.6	0.1	8.3	2.9
Metal manufactures	6.6	0.1	3.8	0
Wood and paper products	5.8	0.6	3.1	0.2
Manufactures	6.3	1.0	6.1	0

Source: GTAP version 7 database and authors' calculations.

The modified tariff reductions for sensitive agricultural and non-agricultural products are applied to all WTO members, not only Indonesia.

The trade liberalization scenarios involve reducing border prices taken from the GTAP simulation described earlier. The shocks to import and export prices for the two scenarios are shown in table 7.8.

Labour programmes that enhance skills may prove beneficial if there is increased demand for goods that require a large input of skilled labour. Such programmes may be ineffective, however, if tariff changes increase demand for goods that are produced primarily by unskilled labour. An alternative approach is to improve labour productivity. These programmes show beneficial effects, but the benefits do not accrue solely to the workers. Much of the benefit may go to owners of capital and land and to domestic and foreign consumers. In fact, the situation of some types of workers may worsen as a result.

The third scenario, Productivity, assumes a hypothetical 1 per cent increase in productivity of the Indonesian labour force (skilled and unskilled). This scenario is

Table 7.8: Relative changes to Indonesian border prices in trade liberalization scenarios

Sector	ACFTA Export price (% change)	Import price (% change)	Doha Export price (% change)	Import price (% change)
Rice	0.9	0.46	1.06	5.78
Other cereals	0.81	0.05	0.54	–0.27
Oilseeds	1	–1.98	0.96	1.68
Vegetable oils and fats	0.77	–0.16	0.14	0.28
Sugar	0.91	0	0.22	0
Vegetables, fruit, and nuts	0.86	–0.15	0.71	–0.03
Other crops	0.69	0	0.59	–0.39
Livestock	0.52	–0.28	0.48	–0.56
Forestry	0.78	–0.27	0.67	0.05
Fishing	1.14	0.09	1.13	0.24
Petroleum and coal products	0.20	–0.18	0.21	0.12
Ruminant meat	0.55	0	0.27	0
Non–ruminant meat	0.63	0.26	0.79	1.78
Other processed agriculture	0.44	–0.61	0.41	0.22
Beverages and tobacco	0.22	–0.57	0.24	–1.3
Textiles and apparel	–0.37	–3.18	–0.19	–0.45
Chemicals	0.29	–0.35	0.32	–0.02
Metal manufactures	0.22	–0.57	0.29	–0.07
Wood and paper products	–0.01	–1.19	0.23	0.01
Manufactures	–0.03	–0.81	0.15	-0.37

Source: GTAP simulation.

in two parts. The first, Productivity Ag, examines a labour productivity increase in the agricultural sector. The second, Productivity Non-Ag, focuses on the industrial sector; the intention here is to show how agricultural workers are affected by productivity changes outside their sector. In these two scenarios the source of the productivity improvement is not specified, but it could be driven by expenditure on research and development or by some technological improvement, such as mobile phones or genetically modified crops. It is assumed that the improvement is externally funded, for example, by an aid agency. Alternatively, it could be funded through foreign capital that introduces new technology.

The final two scenarios, Skills Ag and Skills Non-Ag, involve increasing the number of skilled workers by one per cent and decreasing the number of unskilled workers accordingly (—0.02 per cent for agriculture-only and —0.57 per cent for non-agriculture). The difference in the changes reflects the lesser number of skilled workers in the agricultural sector.

7.2.2 Analysis and findings

The macro results for the six scenarios are shown together in table 7.9. The first observation is that the changes in GDP are rather small in the trade liberalization scenarios – in fact, almost negligible. This is because these scenarios, as negotiated, involve very little liberalization of applied, as distinct from bound, tariff rates. However, the Doha scenario involves tariff reductions in many other countries, and this raises world prices and the cost of Indonesian imports. In the ACFTA scenario liberalization undertaken in each country drives the impacts to a greater extent. Second, in four scenarios, ACFTA, Productivity Ag, Productivity Non-Ag, and Skills Non-Ag, inflation (i.e. increase in the consumer price index) has an important impact on real, as opposed to nominal, GDP. In the trade liberalization scenarios, the changes in import and export prices drive the changes in inflation. The labour market scenarios increase GDP partly by reducing the costs of production, which has no impact on import prices. A programme of increasing productivity in the non-agricultural sector shows a much greater increase (0.27 per cent) in real GDP than the agricultural productivity scenario (0.04 per cent), merely because the productivity increase is applied to a much larger sector. The changes in GDP are positive because, by assumption, the productivity increase comes at no cost. Likewise, skills enhancement in the agricultural sector has no cost, in the modelling, at least. However, the impact on GDP, 0.00 per cent, is negligible because a reduction in unskilled labour offsets the increase in skilled labour.

The interest in each of these scenarios is in how different types of labour may be affected. Table 7.10 presents employment changes by sector for each scenario. The simulated price changes also produce results in terms of real wage changes. Weighted-average changes in real wages by type of occupation are summarized in table 7.11 for all scenarios. The real wage changes by type of occupation are not the same across sectors because of the assumption concerning the less than perfect mobility of labour.

Table 7.9: Changes in gross domestic product (GDP) and prices, all scenarios

Scenario	**Real GDP (% change)**	**Consumer price index (% change)**	**Export price index (% change)**	**Import price index (% change)**
ACFTA	0.02	–0.02	0.00	–0.29
Doha	0.00	0.13	0.08	0.01
Productivity Ag	0.04	–0.07	0.00	0.00
Productivity Non-Ag	0.27	–0.07	–0.11	0.00
Skills Ag	0.00	0.00	0.00	0.00
Skills Non-Ag	0.00	–0.04	0.00	0.00
ACFTA, including rice and sugar	0.02	–0.01	0.00	–0.29

Source: IndoLab model simulations.

Table 7.10 Changes in Indonesian employment by sector, all scenarios

Sector	Baseline employment (persons)	FTA scenario	Doha scenario	Productivity Ag scenario	Productivity Non-Ag scenario	Skills Ag scenario	Skills Non-Ag scenario	FTA including rice and sugar
		%	%	%	%	%	%	%
Paddy	3,241,780	0.05	0.13	–0.47	0.00	0.00	0.00	0.06
Maize	1,146,245	0.03	–0.11	0.21	–0.10	–0.01	–0.02	0.03
Other cereals	434,155	0.06	–0.11	0.17	–0.07	–0.01	0.03	0.06
Vegetables, fruits and nuts	4,721,878	–0.36	0.19	0.35	–0.21	–0.01	0.04	–0.37
Other crops	26,179	0.01	–0.12	0.32	–0.20	–0.01	–0.01	0.00
Rubber	1,769,941	0.07	–0.08	–0.35	0.27	0.00	–0.06	0.07
Sugar cane	354,935	0.01	–0.20	0.14	0.08	0.00	–0.10	0.24
Coconut	390,133	0.17	–0.05	0.09	0.04	0.00	-0.04	0.17
Oilseeds	1,956,504	0.25	0.00	–0.04	0.23	0.00	–0.14	0.25
Tobacco	108,237	0.06	–0.13	–0.04	0.01	0.00	–0.04	0.06
Coffee	244,225	–0.01	–0.29	0.46	–0.31	0.00	–0.01	–0.02
Tea	44,294	–0.04	–0.06	–0.10	0.08	0.00	–0.06	–0.05
Cloves	75,422	0.08	–0.15	–0.01	0.16	0.01	–0.10	0.08
Fibre crops	12,880	–0.23	–0.39	0.46	–0.29	0.01	–0.07	–0.24
Other estate crops	313,784	–0.01	–0.31	0.40	–0.28	0.02	–0.04	–0.02
Other agriculure	758,169	0.05	0.02	–0.14	0.05	0.00	–0.02	0.05
Livestock	1,766,232	0.02	–0.13	0.17	–0.06	–0.01	0.01	0.01
Ruminant meat	1,398,080	0.01	–0.11	0.07	0.01	–0.01	0.08	0.00
Non-ruminant meat	3,007,255	0.08	–0.07	–0.15	0.10	0.00	0.09	0.07
Forestry	552,779	0.05	0.07	–0.22	0.42	0.02	–0.15	0.05
Fishing	1,376,457	0.11	–0.07	0.11	–0.10	0.00	0.02	0.10
Petrol and coal products	1,789,001	–0.03	0.04	–0.03	–0.07	0.02	–0.28	–0.03
Other mining	694,747	–0.03	–0.02	0.04	0.01	0.01	–0.35	–0.03
Food products	778,743	0.04	–0.17	0.24	–0.26	0.00	–0.33	0.03
Vegetable oils and fats	1,631,659	0.61	0.12	0.29	–0.23	–0.01	–0.31	0.60
Rice	732,297	0.08	0.17	0.15	–0.30	0.00	–0.25	0.10
Flour	649,622	0.07	–0.14	0.06	–0.21	0.00	–0.34	0.07
Sugar	135,360	0.03	–0.18	0.42	v0.29	0.00	–0.29	0.28
Other processed agriculture	1,185,472	–0.10	–0.01	0.24	–0.34	0.00	–0.24	–0.11
Beverages and tobacco	744,526	0.10	–0.10	0.06	–0.13	0.00	–0.33	0.09
Textiles and apparel	2,616,193	–0.93	–0.28	–0.08	0.05	0.00	–0.38	–0.94
Wood and paper products	2,624,251	0.18	0.15	–0.02	0.03	0.00	–0.44	0.17
Fertilizer and presticides	795,518	0.03	0.05	–0.15	0.08	0.00	–0.33	0.04
Chemicals	1,756,761	–0.28	–0.05	0.00	0.00	0.00	–0.27	–0.28
Refinery oil	4,062,928	0.03	–0.06	–0.10	0.00	0.00	–0.40	0.03
Rubber and plastics	1,419,021	0.18	–0.06	0.13	–0.12	0.00	–0.20	0.18
Cement	273,438	0.03	0.01	0.02	0.08	0.00	–0.35	0.03
Metal manufactures	495,017	–0.53	0.10	–0.07	–0.01	0.00	–0.34	–0.53
Machinery	2,605,280	0.11	–0.03	–0.07	0.07	0.00	–0.32	0.11
Transport equipment	2,312,863	0.13	0.01	-0.10	0.10	–0.01	–0.18	0.13
Manufactures	3,541,688	–0.18	–0.11	–0.07	0.12	–0.01	–0.31	–0.18
Utilities	1,782,332	–0.08	–0.02	–0.01	–0.01	0.01	–0.09	–0.08
Construction	11,530,207	0.07	0.06	0.04	–0.07	0.00	–0.36	0.07
Trade	7,406,854	–0.04	0.01	–0.03	0.01	–0.01	0.54	–0.04
Hotel and restaurant	2,569,432	–0.03	–0.07	0.06	–0.11	–0.01	0.72	–0.03
Transport and communications	5,514,446	0.12	0.06	–0.07	0.25	0.00	0.02	0.12
Business services	3,966,073	–0.11	–0.03	–0.02	0.12	0.01	0.52	–0.11
Services nes	15,220,162	0.04	0.01	0.02	–0.03	0.01	0.18	0.04

nes=not elsewhere specified

Table 7.11 Changes in Indonesian real wages, all scenarios

Scenario	Farmer (% change)	Operator (% change)	Administrative (% change)	Professional (% change)
ACFTA	0.03	–0.16	0.09	1.51
Doha	0.28	–0.12	–0.28	1.14
Productivity Ag	–1.48	0.27	0.37	–0.91
Productivity Non-Ag	0.76	–0.60	–0.89	0.40
Skills Ag	0.04	0.02	0.08	–0.46
Skills Non-Ag	0.04	1.17	–1.78	3.83
ACFTA, including rice and sugar	0.04	–0.16	0.08	1.51

Source: IndoLab model.
Note: The real wage changes by occupation above are the weighted average real wage changes across sectors.

7.2.2.1 ACFTA scenario

In the ACFTA scenario Indonesia experiences a slight increase in GDP as a result of the liberalization that the free trade agreement undertakes. There is no gain in export prices, but import prices fall. This puts downward pressure on domestic producers who are competing with specific imports. However, the economy-wide effects are slight. With respect to agricultural labour markets, all four occupations experience a gain in real wages, although administrative and professional workers gain much more than farmers and operators. This reflects the differing extent to which these types of workers are used in the different industries.

7.2.2.2 Doha scenario

In the Doha simulation farmers, who make up the bulk of agricultural sector workers, are slightly better off in real terms. Under this scenario Indonesia makes few reductions in its agricultural tariffs because of its sensitive product provisions. In contrast to the ACFTA scenario, the main effect of Doha is to raise import costs as a result of cuts in protection in other countries. The import price index rises slightly (0.01 per cent) rather than falling, as in the ACFTA scenario. The consumer price index rises and converts nominal wage increases into real wage decreases under this scenario. Farm wages rise because of increases in the output of sugar cane and refined sugar. However, the change in demand for labour in the sugar sector is –0.2 per cent. As table 7.8 showed, there is no change in import prices for sugar because the 35 per cent tariff remains unchanged, as sugar is classified as a sensitive product.

7.2.2.3 Productivity scenarios

A programme that increases productivity in the agricultural sector by one per cent generally increases output in each agricultural sector and increases real GDP. However, the simulation results show that increased output drives down the output price, and the fall in prices more than offsets the increase in output. In the simulation results, as the value of agricultural production falls, the wages of farmers fall with it by 1.48 per cent. Falls in paddy and rubber prices drive this reduction. Farmers have limited scope for other activities, and the increase in productivity of agricultural labour effectively drives down their wages. In addition, the increase in labour productivity is associated with a fall in employment of farmers in primary agriculture. For other types of labour, real wages increase.

Declining returns following a supply increase stem from the low elasticity of demand. This is the intuition behind cartels or so-called "commodity agreements", in which countries hold back supply to maintain prices. This negative result might seem to suggest that farmers should not seek to improve productivity, as returns tend to fall if consumers are not very responsive to price falls. Over time, however, it is important to maintain productivity growth. Otherwise, costs and prices will rise, and consumers will eventually seek alternative sources (i.e. imports) or substitutes (e.g. synthetic rubber).

A programme of increasing productivity in the non-agricultural sector has the opposite effect on output prices and wages. In most sectors agricultural output prices rise rather than fall. This increases the value of production with little change in inputs. In the simulation results, the demand for most types of labour falls, with a reduction in real wages. However, the real wages of farmers increase. Increases in productivity in downstream processing raise the demand for raw materials – coffee (0.42 per cent) and fibre crop (0.32 per cent), in particular. Because these products are labour-intensive, farmers producing these crops benefit from real wage increases of 0.49 and 0.46 per cent, respectively.

The two productivity scenarios illustrate that, while productivity gains are beneficial to the economy as a whole, the gains are not totally captured by producers. Furthermore, the situations of some groups in society will worsen as a result.

7.2.2.4 Skills scenarios

Increasing the number of skilled labourers has little impact on real GDP, and improving skills in the agricultural sector alone has no perceptible impact at the national level. Improving skills has effects like those of a productivity improvement, as modelled in the Productivity Ag and Productivity Non-Ag scenarios. In the skills scenarios, however, the benefits go to producers using skilled intensive labour as opposed to unskilled labour. In fact, there is a decrease in unskilled labour. At the macro level the increased productivity lowers the cost of production but not necessarily the consumer price index, as shown in table 7.9.

At the sectoral level the increase in skilled labour and the decrease in unskilled labour affect different industries to different degrees, depending on their use of these factors. Agriculture employs a high share of unskilled workers, and, as a result, output in most agricultural industries falls. Most industries in the industrial sector also experience a slightly decreased output, although the negative impact is somewhat less than in the agricultural sector. The beneficiaries are in the services sector, such as hotels and restaurants, and in "other services", which tend to employ more skilled labour.

Table 7.12 Baseline and changes in Indonesian employment following trade liberalization, ACFTA and Doha scenarios

	Farmer	Operator	Administrative	Professional
Baseline number employed	22,756,000	47,508,000	29,045,000	3,224,000
Change under ACFTA	1.371%	3.860%	0.826%	0.124%
Change under Doha	1.339%	1.804%	0.330%	0.049%

Source: IndoLab model.

The impact on real wages of improving skills is mixed. The additional supply of skilled workers leads to a decline of 0.46 per cent in the real wages of professional workers (table 7.11). Aggregate payments to these skilled workers fall slightly, even though the number of skilled workers has increased. Operator and farmer wages rise slightly, and aggregate payments also rise.

7.2.2.5 Changes in employment

Changes in employment between sectors following trade liberalization are shown in table 7.12. Total (baseline) employment by type of labour is assumed to be fixed. In each case the total churn is less than one per cent. The Doha scenario generates only half the structural change of the ACFTA, although farmers are affected to a similar degree.

7.3 IMPLICATIONS AND CONCLUSIONS

Labour use tends to move in line with output, so the effects of changes in trade on output are a fairly reliable guide to employment changes. However, the effects of trade on real wages depend also on the rate of inflation. Thus, a general equilibrium model is valuable because it captures some of these macroeconomic effects. In some instances real and nominal effects can have opposite signs, reversing the policy implications. Changes in employment also depend on the assumed rates of substitution between factors of production. Primary agriculture has the advantage of high substitutability between various crops. Annual crops, such as either rice or maize, can be grown on the same land.

The trade liberalization scenarios predict only a limited impact on Indonesian agricultural wages and sectoral output and employment, principally because tariffs on rice and sugar are exempt from reductions.

A problem for policy-makers is how to increase labour productivity without inducing a reduction in employment or real wages. A productivity gain, for example due to a technological improvement, should always be beneficial for the economy. Increases in agricultural productivity are considered particularly beneficial because they increase the income of the rural poor. However, the distributional effects of increasing productivity are uncertain, as some of the benefits flow to consumers and owners of land and capital rather than to producers. Consumers capture some of the benefits of increased productivity of agriculture because increasing production lowers prices. With a low elasticity of demand, the fall in prices more than offsets the revenue gained from an increase in production, and the returns to farmers may fall, as illustrated in the productivity scenarios. This raises the question of where productivity improvements should be focused – on farm production, on processing agriculture production, or at the marketing end of the chain. The distribution of the benefits depends on the exact nature of the improvement – for example, whether it is labour-saving or capital-saving. If technology favours skilled workers, the gap in wages between the skilled and the unskilled will increase over time. Furthermore, some of the benefits may flow to overseas consumers.

Increasing productivity in the non-agricultural sector benefits farmers by lowering the cost of their purchases. Hence, real wages increase.

Training that enhances skills has complex consequences. While raising the productivity of the individuals involved, it also increases the supply of skilled workers, putting downward pressures on the real wages of all workers in this category. At the same time, there is upward pressure on the real wages of unskilled workers. In other words, the benefits are not limited to those undergoing the training.

Our data are not sufficiently detailed to predict where skills shortages might occur, certainly not in response to trade liberalization likely to take place in the medium term. The ongoing transformation of the Indonesian economy towards services implies that skills training in these areas is likely to be beneficial.

The estimated changes in employment, along with other results presented here, are based on a static analysis, which ignores the time period over which the tariff or productivity changes would be phased in. Over that time the Indonesian economy would grow considerably, perhaps by 30 per cent over six years. This implies that contractions in output shown in some sectors would be more than offset by continued growth. Adjustment in a growing economy is much easier to accommodate than in a constant or shrinking one. Thus, the costs of adjustment may be less than these static results suggest. Nonetheless, if the products are divided finely enough, there are bound to be some producers who will be made worse off by trade liberalization in spite of the growth in the economy.

One aspect of the picture that could be usefully explored is the degree of substitution of labour between alternative occupations, industries, and regions. The modelling uses an elasticity of 0.5. Further work would show, first, whether the results are sensitive to this elasticity, and econometric work trying to measure it could be undertaken. Certainly, the key to structural adjustment is the ability to switch capital and labour from one sector to another. It is easy to see that greater mobility has an advantage, but mobility comes at a cost. This cost relates to the degree of specialization. While it is more productive to use specialized labour working with specialized equipment, this can be a disadvantage if the demand for the output is falling, as the cost of acquiring skills may not be rewarded.

One limitation of the analysis is unobserved variations in the intensity of effort that are not measured in the data. A farmer can work longer hours or more intensely for the same number of hours when there is an increase in demand for labour. These changes go unobserved because of disguised unemployment, but they reflect a reality at odds with our assumption of a fixed supply of labour. This implies that the changes in wages we report may be overestimated, because some of the adjustment occurs in unobserved changes in the supply of labour.

Modification of the closures might also be revealing. The standard closure assumes the total supply of formal labour by households, informal labour supply to agriculture by households, and informal labour supply by households to non-agriculture are fixed, and so all the adjustment occurs in relative wages. An alternative assumption is that wages are fixed, or at least that they cannot fall, and, thus, the adjustment occurs in the level of total employment. This modification is not undertaken here, but, given that in some agricultural industries 80 per cent or more of workers are informally employed, it would be reasonable to assume that the supply of labour is not as fixed as our simulations assume.

The model could also be used as a recursive dynamic model to capture not only the investment growth and capital accumulation of each sector, but also the employment growth. The implication of training programmes could be analysed in the model for specific types of workers, such as farmers, rather than for all workers in a sector, as undertaken here.

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ANNEX

Table A7.1: Indonesian sensitive products in Doha negotiations

HS code	Description	Imports (in $m)
170199	Cane or beet sugar and chemically pure sugar	76.384
330210	Mixtures of odoriferous substances	72.444
210690	Food preparations nes	41.690
170111	Raw cane sugar excluding added flavouring	33.819
170112	Raw beet sugar excluding added flavouring	16.671
100630	Semi-milled or wholly milled rice	14.648
220820	Spirits obtained by distilling grape wine	14.213
100190	Wheat and meslin excluding durum wheat	13.942
220421	Wine of fresh grapes including fortified wine	11.436
220830	Whiskies	10.082
040210	Milk and cream in solid form	7.833
100640	Broken rice	7.639
240120	Tobacco partly or wholly stemmed	6.217
110100	Wheat or meslin flour	5.522
220410	Sparkling wine of fresh grapes	5.178
070320	Garlic fresh or chilled	4.842
220890	Ethyl alcohol of an alcoholic strength	4.703
040221	Milk and cream in solid forms of a fat	4.660
080810	Fresh apples	4.206
220300	Beer made from malt	3.888
180100	Cocoa beans whole, or broken raw, or roasted	2.926
170191	Refined cane or beet sugar	2.890
240110	Tobacco not stemmed or stripped	2.744
020230	Boneless frozen meat of bovine animals	2.600
010290	Live bovine animals excluding pure bred	2.556
220860	Vodka	2.469
220850	Gin and genever	2.439
230310	Residues of starch manufacture and similar	2.403

Source: Authors' calculations derived from the TASTE database.

Table A7.2: Concordance between GTAP and IndoLab

GTAP primary products	Indolab	GTAP processed products and services	Indolab
Rice	Rice	Other processed agriculture	Food products
	Rice, processed		Flour
Other cereals	Maize		Other processed agriculture
	Other cereals		
		Manufactures	Refinery oil
Oilseeds	Oilseeds		Rubber and plastic
Vegetables, fruit, and nuts	Vegetables, fruit, and nuts		Manufactures
Other crops	Other crops	Wood and paper products	Wood and paper products
	Rubber	Metal manufactures	Metal manufactures
	Sugar cane		Machinery
	Coconut		Transportation equipment
	Tobacco	Textiles and apparel	Textiles and apparel
	Coffee	Chemicals	Pesticides
	Tea		Chemicals
	Cloves	Business services	Construction
	Fibre crops		Trade
	Other estate crops		Hotels & restaurants
	Other agriculture		Business services
Vegetable oils and fats	Vegetable oils and fats	Transport and communications	Transport and communications
Fishing	Fishing	Services and activities nes	Utilities
Forestry	Forestry		Services nes
Livestock	Livestock		
Petroleum and coal products	Cement		
	Petroleum and coal products		
	Other mining		
Sugar	Sugar		
Non-ruminant meat	Non-ruminant meat		
Ruminant meat	Ruminant meat		
Beverages and tobacco	Beverages and tobacco		

nes=not elsewhere specified

8. TOWARDS A CONTINENTAL FREE TRADE AREA IN AFRICA: A CGE MODELLING ASSESSMENT WITH A FOCUS ON AGRICULTURE

Simon Mevel and Stephen Karingi

8.1 INTRODUCTION

The Abuja Treaty[1] envisions the establishment of an African Economic Community, with the creation of a Pan-African Economic and Monetary Union, by 2028 (African Union Commission, 1991). The road towards the ultimate step of regional integration is not straightforward, however, and to date progress within the eight Regional Economic Communities (RECs) recognized by the African Union Commission[2] has been made at different paces. Nevertheless, the tripartite agreement among the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), and the Southern African Development Community (SADC), which aspires to launch a free trade area (FTA) among these three RECs by 2014, highlights the deep commitment to African regional integration. Moreover, African ministers of trade met in Kigali in November 2010, recommending to fast-track the creation of a Continental Free Trade Area (CFTA) by 2017. This was reaffirmed in Accra, in December 2011, at the 7th Ordinary Session of African Union Ministers of Trade Conference. More recently, at the African Union Summit in Addis Ababa in January 2012, African heads of state and government endorsed Accra's declaration on "Boosting Intra-African Trade and the Establishment of a Continental Free Trade Area", with 2017 as the indicative date.

[1] The treaty was signed on 3 June,1991 (in Nigeria) and entered into force on 12 May 1994.

[2] The eight RECs recognized by the African Union are: the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), the Southern African Development Community (SADC), the Intergovernmental Authority on Development (IGAD), the Economic Community of West African States (ECOWAS), the Community of Sahel–Saharan States (CEN-SAD), the Economic Community of Central African States (ECCAS), and the Arab Maghreb Union (AMU).

The agricultural sector continues to play a vital role on the African continent. Being the primary source of employment, it is pivotal to the livelihoods of the majority of the population.[3] Agriculture generally retains a strategic position in the economic growth profiles of these countries, ensuring food security for its people. Further, the sector remains a significant source of Africa's exports, especially within the continent. Agricultural development, and in particular the consolidation of its competitiveness, is seen both as one of the pillars of much-needed structural transformation and as an avenue to reducing poverty. Removing existing trade-related constraints within the African continent is expected to stimulate intra-African trade, helping to push economies towards more diversified structures of production and leading to significant economic benefits necessary to enhance development in Africa. As such, it is crucial to ensure that the expected gains from such an undertaking will be fairly distributed among the population.

Using the computable general equilibrium (CGE) model MIRAGE, this paper aims to assess the economic impacts of establishing FTAs, and in particular the formation of a CFTA, with a focus on the effects of such trade reforms on agriculture and agricultural employment.[4] The rest of the paper is organized as follows: The second section provides an overview of Africa's main trade-related challenges, highlighting the importance of agriculture for its economies. The third section describes the methodology used for the analysis. The fourth section presents the main results from the modelling of FTA reforms. The concluding section summarizes the findings and offers policy recommendations.

8.2 AFRICA'S TRADE-RELATED CHALLENGES AND THE IMPORTANCE OF AGRICULTURE

Africa is facing a number of trade-related challenges today. Africa's low share in world exports and low intra-African trade, lack of export diversification, and tariff and non-tariff barriers are briefly discussed below. Other challenges such as poor infrastructure and supply-side constraints are important and have been the focus of other publications, for example, UNCTAD (2006) and UNCTAD (2009).

8.2.1 Share of African exports in total world exports

The share of Africa's exports in total world exports is only about 4 per cent. In terms of strictly primary products (i.e. coal, oil, gas, and minerals), however, Africa's share

[3] According to the United Nations Economic Commission for Africa (UNECA) in Assessing regional integration in Africa IV: Enhancing intra-African trade (2010), agriculture accounts for 70 per cent of the continent's full-time employment.

[4] It should to be noted, however, that, due to the poor quality of employment data and the difficulty of measuring it in the informal sector, only full employment is considered in the modelling exercise. Attempts were made to account for unemployment, but, as explained in section 8.3, these were not retained.

Table 8.1: Percengtage share of Africa's exports in total world exports by main sectors, 2010

Total	Agricultural and food products	Primary products	Other industrial products	Services
3.9	7.1	16.	2.1	3.6

Source: Authors' calculations based on MIRAGE model (section 8.3 and annex 8.3).

is significantly higher, at 16.7 per cent. The figure for agricultural and food exports alone is 7.1 per cent (table 8.1). This indicates that Africa performs better in exporting primary, agricultural, and food products than it does for categories of industrial products. (See table 8.8 and annex table A8.5 for detailed product classification.)

8.2.2 Share of intra-African trade

Essentially, African exports are directed outside the continent. The share of trade that is intra-African is very low, at 10.2 per cent (table 8.2). Still, agricultural and food products (along with other industrial products) are the products most likely to be traded within the continent, amounting for about one-fifth of the sector's total exports. Primary products, however, are almost entirely exported outside Africa. Adding value to these primary products could enhance the prospects for Africa's economic transformation and cement its place as the new global growth pole.

Table 8.2: Percengtage shares of Africa's exports to Africa versus the rest of the world, for each main sector, 2010

Destination	Total	Agricultural and food products	Primary products	Other industrial products	Services
Africa	10.2	20.0	2.5	19.8	2.3
Rest of the world	89.8	80.0	97.5	80.2	97.7
Africa and rest of the world	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations based on MIRAGE model.

8.2.3 Export diversification

The structure of Africa's exports to the rest of the world reflects a concentration in primary products and a lack of export diversification (table 8.3). Moreover, the market concentration of African exports is also strong. African products directed towards outside the continent go mainly to just a few partners, namely the European Union and the United States of America, receiving 42.8 per cent and 18.1 per cent, respectively, of African exports to the rest of the world in 2010. Nevertheless, the recent developments in trade relationships between Africa and other developing countries, especially emerging economies, translate into significant exports from African coun-

Table 8.3: Percentage share of Africa's exports by main sectors, according to their destination, 2010

	Africa	Rest of the world	Africa and rest of the world
Agricultural and food products	18.4	8.4	9.4
Primary products	8.8	39.4	36.3
Industrial products	68.6	31.7	35.4
Services	4.2	20.6	18.9
Total	**100.0**	**100.0**	**100.0**

Source: Authors' calculations based on MIRAGE model.

tries to developing partners. Some 30 per cent of African exports to the rest of the world go to developing countries, with the BRIC countries[5] taking more than half.

In terms of intra-African trade, the picture is considerably different, as trade of agriculture and food products surpasses that of primary products, at 18.4 per cent and 8.8 per cent, respectively. Moreover, manufactured products represent more than two-thirds of intra-African trade. This statistic suggests that trade within African economies is made up more of sophisticated products than is trade with economies outside the continent. The trade of industrial goods in Africa is, however, dominated by South Africa, which accounts for more than two-thirds of African exports of these goods. Furthermore, since a number of African countries have higher shares of agricultural products among their regional exports than among their global exports,[6] the impact of regional integration on individual countries can vary and should be assessed.

Table 8.4: Percentage share of Africa's imports by main sectors, according to their origin, 2010

	Africa	Rest of the world	Africa and rest of the world
Agricultural and food products	18.4	9.6	10.6
Primary products	8.8	3.2	3.9
Industrial products	68.6	66.4	66.7
Services	4.2	20.7	18.9
Total	**100.0**	**100.0**	**100.0**

Source: Authors' calculations based on MIRAGE model.

[5] "BRIC" stands for Brazil, Russia, India, and China.

[6] See e.g. von Uexkull (2012). Computations based on the MIRAGE model show that 56.5 per cent of agricultural exports from SACU were directed towards the continent in 2010. The figure is 54.1 per cent for Zimbabwe. Countries such as Botswana, Malawi, Mozambique, Senegal, and South Africa also have high shares of agricultural exports destined for African partners.

In terms of import shares, those of agriculture and food exceed those of primary products both from the external world and within Africa (table 8.4). In addition, the share of Africa's total imports of agricultural and food products (regardless of origin) is higher than the corresponding share of Africa's exports (regardless to the destination), as are the absolute volumes. This translates into a negative trade balance (exports minus imports) for Africa of US$4.8 billion for agricultural and food products in 2010.

8.2.4 Tariff barriers

The Abuja Treaty, signed in 1991, provides a clear roadmap detailing six stages[7] for regional integration in Africa, with the ultimate objective to establish an African Economic Community (AEC) by 2028. Currently in the midst of stage 3, the RECs are expected to move towards the formation of regional FTAs, followed by regional customs unions, to be effective by 2017. Not all the RECs are advancing at the same speed. COMESA, EAC, SADC, ECCAS, and ECOWAS appear on track, having made significant efforts to lower internal tariff barriers, and the EAC in particular is in an advanced stage. IGAD and CEN-SAD are lagging behind. Furthermore, even though tariff barriers on goods have started decreasing within the RECs, they remain quite significant between RECs (figure 8.1).

In this context tariff barriers still constitute significant obstacles to trade within Africa.[8] African countries generally have relatively good access when exporting to the rest of the world, with a 2.6 per cent average level of protection, thanks to numerous

[7] Firstly, African countries had until the year 1999 to join an existing economic community or to establish new ones where they did not exist. Secondly, before 2007 each REC was expected to consolidate internal taxes and trade and non-trade barriers and to plan their future reductions. In addition, actions were to be taken to coordinate and harmonize activities among the RECs as well as to enhance sectoral integration in all areas of activities at both regional and continental levels. Thirdly, the RECs were to pursue their regional integration by establishing free trade areas; they have until 2017 to adopt Common External Tariffs (CETs), becoming Regional Customs Unions. Fourthly, no later than 2019, the RECs must set up a continental customs union by coordinating and harmonizing tariffs and non-tariffs systems with the objective of defining a CET band structure for Africa. Fifthly, by 2023 persons must be able to move freely within African states and to establish their residence or firms anywhere on the continent. This will result in the creation of an African Common Market. Finally, a sixth and last step – which must be accomplished by 2028 – leads to the establishment of the AEC and in particular the creation of a Pan-African Economic and Monetary Union.

[8] All tariff barriers mentioned in this paper correspond to data for 2004 computed from the MAcMap-HS6v2 database using the TASTE software. Unfortunately, the 2004 data are the most recent available on market access at the disaggregated level required for CGE modelling. A newer version of the MAcMap-HS6 database, including data for the year 2007, is currently being developed. Protection structures did not significantly evolve in Africa between 2004 and 2007, however; changes have occurred more recently and essentially within the RECs, thanks in particular to the COMESA–EAC–SADC tripartite initiative. However, we made a comparison with the latest tariff data available from the United Nations Conference on Trade and Development (UNCTAD) TRAINS database and found that the general patterns are essentially unchanged (see section 8.3.1, on methodology, for more details). For more information about the MAcMap-HS6v2 database and tariff aggregation methods, see Boumellassa et al. (2009). For more information about the TASTE software, see Horridge and Laborde (2008).

Table 8.5: Africa's average protection imposed/faced on their imports/exports[9]

Average imposed protection on imports								Average faced protection on exports							
TOTAL		Agricultural and food		Primary products		Industrial products		TOTAL		Agricultural and food		Primary products		Industrial products	
From Africa	From rest of world	From Africa	From rest of world	From Africa	From rest of world	From Africa	From rest of world	To Africa	To rest of world	To Africa	To rest of world	To Africa	To rest of world	To Africa	To rest of world
8.7%	13.6%	12.4%	19.4%	2.3%	4.7%	9.0%	13.1%	8.7%	2.6%	12.4%	9.5%	2.3%	1.1%	9.0%	2.3%

Source: Authors' calculations based on TASTE software and MAcMap-HS6v2 database.

preferential agreements: the Generalized System of Preferences (GSP), the Everything but Arms (EBA) initiative, and the African Growth Opportunity Act (AGOA). In contrast, the average protection they face when exporting to African partners is significantly higher, at 8.7 per cent.

These aggregated numbers hide very unequal average protection structures at the product level. The average tariff barriers faced by African countries on primary goods exported both externally as well as within Africa are very low, at 1.1 per cent and 2.3 per cent, respectively. Significant differences appear for other products, however. On one hand, on goods excluding agriculture, food, and primary products exported to the rest of the world, Africa faces relatively low tariff barriers, at 2.3 per cent on average. Protection for these products *within* Africa is considerably higher, at 9.0 per cent on average. On the other hand, exporting agricultural and food products – which are of great importance for African economies, as noted previously – is much more complex due to higher tariff barriers. This remains true whatever the destination, with average protection rates of 9.5 per cent faced by African countries on their exports to non-African partners and 12.4 per cent on Africa's exports to African countries. These high rates partly explain the low levels of intra-African trade.

At the country level tariff barriers imposed or faced are considerably different and reveal extremely complex and heterogeneous protection structures (table 8.5). For example, Swaziland faces the highest average tariff when exporting its agricultural and food products to non-African countries, at 96.7 per cent; Seychelles imposes the highest average tariff on agricultural and food products imported from its African partners, at 53.6 per cent (annex table A8.1).

Tariffs may impede trade, but they also provide revenues for governments. In many African countries the receipts generated by enforcing tariff duties represent an important share of the government's income – nearly 40 per cent of the continent's total tax revenues in 2010[10] – and, therefore, these countries are particularly reluctant

[9] The MAcMap-HS6v2 database does not provide protection data on services.

[10] Authors' calculation based on the MIRAGE model. Tariff revenues represent less than 6 per cent of gross domestic product (GDP) for any African country (World Bank, 2011).

to remove them. More than three-quarters (77.4 per cent) of tariff revenues come from tariffs imposed on non-African countries.[11] This is not surprising, as Africa's imports mainly come from outside the continent and also African countries impose, on average, higher tariff rates on non-African imports than on those originating from their African partners (table 8.5). As a consequence, liberalization reforms within the continent will not, in general, entail considerable loss of tariff revenue.

8.2.5 Non-tariff barriers

In addition to tariff barriers, many non-tariff barriers (NTBs) limit African trade. They take multiple forms, such as lengthy customs procedures, sanitary and phytosanitary measures, product standards, anti-dumping measures, countervailing duties, and licensing, as well as lack of infrastructure (even though this is not an NTB per se). This list in not exhaustive, and, moreover, NTBs are often difficult to quantify. Nonetheless, some estimates have attempted to assess the strength of certain non-tariff barriers. For example, according to the World Bank, *Doing Business 2012: Doing business in a more transparent world*, sub-Saharan Africa has made significant improvements over the last few years, implementing reforms aimed at easing trade across borders. However, Africa still lags behind other regions. Indeed, it takes on average 31.5 days to export from a sub-Saharan African country and 37.1 days to import to a sub-Saharan African country. In contrast, these averages are 10.5 days and 10.7 days for high-income OECD countries[12] (table 8.6). This situation is especially challenging for the agricultural and food sectors as, generally, NTBs are higher than for other sectors (see Kee et al., 2009). In particular, agricultural and food products are perishable and subject to strong sanitary and phytosanitary constraints. Therefore, any delay in the export/import process is generally more costly than for other categories of products, as it can result in the loss of the merchandise.

Table 8.6: Average time to export/import by main regions

	Average time to export*	**Average time to import***
OECD high income	10.5 days	10.7 days
Latin America & Caribbean	17.8 days	19.6 days
Middle East & North Africa	19.7 days	23.6 days
East Asia & Pacific	21.9 days	23.0 days
Eastern Europe & Central Asia	27.0 days	28.8 days
Sub-Saharan Africa	31.5 days	37.1 days

* Includes inland transport, customs procedures, and port handling.
Source: World Bank (2012).

[11] At the country level there are a few exceptions, however (see annex table A8.2).

[12] These figures are average time spent on inland transport, customs procedures, and port handling in the export or import processes.

Considering the high trade protection levels, elimination of tariff barriers following the establishment of FTAs among African economies could lead to substantial increases in trade flows within the continent. This will, however, entail adjustment costs such as tariff revenue losses. If accompanied by other policies – for example, the reduction of non-tariff barriers – benefits could be considerably enhanced and related adjustment costs, offset. Agricultural and food products could reap important gains from such trade policies, as current barriers to trade are particularly significant for these products. The trade-creating effect could lead to higher demand for imports from African countries and, thus, to higher production. Empirical evidence suggests that more trade also could lead to an increase in productivity (Alcala and Ciccone, 2004). In addition, as the majority of the African population relies on agriculture and food production for its livelihood, it is very likely that any economic gains would not be limited to the strictly trade sphere. Also, purchasing power, at least that of those engaged in activities related to agriculture and food, could increase, and, implicitly, poverty could be reduced, as long as employment is also favoured.

To verify the possible effects of reducing trade barriers, a quantitative assessment using a computable general equilibrium (CGE) model was conducted. The methodology chosen for the analysis and the trade reforms analysed are presented briefly in the following section.

8.3 METHODOLOGY AND TRADE REFORMS ANALYSED

8.3.1 Methodology

The analysis employs the MIRAGE multi-country and multi-sector CGE model in its recursive dynamic version. The model is especially well designed for assessing economic impacts of trade policies.[13] Thanks to many interconnected equations representing behaviours of economic agents and various economic linkages, global CGE models are capable of capturing multiple interactions taking place within the world economy. However, this analysis requires a significant amount of very detailed data. In this analysis the Global Trade Analysis Project (GTAP) database, version 7, is used as a global social accounting matrix (SAM) for the model. It provides information for 53 sectors and 113 countries/regions for the year 2004.[14]

For information on protection structures, we rely on the MAcMap-HS6 database, version 2. It provides exhaustive information on market access at the bilateral level for 220 exporter countries and 169 importer countries and for as many as 5,113 products for a particular year. Most notably, it includes all preferential schemes currently

[13] MIRAGE stands for Modelling International Relationships in Applied General Equilibrium. The model was initially developed at the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) in Paris and is now used in several well-know research centres and international organizations around the world. For the main features of the model, see annex 8.3. A full description of the MIRAGE model can be found in Decreux and Valin (2007).

[14] The GTAP database was developed at Purdue University, Indiana, United States of America. A full description of the database can be obtained from Narayanan and Walmsley, eds. (2008).

active, as well as offering an intuitive aggregation methodology that lends itself to a useful description of tariff barriers to worldwide trade at a specific point in time. Indeed, not only is it possible to aggregate tariff lines using trade weights, but also MAcMap-HS6 offers the option to aggregate protection data using a so-called "reference group weight"; in this case the weight used for aggregation does not strictly reflect the trade for the country considered but rather that of a group of countries (group of reference) to which a country belongs according to its income level. As a consequence, the reference group weight limits possible endogeneity bias between trade and protection.[15] Finally, the MAcMap-HS6 database, version 2, has an integrated "GTAP scaling" module such that trade flows associated with tariff lines are kept consistent with the trade information from the GTAP database used in the CGE model. For our analysis tariff barriers are first aggregated at the level of sectors and countries/regions of the GTAP database, using the "reference group weight", before being aggregated at the level of sectors and countries/regions selected for the model following the same aggregation method.

As noted, the protection data from MAcMap-HS6v2, which are used for the analysis, are for the year 2004, which is the latest year available at this time (see footnote 8). Although this may appear somewhat outdated, it is critical to note that CGE models are very demanding in terms of data and therefore require very detailed tariff barrier information, which can then be mapped with the GTAP database. MAcMap is one of the very few sources that can meet such requirements. The TRAINS database[16] also provides protection data at a quite disaggregated level in both geographic and sectoral dimensions. Computations made using TRAINS for the year 2010 indicate that, although average protection has been lowered since 2004, trade patterns generally have changed little. Specifically, average protection within Africa remains considerably higher than protection faced by African countries on their exports to the rest of the world; average protection in agriculture is the highest of any sector; and average protection in Africa is high, especially between, but also within, regional groups. However, it is very difficult to compare tariffs from different sources and with different methods of tariff aggregation. Unlike the MAcMap database, the TRAINS database does not allow for aggregation using a reference group weight, and it also does not offer the possibility to compute aggregated tariffs using trade information fully consistent with the GTAP database. Overall, due to recent average protection reductions within African RECs that are not reflected in the MAcMap-HS6v2 database, findings from liberalization scenarios could be slightly overestimated. Nonetheless, the simulations reflect changes that are to be implemented over the long term following a dynamic approach. Therefore, and considering the substantial hindrance to trade opportunities posed by both tariff and non-tariff barriers, the outcomes of the analysis must not be dismissed.

[15] For example, in the case of a prohibitive tariff, imports are discouraged. Thus, if the "trade weight" aggregation method is used, there will be no weight associated with such a tariff line. The "reference group weight" yields more satisfactory outcomes, as it will allow some weight on non-traded tariff lines.

[16] More information can be obtained at the following Internet address: http://wits.worldbank.org/wits/.

8.3.2 Geographic and sectoral decompositions

Due to technical restrictions, it is usually advised not to run the MIRAGE model with more than 30 countries/regions and 30 sectors. Therefore, the geographic decomposition for the simulations was limited to 27 countries/regions, with a focus on Africa. All the 16 African countries and the six African regions[17] of the GTAP database, as well as their main partners, the European Union, the United States of America, and the BRIC countries, were maintained; the rest of the countries were aggregated into Rest of Developed Countries and Rest of Developing Countries (table 8.7 and annex table A8.4).

With respect to sectors, key products for African economies were considered, namely, agricultural products and a few industrial sectors such as primary products, petroleum and coal products, mineral and metal products, and also textiles, wearing apparel, and leather products. In other words, the sectoral decomposition takes into account a total of 21 sectors – 12 agricultural sectors, 7 industrial sectors, and 2 services sectors (table 8.8 and annex table A8.5).

8.3.3 Trade reforms analysed

For comparative purposes, two sets of scenarios were designed: regional FTAs and a CFTA, both fully implemented by 2017. In addition, each case considers FTA reforms alone as well as FTA reforms complemented by the improvement of trade facilitation measures. The improvement of the trade facilitation measures is in line with the Action Plan for Boosting Intra-African Trade that the African countries agreed in January 2012 at the African Union Summit. The Action Plan contains other measures besides tariff liberalization that are necessary to improve the performance of intra-African trade. Trade facilitation measures are considered a priority, especially where non-tariff barriers continue to hinder regional trade.

Regarding regional FTAs, full elimination of tariff barriers on goods within, as opposed to between, two regional groups is taken into account. In other words, protection is removed between all the countries belonging to a same specific group, but tariffs between the countries belonging to different groups are maintained. Groupings were determined based on the limitations of the GTAP database (see footnote 17), the multiple overlapping memberships,[18] and the current state of regional integration processes, especially the COMESA–EAC–SADC Tripartite initiative.[19] As a conse-

[17] One of the main limitations of the GTAP database, version 7, is that the detail for African countries is rather sparse. Indeed, only Botswana, Egypt, Ethiopia, Madagascar, Malawi, Mauritius, Morocco, Mozambique, Nigeria, Senegal, South Africa, the United Republic of Tanzania, Tunisia, Uganda, Zambia, and Zimbabwe are represented. The rest of the countries of the continent are gathered into six heterogeneous regions, namely, Rest of North Africa, Rest of Western Africa, Central Africa, Rest of South Central Africa, Rest of Eastern Africa, and Rest of South African Customs Union.

[18] Many African countries belong to more than one REC (table 8.7).

[19] Some 26 African country members of COMESA, EAC, and SADC have agreed to establish a Tripartite FTA by 2014.

Table 8.7: Geographic decomposition

# Country/Region	Africa/ Non-Africa	Main regional economic communities							
		COMESA	EAC	SADC	IGAD	ECOWAS	CEN-SAD	ECCAS	UMA
1 Egypt	Africa								
2 Morocco	Africa								
3 Tunisia	Africa								
4 *Rest of North Africa*	Africa								
5 Nigeria	Africa								
6 Senegal	Africa								
7 *Rest of Western Africa*	Africa								
8 *Rest of Central Africa*	Africa								
9 *Rest of South Central Africa (Angola & DRC)*	Africa								
10 Ethiopia	Africa								
11 Madagascar	Africa								
12 Malawi	Africa								
13 Mauritius	Africa								
14 Mozambique	Africa								
15 Tanzania	Africa								
16 Uganda	Africa								
17 Zambia	Africa								
18 Zimbabwe	Africa								
19 *Rest of Eastern Africa*	Africa								
20 Botswana	Africa								
21 South Africa	Africa								
22 *Rest of South African Customs Union*	Africa								
23 *BRIC countries*	Non-Africa								
24 *Rest of developing countries*	Non-Africa								
25 European Union	Non-Africa								
26 United States	Non-Africa								
27 *Rest of developed countries*	Non-Africa								

Country/region fully part of the Regional Economic Community (REC)

At least one country (but not all) in the corresponding region is part of the REC

Table 8.8: Sectoral decomposition

#	Sector	Category
1	Paddy and processed rice	Agriculture
2	Wheat	Agriculture
3	Cereals	Agriculture
4	Oilseeds	Agriculture
5	Sugar cane and sugar beet	Agriculture
6	Cattle, sheep, goats, and horses	Agriculture
7	Animal products and wool	Agriculture
8	Other agricultural products	Agriculture
9	Milk and dairy products	Agriculture
10	Meat products	Agriculture
11	Sugar	Agriculture
12	Other food products	Agriculture
13	Forestry	Industry
14	Fishing	Industry
15	Other primary products	Industry
16	Textile, wearing apparel, and leather products	Industry
17	Petroleum, coal products	Industry
18	Mineral and metal products	Industry
19	Other manufactures products	Industry
20	Transport	Services
21	Other services	Services

quence, one FTA was assumed between COMESA, EAC, SADC, and IGAD,[20] while another was considered between ECOWAS, CEN-SAD, ECCAS, and AMU.[21] In the case of the Continental FTA scenario, all tariff barriers on goods are fully removed within the African continent.

For modelling trade facilitation measures, a database on trade costs related to time currently required for export and import processes, from Minor and Tsigas (2008),[22] was employed. More specifically, estimations are used, by country and products, of the percentage of exports and imports lost due to a delay of one day in customs processing and port handling. Decreux and Fontagne (2009) aggregated data on costs at the border at the GTAP level from Minor and Tsigas.[23] Following their methodology, trade costs at the region/sector level of the study were aggregated to allow for calibration of these costs in the model. Reductions of these trade costs – modelled as "iceberg costs"[24] – were then applied to reflect improved trade facilitation

[20] IGAD is not part of the Tripartite FTA. However, except for Somalia, all country members of IGAD belong to at least one of the three RECs of the Tripartite FTA.

[21] Of the 28 country members of ECOWAS, ECCAS, or AMU, 16 are also members of CEN-SAD.

[22] Hummels (2001) initiated the construction of the database, which was then pursued by the United States Agency for International Development (2007) and further improved by Minor and Tsigas (2008).

[23] Trade weights are used for the aggregation process.

[24] "Iceberg costs" imply that when 100 units of a product are exported, 100 or fewer units reach the destination.

between African countries. In other words, we assume that customs procedures and port handling in import and export processes become twice as efficient within Africa by 2017 as they were in 2010.[25]

Finally, although we considered various scenarios allowing for unemployment in the labour market so as to implement a wage curve in the model following Blanchflower and Oswald's methodology (2005), we present only results based on the assumption of full employment.[26] This is obviously imperfect, as it does not reflect well the situation of African economies. However, there are several reasons that motivate such a decision. First, assuming full employment or assuming unemployment – modelled as briefly described above – for the labour factor in the CGE model does not lead to great differences in the results. Moreover, the lack of availability and reliability of unemployment rates for African economies can render the exercise very questionable. Second, another way to represent unemployment in CGE models is to assume that nominal or real wages are fixed. However, this assumption is a source of intense debate, as it does not consider the wage determination process in developing countries (Ben Hammouda and Osakwe, 2006). Third, the full employment assumption appears to be coherent with the medium- to long-term effects of shocks analysed with CGE models (Bouët et al., 2010). Moreover, under a fixed employment hypothesis, a decrease *(increase)* in employment does not necessarily imply increasing *(decreasing)* unemployment in reality. Indeed, the total labour force is constrained yearly (but varies over time in both the baseline and the simulations based on demographic forecasts[27]), and there will be re-allocation of workers to the sector where remuneration becomes relatively more attractive. In other words, employment in the model will increase where wages become the highest and decrease elsewhere. Therefore, the assumption of fixed employment is likely to slightly underestimate the potential benefits from regional trade liberalization. With unemployment allowed in the labour market, increased demand leads to higher employment, and this expansion of resources could lead to higher gains from trade liberalization.

8.4 PRESENTATION OF MAIN RESULTS WITH A FOCUS ON AGRICULTURE

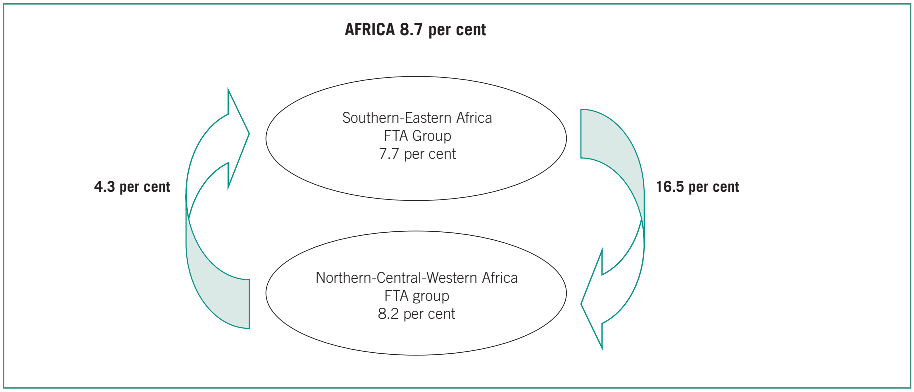
As indicated in section 8.2 (table 8.5), African countries impose relatively high tariff barriers of 8.7 per cent, on average, on their African partners; while those on primary

[25] Due to lack of data, we are not accounting for a certain number of other trade costs, such as those associated with the time merchandise is in transit or the costs generated by relatively poor infrastructure per se. For this reason we may underestimate impacts from trade facilitation. Nevertheless, we do not take into account the price to pay for the improvements in trade costs considered in the analysis. Making customs processing or port handling more efficient certainly requires substantial investments (for example, investments in workforce training or in newer equipment).

[26] The full employment hypothesis assumes wage flexibility, as there is a fixed aggregate employment in all regions.

[27] See annex 8.3 for more details.

Figure 8.1: Average protection structures in Africa



Source: Authors' calculations based on TASTE software and MAcMap-HS6v2 database.

product imports are relatively low, at 2.3 per cent, on average; barriers imposed on industrial and on agricultural and food products are quite significant, at 9.0 per cent and 12.4 per cent, respectively. Therefore, removing protection within defined areas of the African continent could potentially improve considerably market access between African economies and is expected to bring large increases in intra-trade flows. Moreover, while protection within the two defined regional groups, namely, Southern-Eastern Africa FTA group and Northern-Central-Western Africa FTA group, are below the continental average, at 7.7 per cent and 8.2 per cent, respectively, average tariff barriers between regional groups can be as high as 16.5 per cent when countries of the Southern-Eastern Africa FTA group export to those of the Northern-Central-Western Africa FTA group (figure 8.1). This lends support to the case for a CFTA that would fully remove trade barriers within the continent, hence avoiding large tariff distortions between specific groups of countries. However, the elimination of duties will inevitably result in tariff revenue losses. In that respect, trade reforms will be beneficial for African countries overall only if other gains more than compensate for tariff revenue losses.

8.4.1 Exports

Results from the simulations confirm that, at the global level, total exports of African countries would increase with the establishment of larger FTAs. While the formation of two regional FTAs would increase Africa's export to the world by 2.8 per cent (or US$17.6 billion) in 2022 over the baseline scenario, which assumes no change from 2004 trade policies,[28] the creation of a CFTA would increase Africa's exports by 4.0

[28] Although we assume that trade reforms are fully implemented by 2017, we compare results by 2022 in order to leave time for variables to adjust in the model. Indeed, due to the dynamics of the model, shocks occurring today will affect certain economic behaviour only tomorrow. For example, investment made this year may bear fruit only in subsequent years.

Table 8.9: Total export volumes by main region – percentage and value changes compared with the baseline scenario, 2022

	Regional FTAs		Continental FTA	
	%	US$ billion	%	US$ billion
Africa total	2.8	17.6	4.0	25.3
Developed countries excluding Africa	0.0	–2.1	0.0	–2.9
Developed countries	0.0	–3.2	–0.1	–5.0
World	**0.1**	**12.3**	**0.1**	**17.4**

Source: Authors' calculations based on MIRAGE model.

per cent (or $25.3 billion). Other regions that do not implement any trade reforms would see their exports slightly reduced (table 8.9).

As shown in table 8.10, total African exports of agriculture and food products to the world would be the most stimulated by the trade reforms, with 7.2 per cent (or $3.8 billion) more exports in the case of regional FTAs and 9.4 per cent (or $5.0 billion) more exports in the case of the continental FTA in 2022 than under the reference scenario. In fact, exports in all agricultural and food sectors would increase

Table 8.10: Africa's export volumes by agricultural and food sectors as well as main sectors – percentage changes compared with the baseline scenario – 2022

	Regional FTAs	Continental FTA
Agriculture and food	**7.2**	**9.4**
Paddy and processed rice	1.1	3.2
Wheat	25.7	26.0
Cereals	16.3	16.9
Oilseeds	2.4	3.9
Sugar cane and sugar beet	41.2	38.6
Cattle, sheep, goats, and horses	4.3	4.2
Animal products and wool	0.6	0.5
Other agricultural products	1.1	1.7
Raw milk and dairy products	72.7	101.0
Meat products	13.8	26.2
Sugar	13.7	16.5
Other food products	13.6	17.0
Industry	**3.2**	**4.7**
Services	**–0.5**	**–0.6**
All sectors	**2.8**	**4.0**

Source: Authors' calculations based on MIRAGE model.

with the implemented reforms. The greatest increase would occur in sectors such as wheat, cereals, sugar, meat, milk and dairy, and other food products. Industrial exports at the continental level also would increase, by 3.2 per cent (or $14.4 billion) when Regional FTAs are established, or 4.7 per cent (or $21.1 billion) with a CFTA,,[29] thanks to significant increases in textile and apparel and in other manufactured products (annex tables A8.8 and A8.9). Services exports from Africa experience a trade diversion effect at the global level. Indeed, although the trade reforms increase trade in services within Africa, African exports of services to the rest of the world decrease more than the intra-African trade increases. This reflects the lack of reduction of trade barriers in services in the analysed scenario. Services trade makes up a relatively small share of total African trade.

These projected export variations denote that the reforms would be largely trade-creating for Africa. Indeed, trade- creation effects would more than compensate for trade diversion effects.[30] Reductions of African exports to non-African developing countries[31] and to developed countries[32] would be strongly offset by a rise in African exports within the continent (figure 8.2). This would be true in agriculture and food as well as in industrial sectors. For services, however, as mentioned earlier, the increase within Africa would not fully compensate for the decrease in African exports to the external partners.

Overall, the reforms would considerably stimulate intra-African trade, increasing it by 35.7 per cent (or $23.6 billion) with the establishment of regional FTAs and by 52.3 per cent (or $34.6 billion) under a CFTA, compared with the baseline, in 2022 (figure 8.2). This would result from exchanges within Africa increasing in all the main sectors. African exports within the continent would rise most in the industrial sector, by 53.3 per cent (or $27.9 billion) compared with the baseline, in 2022, if a CFTA is established. This would enhance the "sophistication" of intra-African trade, dominated by industrial products, as indicated in tables 8.3 and 8.4. In the same vein, trade of agricultural and food products within the continent also would increase strongly, by 53.1 per cent (or $5.7 billion) in 2022. Intra-African trade in services would also rise significantly, by 31.9 per cent (or $1.0 billion), albeit from a lower base, as intra-African trade in services is relatively limited at the onset (tables 8.3 and 8.4).

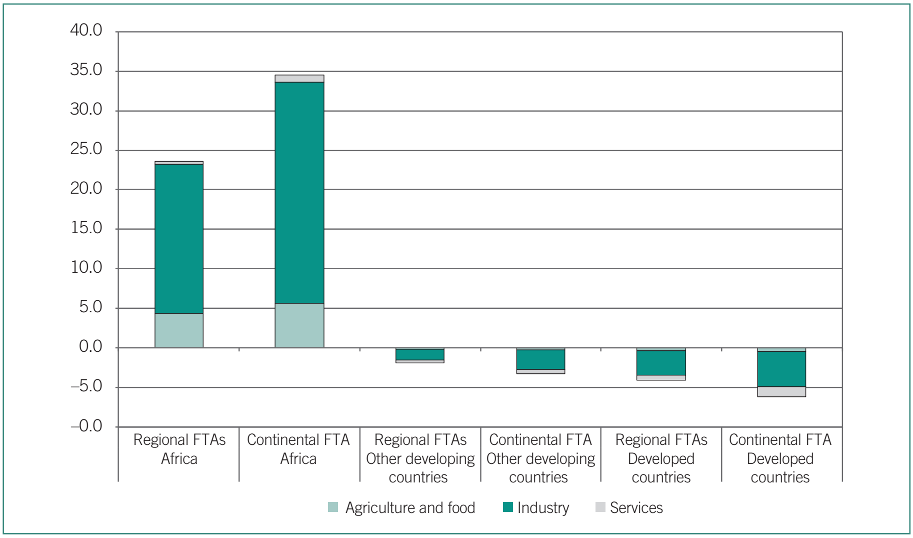
[29] In absolute terms African industrial exports would increase the most, as they initially represent a larger share of total African exports.

[30] This finding is rather reassuring. Indeed, Krugman (1995) explains that, when most trade is already regional before the establishment of a RTA, it can be expected that trade reform will not greatly reduce trade from outside. However, in the case of Africa, and as intra-African trade is initially low, it is difficult to prejudge whether trade creation or trade diversion will dominate after the formation of RTAs. In that sense, it would not be unreasonable to imagine that trade diversion could have outweighed trade creation after establishment of FTA reforms in Africa.

[31] African imports from non-African developing countries would decrease by 0.9 per cent (or $1.9 billion) and by 1.6 per cent (or $3.2 billion) with regional FTAs and the continental FTA, respectively.

[32] African imports from developed countries would decrease by 1.2 per cent (or $4.1 billion) and by 1.7 per cent (or $6.2 billion) with regional FTAs and the continental FTA, respectively.

Figure 8.2: Exports of African countries by destinations and main sectors – changes compared with the baseline scenario, 2022 (in US$ billions)



Source: Authors' calculations based on MIRAGE model.

In other words, following the creation of a CFTA assumed to be effective by 2017, the share of intra-African trade would be enhanced by 52.0 per cent over a 12-year period, rising from 10.2 per cent in 2010 to 15.5 per cent in 2022 (table 8.11). Considering only agricultural and food products, the share of intra-African trade would grow from 20.0 per cent to 28.3 per cent during the same time horizon. Thanks to a considerable increase of trade flows within African economies following the full elimination of tariff barriers, the initially large shares of African industrial and services exports to the rest of the world would be reduced, dropping from 89 per cent in 2010 to 83 per cent in 2022 in industry and from 97.7 per cent to 96.6 per cent in services.

Table 8.11: Evolution of the percentage share of intra-African trade by main sectors, 2010 and 2022

		2022		
	2010	**Baseline**	**Regional FTAs**	**Continental FTA**
Total	**10.2%**	**10.6%**	**14.0%**	**15.5%**
Agriculture and food	20.0%	20.2%	26.5%	28.3%
Industry	11.0%	11.6%	15.3%	17.0%
Services	2.3%	2.6%	2.9%	3.4%

Source: Authors' calculations based on MIRAGE model.

Table 8.12: Real income variations by main regions – percentage and value changes compared with the baseline scenario, 2022

	Regional FTAs		Continental FTA	
	%	US$ billion	%	US$ billion
Africa total	0.14	203.4	0.20	296.7
Developed countries excluding Africa	0.00	–62.5	–0.01	–97.1
Developed countries	0.00	–69.7	0.00	–106.1
World	**0.00**	**71.3**	**0.07**	**93.4**

Source: Authors' calculations based on MIRAGE model.

8.4.2 Income

Thanks to significant and positive intra-African trade variations, the formation of FTAs at the regional level would result in an increase in real income of 0.14 per cent (or $203.4 million) for Africa, compared with the reference case, in 2022. The implementation of a CFTA would bring nearly 50 per cent more gains, amounting to 0.20 per cent (or $296.7 million). Hence, although real income increases for Africa are relatively small, the analysis implies that Africa as a whole would be better off despite tariff revenue losses resulting from the trade reforms. Non-African countries that do not implement the liberalization reforms and that lose markets to Africa would see their real income diminish in absolute terms as regional integration deepens in Africa (table 8.12).

8.4.3 Wages

In addition, the trade reforms have a positive, although small, impact on real wages for all categories of African workers. Unskilled workers employed in non-agricultural sectors register the highest increase in income, at 0.70 per cent and 0.80 with regional FTAs and a CFTA, respectively. For their unskilled counterparts in the agricultural sector, real wages would increase 0.65 per cent and 0.74 per cent with FTAs at regional and continental levels, respectively. Both trade reforms also would improve the income of skilled workers, but to a lesser extent (table 8.13). These wage increases are in line with the intra-African trade increase highlighted in figure 8.2, showing industrial exports rising more than agricultural exports as a consequence of the implemented liberalization reforms.

8.4.4 Employment

As indicated in table 8.14, in response to larger salary increases for unskilled workers employed in non-agricultural sectors than for those in agriculture, employment in Africa would most likely fall slightly in the agriculture sector, while it would rise

Table 8.13: Real wages in Africa by main qualifications and main sectors of activity – percentage changes compared with the baseline scenario, 2022

	Unskilled real wages in agriculture	**Unskilled real wages in non-agricultural sectors**	**Skilled real wages**
Regional FTAs	0.65	0.70	0.49
Continental FTA	0.74	0.80	0.54

Source: Authors' calculations based on MIRAGE model.

Table 8.14: Employment in Africa by main sectors of activity – percentage changes compared with the baseline scenario, 2022

	Employment in agricultural sectors	**Employment in non-agricultural sectors**
Regional FTAs	–0.07	0.02
Continental FTA	–0.08	0.02

Source: Authors' calculations based on MIRAGE model.

slightly in the industrial sector if the assumption of fixed labour endowment were relaxed and unemployment were considered. These changes would be extremely small, however.

8.4.5 Country-level effects

At the country level results are more ambiguous. While FTA reforms would stimulate exports of all African countries,[33] with higher increases associated with larger areas

[33] Botswana's exports, however, would be unchanged with the FTA reforms. Moreover, only three countries/regions – Botswana, Mozambique, and the rest of SACU – would not benefit more from a continental FTA than from regional FTAs. One reason is that these countries are initially among the least diversified economies in terms of products and market of imports and exports. In terms of imports, these economies depend heavily on South Africa: 34 per cent, 65 per cent, and 71 per cent of Mozambique's, rest of SACU's, and Botswana's imports, respectively, come from South Africa, while 33 per cent of rest of SACU products are exported to South Africa. Some 67 per cent of Mozambique's exports and 76 per cent of Botswana's exports go to the European Union. In addition, mineral and metal products constitute 54 per cent of Mozambique's exports, while 71 per cent of Botswana's exports are primary products.

free of tariff barriers on goods, real income impacts from implemented FTAs would be very unequal across countries (table 8.15). Although real income variations are rather modest, nearly half of African countries/regions would see their real income decrease with the trade reforms. There are two main reasons for such a situation. First, following the establishment of FTAs, governments have to renounce tariff revenues, which often constitute a significant portion of their incomes.[34] Second, the reduction of tariff barriers results in greater competition in African markets. As some

Table 8.15: Exports and real income by African country/region – percentage changes compared with the baseline scenario, 2022

	Exports		**Real Income**	
	Regional FTAs	**Continental FTA**	**Regional FTAs**	**Continental FTA**
Angola and Democratic Republic of Congo	1.0	1.5	–0.3	–0.3
Ethiopia	4.7	5.0	0.2	0.3
Madagascar	0.5	0.6	0.0	0.1
Malawi	12.3	12.4	–0.6	–0.6
Mauritius	4.3	4.6	–0.9	–0.8
Mozambique	9.5	9.3	–0.5	–0.5
United Republic of Tanzania	16.2	17.0	0.2	0.3
Uganda	3.0	4.9	0.1	0.4
Zambia	17.1	18.5	–0.5	–0.2
Zimbabwe	14.7	14.9	–1.5	–1.4
Rest of Eastern Africa	6.3	7.1	–0.3	–0.2
Botswana	0.0	0.0	–0.2	–0.4
South Africa	2.2	4.2	0.4	0.7
Rest of South African Customs Union	2.1	2.0	1.1	1.1
Egypt	0.4	2.6	0.0	0.3
Morocco	2.7	4.8	0.2	0.0
Tunisia	6.0	6.9	0.6	0.6
Rest of North Africa	1.3	1.8	0.0	–0.1
Nigeria	1.3	2.2	–0.1	–0.4
Senegal	5.9	6.5	0.3	0.3
Rest of Western Africa	6.9	7.9	0.6	0.6
Central Africa	2.8	5.6	0.1	–0.1
Africa	**2.8**	**4.0**	**0.1**	**0.2**

Source: Authors' calculations based on MIRAGE model.

[34] Countries with initially higher tariff structures are generally the most adversely affected in terms of real income due to tariff revenue losses. For example, Zimbabwe's real income would decrease the most with establishment of regional FTAs and a CFTA, by 1.5 per cent and 1.4 per cent, respectively. Zimbabwe initially imposes an average tariff of 21.5 per cent on its imports of agricultural products from African economies, and its initial import share of agricultural products is among the highest in Africa.

imports from some African countries are replaced by imports from other African partners who benefit more from easier access following tariff reductions, terms of trade (i.e. prices of exports relative to prices of imports) may be affected.[35] In addition, the real income of net food importing countries, such as Angola and the Democratic Republic of Congo, Botswana, Mozambique, rest of North Africa, Nigeria, and Central Africa, tends to be adversely affected as world prices of food products rise slightly with FTA reforms. A significant number of African countries/regions, such as South Africa, being more diversified in terms of product and geographic origin of their imports (or being less dependent on food imports), register welfare gains as a result of trade reforms.

Because FTA reforms lead to higher exports of agricultural and food products by all African countries/regions (annex tables A8.7 and A8.8), in nearly all African countries/regions real wages of unskilled workers employed in agriculture and food sectors increase, compared with the baseline scenario (table 8.16). This is especially true in countries/regions highly specialized in exporting these products, such as Malawi and Zimbabwe[36] (table 8.16) and with the formation of a continent-wide FTA. Nevertheless, unskilled agricultural workers see a decrease in real wages in the main oil exporter countries – Angola, Egypt, Nigeria, rest of Eastern Africa (including Kenya) – as well as Zambia (69 per cent of Zambia's exports are mineral and metal products; see annex table A8.6) and Mauritius (mainly exporting textile, wearing apparel, and leather products).

As observed at the global level, whenever the real wages of unskilled labour employed in non-agricultural sectors increase (decrease) more (less) than those for unskilled workers engaged in agriculture, employment slightly decreases in agriculture and increases elsewhere. However, for some countries (Botswana, Ethiopia, Malawi, Morocco, South Africa, Zimbabwe, and rest of SACU), the establishment of FTAs would favour agricultural employment, thanks to the higher real wages for unskilled workers in the sector (table 8.17).

8.4.6 Trade facilitation

While results from the analysis focusing on the establishment of larger free trade areas and especially the CFTA are rather positive at the global level for Africa, the increase in the share of intra-African trade may not appear sufficient. Indeed, in January 2012 at the 18th African Union Summit of Heads of State and Government, AU Member States expressed the desire to see the share of intra-African trade double within the next ten years. (Our simulations projected an increase of only 52.0 per cent.) Moreover, country-level results can reasonably raise concerns due to real income losses for some African economies.

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[35] For some countries, such as Malawi, Mozambique, Zambia, and Zimbabwe, exchanges shift from relatively efficient to less efficient partners, implying that relatively cheap imports are replaced by more expensive ones, leading to trade diversion, a decrease in terms of trade, and lower real income.

[36] For Zimbabwe 38 per cent and for Malawi 56 per cent of initial exports are concentrated in agriculture and food (annex table A8.6).

Table 8.16: Real wages by main qualifications and main sectors of activity – percentagechanges compared with the baseline scenario, 2022

	Regional FTAs			Continental FTA		
	Unskilled real wages in agriculture	Unskilled real wages in non agricultural sectors	Skilled real wages	Unskilled real wages in agriculture	Unskilled real wages in non agricultural sectors	Skilled real wages
Angola and Democratic Republic of Congo	–0.24	–0.06	–0.28	–0.12	0.04	–0.31
Ethiopia	1.09	0.21	–0.48	1.18	0.25	–0.45
Madagascar	0.03	0.05	0.09	0.20	0.09	0.17
Malawi	3.14	1.95	1.01	3.33	1.97	0.99
Mauritius	–0.11	1.12	0.64	–0.16	1.25	0.71
Mozambique	0.56	1.09	0.27	0.58	1.06	0.26
United Republic of Tanzania	1.10	1.10	1.44	1.13	1.17	1.55
Uganda	0.29	0.41	0.38	0.48	0.91	0.82
Zambia	–0.05	1.12	1.24	0.48	1.42	1.40
Zimbabwe	8.12	4.97	3.15	8.14	5.00	2.99
Rest of Eastern Africa	–0.20	0.37	0.25	–0.13	0.47	0.40
Botswana	0.34	–0.06	–0.18	0.50	–0.18	–0.40
South Africa	0.86	0.30	0.46	0.93	0.56	0.80
Rest of South African Customs Union	1.59	0.86	1.06	1.83	0.82	1.00
Egypt	–0.02	0.04	0.07	0.32	0.28	0.28
Morocco	0.81	0.26	0.33	1.41	0.38	0.47
Tunisia	0.36	1.28	1.48	–0.58	1.42	1.65
Rest of North Africa	0.19	0.24	0.22	0.12	0.25	0.18
Nigeria	–0.26	0.23	–0.02	–0.54	0.12	–0.42
Senegal	0.28	0.84	0.47	0.25	0.97	0.71
Rest of Western Africa	0.27	1.94	1.65	0.40	2.15	1.81
Central Africa	0.27	0.42	0.30	0.46	0.64	0.38
Africa	**0.65**	**0.70**	**0.49**	**0.74**	**0.80**	**0.54**

Source: Authors' calculations based on MIRAGE model.

In that sense it is crucial to investigate the possible impact of additional policy measures that could complement the strict elimination of tariff barriers in goods and potentially augment the relatively small positive effects and counterbalance the minor negative effects associated with the FTA reforms. Recognizing the considerable challenges faced by Africa in terms of non-tariff barriers to trade within the continent (see section 8.2.), our analysis also considers trade facilitation measures – defined as an increase in the efficiency of customs procedures combined with a reduction of the time that merchandise spends at African ports – in addition to trade reforms.

If it is assumed that customs procedures become twice as efficient and the delay of merchandise at African ports is reduced by half by 2017, all of the aforementioned results are strongly affected. Table 8.18 indicates a much higher increase in exports and real income when trade facilitation measures complement FTA reforms. Also, while country-level results in terms of exports, especially effects on real income and real wages, appear moderate and mixed with the implementation of only regional FTAs or a CFTA, the improvement of customs procedures and port handling would lead to positive results in all Africa economies almost without exception[37] (annex tables A8.9 and A8.10).

Table 8.17: Employment by main sectors of activity – percentage changes compared with the baseline scenario, 2022

	Regional FTAs		Continental FTA	
	Employment in agricultural sectors	**Employment in non-agricultural sectors**	**Employment in agricultural sectors**	**Employment in non-agricultural sectors**
Angola and Democratic Republic of Congo	–0.07	0.02	–0.06	0.02
Ethiopia	0.20	–0.24	0.22	–0.25
Madagascar	–0.01	0.00	0.03	–0.02
Malawi	0.40	–0.18	0.45	–0.21
Mauritius	–0.54	0.07	–0.62	0.08
Mozambique	–0.17	0.09	–0.16	0.08
United Republic of Tanzania	0.00	0.00	–0.01	0.01
Uganda	–0.02	0.04	–0.07	0.15
Zambia	–0.42	0.16	–0.34	0.13
Zimbabwe	1.23	–0.25	1.23	–0.25
Rest of Eastern Africa	–0.18	0.10	–0.19	0.11
Botswana	0.19	–0.01	0.33	–0.01
South Africa	0.27	–0.01	0.18	0.00
Rest of South African Customs Union	0.35	–0.02	0.48	–0.02
Egypt	–0.02	0.01	0.02	0.00
Morocco	0.23	–0.05	0.42	–0.09
Tunisia	–0.38	0.08	–0.82	0.17
Rest of North Africa	–0.02	0.00	–0.06	0.01
Nigeria	–0.10	0.14	–0.14	0.19
Senegal	–0.15	0.12	–0.20	0.16
Rest of Western Africa	–0.19	0.64	–0.20	0.67
Central Africa	–0.05	0.02	–0.06	0.03
Africa	**–0.07**	**0.02**	**–0.08**	**0.02**

Source: Authors' calculations based on MIRAGE model

[37] Mauritius would see a slight decrease in real income.

Table 8.18: Exports and welfare with and without adoption of trade facilitation measures on top of FTA reforms – percentage changes compared with the baseline scenario, 2022

	Exports		Real Income	
	Regional FTAs	Continental FTA	Regional FTAs	Continental FTA
FTA reforms only	2.8	4.0	0.1	0.2
FTA reforms accompanied by trade facilitation measures	7.9	10.2	0.8	1.0

Source: Authors' calculations based on MIRAGE model.

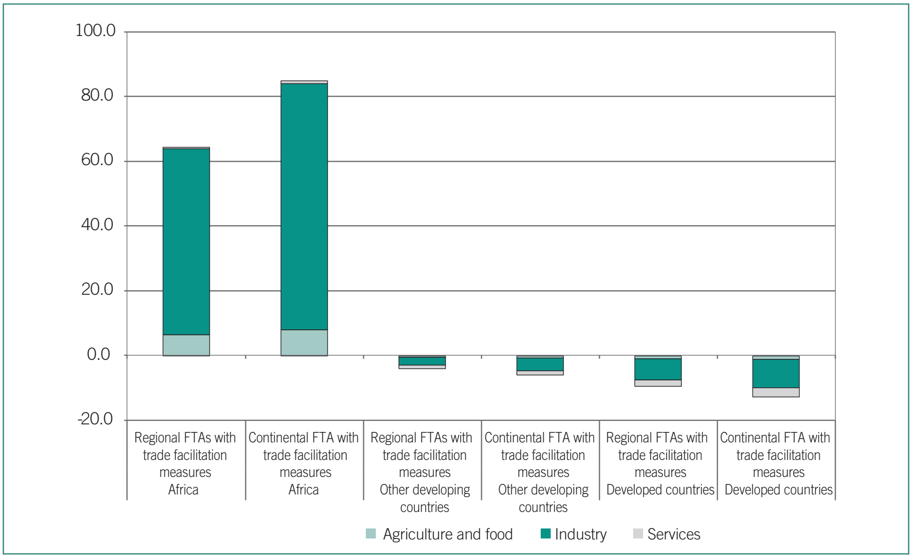
With the addition of trade facilitation measures, agricultural and food exports, as well as industrial exports, would increase considerably (table 8.19). In particular, compared with the effects of FTAs alone, a strong increase in exports of sugar and other food products would drive the increase in agricultural and food exports. However, in percentage terms exports of industrial products would grow more than those of agricultural and food exports – the reverse of the pattern when only FTA

Table 8.19: Exports by agricultural sectors and mains sectors with adoption of trade facilitation measures on top of FTA reforms – percentage changes compared with the baseline scenario, 2022

	Regional FTAs with trade facilitation measures	Continental FTA with trade facilitations measures
Agriculture and food	**9.0**	**11.3**
Paddy and processed rice	1.5	3.0
Wheat	24.4	24.0
Cereals	16.3	16.4
Oilseeds	1.1	2.4
Sugar cane and sugar beet	81.2	77.8
Cattle, sheep, goats, and horses	3.5	3.1
Animal products and wool	–0.4	–1.2
Other agricultural products	0.0	0.3
Raw milk and dairy products	75.7	104.7
Meat products	14.4	25.6
Sugar	11.5	13.8
Other food products	21.2	25.5
Industry	**10.4**	**13.5**
Services	**–2.1**	**–2.7**
All sectors	**7.9**	**10.2**

Source: Authors' calculations based on MIRAGE model.

Figure 8.3: Exports of African countries by destinations and main sectors with adoption of trade facilitation measures on top of FTA reforms – changes in US$ billion compared with the baseline scenario, 2022



Source: Authors' calculations based on MIRAGE model.

reforms are considered. This implies that the trade facilitation measures considered in the analysis would strongly enhance the industrialization of African trade.

After introduction of trade facilitation measures on top of elimination of tariff barriers, intra-African trade increases by 97.2 per cent (or \$64.4 billion) via regional FTA and 128.4 per cent (or \$85.0 billion) through a CFTA, compared with the baseline, in 2022. This large rise would be explained mostly by an increase in industrial trade among African economies – by 110.0 per cent (or \$57.6 billion) following regional reforms and 145.4 per cent (or \$76.1 billion) following continental trade reforms. Intra-African trade of agriculture and food products as well as services also would increase with similar reforms, but to a lesser extent – by 73.8 per cent (or \$7.9 billion) and 30.8 per cent (or \$1.0 billion), respectively (figure 8.3).

The share of intra-African trade would increase more than two-fold between 2010 and 2022, rising from 10.2 per cent to 21.9 per cent, through the adoption of a more efficient system of trading across borders along with establishment of a CFTA (table 8.20). As a share of total exports, African exports to their partners from the continent would grow at similar paces for agriculture and food products (57.6 per cent) and for services (52.9 per cent) between 2010 and 2022. Intra-African trade of industrial products would grow at a much higher rate, from 11.6 per cent in 2010 to 25.0 per cent in 2022 (i.e. a growth rate of 126.1 per cent). Although not all of the industrial products are necessarily sophisticated products, this indicates an expansion of intra-African trade in more elaborated products if an FTA at the continental level is implemented and complemented by trade facilitation measures.

Table 8.20: Percentage increases in intra-African trade volumes with adoption of trade facilitation measures on top of FTA reforms

	2010	2022		
		Baseline	Regional FTAs	Continental FTA
Total	**10.2%**	**10.6%**	**19.3%**	**21.9%**
Agriculture and food	20.0%	20.2%	29.5%	31.5%
Industry	11.0%	11.6%	22.0%	25.0%
Services	2.3%	2.6%	3.0%	3.5%

Source: Authors' calculations based on MIRAGE model.

As a consequence of the shift of trade and production towards more industrial products, real wages for both skilled and unskilled workers in non-agricultural activities increase. With FTA reforms alone, real wages of skilled workers increase less than those of unskilled workers employed in either agricultural or non-agricultural activities, whereas, when trade facilitation measures are introduced as well, skilled labourers register greater salary increase. Thanks to increased production, consumption, and exchanges of agricultural and food products, trade reforms also would increase the real wages of unskilled agricultural workers, but to a lesser extent than for other categories of workers (table 8.21).

Therefore, the inclusion of trade facilitation measures on top on FTA reforms tend to favour employment and salaries for workers engaged in non-agricultural

Table 8.21: Real wages by main qualifications and main sectors of activity with and without adoption of trade facilitation measures on top of FTA reforms – percentage changes compared with the baseline scenario, 2022

	Regional FTAs			Continental FTA		
	Unskilled workers employed in agriculture	Unskilled workers employed in non-agricula sectors	Skilled workers	Unskilled workers employed in agriculture	Unskilled workers employed in non-agricula sectors	Skilled workers
FTA reforms only	0.65	0.70	0.49	0.74	0.80	0.54
FTA reforms accompanied by trade facilitation measures	1.81	2.73	3.07	1.94	2.93	3.23

Source: Authors' calculations based on MIRAGE model.

Table 8.22: Employment by main sectors of activity with and without adoption of trade facilitation measures on top of FTA reforms – percentage changes compared with the baseline scenario, 2022

	Regional FTAs		Continental FTA	
	Employment in agricultural sectors	**Employment in non-agricultural sectors**	**Employment in agricultural sectors**	**Employment in non-agricultural sectors**
FTA reforms only	–0.07	0.02	–0.07	0.02
FTA reforms accompanied by trade facilitation measures	0.21	0.07	0.24	0.07

Source: Authors' calculations based on MIRAGE model.

activities in response to a relatively greater increase in demand for industrial products within Africa. Correspondingly, wages and employment in the agricultural sector decline (tables 8.22 and 8.23). If the model assumptions were changed to allow for unemployment, it could be expected that employment would increase in both agriculture and industry in Africa, considering the large increased demand in all categories of products. However, given the model's assumption of fixed employment – and because the increase in industrial output strongly dominates the increase in agricultural and food production (table 8.23) – employment of workers in agricultural and food activities slightly decreases. The greater the increase in industrial output relative to the output in agriculture and food, the greater the decrease in employment for workers in agricultural sectors.

Results at the county level are very heterogeneous and certainly more meaningful (annex tables A8.11 and A8.12). Indeed, due to the introduction of the trade reforms, imports of agriculture and food products strongly increase, adversely affecting domestic production of these products in almost half of the African countries/regions considered in the analysis. Where imports increase more than exports, countries register a decrease in production, and employment falls. In contrast, in the case of industrial products, production, employment, and wages increase nearly everywhere, thanks to higher demand and stronger exports than imports (annex tables A8.10, A8.11, and A8.12).

Overall, however, at the continental level production of agricultural and food products as well as manufactured goods increases with the establishment of the reforms. In other words, Africa as a whole would be better off if regional integration is deepened. This is particularly true if trade facilitation measures are implemented along with the reduction/removal of tariff barriers on goods (table 8.23).

Table 8.23: Output by main sectors with and without adoption of trade facilitation measures – percentage changes compared with the baseline scenario, 2022

	Regional FTAs			Continental FTA		
	Agriculture and food	Industry	Services	Agriculture and food	Industry	Services
FTA reforms only	0.22	0.34	–0.03	0.26	0.43	–0.06
FTA reforms accompanied by trade facilitation measures	0.30	1.40	0.18	0.34	1.67	0.17

Source: Authors' calculations based on MIRAGE model.

8.5 CONCLUSIONS AND POLICY RECOMMENDATIONS

African ministers of trade recommended in November 2010, in Kigali, that Africa should fast-track its regional integration process. This political will was reaffirmed during the 18th African Union Summit held in Addis Ababa in January 2012, as African heads of state and government endorsed an action plan for "boosting intra-African trade and the establishment of the continental free trade area", with 2017 set as the tentative date for the creation of the CFTA.

The foregoing analysis, using a computable general equilibrium model, shows that such trade reform would benefit Africa as a whole. The results indicate that, for Africa as a whole, the establishment of regional FTAs would increase continental exports, real income, and real wages for all categories of workers, although the estimated changes are small. The formation of a larger FTA at the continental level would amplify these gains. In particular, agricultural and food exports would be significantly stimulated following the removal of relatively high initial tariff barriers, and unskilled workers employed in agriculture would see their purchasing power enhanced. Moreover, with the increase in trade of industrial products, as well as the dominant trade-creating effects of the FTA reforms, intra-African trade as a share of Africa's total trade would increase by about half over a 12-year period, from 10.2 per cent in 2010 to 15.5 per cent in 2022.

However, the formation of a CFTA would not increase the share of intra-African trade as much as the AU Member States desire; they recently affirmed the wish to see the share of intra-continental trade double within the next ten years. Moreover, the relatively small gains in production, real income, and real wage – small in part due to the decrease of revenues from tariff duties – tend to limit the overall benefits of the trade reform. Furthermore, at the country level, results are varied, with some African economies registering a decrease in real income due to tariff revenue losses and/or negative terms of trade and/or net negative food trade balances. Also, in some countries certain categories of workers – especially those engaged in agricultural activities – see their real wages decline with the reforms due to employment contractions as domestic production in agriculture is hurt by the excess of imports over exports.

For these reasons, implementing an FTA alone would not be sufficient to generate benefits for every African economy. One possible path could be to address non-tariff barriers as well. These barriers are quite high within the continent, limiting potential exchanges. Therefore, it is paramount that additional measures aiming at easing trade across borders accompany FTA reforms. The analysis assesses the additional effect of making customs procedures twice as efficient as well as halving the time that merchandise is held at African ports. These improvements would lead to positive exports and real income increases in all African countries. With these non-tariff barriers reduced and a CTFA effectively implemented, the share of intra-African trade more than doubles, rising from 10.2 per cent in 2010 to 21.9 per cent[38] in 2022. Moreover, introducing trade facilitation measures would expand the exchanges of industrial products, thus increasing the sophistication of intra-African trade. In percentage terms the increase of Africa's industrial exports would surpass that of Africa's agricultural and food exports, leading to higher wage increase for skilled and unskilled workers employed in non-agricultural activities than for their counterparts in agriculture.

While real wages in agriculture would still increase significantly, employment in agriculture in Africa is projected to decrease slightly because labour demand in the industrial sector would increase relatively more and because of the model's assumption of fixed employment. The decrease in agricultural employment does not necessarily mean that unemployment is rising, but rather it reflects a reallocation of workers from one sector to another. Since the industrial sector is in general more productive than the agricultural sector (the 65 per cent of labour force engaged in agriculture in Africa contributes 32 per cent of GDP), this change would mean an increase in total productivity. Structural change that contributes to growth is very much needed in Africa. McMillan and Rodrik (2011) observe a growth-*reducing* structural change for Africa between 1990 and 2005, that is to say, on balance, resources were moved from more productive sectors into less productive ones. Therefore, a CFTA that could help production and export structures of African economies to move away from primary commodities and give more weight to industry would facilitate the transition in the right direction. However, efforts will be necessary to ensure appropriate human capital to properly meet the challenge. This requires greater focus on men's and women's education and initiatives that devote sufficient resources to encouraging creativity and innovation. Measures aiming at developing productive capacities will also be essential and could help promote competitiveness and export diversification.

The CGE analysis undertaken entails several limitations, in particular regarding the representation of African economies, such as the lack of data in the GTAP database,

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[38] This corresponds to a growth rate of nearly 115 per cent over the 12-year period.

the assumption of a single representative consumer for each economy, and the assumption of full employment of labour. Still, these caveats should not detract from the message of the above findings. They clearly show that, despite mitigated gains at the country level, the larger the FTA reforms, the greater the overall benefits for Africa. Complementary measures such as trade facilitation are critical to ensure that gains are better redistributed, and they could benefit all African countries. Tackling non-tariff barriers to trade effectively and improving infrastructure should certainly be seen as a key priority in the regional integration process. Finally, the expected impacts of the reforms on the agriculture sector, which engages the major part of the continent's population, are also encouraging, although also suggesting the importance of diversifying economies further towards more industrialized structures. In that respect, education policies should seek to produce better qualified men and women for the African labour market.

ANNEXES

Table A8.1: Average protection (tariff rate) imposed on faced by African countries' imports/exports, 2004

	Average imposed protection on imports								Average faced protection on exports							
	Total		Agric. and food		Primary		Industry		Total		Agric. and food		Primary		Industry	
	From Africa	From rest of world	From Africa	From rest of world	From Africa	From rest of world	From Africa	From rest of world	To Africa	To rest of world	To Africa	To rest of world	To Africa	To rest of world	To Africa	To rest of world
Algeria	13.6	13.9	14.7	15.3	6.8	6.7	13.9	13.8	5.8	0.4	34.9	10.3	4.4	0.2	5.9	1.1
Angola	10.8	6.9	16.3	9.9	21.7	24.2	8.2	6.1	1.7	0.4	18.5	8.5	1.3	0.4	10.7	2.1
Benin	5.5	11.4	7.0	13.5	1.8	3.5	5.0	10.7	8.7	4.6	5.7	4.2	6.1	1.8	11.8	6.5
Botswana	0.5	8.1	0.9	20.4	0.0	0.2	0.3	7.8	11.1	3.1	18.3	67.8	7.8	0.9	11.3	1.0
Burkina Faso	5.4	11.4	7.0	13.5	1.8	3.5	4.9	10.7	5.2	5.7	4.9	6.0	6.4	7.8	7.4	3.5
Burundi	12.2	21.6	16.3	25.5	7.1	14.6	10.2	20.9	6.4	3.5	4.2	5.4	2.5	2.3	7.7	2.2
Cameroon	14.7	15.0	21.2	20.0	13.5	15.9	12.7	14.0	10.6	3.2	11.8	9.5	1.2	0.7	10.9	0.6
Cape Verde	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	14.3	1.7	17.1	2.8	7.6	5.1	13.6	1.6
Central African Republic	14.2	15.0	20.6	20.0	13.5	15.9	12.1	14.0	8.5	0.6	5.3	2.2	2.2	0.0	9.4	0.7
Chad	14.8	15.9	23.3	19.8	10.4	10.0	12.2	14.6	7.9	0.6	3.3	1.1	17.6	0.5	6.8	0.7
Comoros	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.4	0.9	5.7	1.3	3.2	6.5	8.7	0.7
Congo	14.9	15.9	23.3	19.8	10.4	10.0	12.3	14.6	8.4	0.9	8.7	19.2	6.0	0.6	9.8	0.9
Congo (Democratic Rep.)	11.7	10.9	14.7	12.4	10.7	5.5	11.0	10.4	8.4	1.5	14.5	17.5	3.1	0.4	11.3	1.5
Côte d'Ivoire	4.1	10.0	4.5	12.1	0.1	2.6	6.8	9.7	10.9	2.8	9.4	3.9	3.5	0.8	11.6	1.4
Djibouti	19.7	29.9	7.2	14.6	27.7	33.3	22.7	31.6	7.2	8.5	7.5	9.8	8.7	21.0	6.7	7.5
Egypt	4.7	9.7	5.9	8.6	3.8	2.7	4.5	10.3	9.2	4.7	13.5	13.4	5.4	2.1	8.3	3.1
Equatorial Guinea	13.7	15.2	23.7	19.8	11.9	10.4	11.0	14.6	12.7	1.3	30.0	0.5	11.7	1.4	13.1	0.3
Eritrea	3.8	6.9	4.7	7.9	3.9	2.3	3.3	6.7	8.0	9.3	12.1	32.4	9.0	1.8	7.3	2.5
Ethiopia	13.3	10.9	21.9	17.5	6.1	5.5	11.8	10.2	19.5	3.3	20.2	3.3	17.3	0.5	17.0	3.4
Gabon	14.3	15.2	23.8	19.8	12.0	10.4	11.8	14.6	8.5	0.7	14.4	5.0	1.9	0.7	10.9	0.8
Gambia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.5	7.1	15.6	7.8	4.3	1.6	10.7	6.7
Ghana	11.2	14.0	13.4	19.0	0.6	8.0	16.1	13.1	10.1	2.5	13.4	2.3	4.7	1.1	9.1	3.3
Guinea	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.7	1.1	11.7	2.4	4.2	0.3	2.2	3.6
Guinea-Bissau	5.4	11.5	6.7	13.5	1.8	3.5	4.9	10.9	6.1	9.0	7.4	25.3	11.0	1.1	4.2	5.0
Kenya	11.3	18.3	16.2	29.9	8.1	2.0	9.0	16.2	7.6	5.2	8.5	6.4	3.6	6.4	7.3	3.3
Lesotho	1.2	9.9	5.5	13.0	0.2	0.1	0.4	10.2	3.7	0.2	8.4	2.6	0.0	0.0	3.4	0.2
Liberia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.9	1.0	8.1	4.0	4.2	0.7	6.7	1.0
Libyan Arab Jamahiriya	9.6	21.0	5.3	10.9	42.0	25.3	7.5	22.9	4.1	0.5	11.8	7.3	3.3	0.2	4.3	2.7
Madagascar	1.8	4.5	4.0	3.9	0.2	0.1	1.5	4.6	8.9	1.7	13.4	3.1	1.1	1.6	5.7	0.6
Malawi	8.4	11.7	10.1	13.9	1.0	2.0	8.3	11.3	4.1	17.9	3.5	20.4	3.8	1.5	5.6	2.0
Mali	5.3	11.4	6.7	13.5	1.8	3.5	4.9	10.7	4.7	1.6	4.3	1.9	7.9	0.3	6.6	1.1
Mauritania	7.8	9.6	9.2	12.4	5.0	8.9	8.5	9.0	10.1	1.6	10.0	3.1	4.3	0.2	12.1	2.0
Mauritius	13.8	19.3	18.7	17.7	3.1	1.5	12.8	19.9	4.0	13.1	4.3	49.5	6.1	2.3	3.9	1.1
Morocco	11.3	19.7	14.6	44.3	16.4	11.4	9.0	17.5	15.2	2.2	22.4	5.2	7.0	1.5	9.7	1.3
Mozambique	9.4	10.0	15.2	9.0	3.9	4.9	7.9	10.4	10.1	1.4	13.4	9.3	5.8	0.8	6.7	0.3
Namibia	0.7	8.5	3.2	13.5	0.0	0.1	0.3	8.3	4.0	5.6	7.6	18.1	0.9	0.1	1.4	1.7
Niger	5.4	11.4	7.0	13.5	1.8	3.5	4.9	10.7	7.3	1.9	7.5	16.4	9.2	0.7	6.8	0.5
Nigeria	28.1	24.2	46.9	34.0	13.5	14.9	25.2	22.5	2.2	2.6	15.8	3.0	1.0	2.7	13.5	1.5
Rwanda	3.5	7.4	5.1	10.8	3.8	4.2	3.0	7.3	6.3	1.9	6.6	8.7	4.5	0.3	6.7	4.6
Sao Tome and Principe	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.8	1.4	21.3	1.0	12.1	0.2	10.8	2.0
Senegal	2.6	10.1	4.4	11.6	0.1	3.7	6.1	10.0	5.3	5.9	8.3	2.6	5.5	1.4	4.3	9.2
Seychelles	42.2	33.5	53.6	45.1	23.1	17.8	37.1	32.7	10.0	2.7	12.8	3.4	2.2	1.2	6.0	1.4
Sierra Leone	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.7	1.5	13.8	3.3	6.5	0.1	11.5	2.4
Somalia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	17.0	8.3	22.3	13.0	9.0	5.8	9.8	3.0
South Africa	0.8	7.2	2.2	12.1	0.0	0.0	1.1	7.7	12.4	3.3	21.6	9.9	11.4	0.5	11.1	3.1
Sudan	12.9	19.1	13.5	24.6	6.3	4.9	12.8	18.2	5.5	3.7	4.8	21.9	10.2	0.5	5.5	2.9
Swaziland	0.7	8.5	3.0	13.5	0.0	0.1	0.3	8.3	4.2	27.7	10.8	96.7	3.4	2.0	2.5	3.6
United Republic of Tanzania	11.7	10.7	19.5	14.6	8.4	1.2	10.3	10.1	15.4	6.9	21.9	10.0	7.0	1.6	11.1	2.6
Togo	3.9	10.2	4.1	12.9	0.1	2.6	6.1	9.8	7.0	3.6	6.1	4.0	2.7	1.9	7.3	4.7
Tunisia	11.0	17.9	27.0	42.9	3.6	16.2	12.2	15.2	13.0	2.6	19.9	26.5	6.9	0.2	11.8	1.0
Uganda	4.6	6.7	5.7	9.2	8.6	13.0	4.3	6.1	8.3	2.1	8.2	2.1	5.6	2.0	8.5	2.0
Zambia	8.6	8.7	11.5	14.7	5.6	5.1	8.2	9.1	5.3	2.8	6.7	5.0	5.8	5.6	4.9	2.4
Zimbabwe	12.4	15.8	21.5	19.4	8.2	9.9	11.3	15.6	2.4	8.6	5.3	14.5	0.2	2.0	1.6	2.1
Africa	8.7	13.6	12.4	19.4	2.3	4.7	9.0	13.1	8.7	2.6	12.4	9.5	2.3	1.1	9.0	2.3

Source: Authors' calculations based on TASTE software and MAcMap-HS6v2 database.

Table A8.2: Share of tariff revenues collected by African countries on their imports from African partners versus the rest of the world, 2010

	Africa	Rest of the world
Algeria	29.2%	70.8%
Angola	8.6%	91.4%
Benin	50.7%	49.3%
Botswana	5.1%	94.9%
Burkina Faso	37.5%	62.5%
Burundi	13.7%	86.3%
Cameroon	17.5%	82.5%
Cape Verde	50.1%	49.9%
Central African Republic	31.4%	68.6%
Chad	12.4%	87.6%
Comoros	13.9%	86.1%
Congo	22.9%	77.1%
Congo (Democratic Rep.)	12.6%	87.4%
Côte d'Ivoire	36.7%	63.3%
Djibouti	44.7%	55.3%
Egypt	15.4%	84.6%
Equatorial Guinea	6.4%	93.6%
Eritrea	11.7%	88.3%
Ethiopia	33.0%	67.0%
Gabon	26.6%	73.4%
Gambia	25.0%	75.0%
Ghana	37.1%	62.9%
Guinea	33.2%	66.8%
Guinea-Bissau	6.7%	93.3%
Kenya	22.0%	78.0%
Lesotho	13.1%	86.9%
Liberia	27.9%	72.1%
Libyan Arab Jamahiriya	10.5%	89.5%
Madagascar	4.8%	95.2%
Malawi	7.5%	92.5%
Mali	46.1%	53.9%
Mauritania	55.9%	44.1%
Mauritius	2.2%	97.8%
Morocco	19.8%	80.2%
Mozambique	26.9%	73.1%
Namibia	16.3%	83.7%
Niger	30.1%	69.9%
Nigeria	4.3%	95.7%
Rwanda	28.0%	72.0%
Sao Tome and Principe	39.5%	60.5%
Senegal	33.6%	66.4%
Seychelles	16.0%	84.0%
Sierra Leone	41.5%	58.5%
Somalia	38.2%	61.8%
South Africa	33.3%	66.7%
Sudan	4.4%	95.6%
Swaziland	13.4%	86.6%
United Republic of Tanzania	31.3%	68.7%
Togo	70.9%	29.1%
Tunisia	19.0%	81.0%
Uganda	58.0%	42.0%
Zambia	32.6%	67.4%
Zimbabwe	10.2%	89.8%
Africa	22.6%	77.4%

Source: Authors' calculations based on TASTE software and MAcMap-HS6v2 database.

Annex 8.3: Brief description of the MIRAGE CGE model

On the demand side of the model, a single representative agent is assumed in each region; this agent allocates a fixed share of its income for savings and devotes the rest to consumption of goods. A Linear Expenditure System–Constant Elasticity of Substitution (LES–CES) function is used to represent the agent's preferences across sectors.[39] The model allows for vertical (quality) as well as horizontal (variety) differentiations in goods. The goods produced by developed countries are assumed to have a higher quality than the ones produced by developing countries (Armington hypothesis[40]).

On the supply side, the model relies on a Leontief function assuming perfect complementarity between intermediate consumption and value added. Five factors of production contribute to value added: unskilled labour, skilled labour, capital, land, and natural resources. Skilled labour and capital are supposed to be more substitutable for one another than with other combinations of factors. The full employment of factor endowments is assumed. Labour is country-specific. Skilled labour is perfectly mobile between sectors, In contrast, in the case of unskilled labour, there is imperfect mobility between agricultural and non-agricultural sectors, but the mobility is perfect among each group of sectors, while there is immobility across countries. Labour mobility across the two sets of sectors is represented through the assumption that total labour is a Constant Elasticity of Transformation bundle of the two labour types. The rates of variations of labour are exogenously set following the demographic forecasts provided by the World Bank.[41] Land is imperfectly mobile between sectors, while natural resources and capital are sector-specific. Natural resources are constant, while capital is accumulative. The sole adjustment variable for capital stocks is the investment, such that the capital stock for the current year depends on the investment made for the same year and the capital stock from the previous year, which has depreciated.

The macroeconomic closure of the MIRAGE model is obtained by keeping the current account of each region constant and fixed to the base year. The real exchange rate is allowed to adjust in order to balance any possible disequilibrium of the current account. In other words, when a trade reform, such as reduction of tariff barriers, stimulates trade, the real exchange rates appreciate when exports increase more than imports and depreciate when the exports increase less than the imports.

[39] A LES-CES function indicates that the demand structure of each region depends on its income level. In MIRAGE developed countries are assumed to be constrained to a lower minimum level of consumption than developing countries. Ideally, findings of household surveys should be used to represent the demand structures in each region, but this requires a significant amount of data collection.

[40] The Armington hypothesis stipulates that consumer choices can be influenced by the geographic origin of the goods.

[41] Population growth rates are based on IBRD/World Bank projections, *Global economic prospects 2005: Trade, regionalism, and development.* Available at http://siteresources.worldbank.org/INTGEP2005/Resources/gep2005.pdf.

Table A8.4: GTAP countries/regions and correspondences with geographic aggregation chosen for the study

#	GTAP code	GTAP label	Model label
1	AUS	Australia	Other developed countries
2	NZL	New Zealand	Other developed countries
3	XOC	Rest of Oceania	Other developing countries
4	CHN	China	BRIC countries
5	HKG	Hong Kong	Other developing countries
6	JPN	Japan	Other developed countries
7	KOR	Korea	Other developed countries
8	TWN	Taiwan	Other developing countries
9	XEA	Rest of East Asia	Other developing countries
10	KHM	Cambodia	Other developing countries
11	IDN	Indonesia	Other developing countries
12	LAO	Lao People's Democratic	Other developing countries
13	MMR	Myanmar	Other developing countries
14	MYS	Malaysia	Other developing countries
15	PHL	Philippines	Other developing countries
16	SGP	Singapore	Other developing countries
17	THA	Thailand	Other developing countries
18	VNM	Vietnam	Other developing countries
19	XSE	Rest of Southeast Asia	Other developing countries
20	BGD	Bangladesh	Other developing countries
21	IND	India	BRIC countries
22	PAK	Pakistan	Other developing countries
23	LKA	Sri Lanka	Other developing countries
24	XSA	Rest of South Asia	Other developing countries
25	CAN	Canada	Other developed countries
26	USA	United States of America	United States
27	MEX	Mexico	Other developing countries
28	XNA	Rest of North America	Other developing countries
29	ARG	Argentina	Other developing countries
30	BOL	Bolivia	Other developing countries
31	BRA	Brazil	BRIC countries
32	CHL	Chile	Other developing countries
33	COL	Colombia	Other developing countries
34	ECU	Ecuador	Other developing countries
35	PRY	Paraguay	Other developing countries
36	PER	Peru	Other developing countries
37	URY	Uruguay	Other developing countries
38	VEN	Venezuela	Other developing countries
39	XSM	Rest of South America	Other developing countries
40	CRI	Costa Rica	Other developing countries
41	GTM	Guatemala	Other developing countries
42	NIC	Nicaragua	Other developing countries
43	PAN	Panama	Other developing countries
44	XCA	Rest of Central America	Other developing countries
45	XCB	Caribbean	Other developing countries
46	AUT	Austria	European Union
47	BEL	Belgium	European Union
48	CYP	Cyprus	European Union
49	CZE	Czech Republic	European Union
50	DNK	Denmark	European Union
51	EST	Estonia	European Union
52	FIN	Finland	European Union
53	FRA	France	European Union
54	DEU	Germany	European Union
55	GRC	Greece	European Union
56	HUN	Hungary	European Union
57	IRL	Ireland	European Union
58	ITA	Italy	European Union
59	LVA	Latvia	European Union
60	LTU	Lithuania	European Union
61	LUX	Luxembourg	European Union
62	MLT	Malta	European Union
63	NLD	Netherlands	European Union
64	POL	Poland	European Union
65	PRT	Portugal	European Union
66	SVK	Slovakia	European Union
67	SVN	Slovenia	European Union
68	ESP	Spain	European Union
69	SWE	Sweden	European Union
70	GBR	United Kingdom	European Union
71	CHE	Switzerland	Other developed countries
72	NOR	Norway	Other developed countries
73	XEF	Rest of European Free Trade Association	
74	ALB	Albania	Other developing countries
75	BGR	Bulgaria	European Union
76	BLR	Belarus	Other developing countries
77	HRV	Croatia	Other developing countries

Table A8.4: GTAP countries/regions and correspondences with geographic aggregation chosen for the study *(continued)*

#	GTAP code	GTAP label	Model label
78	ROU	Romania	European Union
79	RUS	Russian Federation	BRIC countries
80	UKR	Ukraine	Other developing countries
81	XEE	Rest of Eastern Europe	Other developing countries
82	XER	Rest of Europe	Other developing countries
83	KAZ	Kazakhstan	Other developing countries
84	KGZ	Kyrgyzstan	Other developing countries
85	XSU	Rest of Former Soviet Union	Other developing countries
86	ARM	Armenia	Other developing countries
87	AZE	Azerbaijan	Other developing countries
88	GEO	Georgia	Other developing countries
89	IRN	Iran, Islamic Republic of	Other developing countries
90	TUR	Turkey	Other developing countries
91	XWS	Rest of Western Asia	Other developing countries
92	EGY	Egypt	Egypt
93	MAR	Morocco	Morocco
94	TUN	Tunisia	Tunisia
95	XNF	Rest of North Africa - Algeria - Libyan Arab Jamahiriya	Rest of North Africa
96	NGA	Nigeria	Nigeria
97	SEN	Senegal	Senegal
98	XWF	Rest of Western Africa - Benin - Burkina Faso - Cape Verde - Cote d'Ivoire - Gambia - Ghana - Guinea - Guinea-Bissau - Liberia - Mali - Mauritania - Niger - Saint Helena - Sierra Leone - Togo	Rest of Western Africa
99	XCF	Rest of Central Africa - Cameroon - Central African Republic - Chad - Congo - Equatorial Guinea - Gabon - Sao Tome and Principe	Rest of Central Africa
100	XAC	Rest of South Central Africa - Angola - Congo, Democratic Republic of the	Rest of South Central Africa
101	ETH	Ethiopia	Ethiopia
102	MDG	Madagascar	Madagascar
103	MWI	Malawi	Malawi
104	MUS	Mauritius	Mauritius
105	MOZ	Mozambique	Mozambique
106	TZA	United Republic of Tanzania	United Republic of Tanzania
107	UGA	Uganda	Uganda
108	ZMB	Zambia	Zambia
109	ZWE	Zimbabwe	Zimbabwe
110	XEC	Rest of Eastern Africa -Burundi -Comoros - Djibouti - Eritrea - Kenya - Mayotte - Reunion - Rwanda - Seychelles - Somalia - Sudan	Rest of Eastern Africa
111	BWA	Botswana	Botswana
112	ZAF	South Africa	South Africa
113	XSC	Rest of South African Customs Union - Lesotho - Namibia - Swaziland	Rest of South African Customs Union

BRIC=Brazil, Russia, India, China

Table A8.5: GTAP sectors and correspondences with sector decomposition chosen for the study

#	GTAP code	GTAP label	Model label
1	PDR	Paddy rice	Paddy and processed rice
2	WHT	Wheat	Wheat
3	GRO	Cereal grains nec	Cereals
4	V_F	Vegetables, fruit, and nuts	Other agricultural products
5	OSD	Oil seeds	Oilseeds
6	C_B	Sugar cane and sugar beet	Sugar cane and sugar beet
7	PFB	Plant-based fibres	Other agricultural products
8	OCR	Crops nec	Other agricultural products
9	CTL	Bovine cattle, sheep and goats, and horses	Cattle, sheep, goats and horses
10	OAP	Animal products nec	Animal products and wool
11	RMK	Raw milk	Milk and dairy products
12	WOL	Wool and silk-worm cocoons	Animal products and wool
13	FRS	Forestry	Forestry
14	FSH	Fishing	Fishing
15	COA	Coal	Other primary products
16	OIL	Oil	Other primary products
17	GAS	Gas	Other primary products
18	OMN	Minerals nec	Other primary products
19	CMT	Bovine meat products	Meat products
20	OMT	Meat products nec	Meat products
21	VOL	Vegetable oils and fats	Other food products
22	MIL	Dairy products	Milk and dairy products
23	PCR	Processed rice	Paddy and processed rice
24	SGR	Sugar	Sugar
25	OFD	Food products nec	Other food products
26	B_T	Beverages and tobacco products	Other food products
27	TEX	Textiles	Textile, wearing apparel and leather products
28	WAP	Wearing apparel	Textile, wearing apparel and leather products
29	LEA	Leather products	Textile, wearing apparel and leather products
30	LUM	Wood products	Other manufactured products
31	PPP	Paper products and publishing	Other manufactured products
32	P_C	Petroleum and coal products	Petroleum and coal products
33	CRP	Chemical, rubber, and plastic products	Other manufactured products
34	NMM	Mineral products nec	Mineral and metals products
35	I_S	Ferrous metals	Mineral and metals products
36	NFM	Metals nec	Mineral and metals products
37	FMP	Metal products	Mineral and metals products
38	MVH	Motor vehicles and parts	Other manufactured products
39	OTN	Transport equipment nec	Other manufactured products
40	ELE	Electronic equipment	Other manufactured products
41	OME	Machinery and equipment nec	Other manufactured products
42	OMF	Manufactures nec	Other manufactured products
43	ELY	Electricity	Other manufactured products
44	GDT	Gas manufacture and gas distribution	Other manufactured products
45	WTR	Water	Other services
46	CNS	Construction	Other services
47	TRD	Trade	Other services
48	OTP	Transport nec	Transport
49	WTP	Water transport	Transport
50	ATP	Air transport	Transport
51	CMN	Communication	Other services
52	OFI	Financial services nec	Other services
53	ISR	Insurance	Other services
54	OBS	Business services nec	Other services
55	ROS	Recreational and other services	Other services
56	OSG	Public Administration, Defense, Education, and Health	Other services
57	DWE	Dwellings	Other services

nec=not elsewhere classified

Table A8.6: Initial export structures (percentage distribution) by country/region and sector, 2004

	Paddy and processe rice	Wheat	Cereals	Oilseeds	Sugar cane and sugar beet	Cattle, sheep, goats, and horses	Animal products and wool	Other agricultural products	Milk and dairy products	Meat products	Sugar	Other food products	Total agriculture and food products	Forestry	Fishing	Other primary products of world	Textile, wearing apparel, and leather product	Petroleum and coal products	Mineral and metal p roducts	Other manufactured products	Total ndustrial products	Transport	Other services	Total services
Angola and Democratic Republic of Congo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.01	0.15	0.15	0.46	1.84	0.01	92.74	0.02	0.26	0.48	1.40	96.74	0.87	1.93	2.80
Ethiopia	0.00	0.04	0.32	5.41	0.00	0.23	2.38	17.67	0.08	1.33	0.84	2.02	30.31	2.09	0.01	0.38	3.54	0.00	6.52	1.52	14.07	21.13	34.49	55.62
Madagascar	0.01	0.00	0.00	0.03	0.00	0.00	0.32	13.27	0.00	0.03	0.57	12.32	26.57	0.45	0.29	23.20	21.19	0.04	0.51	5.56	51.23	10.07	12.13	22.20
Malawi	0.02	0.02	0.19	0.79	0.00	0.00	0.11	45.41	0.00	0.00	8.95	0.70	56.20	0.01	0.06	25.19	6.25	0.03	0.47	4.70	36.71	3.53	3.55	7.09
Mauritius	0.01	0.00	0.00	0.00	0.00	0.00	0.54	0.22	0.05	0.01	9.19	3.56	13.58	0.01	0.02	15.45	23.74	0.02	1.05	10.11	50.40	20.48	15.53	36.01
Mozambique	0.02	0.00	0.18	0.52	0.00	0.00	0.03	6.44	0.00	0.01	0.87	5.50	13.58	1.42	0.06	1.13	0.28	0.02	54.00	19.39	76.30	4.13	6.00	10.12
United Republic of Tanzania	0.01	0.22	0.29	1.16	0.00	0.01	0.88	17.08	0.01	0.00	0.70	9.45	29.81	0.79	0.37	4.83	3.61	0.01	11.87	4.35	25.83	12.55	31.81	44.36
Uganda	0.10	0.00	0.51	0.27	0.00	0.00	0.60	16.90	0.19	0.03	0.07	10.20	28.88	0.03	0.23	39.58	1.74	0.06	7.08	3.88	52.61	6.65	11.86	18.51
Zambia	0.06	0.00	1.43	1.52	0.00	0.00	0.27	11.03	0.02	0.04	1.61	0.81	16.78	0.01	0.02	3.56	1.92	0.06	68.50	4.77	78.83	1.79	2.60	4.39
Zimbabwe	0.01	0.00	0.03	0.09	0.00	0.01	0.76	28.75	0.21	0.33	3.45	4.28	37.92	0.12	0.01	11.39	2.92	0.35	25.55	11.00	51.33	3.10	7.65	10.75
Rest of Eastern Africa	0.00	0.05	0.06	1.49	0.00	1.83	0.65	12.48	0.03	0.69	0.39	6.05	23.72	0.69	0.08	30.13	2.63	1.37	3.88	6.59	45.37	9.13	21.77	30.91
Botswana	0.03	0.00	0.05	0.01	0.00	0.00	0.14	0.02	0.00	1.28	0.00	0.59	2.11	0.02	0.00	71.27	1.83	0.00	4.66	5.42	83.21	4.72	9.96	14.68
South Africa	0.05	0.06	0.28	0.04	0.00	0.04	0.35	3.28	0.22	0.23	0.37	3.99	8.90	0.10	0.20	13.59	1.74	2.28	27.93	30.97	76.82	4.66	9.62	14.28
Rest of South African Customs Union	0.01	0.00	0.01	0.00	0.00	1.02	0.18	1.00	0.08	1.56	3.64	11.47	18.97	0.28	0.62	16.94	11.81	0.01	6.88	31.49	68.03	2.32	10.68	13.00
Egypt	1.10	0.00	0.01	0.12	0.01	0.00	0.35	3.24	0.25	0.02	0.23	1.73	7.06	0.01	0.02	3.45	6.01	6.24	10.35	8.20	34.29	26.59	32.07	58.65
Morocco	0.00	0.00	0.00	0.00	0.00	0.00	0.24	4.53	0.36	0.12	0.06	6.98	12.28	0.04	0.93	4.37	18.83	1.18	3.04	23.22	51.62	12.96	23.15	36.11
Tunisia	0.00	0.00	0.05	0.00	0.00	0.00	0.04	1.00	0.08	0.01	0.00	6.44	7.63	0.02	0.30	4.58	30.95	0.30	3.54	26.19	65.88	11.54	14.95	26.49
Rest of North Africa	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.01	0.00	0.00	0.10	0.20	0.00	0.02	73.55	0.05	10.50	1.73	2.84	88.68	3.02	8.10	11.12
Nigeria	0.00	0.00	0.00	0.08	0.00	0.00	0.01	0.87	0.01	0.00	0.01	0.32	1.29	0.06	0.00	87.65	0.63	0.32	0.35	0.93	89.95	1.61	7.15	8.76
Senegal	0.60	0.00	0.00	0.16	0.00	0.00	0.51	3.56	0.29	0.10	0.10	18.17	23.49	0.14	2.93	2.14	1.46	1.58	4.76	26.81	39.82	10.66	26.03	36.69
Rest of Western Africa	0.03	0.01	0.12	0.47	0.00	0.28	0.05	26.59	0.14	0.04	0.26	10.41	38.39	0.64	0.26	15.47	0.98	1.98	6.66	21.48	47.45	4.84	9.31	14.15
Central Africa	0.00	0.00	0.01	0.00	0.00	0.01	0.04	6.13	0.01	0.00	0.05	0.95	7.21	4.79	0.01	61.74	0.07	1.57	2.15	8.73	79.07	3.31	10.41	13.72
BRIC countries	0.11	0.11	0.12	0.51	0.00	0.00	0.14	0.74	0.04	0.65	0.23	2.35	5.00	0.22	0.08	9.01	17.28	2.49	10.59	47.08	86.75	1.90	6.34	8.25
Other developing countries	0.19	0.13	0.13	0.26	0.00	0.05	0.12	1.38	0.13	0.34	0.19	3.17	6.08	0.14	0.13	14.95	8.78	3.28	7.77	40.55	75.60	4.05	14.28	18.32
European Union	0.01	0.09	0.03	0.02	0.00	0.05	0.16	0.40	0.42	0.35	0.06	2.77	4.37	0.03	0.03	1.26	3.15	1.50	6.44	55.48	67.89	6.26	21.48	27.74
United States	0.10	0.54	0.68	0.69	0.00	0.03	0.23	1.28	0.11	0.55	0.01	2.10	6.32	0.15	0.07	0.81	2.06	1.63	4.73	59.54	68.98	4.72	19.97	24.70
Other developed countries	0.01	0.34	0.09	0.14	0.00	0.05	0.25	0.34	0.35	0.63	0.05	1.45	3.68	0.08	0.20	6.09	1.89	1.11	8.76	57.54	75.68	3.17	17.47	20.64

BRIC=Brazil, Russia, India, China. Source: Authors' calculations based on MIRAGE model.

Table A8.7: Export volumes by African country/region and sector, regional FTAs scenario – percentage changes compared with the baseline scenario, 2022

	Paddy and processe rice	Wheat	Cereals	Oilseeds	Sugar cane and sugar beet	Cattle, sheep, goats, and horses	Animal products and wool	Other agricultural products	Milk and dairy products	Meat products	Sugar	Other food products	Total agriculture and food products	Forestry	Fishing	Other primary Products of worl	Textile, wearing apparel, and leather product	Petroleum and coal products	Mineral and metal p roducts	Other manufactured products	Total industrial products	Transport	Other services	Total services
Angola and Democratic Republic of Congo	0.0	0.0	8.0	3.9	0.0	3.4	3.4	3.9	–2.5	15.5	–1.8	6.1	3.2	2.8	3.0	0.7	11.1	1.4	9.6	5.5	0.9	2.6	3.1	3.0
Ethiopia	–2.0	520.5	26.2	–1.8	0.0	16.0	–2.3	5.3	50.4	0.1	4.5	19.1	5.4	47.1	204.2	109.1	12.1	29.6	–0.2	9.3	18.4	–0.7	0.0	–0.3
Madagascar	0.2	0.0	0.1	–1.0	0.0	0.0	0.2	0.3	0.5	5.0	0.0	0.2	0.3	0.1	–0.1	0.2	1.0	–1.3	0.9	0.8	0.6	0.2	0.8	0.5
Malawi	3.9	1.3	–6.9	3.5	0.0	0.0	4.2	9.1	188.6	–32.1	5.7	–6.5	8.3	2.0	1.1	4.0	70.6	–4.2	21.5	18.1	19.2	9.2	4.9	6.8
Mauritius	2.0	0.0	46.7	2.5	0.0	3.6	3.8	3.9	–1.4	3.1	4.2	6.1	4.6	3.6	2.4	1.5	8.3	2.7	12.0	6.3	5.8	1.5	2.4	1.9
Mozambique	138.4	0.0	29.6	6.8	0.0	0.0	4.5	20.1	73.7	20.5	15.4	7.7	15.4	2.5	5.1	2.1	319.1	16.1	8.5	9.0	9.5	5.1	2.2	3.2
United Republic of Tanzania	74.0	1.7	58.2	–0.8	0.0	19.8	–0.3	2.1	97.2	40.9	0.8	38.0	12.5	–4.1	5.6	5.0	141.9	35.4	28.6	41.7	47.6	–1.6	–1.1	–1.2
Uganda	23.9	44.9	–0.1	–1.6	–7.7	–1.0	–0.8	1.8	–2.8	60.2	22.8	3.7	2.6	–1.3	–0.5	–0.3	1.6	12.7	4.5	38.0	4.4	0.6	–0.5	–0.1
Zambia	7.7	22.8	–4.6	7.0	0.0	–0.1	7.1	1.9	2.8	6.8	11.6	–3.6	2.8	10.3	3.8	9.2	10.6	2.7	22.1	7.5	20.1	5.6	4.2	4.7
Zimbabwe	–1.6	16.4	10.6	12.1	0.0	19.9	13.8	8.4	42.4	51.7	32.8	17.6	12.1	–1.9	7.2	15.0	44.5	11.8	15.9	21.7	18.7	11.4	8.6	9.3
Rest of Eastern Africa	11.3	47.3	4.9	4.3	13.0	2.8	4.1	4.9	93.7	15.2	13.3	9.6	6.6	4.9	2.7	2.8	19.2	4.6	15.3	21.5	8.3	2.2	2.9	2.7
Botswana	0.2	1.4	3.1	32.9	0.0	8.1	0.1	25.2	–0.2	–0.1	78.5	4.3	1.9	–1.4	0.0	–0.3	4.6	0.0	1.4	7.0	0.0	–0.4	0.1	–0.1
South Africa	5.6	4.9	21.3	1.6	1.0	–0.4	–1.4	1.3	14.1	28.4	33.6	11.4	8.9	–0.5	–1.3	–2.5	14.7	6.3	–0.5	6.5	2.5	–2.4	–2.7	–2.6
Rest of South African Customs Union	1.3	6.0	1.1	12.0	–9.1	–0.4	–1.2	–1.6	34.4	–2.9	20.5	9.7	9.7	–1.7	–2.3	–3.1	–2.0	21.4	–2.2	5.6	1.6	–4.4	–4.8	–4.7
Egypt	–0.3	9.4	–0.7	0.3	44.4	1.8	1.1	0.2	8.8	0.2	–7.9	3.6	1.1	–0.7	0.0	–0.3	1.1	0.1	0.1	1.1	0.5	–0.1	0.4	0.1
Morocco	0.0	50.8	13.2	–2.9	0.0	–2.7	–1.4	0.4	22.7	–2.7	3.7	28.9	17.3	–0.7	–0.8	1.1	0.0	6.3	8.3	2.7	2.1	–1.2	–0.5	–0.7
Tunisia	0.0	33.0	8.8	38.9	0.0	–2.7	–1.9	15.8	382.7	54.2	113.7	18.6	23.2	3.5	–2.0	0.1	–2.1	0.9	59.5	13.1	8.2	–3.8	–3.1	–3.4
Rest of North Africa	1.3	0.0	0.0	173.1	0.0	–0.1	9.5	7.3	2058.1	–0.2	3.5	98.6	218.6	114.6	12.5	–0.1	106.9	1.2	27.0	11.1	1.0	–0.3	0.3	0.1
Nigeria	142.8	0.0	17.3	4.9	58.1	0.0	3.0	3.3	205.5	351.9	259.6	9.6	8.7	–0.3	1.4	0.2	20.6	3.5	19.0	56.2	1.1	6.8	1.2	2.3
Senegal	0.3	0.0	0.0	6.4	0.0	0.1	–0.8	–0.2	33.0	56.8	1.5	7.2	6.2	–1.5	–0.8	29.1	21.3	17.2	10.8	12.0	12.5	–2.6	–2.3	–2.4
Rest of Western	24.1	–5.1	3.4	4.2	0.0	16.5	4.1	–1.6	64.3	66.6	–1.8	9.5	1.4	–5.7	4.8	–8.0	199.2	90.5	5.7	16.1	14.8	–3.8	–4.7	–4.4
Central Africa Africa	–0.1	0.0	2.7	–2.8	0.0	–0.7	1.7	0.5	36.7	2.2	–1.8	9.8	1.6	1.7	0.6	–0.2	19.5	14.0	9.6	21.3	3.4	0.0	0.6	0.5
Africa	**1.1**	**25.7**	**16.3**	**2.4**	**41.2**	**4.3**	**0.6**	**1.1**	**72.7**	**13.8**	**13.7**	**13.6**	**7.2**	**3.3**	**–0.1**	**–0.1**	**7.8**	**6.6**	**4.6**	**9.1**	**3.2**	**–0.6**	**–0.5**	**–0.5**

Source: Authors' calculations based on MIRAGE model.

Table A8.8: Export volumes by African country/region and sector, continental FTA scenario – percentage changes compared with the baseline scenario, 2022

	Paddy and processe rice	Wheat	Cereals	Oilseeds	Sugar cane and sugar beet	Cattle, sheep, goats, and horses	Animal products and wool	Other agricultural products	Milk and dairy products	Meat products	Sugar	Other food products	Total agriculture and food products	Forestry	Fishing	Other primary Products of world	Textile, wearing apparel, and leather product	Petroleum and coal products	Mineral and metal p roducts	Other manufactured products	Total industrial products	Transport	Other services	Total services
Angola and Democratic Republic of Congo	0.0	0.0	10.0	9.0	0.0	76.7	4.0	7.5	108.6	19.4	50.5	21.3	27.0	3.1	3.4	0.7	51.8	9.5	19.5	16.5	1.3	3.3	4.4	4.1
Ethiopia	–2.5	516.9	26.3	–2.3	0.0	18.2	–2.9	5.8	41.8	–0.9	3.9	18.7	5.5	52.7	204.2	106.6	11.9	25.9	–0.9	11.9	19.5	–1.1	0.6	0.0
Madagascar	–0.8	0.0	–0.5	–1.5	0.0	0.0	–0.5	0.9	–1.1	136.4	–0.7	–0.3	0.6	0.3	–0.4	0.9	0.4	–2.4	0.4	0.9	0.7	–0.3	1.3	0.6
Malawi	4.2	1.3	–4.5	5.0	0.0	0.0	3.4	9.4	187.0	–28.3	5.4	–3.0	8.6	0.8	0.6	4.1	70.6	–4.2	23.3	18.1	19.3	8.2	4.6	6.2
Mauritius	1.5	0.0	47.1	2.1	0.0	3.1	3.4	3.5	–0.8	20.2	3.8	6.6	4.5	3.0	2.1	1.8	9.5	2.8	17.2	6.4	6.5	1.0	2.5	1.7
Mozambique	140.0	0.0	30.5	6.8	0.0	0.0	5.3	20.2	75.1	20.1	18.7	8.0	15.7	2.0	6.4	1.6	326.0	16.5	7.7	10.0	9.1	4.7	2.9	3.5
United Republic of Tanzania	80.2	4.0	58.3	–1.7	0.0	19.4	–0.9	1.9	82.8	38.5	0.2	38.6	12.5	–5.2	10.8	4.7	149.8	35.6	28.3	50.4	50.8	–2.4	–1.3	–1.6
Uganda	51.4	40.1	–1.1	–5.6	14.9	–2.5	–3.8	0.4	–1.0	58.2	68.2	8.4	3.7	–5.3	–2.3	–1.7	11.2	13.1	16.3	61.6	8.3	–1.6	–3.1	–2.6
Zambia	179.1	15.2	–3.7	5.1	0.0	–1.0	5.7	–1.6	135.5	307.0	54.2	43.5	7.9	12.8	2.0	43.3	21.2	39.8	18.0	43.0	21.2	2.2	1.3	1.7
Zimbabwe	7.6	18.9	10.9	11.9	0.0	33.0	27.9	7.9	42.6	50.8	32.4	27.3	13.2	–3.0	6.6	15.5	45.1	17.3	14.5	23.4	18.6	10.1	8.0	8.5
Rest of Eastern Africa	50.5	46.9	4.9	4.0	14.0	2.3	4.3	5.0	102.0	16.9	13.2	11.7	7.1	4.1	2.4	2.5	21.0	7.1	20.7	24.1	9.3	1.6	4.1	3.4
Botswana	0.8	2.6	4.4	37.6	0.0	11.6	0.3	25.9	–24.9	0.1	81.3	6.8	2.9	–2.2	0.0	–0.4	6.4	0.0	1.6	8.2	–0.1	–0.7	0.7	0.2
South AfricaAfrican Customs Union	13.2	5.3	21.8	1.3	–0.2	–0.9	–2.9	2.1	19.1	52.2	38.2	20.2	14.2	–1.1	–2.3	–0.8	20.2	16.0	0.0	10.1	4.8	–4.5	–4.5	–4.5
Rest of South	0.9	6.7	1.0	10.5	–10.4	0.8	1.1	–1.7	23.7	–2.8	21.6	12.1	11.4	–0.9	3.5	–3.4	–2.7	19.8	–3.7	5.2	1.1	–5.2	–5.0	–5.0
Egypt	0.5	4.8	12.8	35.4	41.5	0.2	2.3	3.8	24.8	–2.6	–5.9	14.6	7.0	15.3	–1.0	–4.2	–1.1	–0.6	11.0	17.3	7.3	–1.8	–1.1	–1.4
Morocco	0.0	48.9	12.4	–3.3	0.0	–3.3	–1.6	–0.1	109.2	–2.4	3.9	27.9	21.0	–1.2	–0.8	6.2	1.2	13.1	9.4	5.4	4.5	–0.7	0.7	0.2
Tunisia	0.0	39.4	10.0	50.0	0.0	0.0	0.7	18.6	393.0	61.2	110.5	20.9	25.6	27.6	–1.8	0.5	–1.3	1.3	57.4	14.4	9.0	–3.6	–2.0	–2.7
Rest of North Africa	3.9	0.0	0.0	100.7	0.0	0.5	9.7	9.5	2047.3	1.1	4.1	96.4	217.1	15.7	12.6	–0.1	118.4	3.7	29.0	13.4	1.5	0.0	1.1	0.8
Nigeria	148.9	0.0	19.2	8.4	29.7	0.0	5.9	7.0	218.0	355.6	92.4	14.0	11.1	0.3	2.8	0.9	28.5	4.2	25.2	63.8	1.9	8.9	4.0	5.0
Senegal	0.5	0.0	0.3	6.9	0.0	11.5	0.8	0.0	33.2	51.6	1.8	8.2	7.0	–1.2	–0.4	26.4	28.6	15.3	6.6	12.6	12.6	–2.2	–0.8	–1.2
Rest of Western Africa	23.9	–4.9	3.2	4.4	0.0	16.0	4.1	–1.4	67.7	213.7	–0.7	9.3	1.8	–5.8	5.0	–7.4	199.8	87.1	8.1	18.5	16.3	–3.2	–3.5	–3.4
Central Africa	–1.5	0.0	8.9	11.0	0.0	–5.8	4.1	3.1	36.5	8.3	–15.6	16.8	4.7	3.2	2.3	1.5	40.9	24.4	22.4	27.2	6.1	2.5	3.6	3.4
Africa	**3.2**	**26.0**	**16.9**	**3.9**	**38.6**	**4.2**	**0.5**	**1.7**	**101.0**	**26.2**	**16.5**	**17.0**	**9.4**	**4.4**	**0.2**	**0.4**	**8.8**	**9.8**	**6.2**	**13.1**	**4.7**	**–1.3**	**–0.3**	**–0.7**

Source: Authors' calculations based on MIRAGE model.

Table A8.9: Export volumes and real income by African country/region, FTA reforms with introduction of trade facilitation (TF) measures – percentage changes compared with the baseline scenario, 2022

	Exports		Real Income	
	Regional FTAs with TF measures	Continental FTA with TF measures	Regional FTAs with TF measures	Continental FTA with TF measures
Angola and Democratic Republic of Congo	3.7	4.8	0.6	0.8
Ethiopia	12.2	12.7	0.9	1.0
Madagascar	1.8	1.9	0.6	0.7
Malawi	24.4	24.4	2.9	2.8
Mauritius	7.5	7.9	–0.3	–0.1
Mozambique	17.0	16.4	1.5	1.4
United Republic of Tanzania	32.6	34.5	1.4	1.5
Uganda	13.0	17.6	1.8	2.3
Zambia	41.0	42.4	2.3	2.6
Zimbabwe	29.1	29.3	4.2	4.2
Rest of Eastern Africa	16.8	18.2	0.3	0.4
Botswana	7.3	7.3	4.4	4.0
South Africa	9.8	14.3	1.0	1.7
Rest of South African Customs Union	32.4	32.1	10.9	10.9
Egypt	1.1	4.9	0.1	0.5
Morocco	4.4	6.7	0.3	0.2
Tunisia	10.1	11.2	1.3	1.2
Rest of North Africa	2.1	2.8	0.1	0.0
Nigeria	2.6	4.5	0.2	0.1
Senegal	20.8	21.5	1.6	1.6
Rest of Western Africa	18.2	20.2	2.0	2.2
Central Africa	6.1	11.5	0.5	0.6
Africa	**7.9**	**10.2**	**0.8**	**1.0**

Source: Authors' calculations based on MIRAGE model.

Table A8.10: Real wages by African country/region, FTA reforms with introduction of trade facilitation (TF) measures – percentage changes compared with the baseline scenario, 2022

	Regional FTAs with TF measures			**Continental FTA with TF measures**		
	Unskilled, agriculture	**Unskilled, non-agricultural sectors**	**Skilled**	**Unskilled, agriculture**	**Unskilled, non-agricultural sectors**	**Skilled**
Angola and Democratic Republic of Congo	0.84	1.05	1.56	1.12	1.46	1.92
Ethiopia	1.44	1.79	0.34	1.53	1.83	0.36
Madagascar	0.44	0.77	1.20	0.60	0.79	1.26
Malawi	8.45	6.82	7.37	8.45	6.75	7.17
Mauritius	0.70	2.35	1.81	0.60	2.49	1.80
Mozambique	1.76	3.24	2.46	1.78	3.14	2.40
United Republic of Tanzania	2.31	2.40	3.84	2.33	2.70	4.17
Uganda	1.12	3.21	4.22	1.25	4.26	5.12
Zambia	2.64	4.99	7.92	3.18	5.29	7.97
Zimbabwe	15.95	12.10	11.53	15.60	11.97	11.07
Rest of Eastern Africa	0.33	1.29	1.44	0.40	1.45	1.65
Botswana	3.20	5.07	7.69	3.56	4.80	7.21
South Africa	1.24	0.93	1.39	1.22	1.42	2.09
Rest of South African Customs Union	4.25	9.98	13.61	4.61	9.92	13.39
Egypt	–0.08	0.09	0.13	0.17	0.41	0.39
Morocco	0.99	0.41	0.55	1.67	0.57	0.73
Tunisia	0.79	2.07	2.57	–0.17	2.23	2.76
Rest of North Africa	0.30	0.39	0.41	0.27	0.45	0.42
Nigeria	0.19	0.76	0.51	0.15	0.93	0.42
Senegal	0.06	2.38	1.27	0.21	2.61	1.74
Rest of Western Africa	0.15	4.62	4.47	0.51	5.26	5.23
Central Africa	0.61	1.01	1.04	1.33	1.66	1.80
Africa	**1.81**	**2.73**	**3.07**	**1.94**	**2.93**	**3.23**

Source: Authors' calculations based on MIRAGE model.

Table A8.9: Export volumes and real income by African country/region, FTA reforms with introduction of trade facilitation (TF) measures – percentage changes compared with the baseline scenario, 2022

	Regional FTAs with TF measures			**Continental FTA with TF measures**		
	Agriculture and food	**Industry**	**Services**	**Agriculture and food**	**Industry**	**Services**
Angola and Democratic Republic of Congo	–1.3	–0.6	0.5	–1.4	–0.5	0.5
Ethiopia	–0.3	–1.0	–0.9	–0.4	–1.0	–1.0
Madagascar	–0.1	–0.2	0.5	0.0	–0.3	0.5
Malawi	2.6	3.2	0.9	2.6	3.4	0.7
Mauritius	–0.6	2.4	-0.1	–0.8	3.0	–0.3
Mozambique	–3.1	5.6	0.3	–2.8	5.2	0.3
United Republic of Tanzania	1.0	3.9	1.4	0.9	4.5	1.3
Uganda	–0.1	5.7	0.8	–0.2	9.0	0.5
Zambia	–1.3	10.0	3.1	0.0	9.0	2.7
Zimbabwe	0.8	4.1	0.8	1.5	3.8	0.5
Rest of Eastern Africa	–0.3	0.8	0.0	–0.3	1.0	0.1
Botswana	0.1	2.2	1.9	0.7	2.2	1.7
South Africa	1.9	1.0	0.3	2.4	1.5	0.4
Rest of South African Customs Union	1.1	11.4	1.7	2.1	11.3	1.6
Egypt	–0.1	0.2	0.0	0.0	1.3	–0.3
Morocco	2.3	–0.1	0.0	2.5	0.2	0.0
Tunisia	0.2	3.6	–0.2	–0.1	3.9	–0.2
Rest of North Africa	0.3	0.4	0.0	0.2	0.5	0.0
Nigeria	–0.8	0.3	0.2	–1.4	–0.2	0.0
Senegal	–0.6	8.6	–1.0	–0.3	7.9	–0.8
Rest of Western Africa	–0.6	15.7	–0.3	v0.6	16.4	–0.2
Central Africa	–0.7	0.7	0.0	–1.3	–0.1	0.1
Africa	**0.3**	**1.4**	**0.2**	**0.3**	**1.7**	**0.2**

Source: Authors' calculations based on MIRAGE model.

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9. POTENTIAL IMPACTS OF WTO AND EU ACCESSION ON THE AGRICULTURAL SECTOR IN BOSNIA AND HERZEGOVINA[1]

David Vanzetti and Aleksandra Nikolić

9.1 INTRODUCTION

The agricultural sector of Bosnia and Herzegovina (BH) is continuing to undergo significant changes. While ongoing integration into the European Union (EU) and global markets poses a threat to domestic production, it also provides opportunities to potential exporters. Agriculture is a sensitive sector in BH, accounting for a relatively high share of employment and also of people living below the poverty line. Therefore, the general objective of this paper is to provide detailed information about the potential impacts on the agricultural sector of greater integration into the EU and global markets. This information may help identify ways to overcome major constraints and boost development.

The specific objectives of this paper are to develop two scenarios, BH accession into the World Trade Organization (WTO) and BH accession into the EU, to assess impacts on sensitive agribusiness sub-sectors such as dairy, beef, pork, poultry meat, processed meat, fruit and vegetables, cereals, and wine. Our assessment focuses on impacts on trade, output, and employment and then on impacts on consumers and the economy more generally. To assess these impacts, first we describe recent political and institutional developments and trade patterns. Next, we examine the current BH policy framework, including applied agricultural tariffs that are calculated from the specific and ad valorem components. Next, we describe in detail a framework for quantitative assessment of the effects of accession on selected sensitive products.

The main part of the analysis compares current tariffs with two other options: the WTO initial offer and the EU regime. We assess the potential impacts on production and trade using a bilateral trade model that captures the differential tariff changes by BH's various trading partners. While the modelling is simple, in that it is based on output and trade and does not take into account cross-sectoral effects,

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at the same time it is transparent, and it throws light on which specific tariff changes are important and which are not. By doing so, the model identifies major issues that should be the centre of policy focus. The study assesses employment effects assuming fixed labour–output ratios for each sector. In the final part of the paper, we describe the results and main implications for policy-makers and the sector.

9.2 RECENT DEVELOPMENTS

The Balkans wars (1992–1995) led to the formation of BH as an independent nation along with other members of the former Yugoslavia. The 1995 Dayton peace agreement shaped its political and socio-economic structures. Reflecting the need for compromise, a major part of institutional responsibility and governance went to the entity (provincial) level, leaving the central government relatively powerless. Therefore, in reality BH is split into two economic entities (Republika Srpska (RS) and the Federation of Bosnia and Herzegovina (FBiH)) with different business environments. In addition, the division of responsibilities between state/national and entity levels is unclear, fuelling bureaucracy and slowing the reforms and development of key institutions at the national level. In spite of these difficulties, BH succeeded in establishing relatively stable macroeconomic conditions, at least until the global financial crisis and the recent political crisis (during which BH was without government for one year). In contrast to other south-eastern European (SEE)[2] countries, BH was able to maintain economic growth (gross domestic product (GDP) per capita increased from €1,278 in 1999 to €3,270 in 2010[3]), control inflation, and avoid an increase in the share of foreign debt in GDP. At 26 per cent in 2010,[3] BH's foreign debt is quite low in comparison with that of other SEE countries (Croatia's was above 85 per cent, and Serbia's was 63 per cent in 2007[3]). The moderate share of foreign debt in GDP provides scope for BH to borrow for key investments (infrastructure) that will fuel economic growth and improve competitiveness. After a drop of the GDP in 2009, BH began a slow recovery, with estimated real GDP growth of 0.7 per cent in 2010 and 1.6 per cent in 2011, according to the Economist Intelligence Unit.

The requirements of integration into the EU have shaped all BH macroeconomic policies and the development of an institutional and regulatory framework. Entry into the EU had been proclaimed domestically as the ultimate goal of BH development. Trade liberalization and stronger economic integration of SEE markets are an integral, mandatory part of the EU accession process. Since its formation BH has signed bilateral free trade agreements with neighbouring Albania, Croatia, Macedonia, Moldova, Romania, Serbia-Montenegro, and Turkey to form a single regional trade

[2] According to the Regional Co-operation Council (established in February 2008), the countries included in the SEE region are Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Moldova, Montenegro, Romania, and Serbia.

[3] Data from Central Bank of Bosnia and Herzegovina.

Table 9.1: Annual growth in BH trade

Year	Growth of exports (%)	Growth of imports (%)
2006	36	1.8
2007	15	22
2008	13	17
2009	–17	–24
2010	28	10
2011	16	14

Source: Central Bank of Bosnia and Herzegovina.

agreement, the Central European Free Trade Agreement (CEFTA). In mid-2008 BH signed the Stabilization and Association Agreement with the EU and is planning to join the WTO. This three-pronged approach (bilateral, regional, and multilateral) to trade policy both widens and deepens BH's integration into the world economy. Currently, BH has the lowest average applied tariffs in the region (Čaušević, 2006). This includes zero applied tariffs for the CEFTA countries and a gradual lowering of tariffs on imports from EU countries. Likewise, BH faces almost no tariffs in exporting to the CEFTA countries, and more than 90 per cent of agricultural exports to the EU are duty-free.

Trade liberalization can significantly affect domestic competitiveness and, consequently, depending on comparative advantage, the patterns of production and trade as well as consumption. Trade liberalization also creates new relationships between countries at the multilateral and regional levels and in a wide range of economic sectors (Hallatt, 2005). The change in the value of total BH imports and exports over time illustrates this. After initial trade liberalization in 2004, exports and imports have increased each year, except in 2009 as a consequence of the global economic crisis (table 9.1).

In spite of a rapid growth in exports, in 2011 imports far exceeded imports – €7,938 million in imports compared with €4,209 million in exports. Although the trade deficit is significant as a share of GDP, it has been decreasing steadily, from about 36 per cent in 2007 to 26 per cent in 2011. At the same time trade is becoming more important. The share of trade in GDP has been steadily increasing, from 42.7 per cent in 2007 to about 53 per cent in 2011. This trend is expected to continue as BH integrates into the regional and global economies.

Following trade liberalization in BH, the contribution of tariffs to government revenues has fallen slightly, from 13 per cent in 2006 to 11 per cent in 2007 (BH Indirect Tax Authority, 2008). As a result of trade agreements with the EU, duty revenues in 2008 were 0.6 per cent less than those collected in 2007. However, full and more dramatic effects of the reduction in duty revenues were expected at the start of 2009, based on an additional reduction of duty rates, imports, and consumption (BH Directorate for Economic Planning, 2009). Thus, it is no surprise that duty

Table 9.2: BH share of exports and imports by sector

Sector	Import share (%) 2005	2007	2011	Sector	Export share (%) 2005	2007	2011
Food and beverage	12.1	11.3	13.1	Base metals	22.0	21.7	15.9
Coke, refined petroleum products	9.3	10.2	7.5	Fabricated metal products, except machinery and equipment	5.9	8.4	6.5
Machinery and equipment	8.9	9.5	5.8	Wood and wood products, except furniture	9.2	7.9	4.6
Base metals	5.0	9.3	6.7	Furniture	5.8	7.3	8.5
Chemicals and chemical products	9.4	9.3	7.2	Motor vehicles, Trailers, and semitrailers	9.5	7.1	2.5
Motor vehicles, trailers, and semitrailers	8.9	8.3	5.5	Tanning and dressing of leather	2.9	6.5	6.4
				Food and beverage**	6.6	5.9	7.5
				Machinery**	5.2	3.9	6.2

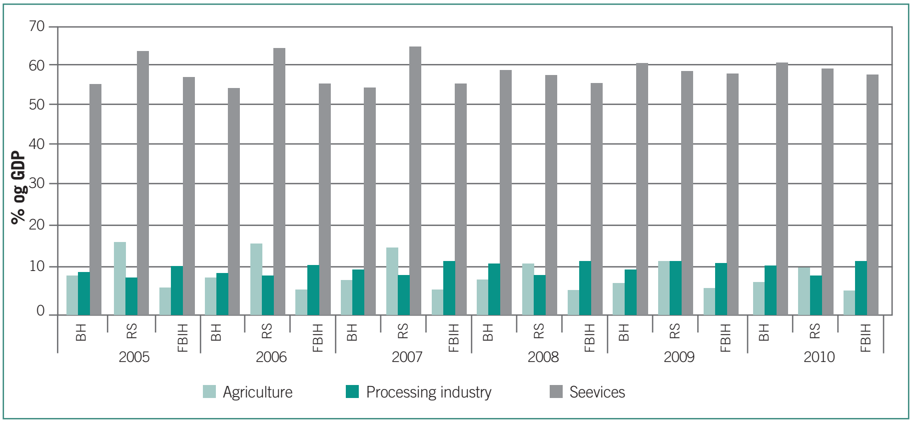
**These two sectors increased their share significantly in 2011.
Source: BH Statistical Office.

revenues contributed only 4.8 per cent of government revenues in 2011 (BH Indirect Tax Authority, 2012).

Even a superficial look at the major export and import sectors indicates that BH exports are driven by primary industries such as base metals (table 9.2), with insignificant contribution from middle- or high-tech sectors (Silajdžić, 2007). The trade structure suggests that BH exports strongly depend on raw material imports such as chemicals and chemical products, fuel, and machinery and equipment. It also suggests that low levels of supply capacity and other problems connected with the size and scope of production, product quality, poor institutional framework, and high transaction costs of trade are behind the weak BH trade position.

The level of competitiveness (Ca'Zorzi and Schnatz, 2007; Esterhuizen and van Rooyen, 2006) helps to explain the achievements or failures of the economy (Adams et al., 2004; Kovačić, 2007; Nikolić, 2008) as well as patterns of sustainable development including rural development (Krom and Sagi, 2005). The fact that BH trade deficit is fuelled by high levels of food imports – the deficit in food trade accounts for 29 per cent of BH's overall trade deficit – confirms the limited ability of food producers to respond to new market conditions and trends. However, recent trade liberalization improved market access, which, in turn, induced growth in the food industry; from 2004 to 2009 growth amounted to 59 per cent. This made the food industry one of the most dynamic sectors.

Figure 9.1 The GDP share of agriculture, processing industry, and services at entities and state levels



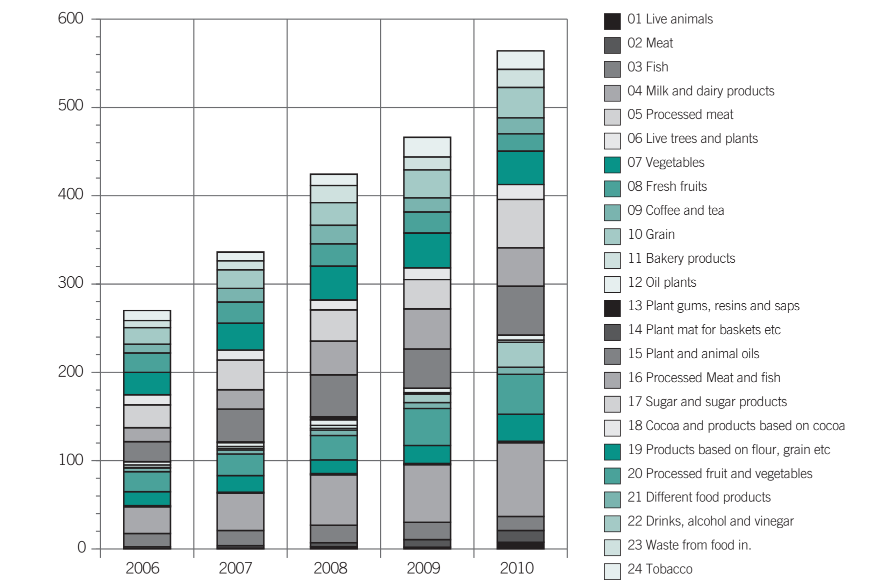
Notes: BH=Bosnia Herzegovina, RS=Republika Srpska, and FBiH= Federation of Bosnia and Herzegovina

Agriculture remains an important source of employment in BH. Reliable data about employment in agriculture are not available, however. With the loss of non-agricultural jobs associated with the destruction of the war and associated economic declines, a large proportion of employees in industrial activities have been left obviously unemployed or else have moved into (hidden) agricultural and rural unemployment (Bojnec, S., 2005; cited from AgriPolicy, 2007). According to a study from AgriPolicy (2007), the share of agriculture in total employment in BH was 18.1 per cent in 2003. Along with high unemployment, there is a large informal sector in BH, of which 39 per cent or 50 per cent (according to different sources – AgriPolicy, 2007, and the World Bank, respectively) are active in agriculture. It is roughly estimated that in a population of 3.2 million, with 1.2 million economically active, about 500,000 people are employed in agriculture. In fact, this is probably an upper bound.

Agribusiness groups are concerned about further liberalization of sensitive sectors and are pointing to several factors as reasons for concern. These include the huge agri-food trade deficit (over €1 billion in 2008), the continuing growth in imports, and the sector's economic importance (figure 9.1), especially for employment. Stakeholders argue that agriculture makes a significant contribution to GDP and poverty reduction. The public debate, however, fails to recognize either the sector's poor performance or positive trade developments such as a significant increase in agricultural exports.

Agricultural exports have been growing steadily at high annual rates (figure 9.2). Agricultural exports grew even in 2009, when the whole economy, including exports overall, declined (GDP by –2.8 per cent and total exports by –17 per cent). The sector's contribution to overall export value is slowly decreasing as other exports increase faster. However, it still remains significant (8.4 per cent in 2009, 8.0 per cent in 2010, and 7.4 per cent in 2011), even though its absolute value is modest (Bosnia and Herzegovina convertible mark (BAM) 612.2 million). At the same time, the value

Figure 9.2: Structure of total BH agri-food exports (in BAM000)



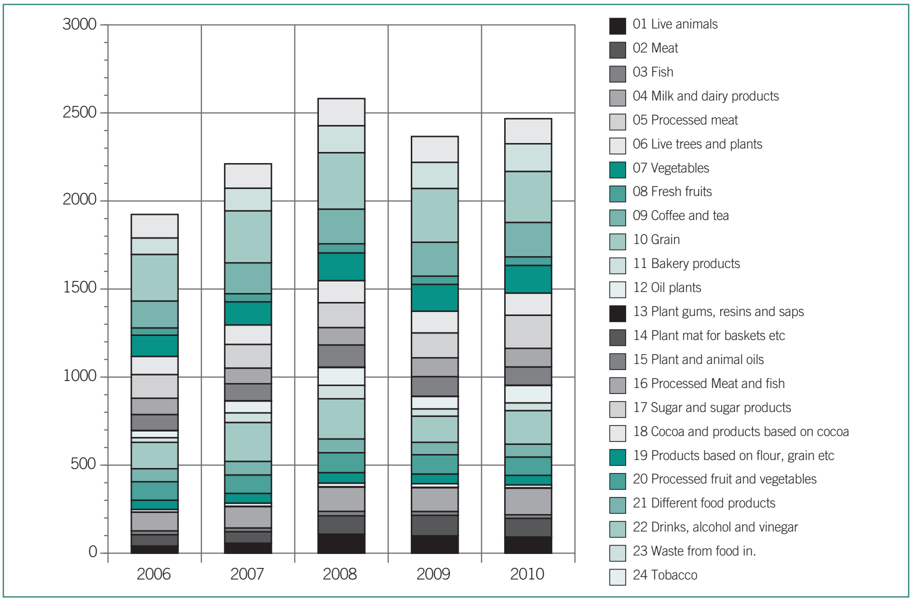
of agricultural imports has increased (figure 9.3), but at significantly lower rates than exports – by 15 per cent in 2007, 17 per cent in 2008, –8 per cent in 2009, and only 4 per cent in 2010. The increase of BH agri-food import values in 2008 was driven partly by increases in global food and fuel prices (BH Directorate for Economic Planning, 2009). Export growth has continued, with the value of exports of agricultural goods increasing by 21 per cent in 2010 and 9 per cent in 2011. Aggregate agri-food trade data suggest that trade liberalization (especially with CEFTA members) opened up a "window of opportunity" for BH agribusiness.

One of the most important factors behind the rapid increase in agricultural imports is the inability of BH agribusiness to increase production and productivity to satisfy market needs. BH agricultural imports are dominated by beverages, alcohol, and vinegar (11.7 per cent share in 2010), various food products (7.9 per cent), followed by cereals (7.7 per cent), sugar and sugar products (7.6 per cent), food industry remains and products based on flour, grain, etc. (6.4 per cent each 2010), dairy products (6.1 per cent), tobacco (5.8 per cent), and cocoa and processed food based on cocoa (5.1 per cent).

The major exporters to BH are the 25 EU members (EU-25)[4] (about 48 per cent of total imports), closely followed by Croatia and by Serbia and Montenegro (together about 45 per cent of total imports). BH agricultural imports are driven by higher value goods (figure 9.3), which require higher innovative capacity and more

[4] These are all the members of the EU in 2007. Trade with the 26th and 27th EU members, Bulgaria and Romania, is less than 1 per cent.

Figure 9.3: Structure of total BH agri-food imports (in €000)



sophisticated marketing knowledge as well as facility at recognizing and following market trends. This suggests that the trade deficit could not be significantly decreased without local industry becoming more sophisticated, moving into greater levels of processing, and developing economies of scale and scope (greater quantities and a wider assortment of products).

Additionally, the main BH agri-food export markets are Croatia, Serbia, Macedonia, Kosovo,[5] and Montenegro (about 70 per cent of total exports (Lalić et al., 2010)), followed by the EU-25 (about 23 per cent of total exports). This suggests that sanitary and phytosanitary (SPS) and technical barriers to trade (TBT) requirements, which are more stringent in EU markets than in CEFTA markets, constrain exports. An example is exports of meat and dairy products to the EU, which, according to Nikolić (2007, p. 112), accounted for less than 1 per cent of dairy product exports in 2007. This low share decreased to almost zero in 2010 (UNCTAD statistics). It is likely that cultural and historical ties as well as common consumption patterns partly explain the low share of dairy exports going to the EU. Still, the particularly low level exports of goods where standards are very important may reflect the low capacity of the sector to comply with sanitary requirements.[6] This inability to meet SPS requirements reflects, in turn, the limited capability of the national institutional frame-

[5] As defined in United Nations Security Council Resolution No. 1244 of 1999.

[6] In 2006 only 10 of 53 BH dairies had a hazard analysis and critical control points system. An additional seven were introducing it. Eight dairies were certified by ISO 9001:2000; one, by ISO 22000; and 11 possessed export licenses (Nikolić et al., 2009).

work (involving testing, verification, inspection, and certification systems) to ensure that SPS measures and other standards and technical regulations are satisfied. These BH institutions are too weak (Bajramović et al. 2004; Efendić, 2004) to support valid international cooperation, as they might do by helping reassure trading partners that products conform to standards and by facilitating mutual recognition between trading partners. As Chena et al. point out (2008, p. 501), reaching Mutual Recognition Agreements (MRAs) can help firms to comply with standards and to benefit fully from trade liberalization. In short, adequate institutions and domestic policies are crucial to obtaining the full benefit from trade liberalization (Esterhuizen and van Rooyen, 2006; Mitra and Ural, 2008; Romano, 2006) and to realizing its potential to contribute to increasing global welfare and promote better employment (Jansen and Lee, 2007). Due to weak institutions and therefore inadequate food safety and quality assurance, BH exports could be seriously compromised when Croatia becomes a full EU member in 2013 and adopts EU standards. Currently, Croatia is BH's biggest agricultural trade partner, accounting for one-third of total agri-food trade.

Employment creation is important and needed. The unemployment rate in BH was 27 per cent in 2010 according to the World Bank and 43 per cent according to official statistics.[7] The latest Labour Force Survey, in 2008, reported the youth unemployment rate at 51.9 per cent, double the overall rate and four times higher than the EU average (USAID, 2009). Since BH has a growing workforce, it is very important for policy to support job-creation. Economic prosperity and continuous improvement of living standards, which currently are still low, are important to stabilize the country. Recently, concerns have been raised that efforts to stabilize BH are failing (Woehrel, 2012).

Protectionist sentiments concerning agribusiness characterize the current public debate in BH over further integration into regional and global markets. The preceding overview of BH agri-food trade, previous research on BH's agricultural sector (Bajramović, 2006; Čaušević, 2006; Hadžiomeragić et al., 2007; Nikolić, 2008; Nikolić et al., 2011; Silajdžić, 2007), and other literature linking trade liberalization and productivity growth (Alfonso and Henrique Alves, 2008; Kucera and Sarna, 2006; Mitra and Ural, 2008), coupled with concerns about the effect of trade liberalization on employment, suggest that this debate could benefit from better information on the likely impact of closer integration.

9.3 CURRENT POLICY FRAMEWORK

9.3.1 Trade reform in Bosnia and Herzegovina

BH has preferential agreements with the European Union, which takes around 50 per cent of its agricultural exports. In mid-2008 BH signed the Stabilization and

[7] Source: World Bank Development Indicators, 2012 and Woehrel (2012), respectively. Figures may differ because of inclusion of informal-sector work.

Association Agreement. The Interim Agreement entered into force on 1 July 2008, calling for gradual reduction of duties to zero for goods originating from the EU. This phasing-out of tariffs is scheduled for completion in 2013.

BH also has bilateral agreements with its neighbours Albania, Croatia, Macedonia, Moldova, Serbia and Montenegro (CEFTA agreement), and Turkey, with whom it is negotiating a free trade area with a common external tariff and zero tariffs on internal trade. These countries account for about 45 per cent of BH's trade. As of 2008 the greatest contribution to overall exports and imports came from the EU countries. This pattern is expected to continue, since the EU market is becoming more open for BH exports.

The remainder of the country's trade is mostly with other countries that are WTO members. It seems likely that liberalizing trade with WTO members outside Europe will have little impact on trade flows. According to WTO/ITC/UNCTAD estimates (WTO, 2011), the average applied agricultural tariff is 10.2 per cent, similar to that of its neighbours.

In preparation for accession to the WTO, BH has reduced the higher tariffs facing countries outside its preferential agreements. There are 2,077 tariff line items covered by the Agreement on Agriculture. The Most Favoured Nation (MFN) tariffs were set at zero, 5, 10, or 15 per cent in 2008; about one-half of the tariffs are less than or equal to 10 per cent. The simple average of ad valorem tariffs is 5.2 per cent. The highest tariffs are for alcohol (HS Chapter 22) and tobacco (HS Chapter 24). About one-third of tariffs in agriculture are specific tariffs, i.e. not in ad valorem terms. The ad valorem equivalent rates for these tariffs are considerably higher, giving an overall average of 10.2 per cent. Compared with the tariffs of other countries now negotiating accession to the WTO, as well as existing members, agricultural tariffs in BH are low.

The relatively high tariffs facing WTO members on processed agricultural goods exported to BH may pose concerns for negotiators. The top ten BH agricultural imports are shown in table 9.3. The list is dominated by processed products, including tobacco, beer, and chocolate. Unprocessed products in the top ten include wheat, maize, and animal feeds, but these have relatively low tariffs.

Outside the first ten, but important nonetheless, are tariffs on various meats. These are shown in table 9.4, which lists the ten highest agricultural tariffs facing non-preferential exporters. The significant items here are meat and processed meats, plus processed cereal products, as production and employment for these items are significant in BH, and tariff reform threatens a sizeable domestic industry.

Some of agricultural products (cereals, grain, oilseed, tobacco, sugar, raw meat, live animals, seeds, etc.) are intermediate inputs for the food production and processing industry. Currently, the tariff rate for new machinery and equipment is 10 per cent. Tariffs on inputs are, in effect, a tax on production and possibly on exports as well. Additionally, those tariffs could slow the growth of productivity in the primary production and processing sector.

Table 9.3: Bosnia and Herzegovina's top ten agricultural imports and their MFN tariffs, 2008

HS code	Product description	Imports US$m)	(Tariff (%)
1001	Wheat and meslin	100	5
2402	Cigars, cheroots, cigarillos, and cigarettes…	86	15
2203	Beer made from malt	78	15%+0.3 KM/L
1806	Chocolate and other food preparations …	73	10%+1.0 KM/L
2202	Waters, including mineral waters and aerated water	59	10%+0.2 KM/L
1905	Bread, pastry, cakes, biscuits, and other bakers' …	58	15%+0.2 KM/L
2106	Food preparations not elsewhere specified …	54	5
1005	Maize (corn)	40	10
2309	Preparations of a kind used in animal feeding	39	5
1512	Sunflower-seed, safflower or cotton-seed oil …	38	5

Source: UNCTAD TRAINS and Comtrade. Tariffs are applied MFN. These tariffs are not necessarily applied to all the imports, most of which enter under preferential arrangements. Trade data are for 2007.

Table 9.4: Bosnia and Herzegovina's highest tariffs, 2008

HS code	Product description	Imports US$m)	(Tariff (%)
0201	Meat of bovine animals, fresh or chilled	2.127	10%+2.5 KM/kg
0202	Meat of bovine animals, frozen	17.329	10%+2.5 KM/kg
0204	Meat of sheep or goats, fresh, chilled, or frozen	1.234	10%+2.0 KM/kg
0207	Meat and edible offal of poultry, fresh, chilled or frozen	19.651	10%+2.0 KM/kg
0209	Pig and poultry fat, fresh, chilled, frozen, salted ... or smoked	0.960	10%+2.5 KM/kg
1101	Wheat or meslin flour	24.568	10%+0.2 KM/kg
1211	Plants and parts of plants, of a kind used in perfumery, pharmacy ...	4.014	0%+6.0 KM/kg
1601	Sausages and similar products; food preparations based on these products	28.001	10%+3.0 KM/kg
1602	Other prepared or preserved meat, meat offal, or blood	18.985	10%+2.5 KM/kg
1905	Bread, pastry, cakes, etc.; communion wafers, rice paper, etc.	81.049	15%+1.5 KM/kg
2201	Waters (including mineral waters and aerated waters); ice, and snow	13.846	15+0.2 KM/kg

Source: World Integrated Trade System (WITS). Tariffs are applied MFN.

9.3.2 Non-tariff market access measures

Non-tariff barriers include various quantitative restrictions, import licensing, customs valuation procedures, rules of origin, trade-related investment measures, standards (i.e. technical barriers to trade), and SPS regulations. In the BH agricultural and food sector, there are no quantitative restrictions (quotas) on imports of any products. Only products that are considered as a public health, environmental, or economic risk (pharmaceutical, chemical, and military products, antiques, etc.) require import and export licenses. Those rules are not important for the agricultural sector.

Rules of origin determine whether goods imported from specific countries have preferential or non-preferential status. BH Law on Custom Policy governs the implementation of preferential tariffs, which apply to imports from the nine countries with which BH has free trade agreements. Each of those agreements includes provisions in which contracting parties agreed to apply the harmonized European preferential rules of origin in their mutual trade (Efendić, 2004). This means that the countries are supposed to implement a sophisticated administrative system to issue certificates of origin and to verify them. According to Hadžiomeragić et al. (2007, p. 30), "Experts added that, without diagonal cumulation of origin, at least among the other SEE countries, fewer BH products can qualify as of BH origin. Therefore, origin requirements in the present form create a significant barrier for exports (CEFTA should improve the situation)…." However, implementing European standards is, in several aspects, beyond the administrative capacity of many countries, including BH.

Additionally, each business export/import entity has to be registered with the Ministry of Foreign Trade and within the Court of Entity where it is located and/or where goods are cleared. Consequently, the procedure for registration is long. Efforts are underway to simplify and shorten the process by using a common registration system.

Clearly, SPS and TBT measures are fields where the differing authorities between the State and the Entities, combined with an outdated approach based on compulsory standards, have created a serious obstacle to quick integration of BH into the modern international trading system (Efendić, 2004). The institutions established at the state level (Veterinary Office, Agency for Plant Health Protection, and Food Agency) are not capable of providing the necessary services to facilitate imports of food and foodstuffs while ensuring consumer protection.

BH's cumbersome governing structure hampers customs control, although many improvements have been made in recent years. A further impediment to trade is the long waiting times at border crossings. On average, time for export is 16 days, with costs amounting to US$1,125 per container. By comparison, in the EU the average wait is 12 days, with costs of $1,039 per container. For perishable food items this longer delay causes difficulties. Also, foreign transporters need a CEMT[8] certificate, which is not available at the border. (Transporters from countries with which BH has bilateral agreements are exempt from this rule.)

[8] Conférence Européenne des Ministres des Transports/European Conference of Ministers of Transport.

9.3.3 Barriers to exports

Bosnia and Herzegovina enjoys the autonomous trade measures granted unilaterally by the European Union, BH's major trading partner. These measures, expanded in the interim agreements on trade and trade-related matters, ensure free access to the EU market for almost all products. The only exceptions are the tariff rate quotas for wine, some fisheries products, and sugar. For baby beef, only the specific element of the import duty has been eliminated, whilst the ad valorem element, set at 20 per cent, continues to apply. EU exports to BH have been granted trade preferences. BH also has signed bilateral free trade agreements with all countries in the region. That means BH enjoys preferential status in all major export markets.

Nonetheless, BH's poor trade performance reflects an inability to benefit fully from such a situation. The weakness of BH's administrative and managerial capacity to deal with food safety and quality issues as well as with the rules of origin is a major obstacle to an increase in agricultural BH exports. The largest barrier to exports of BH animal products to the EU is the inability of potential exporters to meet the SPS requirements (World Bank, 2005) or, more precisely, to provide an efficient institutional framework for food safety and quality assurance.

In addition, the lack of defined administrative structure and trained people constrain the efficient operation of international transport. The major part of international shipment has to be done by foreign companies because the TIR[9] carnet system of international insurance is not fully operational. Consequently, the transaction costs of BH exporters are high, undermining the competitiveness of BH goods.

Additional barriers to BH exports include: (i) the significant reduction of marketed agricultural production in BH due to internal conflict in the 1990s; (ii) the paucity of stable trade links between exporters from the region and importers in the EU; and (iii) not enough produce of homogeneous quality to take advantage of economies of scale (Bajaramović et al., 2004).

9.3.4 Domestic support

Domestic support to agriculture is very low in BH (figure 9.4). According to the Ministry of Foreign Trade and Economic Relations (MOFTER), only three commodities receive product specific support in excess of the WTO de minimis limit of 5 per cent of the value of production.[10] Support under this limit is exempt from reduction commitments.

In summary, it appears that BH has one of the lowest levels of tariffs on its agricultural products in the region and minimal domestic support. Through its various

[9] Transport International (de Merchandises) par Route: customs transit document used for an international transit of goods.

[10] Although BH is a lower middle income country, it is likely to be treated as a developed country following accession. This implies that a de minimis of 5 rather than 10 per cent would apply (see chapter 2 of this book).

Figure 9.4: Domestic support to agriculture (in € million)

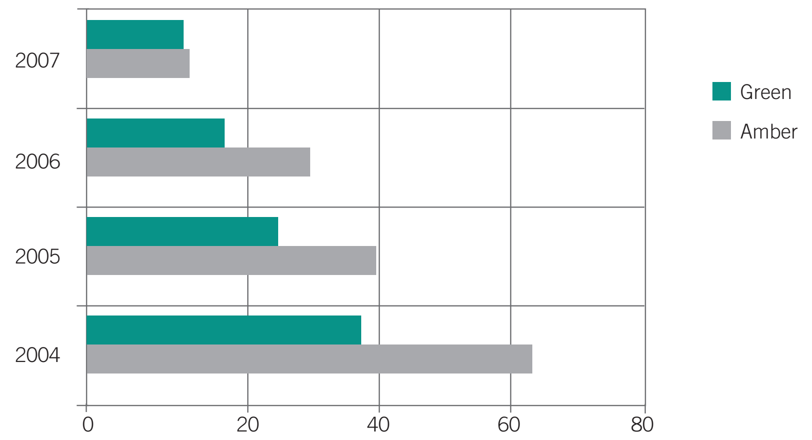


Table 9.5: Agricultural budget according to government level in Bosnia and Herzegovina

	2006	2007	2008	2009	2010
Agricultural budget in million BAM					
FBiH	35.42	58.54	78.79	72.07	78.92
RS	45.47	80.91	80.21	81.56	80.34
Brcko District	3.08	5.01	4.72	6.06	6.43
BH	83.97	144.46	163.72	159.69	165.69
Share of agricultural budget in GDP					
FBiH	6	9.07	11.59	10.45	11.37
RS	5.29	8.82	8.2	8.86	10.2
Brcko District	6.62	10.06	9.01	12.73	13.61
BH	5.62	8.96	9.58	9.63	10.84
Agricultural budget per utilized agricultural area (UAA) (in BAM/ha)					
FBiH	38	63	82	76	82
RS	60	108	111	113	113
Brcko District	103	167	157	195	207
BH	49	84	95	94	98

Note: Two entities FBiH=Federation of Bosnia and Herzegovina, RS=Republika Srpska, and one district. "BH" stands for total agricultural budget in BH.

Source: Ministry of Foreign Trade and Economic Relations cited in Bajramovic et al. (2010).

bilateral and multilateral trade agreements, BH has preferential status in its major exporting markets. In spite of substantial non-tariff barriers to imports and exports, the tariff reductions, driven by these agreements, have had a positive impact on the growth of agricultural export: In the period 2004–2011 exports increased by 248 per cent. In the same period imports have grown but at lower annual rates: In the period 2004–2011 imports increased by 43 per cent.[11]

Tariffs on imports from outside Europe are significantly higher, at 50 to 100 per cent or more on some sensitive goods such as meat and other processed foods. Accession to the WTO will most likely require reduction of these tariffs. Accession to the European Union will also require a realignment of tariffs to EU levels. The tariff reductions have the potential to increase trade and may have effects on employment in agriculture. However, with respect to WTO accession, the impacts are likely to be slight because a relatively small share of trade is with WTO members outside the region (about 7 per cent of total agri-food trade). The next section quantifies the likely impacts.

9.4 A QUANTITATIVE ASSESSMENT OF ACCESSION ON SELECTED SENSITIVE PRODUCTS

To assess the impacts of accession on selected products, we look at two scenarios:

1. EU accession: Removal of tariffs on BH–EU trade, and change in BH tariffs on Rest of World (RoW) imports to EU levels.
2. WTO accession: Reduction in BH tariffs on imports from RoW to 5 per cent.

Table 9.6: Initial tariffs on sensitive products, Bosnia and Herzegovina and European Union compared

Product	BH tariffs on imports from RoW (%)	EU tariffs on imports from RoW (%)
Beef	83	23
Pork	62	32
Poultry meat	0	34
Dairy products	10	35
Processed meat	64	14
Processed cereals	5	15
Processed fruit and vegetables	7	11
Wine	15	15

RoW=rest of world.
Source: UNCTAD TRAINS database.

[11] Data from the Central Bank of Bosnia and Herzegovina.

The analysis is limited to looking at tariff reductions for sensitive products such as meat, dairy products, wine, and some processed foods, as listed in table 9.6. The first scenario involves removing BH tariffs on imports from the EU and raising or lowering BH tariffs on imports from RoW levels to EU levels, given in the right column of table 9.6. All countries within the European Union must have a common external tariff. This implies, for example, that the BH tariff on beef would fall from 83 to 23 per cent. The scenario assumes that there is no change in domestic support or export subsidies. The second scenario assumes tariffs on imports from countries outside the preferential markets, labelled "RoW" in table 9.4, would be reduced to 5 per cent. This relatively low level is perhaps a lower limit, but it may be requested in accession negotiations for certain products. Tariffs on imports from the free trade areas and the European Union would remain unchanged.

9.4.1 The model

The quantitative analysis employs GSIM, a static, single-commodity, bilateral trade model that distinguishes between imports from different sources (Armington assumption). This capability is essential to capture the impacts on trade of the differing tariff changes in different countries, in this case due to the regional trade agreements.

GSIM is essentially a set of simultaneous equations in a spreadsheet in which export prices are varied to satisfy the requirement that global imports equal exports. As a static model it compares two situations at a point in time and does not attempt to show the transition from one state to another. In this particular case the effect on trade is assessed with and without the bilateral tariff reductions required to be implemented following accession. With lower tariffs imports become cheaper compared with domestically produced goods. This decrease in cost will reduce consumer prices and increase consumption, but there will be a decrease in demand for locally produced goods. The aim of this analysis is to estimate the resulting effects on output and employment. We also estimate the effects on government revenue, total returns to farming, and consumer expenditure (here called "net welfare").

GSIM was designed as a single-commodity modelling framework (for example, for beef). For this application linkages on the production side have been incorporated with cross-price elasticity. This implies, for example, that the price of beef affects the production of pork. Potential substitution in consumption between goods (for example, beef and poultry) is ignored. A further simplifying assumption is no changes in stocks, nor is there growth in production or consumption over time. Thus, we are ignoring the phase-in period and merely assessing what the pattern of production and trade would have been had the tariff changes been applied to the economy as it was in 2007, the base period.

The model is simple, in that it does not include land, labour, and capital or other sectors of the economy. However, if it is assumed that inputs are used in fixed proportions, then changes in employment can be gauged from the change in output. This implies that there is no substitution between labour, on one hand, and capital and other inputs, on the other, when output changes. GSIM does not include constraints that may limit production, such as the availability of water for irrigation, or demand-side constraints such as SPS requirements. Nor does it take into account that labour forced out of agriculture by declining output may find employment in other sectors of the economy. Notwithstanding these limitations, the advantage of simplicity is that the model is transparent, and the factors determining changes in trade flows and employment can be readily identified. Furthermore, it allows setting the level of product aggregation according to the analytical requirement. Here, most products are at the 4-digit HS level.

9.4.2 Data

As with most models, the data available determine the quality of the output. In this case the data required include:

- Bilateral trade flows between the main countries involved in trade. These data, in values at world prices, are obtained from UN Comtrade via WITS, a World Bank/UNCTAD data integration package. The trade data originally come from national sources.
- Production. Estimates of production at world prices come from FAOSTAT and are supplemented by official state data.
- Employment. In the absence of census data or recent surveys, it is assumed that 500,000 people are employed in agriculture, and about 204,000 are employed in the eight sectors examined here. This assumption is based on the estimated value of production, from FAOSTAT. This number of workers is allocated to the sectors taking into account the labour–output ratios taken from the Global Trade Analysis Project (GTAP) Version 8 database. Because BH data are not in the database, BH is assumed to have labour–output ratios similar to those of Bulgaria, a neighbouring country at a similar stage of development.
- Bilateral tariffs. The model requires applied tariffs on an ad valorem equivalent basis. Many of the agricultural tariffs of the European Union and BH contain a specific element and therefore need to be converted. There are several methods for converting specific tariffs to ad valorem equivalents. These differ on the appropriate price to use and can generate markedly different results. The method used here is the so-called "WTO method", to which WTO members agreed in May 2005.
- Export subsidies. These data are notified to the WTO. They are obtained from the Agricultural Market Access Database (AMAD). BH pays no export subsidies, but it imports subsidized exports from the European Union.
- Domestic support. BH pays limited domestic support, less than 5 per cent of the value of production for most products. This level of support would be allowed under the de minimis provisions. However, BH may have to change the nature of its support away from market-based measures to income support.

- Responsiveness of production and consumption to changes in prices. There are three types of elasticity in the model: demand, supply and Armington elasticities. Where possible, demand and supply elasticities are obtained from UNCTAD's Agriculture Trade Policy Simulation Model. Where this is not possible, estimates are obtained from a similar country (Croatia) or based on a lower level of processing. For example, in the absence of estimates for processed meat, estimates for beef are used. The Armington elasticities, which measure the responsiveness of consumers to a change in relative prices of imports from alternative sources, come from the GTAP database. Because BH is not included as a separate country in the database, estimates for Bulgaria are used.

This analysis is applied to eight specific products, as listed in Table 9.7. These products are considered sensitive and of particular interest to policy-makers.

Bilateral trade flows for the four regions are shown in table 9.8. The diagonals in each matrix (that is, the figures at the intersections of a rows and columns with the same label) refer to domestic production that is consumed locally. The remaining elements in each row refer to exports. For example, the first row indicates that BH produces US$23 million in beef that is consumed domestically plus exports of $19,000 to the EU and $2,000 to CEFTA members.

9.4.3 The results

The accession of BH to both the EU and the WTO will lead to falls in tariffs on BH's imports and exports for the products examined here. The resulting changes in trade in turn lead to changes in output and employment. The net effect on employment is negative but slight, with an estimated 2,000 agricultural workers displaced. Changes in BH's exports, imports, output, and employment are presented in this section. We also report, in less detail, changes in tariff revenue, returns to producers, and benefits to consumers. Because the changes in trade flows are driving the change in output, we present them first.

Table 9.7: Model coverage

Regions	Product	HS Code
	Beef	0201–0202
Bosnia and Herzegovina	Pork	0203
European Union 25	Poultry meat	0207
CEFTA	Dairy products	0402–0406
Rest of world	Processed meat	1601–1602
	Processed cereals	1901–1905
	Processed fruit and vegetables	2001–2009
	Wine	2204–2205

Note: CEFTA includes Albania, Bulgaria, Croatia, Macedonia, Moldova, Serbia, Montenegro, and Turkey.

Table 9.8: Initial bilateral trade flows, 2007

Product	Exporter	Importer BH (US$000)	EU25 (US$000)	CEFTA (US$000)	RoW (US$000)
Beef	BH	23 001	19	2	0
	EU-25	1 811	15 837 290	11 737	382 156
	CEFTA	1 545	242	1 283 700	862
	RoW	1 214	85 384	105 220	105 789 831
Pork	BH	5 472	0	4	0
	EU-25	6 462	25 899 657	120 846	3 300 317
	CEFTA	659	51	1 089 291	59
	RoW	1 538	72 222	44 219	94 760 867
Poultry meat	BH	18 783	12	89	10
	EU-25	2 541	12 044 887	37 607	1 036 879
	CEFTA	7 514	4 383	1 471 979	5 029
	RoW	397	110 700	123 418	79 341 133
Dairy products	BH	141 809	23	4 808	988
	EU-25	7 561	34 866 177	53 042	797 276
	CEFTA	18 108	4 734	831 373	9 378
	RoW	13 686	51 868	21 171	36 347 174
Processed meat	BH	93 071	0	6 834	282
	EU-25	32 380	92 959 082	176 929	7 847 717
	CEFTA	22 704	6 692	6 415 299	91 930
	RoW	6 736	107 090	86 842	105 476 617
Processed cereals	BH	125 217	297	13 468	2 448
	EU-25	20 741	78 035 428	291 909	5 639 806
	CEFTA	30 786	41 459	9 760 491	240 325
	RoW	38 519	205 771	107 913	378 147 972
Processed fruit and vegetables	BH	75 942	1 623	7 218	3 022
	EU-25	12 160	39 178 851	209 776	3 854 903
	CEFTA	9 800	46 772	12 191 701	414 481
	RoW	22 114	611 762	120 646	288 850 800
Wine	BH	5 656	7	1 934	132
	EU-25	2 572	989 328	22 501	9 058 022
	CEFTA	7 740	44 402	77 333	217 938
	RoW	7 407	196 360	14 102	1 414 157

Source: Comtrade, FAOSTAT, BH government. Elements on the diagonal refer to own production consumed domestically.

Table 9.9: Change in BH exports

		EU accession		WTO accession	
Product	**Initial exports (US$000)**	**Change in value (US$000)**	**Change in value (%)**	**Change in value (US$000)**	**Change in value (%)**
Beef	21	91	433.33	44	209.52
Pork	4	0	0.00	0	0.00
Poultry	111	–4	–3.58	0	–0.36
Meats	5 820	38	0.65	28	0.47
Dairy	7 116	9	0.12	2	0.02
Processed cereals	16 213	–5	–0.03	0	0.00
Processed fruit and vegetables	11 864	0	0.00	0	0.00
Wine	2 073	4	0.19	8	0.39

Source: GSIM simulations.

9.4.3.1 Exports

The changes in exports following accession are shown in table 9.9. The dominant effects are increases in exports of beef, processed meats, and dairy products, but these changes are modest because there is no additional opening of export markets in either the EU or CEFTA, with which BH currently has trade agreements, nor with the RoW countries that already impose MFN rates on imports from BH.

Under the EU accession scenario, the strongest positive change estimated is in beef exports. A modest decrease of poultry and cereals exports is expected as well. Other sectoral exports will grow by only very modest amounts.

The policies modelled under the WTO accession scenario also have modest impacts on export performances for the sectors in question. As in the first scenario, the greatest change is in beef exports. Exports of pork, cereals, and vegetables and fruit will remain virtually unchanged under this scenario, while a modest contraction of poultry export is anticipated.

9.4.3.2 Imports

The EU accession scenario involves a switch in imports from CEFTA and RoW to the EU. This is driven by a significant reduction in BH bilateral tariffs on beef, pork, and processed meat imports from the EU. Furthermore, tariffs on imports of poultry and dairy products from RoW would rise to match EU levels, contributing further to the trade diversion. Therefore, a significant fall of imports of pork, poultry, and dairy products from RoW is anticipated. Imports of processed cereals would fall as tariffs on imports from RoW are raised to EU levels. The fall reflects the significant share of imports of processed cereals in the base period. The total import values will increase by 37 percent for pork, 31 per cent for beef, 25 per cent for processed meats, and 13 per cent for dairy (table 9.10).

The WTO accession scenario modelled here involves the reduction in bilateral tariffs on imports from RoW (that is, excluding CEFTA and EU-25 countries). Tariffs on imports of beef, pork, and processed meats from these countries are quite high (as shown earlier, in table 9.4). Therefore, reform of those policies leads to an increase in imports from RoW. At the same time, a reduction of imports from the CEFTA and EU-25 countries occurs as consumers switch to the relatively cheaper products. The overall import value for the selected products increases by 13 per cent for beef, 5 per cent for pork, and 17 per cent for processed meats. There is little change in imports of poultry, dairy products, processed cereals, vegetables, and wine, as tariffs on these items are relatively low.

9.4.3.3 Output and employment

The estimated changes in output and employment following implementation of the two scenarios are shown in table 9.11. The dominant effects are decreases in the output of processed meats and, to a lesser extent, dairy products, beef, and pork, and slight increases in production of poultry and cereals. However, these changes, at less than 10 per cent, are relatively modest because there is little additional trade generated, as noted above.

The WTO accession scenario leads to an increase in imports from RoW and a fall in domestic production for all products except poultry. The effect on production of an increase in imports from WTO countries is offset to some extent by a reduction of imports from the CEFTA and EU-25 countries. After accounting for the switch in source of imports, the changes in output are slight, less than 3 per cent, with meats being the most affected sector.

Because labour is assumed to be used in fixed proportions with other inputs, the changes in employment are proportional to the changes in output. Thus, a 3 per cent change in output for beef leads to a change in employment of 3 percent, or 273 jobs.

Table 9.10: Change in BH imports

		EU accession		WTO accession	
Products	**Initial ($m)**	**Change in value (US$m)**	**Change in value (US$m)**	**Change in value (US$m)**	**Change in value (US$m)**
EU-25 beef	1 811	1 731	96	–467	–26
CEFTA beef	1 545	–937	–61	-398	–26
RoW beef	1 214	632	52	1 471	121
Total	**4 570**	**1 426**	**31**	**606**	**13**
EU-25 pork	6 462	5 295	82	–3 209	–50
CEFTA pork	659	–659	–100	–327	–50
RoW pork	1 538	–1 410	–92	3 971	258
Total	**8 658**	**3 227**	**37**	**435**	**5**

Table 9.10: Change in BH imports *(continued)*

		EU accession		WTO accession	
Products	**Initial ($m)**	**Change in value (US$m)**	**Change in value (US$m)**	**Change in value (US$m)**	**Change in value (US$m)**
EU-25 poultry	2 541	168	7	22	1
CEFTA poultry	7 514	489	7	63	1
RoW poultry	397	-397	–100	–171	–43
Total	**10 452**	**260**	**2**	**–87**	**–1**
EU-25 meats	7 561	9 599	127	–3 521	–47
CEFTA meats	18 108	–11 172	–62	–7 772	–43
RoW meats	13 686	11 421	83	18 102	132
Total	**39 356**	**9 849**	**25**	**6 809**	**17**
EU-25 dairy	32 380	17 367	54	–845	–3
CEFTA dairy	22 704	–2 798	–12	–577	–3
RoW dairy	6 736	–6 729	–100	2 059	31
Total	**61 820**	**7 840**	**13**	**636**	**1**
EU-25 cereals	20 741	4 710	23	–50	0
CEFTA cereals	30 786	2 336	8	–74	0
RoW cereals	38 519	–1 0731	–28	243	1
Total	**90 046**	**–3 686**	**–4**	**118**	**0**
EU-25 PFV	12 160	3 528	29	–297	–2
CEFTA PFV	9 800	–8	0	–239	–2
RoW PFV	22 114	–3 517	–16	1 259	6
Total	**44 074**	**3**	**0**	**723**	**2**
EU-25 wine	2572	1484	58	–404	–16
CEFTA wine	7740	–570	–7	–1 191	–15
RoW wine	7407	–697	–9	2 050	28
Total	**17719**	**216**	**1**	**455**	**3**

Note: PFV=processed fruit and vegetables
Source: GSIM simulations.

It is worth noting the impact of differing labour–output ratios in the different sectors. Processed meats, the most affected sector in terms of value, has a relatively low labour–output ratio at 0.12 (table 9.12). – half the labour content of pork and poultry, which are relatively labour-intensive sectors. This is because processed meats is a downstream sector, which relies on less processed inputs, including beef, pork, and poultry. While it may seem an advantage that processed meats is not a labour-intensive sector, the effects of a change in output are passed up and down the supply chain. A decrease in demand for processed meats leads to a decrease in demand for

Table 9.11: Change in BH output and employment

	EU accession		WTO accession	
Products	Change in output (%)	Change in employment (number)	Change in output (%)	Change in employment (number)
Beef	–2.67	–273	–1.14	–117
Pork	–7.84	–408	–1.53	–80
Poultry	2.04	366	0.39	69
Meats	–3.67	–1 413	–2.54	–980
Dairy	–0.92	–466	–0.35	–178
Cereals	0.47	134	–0.02	–4
Processed fruit and vegetables	0.00	–2	–0.15	–69
Wine	–0.31	–21	–0.66	–44

Source: GSIM simulations.

unprocessed meats and ultimately for livestock. These interactions are not captured in this single-commodity analysis. Thus, both negative and positive employment effects may be understated. At the same time, there is no attempt to take into account the scope for displaced workers to find employment in other sectors. A general equilibrium model, with an up-to-date social accounting matrix, would be required for this. Most social accounting matrices have a high level of product aggregation and therefore could not analyse the effects on specific sectors such as processed meat.

Table 9.12: BH employment and labour–output ratios, by sector

Product	Employment	Labour–output ratio
Beef	10 226	0.15
Pork	5 202	0.33
Poultry meat	17 947	0.33
Dairy products	38 545	0.13
Processed meat	50 782	0.12
Processed cereals	28 328	0.07
Processed fruit and vegetables	47 089	0.19
Wine	6 719	0.30

Source: Authors' estimates derived from FAOSTAT and GTAP.

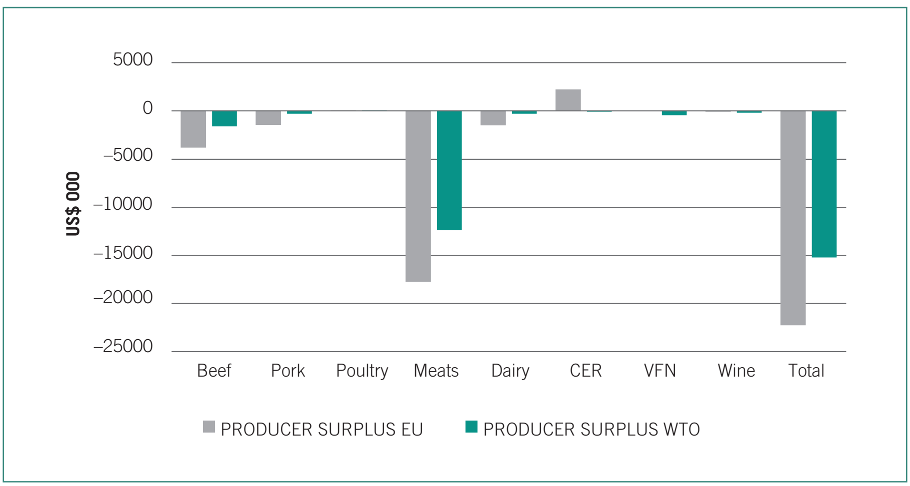
9.4.3.4 Government revenues

Custom tariffs contributed about 13 per cent to BH government revenue in 2006. This share has increased in recent years with the increase in imports. Under the WTO scenario, government revenues from agricultural tariffs for the listed products would fall by US$14 million from an initial value (in 2007) of $25 million. Under the EU accession scenario, tariff revenues would fall by $20 million. The major difference between the scenarios is that in the dairy sector revenue would be lost under the EU scenario but there would be little change under the WTO scenario. Overall, both scenarios will have an adverse impact on government revenues, which would have to be offset by other tax policies. Since a relatively small share of government revenue comes from total tariff revenue, and in general the major share of that revenue comes from non-agricultural products, this contraction will not have a dramatic impact on fiscal stability. At the same time, under both scenarios modest increases of exports and consumption are likely, which would boost business activities within the sector and thus revenues from other tax sources.

9.4.3.5 Producer surplus

As outlined earlier, the agricultural sector can play an important role in providing the vulnerable rural population of BH with opportunities to generate income. This is why it is important to assess the impact of policy changes on agricultural producers. While the change in output gives some indication of the likely change in employment, it says little about changes in wages. Assuming that supply is inelastic (less than one), the change in output in response to a price change will be less than the change in returns to producers. To add the price (wage) change to the quantity (employment) change, it is helpful to look at producer surplus, which is a measure of the profits in the industry, that is, returns minus costs of production. For self-employed farmers the producer surplus is a measure of their income. It can be assumed that wages are

Figure 9.5: Change in BH producer surplus



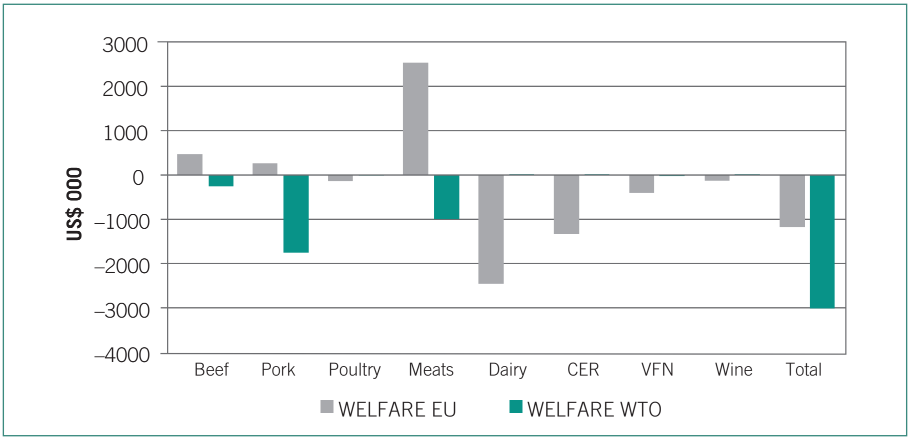
positively correlated with producer surplus. Reducing tariffs tends to reduce domestic prices and returns to producers. This happens across all sectors under both scenarios, as shown in figure 9.5. The greatest losses are in processed meats, where tariffs averaging 64 per cent are removed (EU) or reduced (RoW). Losses amount to US$18 million under the EU scenario and $12 million under the WTO scenarios. These losses reflect a fall in producer prices of 12 per cent. Losses to beef and pork producers would be less, but in fact the price changes are greater, 17 per cent for beef and 28 per cent for pork.

While the effects on producers are negative, they lead to lower prices for consumers. Indeed, consumers benefit despite losses in producer surplus and also in government revenue. Often, consumers are also producers, however. In this case the impact on them depends on whether they are net buyers or sellers. The distribution of gains and losses is an important issue for policy-makers to consider. In order to judge overall effects of implemented policies and benefits to the economy as a whole, it is important to aggregate those various effects; this is done in the next section.

9.4.3.6 Welfare

Any policy change generates winner and losers. The major effects of a tariff reduction are transfers from tax collectors and producers to consumers. Welfare measures the net effects in each sector. Most of the gains from removing deadweight losses are the results of increased efficiency of resource utilization. There may also be the terms of trade effects, such as the relative rise in prices of wheat that come from policy reform elsewhere. These effects may be positive or negative depending on whether the country is an importer or exporter of the product. BH is a net importer of almost all food products. The effects of WTO and EU accession scenarios on BH welfare are presented in figure 9.6. There are gains to the beef, pork, and processed meat sectors from EU accession, but losses when these sectors are open to competition from the rest of the world.

Figure 9.6: BH change in welfare



The welfare gains estimated here highlight the observation that policies with a negative impact on some producers and on employment could have a positive impact on the overall well-being of society. The assumption underlying this calculation of benefits and losses is that producers, consumers, and taxpayers are equally important. In reality, policy-makers may wish to take into account other considerations, such as downstream effects, the scope for employment elsewhere in a given industry or region or a range of equity, social, and environmental considerations.

9.5 IMPLICATIONS AND CONCLUSIONS

In spite of its agricultural base, BH is a net importer of food. In recent years it has reformed much of its trade through various free trade agreements with neighbouring countries and a bilateral agreement with the European Union. Consequently, almost all of its trade is covered by preferential agreements. On joining the WTO, BH may be required to reduce its tariffs to an average of about 5 or 10 per cent, as other new entrants have done. While there are relatively high tariffs on imports of certain products from WTO members not covered by these preferential agreements, liberalization following WTO accession is unlikely to generate significant trade flows. Furthermore, since WTO members already apply MFN rates on imports from BH, it is unlikely that access to other countries' markets will improve. BH has also applied to join the European Union and has already agreed to phase out tariffs on trade with EU members. If BH becomes an EU member, it will be required to set its tariffs at EU levels so that all EU members share a common tariff. This will require that some tariffs rise from their current levels. Agriculture is a sensitive sector, employing half of the BH workforce, and so the potential impacts of these two accession scenarios on the sector are worth analysing.

BH is disadvantaged by the inadequacy of institutional and managerial capacities to ensure the application of food safety and quality measures, rules of origin, and other administrative measures. WTO accession will draw attention to these inadequacies and should facilitate faster development and improvement.

Quantitative analysis of sensitive agricultural sectors suggests that the major impact of a fall in bilateral tariffs with non-SEE countries will be a switch in the source of imports. Overall, imports are estimated to increase, driven by the livestock products sector. Exports are affected only slightly. Overall customs revenue is expected to drop. This drop is significant in individual sectors but not significant for overall government revenue. The modelling undertaken here suggests that a rapid expansion in the current account deficit is not likely, but this depends on the changes in protection in individual sectors and the response of producers and consumers to these changes.

The modelling has its limitations. Apart from the usual caveats concerning data quality, especially where employment is concerned, the main drawback is the absence of intersectoral effects. For example, an increase in agricultural production will require an increase in fuel consumption. These additional costs are not taken into account here. Such analysis requires a general equilibrium model, with underlying input–

output tables. The modelling here has focused on a limited number of sensitive sectors. An advantage of the chosen model is that the products and the level of aggregation can be selected to assess implications in specific sectors.

Bosnia and Herzegovina is expected to experience a small reduction in agricultural sector welfare following accession to the EU and the WTO. The implications for poverty are likely to be negative, especially for meat producers. Many poor farmers depend on livestock production, and a drop in prices will make their situation more difficult. At the same time, further integration will have little or no impact on producer surplus in vegetable and fruit, wine, and cereals production, while poultry and processed cereal producers could expect small surpluses. Employment effects should be small, with about 2,000 jobs lost. Most of these are in the meat processing sector, which is not particularly labour-intensive compared with other agricultural industries. However, there will be flow-on effects up and down the supply chain, and a fall in output would most likely generate downward pressure on wages. This is a concern for policy-makers because many poor people work in the agricultural sector. Because of their ties to land, agricultural workers have limited scope for finding work in other sectors.

The main beneficiaries of trade liberalization will be consumers. This presumes that lower border prices are passed through to domestic consumers. Some recent research (Lubura and Apotekar, 2006) shows that, in fact, recent reductions in tariffs in BH were not passed on to consumers because of a weak trading sector that lacks competition. Consequently, improvement of trade sector performance and a decrease of transport costs are preconditions to a positive impact on consumers from tariff reductions.

Following substantial reforms, agricultural trade policies in BH are already quite liberal in comparison with those of its trading partners. Thus, joining the WTO will probably have little direct impact. However, there is much that the government can do to promote employment. The scale of unemployment and underemployment points to the need to reform the labour market and to create more jobs. Among the main constraints holding back the development of the BH's labour market are sizable skill gaps, the large size of the informal sector, which distorts the labour market, and the ineffectiveness of public services for labour mediation. One result is a low labour force participation rate, with workers discouraged from entering the labour force. The labour laws in the entities (Republika Srpska (RS) and the Federation of Bosnia and Herzegovina (FBiH)) provide the broad regulatory framework for employment. Both sets of laws are fairly modern and flexible (IMF 2010, p.18). The flexibility and efficiency of legislation has been hampered, however, by an extensive and generally rigid set of rules in collective bargaining agreements, many aspects of which are carried over from the old market socialism mode of labour relations. Furthermore, wage-setting relies on a system of coefficients – reflecting the complexity of the work performed and the worker's education – that is not compatible with the principles of a market economy (IMF, 2010). According to the International Monetary Fund (2010), the minimum net wages in BH (KM 308 in FBiH and KM 370 in RS) are among the highest in Eastern Europe when expressed as a share of the average wage

(World Bank, 2005). The effect of such provisions on labour relations is largely offset by widespread non-compliance, particularly in the private sector. However, the current status quo is sub-optimal, because "[n]on-enforcement of rigid regulations leads to informality, which creates rents for officials and uncertainty among employers and new investors, and leaves workers without protection (such as social insurance coverage)" (World Bank, 2005). Overall social security contribution rates, at 34 per cent, are higher than the OECD average of 29.5 per cent, but they are not excessive in the regional context (World Bank, 2005). However, when combined with the high level of wages in BH relative to its Balkan peers, the magnitude of the labour tax wedge undermines the competitiveness of the country and makes informal employment more attractive to businesses. Furthermore, due to lack of active job placement policies, sizable skill gaps have arisen, particularly among staff members with long tenure. The public employment mediation agencies in both entities are not able to face this issue because they are impeded by administrative mandates, and insufficient resources are allocated for active job placement policies.

In addition to revised labour market policies, other public policies and institutions need immediate strengthening through the following measures:

- strengthening of institutional and management capacities of the government in order to be able to implement food safety and quality standards, rules of origin, and other systems necessary to ensure a fair position for all market actors and to protect consumers' rights;
- proceeding with macroeconomic reforms in order to ensure, first of all, a single economic space in BH;
- increasing the growth of productivity in all sectors;
- developing sound policies to generate jobs outside the agricultural sector in order to absorb poor rural workers who may be displaced by trade liberalization;
- decreasing transaction costs – especially costs of transport, distribution, and compliance with standards. Competition policy needs to be developed and implemented to ensure that markets work efficiently.

These changes have to be planned carefully, because proper timing and sequencing are crucial to realizing the benefits of integration into the EU and accession to the WTO.

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ANNEX 9.1: THE GSIM MODEL

GSIM is static, deterministic, single-commodity bilateral trade model driven by export supply and bilateral import demand equations.[12] Exports and imports are a function of the world price plus or minus the relevant bilateral trade tax or subsidy. Because tariffs are bilateral and possibly different from country to country, changes in tariffs lead to changes in relative prices that drive differential changes in imports from various sources. This feature of the model is essential where preferential trade agreements exist. An elasticity of substitution determines the extent to which changes in relative prices lead to a switch in the source of imports. The model solves numerically to a specified tolerance using Excel's Solver to find a market clearing price such that global imports equal global exports.

The crux of the model is the import demand equations. Import demand in country *v* for commodity *i* from country *r* is a function of prices and total expenditure on the commodity:

$$M_{(i,v),r} = f(P_{(i,v),r}, P_{(i,v),s\ r}, Y_{(i,v)}) \qquad (1)$$

where $M(i,v),r$ is imports, $P(i,v),r$ is internal prices, $P(i,v),s\ r$ is external prices, and $Y(i,v)$ is expenditure on imports *i* in country *v*.

The response of imports to changes in relative prices depends on an expenditure share-weighted sum of the composite demand elasticity, E_m, and the supply elasticity, E_s:

$$N_{(i,v),r,s} = \vartheta_{(i,v),s}(E_m + E_s) \qquad (2)$$

and

$$N_{(i,v),r,r} = \vartheta_{(i,v),r} E_m - \vartheta_{sr\ (i,v),s} E_s = \vartheta_{(i,v),r} E_m - (1 - \vartheta_{(i,v),r} E_s) \qquad (3)$$

The price linkage equations relate internal prices to exports prices:

$$P_{(i,v),r} = (1 - t_{(i,v),r})P^{*}_{i,r} = T_{(i,v),r}P^{*}_{i,r} \qquad (4)$$

where $T = (1+t)$, the power of the tariff. Quotas or outright bans can be expressed as a tariff equivalent. On the export side, exports are a function of world prices:

[12] GSIM was developed by Joseph Francois of the Tinbergen Institute and H. Keith Hall of the U.S. International Trade Commission. The model is more fully documented in a memo by these authors entitled "Global simulation analysis of industry-level trade policy", October 2002. See also Francois, J.F.; Hall, H.K. 1997. "Partial equilibrium modeling", in J.F. Francois and K. Reinert (eds.), *Applied methods for trade policy analysis: a handbook* (Cambridge, Cambridge University Press).

$$X_{(i,v),r} = f({}_rP^*_{i,r}) \qquad (5)$$

These equations are in levels. By differentiating the import, export, and price equations, it is possible to obtain expressions for the change in imports and exports according to changes in tariffs and world prices:

$$M'_{i,r} = \Sigma_v M'_{(i,v),r} = \Sigma_v N_{(i,v),r,r} P'_{(i,v),r} + \Sigma_v \Sigma_{sr} N_{(i,v),r,s} P'_{(i,v),s} \qquad (6)$$

$$= \Sigma_v N_{(i,v),r,r} [P^*_r + T'_{(i,v),r}] + \Sigma_v \Sigma_{sr} N_{(i,v),r,s} [P^*_s + T'_{(i,v),s}]$$

The model is solved numerically by finding a set of prices such that the change in global imports (equation 6) equals the change in global exports (the derivative of equation 5).

Once we have solved for world prices, it is possible to work backwards to solve for export quantities and import quantities. Changes in government revenues are simply determined by the trade flows times the tariff rates. Producer and consumer surplus effects can then be determined from changes in prices and quantities:

$$\Delta PS_{i,r} = R^0_{i,r} P'_{i,r} + 0.5\, R^0_{i,r} P'_{i,r} X_{i,r} \qquad (7)$$

where $R^0_{i,r}$ is the initial export revenue.

Consumer surplus is more complex because consumption is a composite of imports from different sources.

$$\Delta CS_{i,r} = (\Sigma_v R^0_{(i,v),r} T^0_{(i,v),r}) * (0.5\, E_{m(i,v)} P'^{\,2}_{i,v} * sign\,(P_{i,v}) - P_{i,v}) \qquad (8)$$

where $P'_{i,v} = \Sigma_r \vartheta_{(i,v),r} P^{*\prime}_r + T_{(i,v),r}$

$P'_{i,v}$ represents the price for composite imports, and $R^0 T^0$ is the initial expenditure.

The change in total welfare is the sum of changes in producer and consumer surpluses and government revenue.

Data required for the model are bilateral trade flows (in values), bilateral trade taxes, and elasticities of supply, demand, and substitution between imports (the so-called Armington elasticities).

Limitations of the model include the (log) linear demand and supply relationship. Linearity implies that large shocks to the model may induce some errors in the size of the quantity changes. For example, it is reasonable to expect that, as prices rise, consumers become less responsive. A second limitation is the lack of substitution between products on the demand side, such as beef and sheep meat. Empirically, however, the cross-effects tend to be rather small, depending on how the commodities are defined. A further consideration is the absence of upstream and downstream linkages, between beef and processed meats, for example. (This reflects an absence of data rather than limitations in the modelling framework.) There is no storage in the model nor time-related effects or uncertainty. These limitations need to be kept in mind when interpreting the results.

10. A COHERENT AGRICULTURE TRADE POLICY FOR MEXICO

Ralf Peters and David Vanzetti[1]

10.1 INTRODUCTION

Mexico has a large rural territory and population – the largest population living in predominantly rural areas in the countries of the Organisation for Economic Cooperation and Development (OECD, 2007, p. 14). Farm employment, however, has dropped significantly in recent decades. Agriculture accounts for about 14 per cent of employment in Mexico,[2] down from more than 25 per cent in the early 1990s. Furthermore, agriculture today contributes only about 4 per cent to Mexico's gross domestic product (GDP), which is half the level that it contributed two decades ago. Rural poverty is high; 56 per cent of the people in rural areas live in poverty (OECD, 2007, p. 16).

This development coincides with a trade policy that has led to much more open markets, especially within the North American Free Trade Agreement (NAFTA) region, and significantly increased trade in agricultural products. Although a shrinking agricultural sector is not uncommon during the course of development, the situation of the agricultural sector in Mexico is considered unsatisfactory by many Mexicans and development economists, and it has been argued that Mexico's external trade relations have an adverse impact on the agricultural sector in Mexico. Increasing imports of maize, of which more than 99 per cent come from the United States of America (US), have been discussed extensively in the literature. Corn imports were 670 per cent higher in 2008–2010 than they were in 1991–1993. Although it is clear that NAFTA had an impact on the trade flows, it appears less clear what effects the increasing trade have had on employment and wages in Mexico. This chapter provides an overview of the development of trade and employment in Mexico's agricultural sector and discusses causality. The focus, however, is on analysing the possible effects of some potential policies intended to reinforce the agricultural sector.

[1] David Vanzetti was employed by UNCTAD when writing the first draft.

[2] World Development Indicators 2011. The Food and Agriculture Organization (FAO) reports that the agricultural population was 19 per cent of the total population in 2008, down from 30 per cent in 1990. OECD statistics report 12.9 per cent employment in agriculture in 2009 as a share of total civilian employment, down from 25.7 per cent in 1993.

What can the Mexican government do to strengthen its agricultural sector so as to increase employment and food security while reducing poverty? The scope for trade measures is limited, as Mexico has committed itself in the World Trade Organization (WTO) and various regional trade agreements to abstain from certain types of measures and as Mexico has a free trade agreement with its largest trading partner, the US. There is limited scope for increasing tariffs on imports or reducing tariffs facing its exports.

If agricultural tariffs were to be raised, trade agreements, especially NAFTA, would have to be revised. Revisions have been advocated – by presidential candidates, among others – and discussed in the literature.[3] Mexico would probably have to offer Canada and the US something in return, and thus any benefits to some agricultural sectors could be offset by additional costs to other sectors in Mexico. For example, because of the links between grains, oilseeds, and livestock, trade policies raising prices for feed grains could have adverse effects on livestock producers and consumers.

An alternative policy is to provide additional domestic support, or to provide the same amount in a different fashion, possibly better targeted to producers in need. As a means of support, input subsidies, on electricity or credit, for example, have the advantage of distorting only one side of the market, production, as opposed to both sides, as do output subsidies. Input subsidies may be preferred for that reason. However, the question remains whether such support can address poverty. McMillan et al. (2006) find, for example, that the poorest corn farmers in Mexico are net consumers of corn, and de Janvry et al. (1995) find that the majority of small- and medium-size corn producers do not produce for the market. To address poverty, the government might consider providing targeted direct income support to those in need, whether or not they are farmers.

The purpose of this study is to assess various policy options. Policies examined include:

1. increasing tariffs on agricultural imports from NAFTA countries to most favoured nation (MFN) levels;
2. removing the payroll tax on agricultural labour;
3. funding research and development to increase agricultural productivity;
4. switching current domestic support to subsidies on output or input.

A global general equilibrium model, the Global Trade Analysis Project (GTAP) model, is used to analyse the production, trade, and welfare effects of such policy changes. The results show that policies that increase distortions may strengthen the agricultural sector in terms of higher output, exports, and employment but are likely to have

[3] See, for example, DTB Associates and AgRisk Management. *Implications for the U.S. and Mexico of Mexico withdrawing certain agricultural products from NAFTA*. 2006, and McKinley (2008).

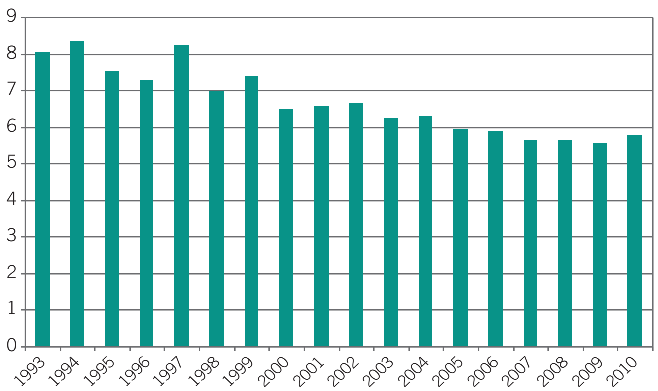
adverse effects on the rest of the economy. In contrast, removing payroll taxes and adopting policies that increase agricultural productivity have positive effects for both the agricultural sector and the economy as a whole.

10.2 THE AGRICULTURAL SECTOR

Agriculture plays an important role in Mexico's economy.[4] It accounts for about 14 per cent of employment in Mexico (World Bank, 2011), contributing, however, only about 4 per cent of its GDP. The relative importance of agriculture to Mexico has declined, as in other OECD countries. Between 1993 and 2010 total agricultural employment in Mexico declined by 28 per cent (figure 10.1).[5] In 1993 about 8 million people were employed in agriculture in Mexico, and in 2010, 5.8 million. Agriculture's contribution to GDP in per cent has halved in two decades.

The decline of the agricultural sector in Mexico appears to be greater than in many other countries. The share of employment in agriculture declined between the periods 1990–95 and 2005–10 by 45 per cent, more than in such other middle income countries as Brazil (29 per cent), Chile (30 per cent), Malaysia (37 per cent), and Turkey (43 per cent). On average, the decline in the upper-middle income group of countries was 29 per cent. Furthermore, agriculture's current share of employment in Mexico, at 14 per cent, is at the lower end of the scale compared with many other developing countries in this group, where an average of 33 per cent are employed in agriculture.[6]

Figure 10.1: Employment in agriculture in Mexico, in millions of people, 1993–2010



Source: OECD labour force statistics.

[4] Section 10.2, 10.3 and 10.3 partly use material from UNCTAD (2013).

[5] International Labour Office (ILO) data confirm the order of magnitude for the period 1995–2008.

[6] Data are based on World Bank World Development Indicators 2012; latest available year for each country.

The structural adjustment of the rural economy, with a declining contribution of agriculture and an increasing share of non-farm activities, has increased significantly the number of unemployed people in both rural dispersed and rural semi-urban areas. Furthermore, significant migration from rural areas to urban areas or to the US indicates a lack of rural employment opportunities.

Economic disparity and poverty remain challenges in Mexico. Most people living below the poverty line live in rural areas(Agriculture and Agri-Food Canada, 2010). The percentage of the rural population living in poverty is 56 per cent. Wages in the primary sector are about one-fifth to one-quarter of wages in other sectors (Scott, 2010). This is one consequence of the low labour productivity of agriculture in Mexico.

Mexico's agricultural sector is diverse. In some areas, predominantly in north-western parts of the country, larger commercialized farms operate. In central and southern states, farms are often smaller and often produce for subsistence. The relative importance of products for big and small farms varies as well. According to Prina (2011), fruits and vegetables are relatively more important for smaller farms than for larger farms, for which maize is more important. The average farm size is 8 hectares. Both small and large farms have become more common, while the number of middle-sized farms has decreased. Small farms represented approximately 73 per cent of total production units in 2007. Small- and medium-size farms employ a majority of the agricultural workforce. Many constraints, such as the land tenure system, limit the productivity of these smaller operations.

Table 10.1: Mexican agricultural products with highest production value in 1990 and 2010, US$ million

Commodity	**1990**	**2010**
Indigenous cattle meat	3 735	5 279
Indigenous chicken meat	1 065	3 811
Cow milk, whole, fresh	1 917	3 332
Hen eggs, in shell	838	1 975
Indigenous pig meat	1 160	1 804
Sugar cane	1 311	1 656
Maize	1 510	1 433
Tomatoes	797	1 108
Chillies and peppers, green	298	1 099
Mangoes, mangosteens, guavas	644	978
Oranges	429	783
Avocados	476	767
Lemons and limes	276	750
Beans, dry	735	665
Bananas	559	592
Wheat	547	554

Source: FAOstat.

Production in terms of value and quantity has increased from 1990 to 2010 for most major agricultural products. Meat products have the highest value of production, followed by the crops sugar and maize, and fruits and vegetables (table 10.1). Wheat and rice production values are relatively low, about US$600 million and $200 million, respectively.[7]

10.3 AGRICULTURAL TRADE

In 2010 agriculture accounted for about 6 per cent of Mexico's merchandise exports (about US$17 billion) and less than 7 per cent of its imports (US$21 billion) (figure 10.2).[8] These shares have continuously decreased from an average of 11.9 per cent for exports and 16.8 per cent for imports in 1980–1993 (Kose et al., 2004), while manufacturing trade has increased its shares. In absolute terms both exports and imports have increased.

Mexico's agricultural exports and imports both are highly concentrated on the US, which accounted for 78 per cent of total agricultural exports and 74 per cent of imports in 2010. The share of agricultural imports sourced from the US increased before the start of the implementation of NAFTA in 1994 to a level of around three-quarters (74 per cent in 1993), and since then has fluctuated around that level (figure 10.3). The share of agricultural exports going to the US decreased from 89 per cent in 1993 to the current level of 78 per cent. Thus, the share of aggregated agricultural trade with the US has not significantly increased since the implementation of NAFTA began.[9] The composition of trade, however, has changed; for certain staple food and meat products, the share of US imports has increased significantly (table 10.2).

More staple crops and meats are flowing south and more beverages, seasonal fruits, and vegetables are flowing north. In that sense, NAFTA's liberalization of agricultural trade appears to have produced the "expected" results (Wise, 2009). The major imports from the US are stock feed – soya beans, maize, and sorghum. Wheat and beef are the major food imports (table 10.3). Total agricultural imports from the US have increased from US$4.3 billion in 1993 to $15.6 billion in 2010.

Notwithstanding the growth of aggregate agricultural imports, which is basically in line with growth for other developing countries,[10] imports of some particularly sen-

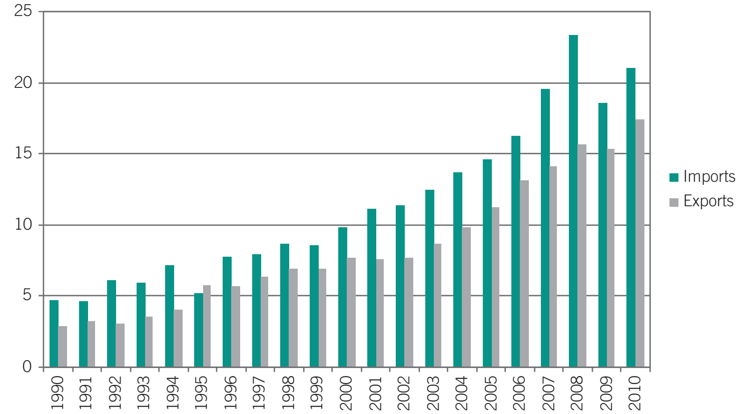
[7] Rice production value was not available from FAO. The value has been calculated from the amount of production and a price of US$500 per ton.

[8] UN Comtrade; WTO definition of agricultural trade.

[9] Trade with Canada has been growing disproportionately but remains at a low level. The share of imports from Canada grew from 5 per cent to 8 per cent from 1993 to 2010 and the share of exports to Canada from 1 per cent to 3 per cent.

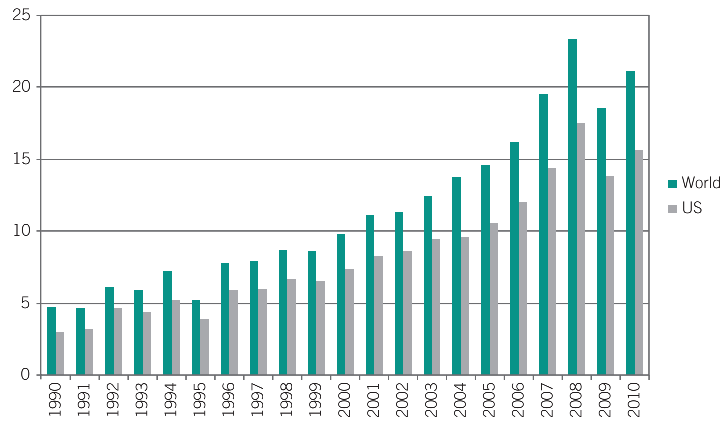
[10] From 1995–1997 to 2008–2010, Mexico's agricultural imports increased by 201 per cent. During that same period world agricultural imports increased by 130 per cent in US$ nominal value terms, and total low- and middle-income countries' imports increased by 238 per cent (e.g. Brazil26 per cent, Chile 207 per cent, Colombia 124 per cent, Guatemala 278 per cent, Peru 146 per cent, and Turkey 147 per cent).

Figure 10.2: Mexican agricultural imports and exports, 1990–2010, in US$ billion



Source: UN Comtrade, current US$.

Figure 10.3: Mexican agricultural imports from the world and the US, 1990–2010, in US$ billion



Source: UN Comtrade, current US$.

sitive products, such as corn, rice, beef, poultry, and beans, are dramatically high. Moreover, for all these imports, the US market share is very high, and, for many of these products, the US share has been increasing since 1993. Imports of maize were 670 per cent higher in 2008–2010 than they were in 1991–1993. Almost all of the imported maize comes from the US (table 10.3). Similarly, beans imports have increased by 853 per cent. Imports of wheat from the world have increased less, by 192 per cent, but the share of imports coming from the US increased from 58.9 to 76.1 per cent. Growth in pork and poultry meat imports was also high, at 664 per cent and 390 per cent, respectively.

Table 10.2: Main Mexican agricultural imports from US as a percentage of total agriculture imports from US

HS 2 digit	Product	1993	2010
10	Cereals	15.4	19.0
02	Meat and edible meat offal	13.5	17.7
12	Oilseed, oleaginous fruits; miscellaneous grains	14.4	12.8
52	Cotton	8.0	6.8
23	Residues and waste from the food industry	4.9	6.0

Source: UN Comtrade.

Table 10.3: Imports to Mexico of selected agricultural products

	Imports from the world				US share of total imports (%)	
	Volume (average 2008-10 in 1000 tons)	% change in volume 1991-93 to 2008-10	Value (average 2008-10 in US$ millions)	% change in value, 1991-93 to 2008-10	Value 1991-93	Value 2008-10
Beans	129.1	852.6	126.1	1 330.0	92.4	90.8
Beef	318.9	70.2	1 152.7	198.6	81.1	84.6
Maize	8 179.6	670.3	1 854.6	947.7	99.0	99.3
Pork	478.4	664.1	843.3	791.5	78.3	90.5
Poultry	642.6	390.2	757.9	506.4	98.5	90.7
Rice	820.7	173.7	345.5	390.8	72.3	99.5
Sorghum	2 101.0	–44.4	411.3	–3.9	99.4	100.0
Sugar	4 556.5	1 031.5	649.7	413.1	43.5	73.9
Wheat	3 323.2	191.7	1 006.8	484.0	58.9	76.1

Source: UN Comtrade, SITC classification of products; see annex.

Mexico's agricultural exports to the US increased from an estimated $3.2 billion in 1993 to $13.6 billion in 2010, and account for about 17 per cent of the total value of agricultural imports of the US. Horticulture products such as tomatoes and fruits are the main exports (table 10.4). Beer exports have increased significantly, while the importance of live cattle has decreased.

Regional trade agreements (RTAs) usually cause trade creation and diversion effects, resulting in a higher share of intra-RTA trade. Mexico's imports from Canada and the US increased slightly between 1993 and 2010, from 79 per cent to 82 per cent (table 10.5). On the other side, US imports from Mexico increased from an import market share of 11 per cent to 17 per cent between 1993 and 2010, and for Canada Mexico's share of imports has increased from 2 per cent to 4 per cent. This confirms the trade creation effect. The decreasing share of Mexico's exports to the

Table 10.4: Main Mexican agricultural exports to US as a percentage of total agriculture exports to US

HS 2 digit	Product	1993	2010
07	Edible vegetables and certain roots	38.1	30.3
22	Beverages, spirits, and vinegar	7.8	17.0
08	Edible fruit and nuts; peel of citrus	12.3	14.9
17	Sugars and sugar confectionery	1.3	8.7
19	Preparations of cereal, flour, starch/milk	1.9	5.3

Source: UN Comtrade.

NAFTA markets (from 89 per cent to 78 per cent) is explained by lower import growth rates in Canada and the US and does not reflect loosing market shares. However, the Mexican market share in Canada is still very low.[11]

Increasing specialization, with more staple crops and meat flowing south and more seasonal fruits and vegetables flowing north, has resulted from the NAFTA-induced tariff cuts, which reduced the real Mexican border price of corn, an imported commodity, and increased the real Mexican border price of fruits and vegetables, which are exported commodities (McMillan et al., 2006; Prina, 2011). This confirms the finding by Dimaranan et al. (2003), cited in Stiglitz and Carlton (2005), that, on one hand, Mexico has become more dependent on imports in programme crops and meat/livestock. On the other hand, Mexico has been successful in the export of vegetables and fruits. Vegetable exports to the US increased at 0.8 per cent annually during the 1989–1993 period and then jumped to increases of 6.2 per cent annually in the post-NAFTA period (1994–2004)(Prina, 2012). More than 85 per cent of the tomatoes imported into the US come from Mexico. Mexican fruit exports to the US rose at 2.8 per cent per year between 1989 and 1993 and at 4.8 per cent per year after that.

Table 10.5: Market shares of exports and imports in NAFTA

Reporter	Partner	Imports (%)		Exports (%)	
		1993	2010	1993	2010
Mexico	US	74	74	89	78
	Canada	5	8	1	3
	NAFTA	79	82	90	81
US	Mexico	11	17	8	12
Canada	Mexico	2	4	2	4

Source: UN Comtrade.

[11] The average MFN rate in Mexico has not decreased since the implementation of NAFTA. It remains relatively stable at around 20 per cent for the simple average. It is possible, however, that non-NAFTA trade, which accounts for about 20 per cent of agricultural trade, is not MFN trade but is instead under other preferential schemes.

10.4 TRADE POLICY

Mexico has undertaken significant agricultural market reforms. Since the early 1990s it has decreased its trade barriers, shifted away from commodity support to more decoupled forms of support, and encouraged market liberalization (OECD, 2007).

10.4.1 Market access

Mexico is a founding member of the WTO, with an average bound rate of 44 per cent and a relatively high and stable average MFN applied rate of 21 per cent (simple averages for agricultural products, 2010) (table 10.6). Sugars and confectionary, animal and dairy products, and coffee and tea attract the highest tariffs.

Most of Mexico's imports are under preferential agreements. The NAFTA among Mexico, the US, and Canada was ratified in 1994. Many tariffs were eliminated immediately, and others were phased out over several years. Because of the sensitivity of agriculture, the agreement featured an extended implementation period for sensitive products over periods of 5 to 14 years. In Mexico maize is particularly sensitive; the NAFTA agreement had a 14-year phase-in period to protect the Mexican market from imports of US maize. The phase-in was completed in 2008.

It has been shown that the comprehensive liberalization schedule with the US has had the impact of increasing certain agricultural imports from the US (see, e.g. McMillan et al., 2006 and Prina, 2011). The free market access to the US has most likely also helped Mexican exporters, but the US does not in general have very high tariffs on agricultural goods. On fruits and vegetables, the major export products to the US, the average applied MFN rate is low, at 4.9 per cent. In many sectors where

Table 10.6: Mexican tariffs by product group

	Bound	**MFN applied 2010**	**NAFTA**
Animal products	64	41	0
Dairy products	63	35	0
Fruit, vegetables, plants	37	18	0
Coffee, tea	64	37	0
Cereals and preparations	45	20	0
Oilseeds, fats, and oils	44	17	0
Sugars and confectionary	119	66	0
Beverages and tobacco	44	28	0
Cotton	39	5	0
Other agricultural products	28	7	0
All agriculture	**44**	**21**	**0**
Fish and fish products	35	17	0

Source: WTO, ITC, UNCTAD world tariff profiles 2010.

Table 10.7: Average applied tariffs in agriculture between the US, Canada, and Mexico

Import country	Export country	Preferential tariff (%)	MFN rate for export basket (%)
Mexico	US	0.0	31.1
	Canada	0.0	16.7
US	Mexico	0.0	5.4
Canada	Mexico	0.0	5.8

Note: MFN rate is the trade-weighted average MFN tariff for the actual export basket from the indicated export country. Preferential tariff is the theoretical rate since some products may face the MFN level if they do not meet, for example, rules of origin requirements.
Source: UNCTAD TRAINS Database, 2009 and 2010.

the US has high tariffs, such as in dairy (16.2 per cent), Mexico is not a major exporter.[12] Thus, the tariff preferences through NAFTA appear to have relatively lower value for Mexico's agricultural producers than for US farmers (table 10.7).

10.4.2 Domestic support

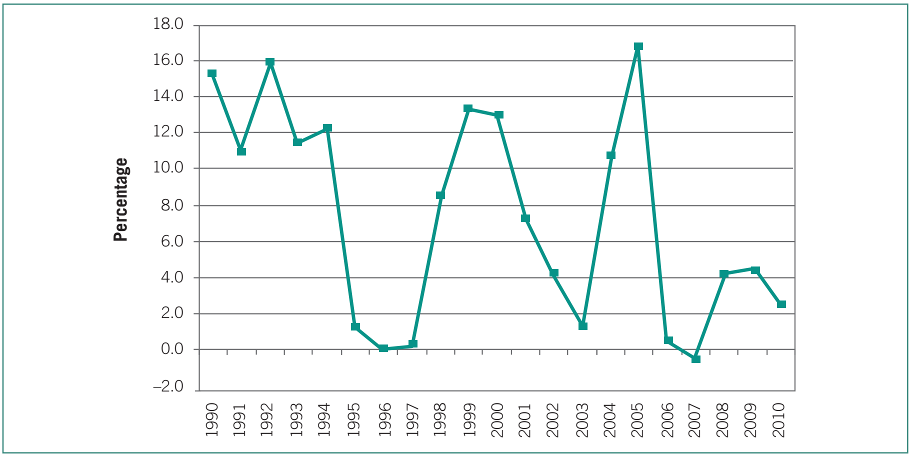
There are no limitations in the NAFTA agreement concerning the use of domestic support. Still, US subsidies on agriculture are a major concern for Mexican farmers. Total support for US agricultural producers has risen and fallen since NAFTA was implemented in 1994. The latest figure for producer support is $26 billion (2010), according to OECD estimates. This is currently about 7 per cent of the total value of production. After a peak of more than $55 billion in 1999 (about 26 per cent of the total value of production), the decline is attributable in part to an increase in commodity prices; since some of the payments are countercyclical, payments are reduced in times of high prices.

Total domestic support (for example, including general services such as research and food stamps for low income families) for US agriculture in 2010 was still significant, totalling $133 billion. However, little of this was paid to producers according to output use ($1.9 billion) or input use ($9.6 billion). These are the categories that are considered most production-distorting. Therefore, it is difficult to assess how distorting the US domestic support is for Mexico.

Of particular interest is maize, as both Mexico and the US grow this crop, and at the signing of NAFTA Mexican producers were concerned about being flooded with cheap imports of maize following the removal of tariffs. US and Mexican maize are not completely substitutable. The US produces mainly yellow maize, which is used as a stock feed. Mexico produces white maize, which is also used as a food for human consumption. However, there is some substitutability between yellow and white maize, and the US also exports some white maize.

[12] There are some exceptions. US imports of processed tobacco and processed ground-nuts, for example, were protected by tariffs of 77 per cent and 164 per cent of the product price, respectively. Relative to the rest of the world, Mexico benefits from preferential access to the US market for these agricultural products.

Figure 10.4: Producer support for maize in the US as a percentage of production value, 1990–2010



Source: OECD.

Domestic support in the US for maize as a percentage of production, according to OECD estimates, is shown in figure 10.4. Product-specific support was very high in certain years, reaching 16 per cent in 2005. Since then it has been decreasing, reaching a level close to 2 per cent in 2010.

Mexican maize producer prices were double US prices in 1994, when the NAFTA agreement was ratified. Some convergence appears to have occurred in the first year, but a gap remains, and prices in the two countries have generally moved in the same direction since then. McMillan et al. (2006) found that, while the Mexican producer price has always moved in tandem with the world price, NAFTA squeezed the differential between Mexican producer prices and border prices.

There is, however, no consensus concerning the impact of the US subsidies on the border price. McMillan et al. (2006) conclude from an overview of the literature that "though the estimates are all over the place … the bottom line seems to be that the magnitude of the price difference would actually be quite small." Wise (2009) disagrees. He analysed the impact of US agricultural policy on Mexican producers and assessed the extent to which subsidized products were exported to Mexico at prices below production costs between 1997 and 2005. His calculation is based on dumping margins that are supposed to capture not only the effect of direct subsidies but also other subsidies that allow exports below production costs. Maize producers were by far the most heavily affected, with a dumping margin of 19 per cent, resulting in a loss of $6.6 billion for Mexican maize farmers during that 9-year period.

Maize is not the only US product competing with Mexican production that benefits from subsidies. According to OECD's Producer Single Commodity Transfers estimate, the US subsidizes mainly crops and milk. For the eight products – maize, soybeans, wheat, cotton, rice, beef, pork, and poultry – for which Wise (2009) estimates the dumping margin, he calculates that subsidies in the US caused losses of $12.8 billion for Mexican producers over the period from 1997 to 2005.

Since 2005 product-specific domestic support in the US has dwindled to very low levels due to the countercyclical nature of much of that support, as noted. For instance, US maize prices have risen from a little over US$2 per bushel in 2001 to $8 per bushel in 2011. Some observers have attributed part of this rise to the influence of US- and EU-mandated biofuels policies. Some 40 per cent of the US maize crop is diverted for this purpose, according to the United States Department of Agriculture (USDA).[13] Babcock (2011) suggests that, as a result, US maize prices were 17 per cent higher in 2011 than they would have been otherwise. This policy not only raises the price of maize but also the prices of other crops, such as vegetable oils and sugar, that are used in ethanol production, and wheat and coarse grains, which are substitute animal feeds.

While previous US policies may have had a detrimental effect on Mexican maize producers, the data suggest this effect is now small or, indeed, may have reversed. If the US policy that supports the production of maize for ethanol production leads to higher prices, the Mexican maize sector could benefit from that policy. While beneficial for maize producers, higher maize prices are likely to be detrimental for Mexican livestock producers and for consumers' access to food. Wise (2012) estimates that, from 2006 to 2011, expansion of US ethanol production cost Mexico about $1.5 billion due to ethanol-related corn price increases.

For its part, Mexico supported its agricultural producers with MXN79 billion in 2010 (US$6.2 billion),[14] 12 per cent of the value of agricultural production, which is about MXN592 billion. The total support estimate, which includes transfers from consumers, was MXN94 billion. The largest items are support based on commodity outputs and input use. Market price support goes primarily to poultry meat, sugar, and milk. Subsidies on input use include electricity, price hedging (mainly on maize, sorghum, and wheat), and fixed capital formation. Expenditure on research and development is relatively low, at MXN1.3 billion.

Mexico's domestic support is significant but lower than the average OECD farm support. The OECD calculated an average producer support of 18.3 per cent for 2010, partly driven by highly subsidizing countries such as Japan, Republic of Korea, Norway, and Switzerland. Although in 2010 the Mexican producer support estimate was 12 per cent compared with the US level of 7 per cent, during many years in recent decades product-specific subsidies on crops in Mexico were lower than in the US. For instance, maize support was 8.8 per cent in 2005, roughly half of the support that US farmers received.

Scott (2010) notes that market price support and output-linked payments in Mexico have targeted mostly traditional crops, particularly maize and other grains, as well as raw sugar and some animal products such as milk and poultry meat.

[13] http://www.usda.gov/oce/commodity/wasde/

[14] Exchange rate from USDA ERS 12.64.

However, fruits and vegetables have not received significant support but have benefited from the liberalization of agricultural markets.

10.4.3 Non-tariff measures

Mexico's trade policy has led to much more open markets, especially within the NAFTA region. While tariffs on agricultural products between the US and Mexico have been eliminated, standards and other non-tariff measures regulating cross-border trade prevent full integration of the two markets. Non-tariff measures are the dominant obstacle to exports for Mexican agricultural producers. The most important non-tariff measures are technical measures, mainly sanitary and phytosanitary (SPS) measures and labelling requirements, as well as rules of origin requirements. NAFTA has allowed differing levels of standards to develop (as opposed to effective equivalence). Vollrath (2004) notes that SPS-related issues and standards remain contentious in the context of NAFTA in areas such as dairy, beef, sugar, wheat, rice, corn, and livestock. This is due to a lack of harmonized product, health, safety, and environmental standards, which, in turn, stem from differences in national laws and regulations, divergent farm programmes, and incompatible macroeconomic policies. Products legally produced in one country in NAFTA cannot automatically be sold in other NAFTA countries but may require additional certification.

10.4.4 Effect of trade policy on Mexican producers

NAFTA has been accused of damaging farmers in Mexico and jeopardizing Mexico's food self-sufficiency (Polaski, 2006). Fanjul and Fraser (2003) argue that NAFTA has been responsible for a surge in US maize exports to Mexico and the associated decline in the Mexican producer price of maize. Moreover, Mexican farmers would be at a disadvantage vis-à-vis US farmers because of the US subsidies. The result, it is argued, was an increase in poverty. Similarly, Polaski (2004) contends that US exports of subsidized crops such as corn have depressed agricultural prices in Mexico, and the rural poor have borne the brunt of the adjustment to NAFTA. Khor (2007) also is critical of NAFTA, arguing that the increase in Mexican exports of some agricultural products has not been enough to compensate for the substitution of imports of other products for domestic agricultural products.

In contrast, the World Bank (2004) argues that the reduction in producer prices reflected a long-term trend and cannot be blamed on NAFTA. Barron and Rello (2000) analyse the growing tomato agro-industry and argue that vegetable exports have proved to be an alternative to rural unemployment and are crucial to the survival of entire villages. The authors are, however, also critical of poor working conditions. Hufbauer and Schott (2005) acknowledge that expanded agricultural trade under NAFTA imposed adjustment costs in Mexico, but they argue that static and dynamic gains probably exceed adjustment costs within Mexico by a factor of five or more. Others find small effects of US subsidies on Mexican prices (see discussion in McMillan et al.(2006)).

Some analyses of the impact of NAFTA on Mexico's agricultural sector distinguishes between regions close to the US border and remote areas in the south of Mexico as well as among farms of different sizes. Nicita (2004) finds that trade liberalization has affected domestic prices and labour income differently both across income groups and geographically across the country. The effects on prices were found to be higher in regions more exposed to global markets, close to the US border. The findings indicate that trade liberalization has lowered relative prices of most non-animal agricultural products, reducing households' agricultural income. While reducing the cost of food, thus benefiting consumers, the policy also contributed to widening the income gap between urban and rural areas.

Using household survey data, de Janvry et al. (1995) found that the majority of small- and medium-size corn producers do not produce for the market. Therefore, they predicted that most corn farmers' income will not be directly affected by the decline in the price of corn associated with NAFTA, while a significant share will benefit as consumers. Using a general equilibrium model, Levy and Van Wijnbergen (1995) quantify the impact on household income, labour, and land markets of liberalizing the Mexican corn sector. They emphasize that even subsistence farmers who do not sell corn are likely to sell labour. Thus, if dropping corn prices reduce wages, subsistence farmers are likely to be hurt by the liberalization of the corn sector. Prina (2012) finds, however, that NAFTA-triggered changes in the border prices of crops imported from the US and exported to the US had no impact on the wages of agricultural workers in Mexico. She argues that the mobility and flexibility of workers, inter alia resulting from little likelihood of sector-specific skills, insulated workers from any adverse impact.

McMillan et al. (2006) confirm that the majority of the poorest corn farmers did not sell corn in the market prior to NAFTA, and so their income will not have been directly affected by the forces of globalization associated with NAFTA. A majority of the medium- and large-size corn farmers, however, sell corn in the market, and the medium-size corn farmers experienced a sharp decline in real income as a result of NAFTA. The income of the largest corn farmers has increased.

Thus, the studies have shown that the impact of globalization, and more specifically NAFTA, appear to depend on farm size, proximity to the US border, types of agricultural products produced, income levels, and share of agricultural income in total household income. It appears that a majority of small farms were not much affected, and that middle-income corn farmers were adversely affected, while the highest-income farmers were able to profit.

In her econometric study Prina (2012) also assesses the impact of NAFTA-induced changes in the border price of crops on agricultural employment in Mexico.[15]

[15] Prina (2011) finds that NAFTA-induced tariff cuts caused a reduction in the real Mexican border price of corn and an increase in the border price of tomatoes and melons. Nicita (2009) finds that tariff liberalization in Mexico decreased the price of a basket of agricultural goods.

She finds that increases in the real price of vegetables are associated with an increase in employment in the cultivation of vegetables, and the drop in the real price of corn reduces employment in the corn sector. Furthermore, she confirms that the effects vary with the distance to the US border, emphasizing the importance of accounting for regional differences.

Prina (2012) does not assess the overall effect on employment in agriculture. Furthermore, it has been argued that agriculture cannot be looked at separately in the context of NAFTA. Nicita (2004), for example, shows that, despite the likely negative effect on certain farm households, tariff changes during the 1990s appear to have raised disposable income for all households, with richer households enjoying a 6 percent increase and poorer households enjoying a 2 percent increase.

To summarize, it appears that NAFTA has reduced domestic prices for many agricultural products in Mexico, including corn, while tariff reductions increased prices for certain vegetables and fruits. Most analysts find an adverse effect of US subsidies on Mexican farmers, but the degree to which prices are reduced is controversial and in any case varies from year to year. These price changes have brought hardship for many Mexican farmers, such as those with medium-size corn farms, whose incomes have declined, while benefiting some larger farms as well as vegetable producers. Smaller farms appear to be less affected, as they produce little for the markets. Wages seem to have been little affected, while employment has shifted between sectors.

10.4.5 The way ahead

The need to strengthen the rural sector in Mexico, with its high unemployment and poverty rates, is evident. The United Nations Conference on Trade and Development (UNCTAD) (2011) argues that, along with structural change in developing countries, agricultural development can facilitate economic development, can promote higher value addition, and can provide export-led growth opportunities while generating positive externalities for society, such as poverty reduction, employment, and food security. The World Bank (2008) also has emphasised the importance of agriculture as a vital development tool. In recent years agriculture has contributed little to Mexico's growth, however. Between 1996 and 2010 the contribution of agriculture to real GDP growth was 2.6 per cent, considerably lower than the contribution of agriculture in, for instance, Brazil or Turkey. In developing countries the average contribution was much higher, at 5.7 per cent (table 10.8).

What can the Mexican government do to strengthen its agricultural sector so as to increase employment and food security while reducing poverty? The scope for trade measures appears limited, as Mexico has committed itself in the WTO and in various RTAs to abstaining from certain types of measures. There is limited scope for increasing tariffs on imports or reducing tariffs that its exports face. The possibility to use tariff rate quotas in NAFTA has been phased out, and subsidies have not been addressed in existing RTAs. A successful conclusion of the Doha Round, where subsidies could be limited, seems unlikely at this point.

Table 10.8: Contribution of agriculture to growth of real GDP between 1996 and 2010

	Percentage contribution of agriculture to real GDP growth
Brazil	6.6
Mexico	2.6
Turkey	3.9
United States of America	1.4
Developing economies	5.7
World	3.2

Source: Authors' calculation based on UNCTADStat.

It is important to increase the competitiveness of the agricultural sector. In Mexico agriculture is the least productive sector, in contrast to the case in many other Latin American countries, where agriculture is often more productive than, for example, wholesale and retail trade, construction, or even business services (McMillan and Rodrik, 2011). Poverty in rural areas is correlated with low productivity. Increasing total factor productivity could help strengthen the agricultural sector, although the impact on employment is unclear. Mexico spends relatively little on research and development in agriculture. Studies, such as Alston et al. (2010) and Alston (2010), have shown that increasing research and development can increase the productivity of the agricultural sector and that this policy can have a high rate of return on investment.

If agricultural tariffs were to be raised, trade agreements would have to be changed. Such revisions have been advocated and discussed in the literature (e.g. DTB Associates and AgRisk Management, 2006). Mexico would probably have to offer Canada and the US something in return, and any benefits to the agricultural sector could be offset by additional costs to others sectors in Mexico. Because of the links between grains, oilseeds, and livestock, trade policies raising prices for feed grains could have adverse effects on livestock producers and consumers.

An alternative policy is to provide additional domestic support, or to provide the same amount in a different fashion, possibly better targeted to the producers in need. The WTO rules on domestic support provide considerable flexibility for countries to design their own support mechanisms, and the domestic support pillar is not covered in Mexico's bilateral treaties.

Another possible policy is to reduce payroll taxes on agricultural labour. Agriculture is a labour-intensive sector and such sectors can contribute to creating – or keeping – jobs. A higher labour productivity, however, would allow higher wages in agriculture, a sector where salaries are typically low, especially in developing countries. Sustainable agriculture could be an alternative to conventional agriculture for some Mexican small-scale farmers as a means to increase their profitability and to create jobs. Sustainable agriculture relies on such techniques as crop rotation, composting, and biological pest control to increase soil productivity. Yields increase, they need less expensive inputs, and the production is more labour-intensive than conventional agriculture, thus having a positive impact on employment and poverty reduction. In Mexico organic production is dominated by small-scale producers. A study by UNCTAD and the United Nations Environment Programme (UNEP) confirmed that this can be an economically advantageous way for small farmers in developing countries to escape the rising prices of inputs, with corollary benefits for the environment, climate, and employment (UNCTAD, 2008). A lower payroll tax is only one – admittedly weak – instrument that could contribute to moving agriculture in a direction that uses fewer non-labour inputs (that often are based on fossil fuels) towards a more labour-intensive production (see discussion in Hoffmann, 2011).

The possible effects of these policy options are analysed in the next section.

10.5 MODEL, DATA, AND SCENARIOS

The well-known global general equilibrium trade model, GTAP, is designed for trade policy analysis of this nature (Hertel, 1997, and chapter 3 of this book). Specifically, it contains the bilateral trade and tariff data that are necessary to model the impacts of trade and domestic policy changes in the context of preferential agreements. The GTAP database, version 8, refers to the base year 2007. The model divides labour into two types, skilled and unskilled. Input–output tables link the sectors in each economy.

The base data specifies the use of each primary factor (land, labour, capital, etc.) and intermediate input into the production of each good. Changes in output affect the use of labour according to the labour–output ratios shown in table 10.9. For example, assuming no changes in response to relative prices, a US$1 increase in the output of rice requires an additional 39 US cents in labour costs, whereas the production of more wheat requires less than half as much additional labour. It can be seen that crops are more labour-intensive than livestock products. This suggests that policies to increase the output of crops are likely to be of greater assistance to labour than those addressing livestock production. Cereals, including maize, and vegetables and fruit are similarly labour-intensive, according to the GTAP database.

The GTAP database has Mexican tariffs of 16 per cent on coarse grains and 5 per cent on milk products.[16] The US has tariffs of 27 per cent on sugar imports from Mexico.

[16] World Integrated Trade Solution (WITS) data show that for 2010 Mexico imported maize worth US$1,423 million from the US at a trade-weighted tariff of 5.9 per cent. However, for the previous two years the tariff was zero. Positive tariffs can occur despite a free trade agreement if, for example, some imports do not meet the rules of origin requirements.

Table 10.9: Labour–output and capital–output ratios in Mexican agriculture

Product	Code	Labour–output ratio	Capital–output ratio
Primary agriculture			
Paddy rice	pdr	0.39	0.24
Wheat	wht	0.18	0.12
Cereal grains nec	gro	0.36	0.23
Vegetables, fruit, nuts	v_f	0.34	0.21
Oilseeds	osd	0.09	0.07
Sugar cane, sugar beet	c_b	0.35	0.22
Plant-based fibres	pfb	0.13	0.09
Crops nec	ocr	0.30	0.19
Cattle, sheep, goats, horses	ctl	0.17	0.13
Animal products nec	oap	0.27	0.18
Raw milk	rmk	0.10	0.08
Wool, silk-worm cocoons	wol	0.15	0.09
Forestry	frs	0.47	0.08
Fishing	fsh	0.03	0.46
Processed agriculture			
Meat: cattle, sheep, goats, horse	cmt	0.07	0.01
Poultry and other meats	omt	0.23	0.34
Vegetable oils and fats	vol	0.16	0.40
Dairy products	mil	0.03	0.06
Processed rice	pcr	0.69	0.17
Sugar	sgr	0.31	0.35
Food products nec	ofd	0.23	0.04

nec=not elsewhere classified.
Source: GTAP version 8 database.

Four hypothetical scenarios are simulated to assist in analysing the likely impacts of policy options aimed at assisting agriculture (table 10.10).

Trade between Mexico and the US is now duty free. One possible approach to support Mexican producers that has been proposed and discussed would be for Mexico to request a revision of NAFTA. One option, albeit somewhat speculative, would be for Mexico to raise agricultural tariffs to their MFN levels. This is analysed in the first scenario, MFN.

The second scenario, Labour, involves removing taxes on the employment of agricultural labour. Payroll taxes for unskilled and skilled labour amount to 4 and 5 per cent, respectively, of the cost of employing labour. Lowering the cost of hiring

Table 10.10: Scenarios

Scenario	Description
MFN	Increasing Mexico's tariffs on agricultural imports from NAFTA countries to MFN levels
Labour	Removing payroll tax on agricultural labour
R&D	Funding research and development (R&D) to increase agricultural productivity
Domestic Support	Increasing support on output to 5 per cent or switching support to inputs

labour would lead to a substitution of labour for capital and make the sector more competitive domestically and internationally.[17]

In the third scenario, R&D, we assume that R&D expenditure is increased, with a resulting increase in productivity of 1 per cent. Currently, Mexico spends only 2 per cent (MXN1.3 billion) of its support to agriculture on R&D. A survey of meta-studies suggests that R&D expenditure has an internal rate of return of between 20 and 80 per cent per annum (Alston, 2010), indicating a likely underinvestment in R&D in Mexico. Estimates of returns will depend on specific circumstances, such as location and crops, but are likely to be greater in developing countries, where productivity is low. To finance the increase in R&D expenditures, taxes would have to be increased or expenditures in other areas reduced. We do not assess these effects here and focus on sectoral rather than macro effects.

Finally, the fourth scenario, Domestic Support, involves increasing domestic support on all agricultural outputs to 5 per cent. Other subsidies in agriculture, such as general services, remain intact. Subsidies on output tend to benefit non-target groups, that is, those farms that are larger than average. Therefore, a second Domestic Support scenario involves switching the same amount (about US$8 billion) to an input subsidy on all primary factors (see chapter 3 of this book).

In this application of GTAP, the standard closure is modified to reflect a semi-variable labour market for unskilled labour, implying that a change in the demand for labour leads to some increase in both wages and employment. Skilled labour is assumed to be mobile in each country but in fixed supply, with no surplus labour. This is the standard GTAP assumption.

GTAP is used here to compare the trade and welfare effects of changes in trade and other domestic policies once the impacts have worked through. There is no attempt either to phase-in the policy changes or to trace the time profile of the impacts. Thus, we ignore changes such as growth in trade that may have occurred over the implementation period.

[17] Technically, changing the payroll tax requires running an uncondensed version of the GTAP model. In the standard model the payroll tax is not an exogenous variable that can be shocked.

10.6 RESULTS

10.6.1 MFN scenario

Under this scenario tariffs in Mexico on all agricultural imports from the US are increased from the preferential tariffs to Mexico's MFN rates (table 10.11).

The increase in the tariffs leads to a reduction of imports into Mexico of 0.8 per cent. Total imports from the US fall by 3.6 per cent. The main imports from the US that are reduced the most are rice, vegetable oils and fats, dairy products, and meat products (table 10.12).

Table 10.11: Initial and new tariffs in Mexico on imports of agricultural products from the US, MFN scenario

Product	Initial (%)	MFN (%)
Paddy rice and processed rice	0	49.99
Other cereals	16.1	20
Sugar	0	10
Oilseeds	0	5
Vegetable oils and fats	0	18
Vegetables and fruit	1.53	19
Other crops	0	13
Milk	0	0
Dairy products	4.66	29
Cattle and sheep	0	7
Pigs and poultry	0	9
Ruminant meat	0	31
Non-ruminant meat	0	57.33
Other processed agriculture	0	20

Source: GTAP and WITS.

Table 10.12: Change in value of imports of agricultural products to Mexico from the US, MFN scenario

Product	Initial (US$ million)	Under MFN (US$ million)	% change
Paddy rice and processed rice	884.29	142.98	–83.8
Other cereals	1 917.38	1 895.42	–1.1
Sugar	141.68	110.54	–22.0
Oilseeds	1 449.05	1 399.80	–3.4
Vegetable oils and fats	747.18	386.44	–48.3
Vegetables and fruit	824.69	681.62	–17.3
Other crops	190.46	104.40	–45.2
Milk	0.50	0.54	8.0
Dairy products	894.83	269.09	–69.9
Cattle and sheep	57.97	44.23	–23.7
Pigs and poultry	648.09	597.78	–7.8
Ruminant meat	1 352.44	569.65	–57.9
Non-ruminant meat	939.41	57.56	–93.9
Other processed agriculture	3 179.58	2 069.92	–34.9

Source: GTAP and WITS.

Table 10.13: Change in agricultural imports to Mexico from the world, MFN scenario

Product	Initial (US$ million)	Under MFN (US$ million)	% change
Paddy rice and processed rice	1 128.96	1 022.40	–9.4
Other cereals	2 014.96	1 999.88	–0.7
Sugar	156.60	129.90	–17.0
Oilseeds	2 046.85	2 118.18	3.5
Vegetable oils and fats	1 150.97	1001.30	–13.0
Vegetables and fruit	1 077.75	1 054.39	–2.2
Other crops	587.48	576.03	–1.9
Milk	2.73	2.95	8.1
Dairy products	1 747.01	1 432.84	–18.0
Cattle and sheep	126.67	122.98	–2.9
Pigs and poultry	709.83	668.68	–5.8
Ruminant meat	1 661.84	1 592.61	–4.2
Non-ruminant meat	1 097.12	608.52	–44.5
Other processed agriculture	5 033.18	4 342.96	–13.7

Source: GTAP simulation.

As products from other countries become relatively less expensive, imports of these products would partly compensate for the sharp reduction of imports from the US. Despite the trade diversion and creation effect, the scenario still leads to significantly reduced imports of agricultural products, indicating the importance of the NAFTA agreement for imports to Mexico (table 10.13). Meat and sugar imports would be about 20 per cent smaller if tariffs vis-à-vis the US were at MFN levels.

As a result of decreasing imports of most agricultural products, domestic output increases by 2.5 per cent. For example, the value of domestic production of rice would increase by 22 per cent, and the value of certain meat products would increase by 9 per cent (table 10.14).

Table 10.14: Change in value of agricultural production in Mexico, MFN scenario

Product	Initial (US$ million)	Under MFN (US$ million)	% change
Paddy rice and processed rice	1 504.36	1 828.09	21.5
Other cereals	7 270.61	7 462.83	2.6
Sugar	6 967.28	7 038.59	1.0
Oilseeds	370.70	394.24	6.4
Vegetable oils and fats	3 308.05	3 514.40	6.2
Vegetables and fruit	15 414.69	15 513.99	0.6
Other crops	1 029.50	1 030.10	0.1
Milk	5 345.48	5 559.76	4.0
Dairy products	14 627.55	15 084.68	3.1
Cattle and sheep	4 128.76	4 152.97	0.6
Pigs and poultry	11 260.29	11 806.32	4.8
Ruminant meat	5 043.36	5 316.62	5.4
Non-ruminant meat	7 622.01	8 285.39	8.7
Other processed agriculture	83 037.75	84 087.45	1.3

Source: GTAP simulation.

Table 10.15: Percentage change in demand for unskilled labour in Mexican agriculture, MFN scenario

Sector	Assumption: Fixed wages	Assumption: Wages and employment adjust 50/50
Paddy rice and processed rice	20.50	20.48
Other cereals	2.02	1.98
Sugar	1.02	1.01
Oilseeds	4.99	4.97
Vegetable oils and fats	3.97	3.99
Vegetables and fruit	0.15	0.11
Other crops	–0.39	–0.41
Milk	2.88	2.85
Dairy products	2.26	2.29
Cattle and sheep	–0.48	–0.50
Pigs and poultry	3.73	3.70
Ruminant meat	0.52	0.54
Non-ruminant meat	7.36	7.39
Other processed agriculture	0.54	0.56

Source: GTAP simulation.

While the output of agricultural products increases, the output of non-agricultural products and services decreases even though tariffs for those products have not changed. Agricultural output becomes more expensive, and this raises the cost of production of downstream processed agricultural products. Since the share of agricultural inputs in non-agricultural production is low, the main reasons for the decrease in production of non-agricultural products are general equilibrium effects. In addition, demand for primary resources such as land and labour in agriculture is increasing, which raises the costs for these factors. Total value of output increases only slightly, by 0.2 per cent.

The impact of the change in trade policy on imports, exports and output is fairly robust across labour market assumptions. This is also the case for changes in employment of unskilled labour at the sectoral level, under two different assumptions (table 10.15). Under the first assumption wages are fixed, and all adjustment is absorbed by a change in the level of employment. This is the standard assumption in this analysis. Total employment of unskilled labour would decrease by 0.4 per cent. Behind this nationwide change is an increase of employment in the agricultural sector and a decrease in the non-agricultural sector. The value of employment, i.e. wages multiplied by employment, increases by 1.4 per cent in agriculture, while in the non-agricultural sector it decreases by 0.02 per cent. Under the second assumption the adjustment for changes in labour demand is shared equally by employment changes and wage changes. The results are similar, however. In this case total employment of unskilled labour would decrease by only 0.2 per cent, and wages for unskilled labour would decrease slightly, by about 0.06 per cent. Sectoral changes in the value of unskilled labour are similar. Table 10.15 shows the changes in the value of employment for unskilled labour in agriculture under these two assumptions.

Real land rents would increase by almost 5 per cent under both assumptions. Thus, if farmers own their land, the de facto impact on incomes would be a mixture of increased revenue from land rents and slightly decreasing wages.

An increase of tariffs to the MFN level in Mexico vis-à-vis imports from the US would have a strong redistribution effect. Similar but much smaller effects would result from a similar exercise regarding trade with Canada. The agricultural sector would benefit, while the other sectors would be worse off. Total welfare in Mexico is estimated to be reduced by about US$1.0 billion.

Since the free trade agreement is a reciprocal preferential agreement, a scenario in which Mexican tariffs are raised to MFN levels could imply higher rates on Mexican exports to the US as well. This would result in lower agricultural exports from Mexico to the US. Raising tariffs in the US to its MFN levels would reduce agricultural exports by Mexico to the US by 13 per cent and reduce Mexico's *increase* in output by 60 per cent compared with the scenario in which only Mexican tariffs are raised. Opposite employment effects in agriculture would almost neutralize each other, resulting in only a small positive effect in agriculture of 0.2 per cent but also a small negative total employment effect of -0.01 per cent. Output in agriculture would still increase, however, since US MFN rates are considerably lower than Mexico's. Thus, excluding the agricultural sector in both Mexico and the US from preferential access would have larger effects on Mexico's imports than on its exports.

The effect of raising tariffs to MFN levels is likely to be different from the effect of having left trade barriers at that level in the first place, i.e. excluding sensitive sectors from tariff reductions, as is frequently done with agricultural products, as shown in chapter 2 of this book. Years of economic integration have increased interdependency, e.g. in terms of inputs being imported, and have led to a structural adjustment in which some sectors have declined and others have expanded.

A scenario with a long-term closure, in which capital is mobile and adjusts to the new trade policy, does not lead to very different results. The assumption can have a significant impact, but in the MFN scenario the impact on the agricultural sector is not dramatic. The decline in employment in Mexico would be slightly greater, at about 0.6 per cent, than in the standard MFN scenario, at 0.4 per cent. Sectoral changes in trade and output are roughly similar to the changes discussed above.

10.6.2 Labour scenario

GTAP records information about payroll taxes, which drive a wedge between what the employer pays and what the employee receives.[18] A payroll tax is often an important source of revenue for governments and social security systems, but it has negative

[18] The data are not represented explicitly. They are implicit as the difference between valuations of primary factor flows. Payroll taxes are the difference between market value and agents' value (where agents are employers of factors). Negative values indicate a subsidy.

Table 10.16: Payroll tax on unskilled and skilled labour in Mexican agriculture

Product	Unskilled (% of wage)	Skilled (% of wage)
Paddy rice and processed rice	2.85	3.57
Other cereals	–0.88	–1.01
Sugar	2.78	4.87
Oilseeds	3.48	3.46
Vegetable oils and fats	5.59	5.59
Vegetables and fruit	2.53	2.49
Other crops	2.97	2.94
Milk	2.95	2.94
Dairy products	5.59	5.59
Cattle and sheep	2.48	2.46
Pigs and poultry	–0.72	–0.78
Ruminant meat	5.59	5.59
Non-ruminant meat	5.59	5.59
Other processed agriculture	5.59	5.59

Source: GTAP.

economic effects on both the demand side and the supply side. It reduces workers' income and increases the costs of employers to hire workers. In theory payroll taxes reduce the incentive to work and increase the incentive to substitute other production factors for labour. Reduction of payroll taxes can be an instrument to increase employment. This is frequently discussed as a policy instrument. In the Labour scenario the payroll tax on both unskilled and skilled labour is eliminated in the agricultural sector. Table 10.16 shows the initial payroll tax in the agricultural sector in Mexico in GTAP. The payroll tax is on average only 4 per cent for unskilled and 5 per cent for skilled labour.

Eliminating payroll taxes has only a small impact on trade and output value. Total agricultural exports increase by 1 per cent, and total agricultural imports decrease by 0.3 per cent. Total overall and total agricultural production values remain almost the same, although with some small variation among sectors. The total value of output increases by 0.1 per cent, while the value of agricultural output decreases slightly, by 0.03 per cent. This reflects the change in domestic prices, which fall due to the reduction in production costs. Output in real terms increases for all agricultural sectors and all non-agricultural sectors (table 10.17).

The impact on employment in agriculture is clearly positive. The total value of unskilled employment in agriculture increases by 2.5 per cent. Employment in the sectors vegetable oils and fats, dairy products, ruminant meat, non-ruminant meat, and other processed agriculture increases by more than 5 per cent (table 10.18). These are sectors in which the payroll tax was relatively high, and thus its removal has a significant impact.Total employment of unskilled labour in Mexico increases by 0.5 per cent.

Table 10.17: Percentage changes in Mexican agricultural imports from and exports to the world and output (real) of Mexico, Labour scenario

Product	Exports	Imports	Output
Paddy rice and processed rice	2.9	–0.1	1.4
Other cereals	–0.4	0.6	0.2
Sugar	2.4	–1.0	0.4
Oilseeds	2.8	0.3	2.0
Vegetable oils and fats	1.5	–0.5	0.6
Vegetables and fruit	0.6	0.1	0.6
Other crops	2.7	–0.3	2.2
Milk	0.0	–1.5	0.5
Dairy products	3.2	–1.4	0.5
Cattle and sheep	1.4	–0.5	0.5
Pigs and poultry	0.0	0.1	0.2
Ruminant meat	3.1	0.0	0.5
Non-ruminant meat	1.7	–0.7	0.4
Other processed agriculture	1.4	–0.7	0.5

Source: GTAP simulation.

Table 10.18: Changes in agricultural employment of unskilled labour in Mexico, Labour scenario

Product	% change in employment
Paddy rice and processed rice	2.15
Other cereals	0.25
Sugar	1.80
Oilseeds	2.52
Vegetable oils and fats	5.24
Vegetables and fruit	0.97
Other crops	2.73
Milk	0.91
Dairy products	5.60
Cattle and sheep	0.87
Pigs and poultry	0.20
Ruminant meat	5.10
Non-ruminant meat	5.42
Other processed agriculture	5.27

Source: GTAP simulation.

Table 10.19: Changes in factor prices, Mexico, Labour scenario

Product	**% change in factor price**
Rent for land	1.55
Wage of unskilled labour	0
Wage of skilled labour	0.23
Capital	0.12
Natural resources	0.12

Source: GTAP simulation.

For skilled employment it is assumed that changes in demand for labour lead to changes in wages instead of changes in total employment, as it is assumed for unskilled labour. Under the Labour scenario wages for skilled labour in Mexico rise modestly, by 0.23 per cent (table 10.19). Given that skilled labour is mobile between sectors and agriculture employs only a small fraction of Mexico's skilled labour (skilled labour accounts for only 8.4 per cent of the wage bill), this small increase is remarkable.

Eliminating the payroll tax in agriculture is an opportunity to increase employment in the sector. Although the payroll tax is on average not very high, removing it leads to an estimated increase in agricultural employment of about 2.5 per cent. Government revenue may fall as a consequence of the tax cut. At the same time, however, a tax cut can stimulate the economy and lead to more activity, which in turn leads to higher revenues from other taxes. The general equilibrium model takes the effect on government revenue into account. Removing the payroll tax in agriculture indeed does lead to a very small increase in government revenue and spending and to a small increase in the GDP. The total welfare effect in Mexico is positive but not large, an increase of $940 million.

10.6.3 R&D scenario

The approximately 13 per cent of Mexico's total labour force that works in agriculture is producing 4 per cent of the national output (World Bank, 2011). Thus, as in most developing countries, labour productivity in Mexican agriculture is low compared with other sectors in the economy. While a partial measure of productivity, such as the productivity of labour, measures output per unit of a particular input, total factor productivity (TFP) measures output in relation to an index of inputs, usually the value-weighted sum of all production components. TFP can be taken as a measure of technological progress, which can be attributed to changes in agricultural research and development, human capital, infrastructure, extension services, and government policies. High productivity implies high competitiveness for given factor prices. In an open economy, where domestic goods compete with goods from abroad, productivity is very important.

Table 10.20: Percentage changes in agricultural imports, exports, and real domestic output of Mexico, R&D scenario

Product	Exports	Imports	Output
Paddy rice and processed rice	6.4	–1.3	1.3
Other cereals	1.5	–1.0	0.2
Sugar	4.8	–3.1	0.4
Oilseeds	3.0	0.0	1.9
Vegetable oils and fats	5.4	–1.6	0.5
Vegetables and fruit	0.9	–0.5	0.6
Other crops	3.5	–1.0	2.2
Milk	8.7	–4.5	0.5
Dairy products	8.9	–3.9	0.5
Cattle and sheep	5.1	–2.3	0.5
Pigs and poultry	2.0	–0.8	0.2
Ruminant meat	8.5	–0.8	0.4
Non-ruminant meat	13.5	–5.2	0.3
Other processed agriculture	2.0	–1.0	0.4

Source: GTAP simulation.

Productivity in agriculture is low because labour is relatively unskilled and the amount of capital used with labour is small. Productivity could be enhanced by improving the quality of labour through more education and skills-building for farmers and by investments in physical capital such as infrastructure. Other factors also affect productivity. Public investments in institutions, extension services, training, and technology research are important levers of productivity in agriculture (Zepeda, 2001). Investment in developing and extending agricultural technology yields high rates of return.

The R&D scenario assumes a hypothetical 1 per cent increase in the productivity (TFP) of the Mexican agricultural sector. Increasing productivity is generally desirable for an economy, but there are two negative effects. The increase in domestic supply may lead to a decrease in domestic prices of agricultural goods. In addition, if the technology change is labour-saving, the productivity change may lead to a decrease in employment. A general equilibrium model can capture these effects.

In this scenario exports from Mexico increase significantly, by 3.4 per cent. Exports of meat and dairy products increase by more than 8 per cent. Rice exports increase by 6.4 per cent. Products where initial exports are high, such as vegetables and fruits, increase by a smaller percentage, e.g. 0.9 per cent (table 10.20). In contrast, imports decrease for all agricultural products except oilseeds. The impact on non-agricultural products is small. Exports decrease and imports increase slightly, both by less than 1 per cent.

The impact on employment is positive in most agricultural sectors and overall, but the increase is small (table 10.21). Total employment of unskilled labour in agri-

Table 10.21: Changes in Mexican agricultural employment, R&D scenario

Product	**% change in employment**
Paddy rice and processed rice	1.1
Other cereals	–0.8
Sugar	–0.6
Oilseeds	0.7
Vegetable oils and fats	0.6
Vegetables and fruit	–0.2
Other crops	1.6
Milk	–0.7
Dairy products	0.8
Cattle and sheep	0.2
Pigs and poultry	0.1
Ruminant meat	0.7
Non-ruminant meat	1.8
Other processed agriculture	0.3

Source: GTAP simulation.

culture increases by 1 per cent. The total employment effect for Mexico also is positive but very small, with an increase in the use of unskilled labour of 0.4 per cent.

The reason for the more significant change in exports and imports and yet small positive employment effects is that an increase of productivity leads to reduced factor demand for a given output. Thus, if real output increases only slightly more than productivity, the effect on employment is small. As Table 10.20 shows, the output effects are mostly below 1 per cent.

R&D programs that increase productivity yield beneficial effects, but the benefits do not accrue solely to the workers. Much of the benefit may go to owners of capital and land and to domestic and foreign consumers. In fact, if the labour mobility between sectors is in reality not perfect, as assumed here, but instead is sluggish, workers in some sectors may be worse off as a result. Also, wages can come under pressure. A program of increasing productivity by 1 per cent in the agricultural sector generally increases output in each agricultural sector and real GDP as a result. However, increased output drives down the output price, and the fall in prices more than offsets the increase in output. This implies that the value of agricultural production falls, and, with it, employment in the agricultural sector. If real wages are fixed, some agricultural workers will seek jobs in the industrial and service sectors.

Despite these caveats, the productivity increase would have many positive implications for many of Mexico's stated objectives. It leads to greater self-sufficiency ratios in agriculture and higher employment in the some agricultural sectors as well as higher total employment in Mexico; it produces significant welfare gains of some $4.3 billion. Costs for the R&D programmes, however, would need to be deducted from those benefits.

10.6.4 Domestic support scenario

Mexico's domestic support for agriculture is well below the OECD average. According to its WTO commitments, it can provide product-specific trade-distorting support under de minimis of up to 10 per cent. Official data notified by Mexico to the WTO on domestic support are not available for recent years.[19] In 2004, the latest available notification, Mexico reported a total of 1.4 billion, in constant 1991 pesos, of product-specific support. Most of this, 954.5 million pesos, falls under de minimis support, i.e. its value is relatively low compared with the value of production.

The GTAP data, based on the year 2007, show subsidies approaching 5 per cent only for oilseeds output (table 10.22). Subsidies for rice are 1.7 per cent. For vegetables and fruits and other crops, subsidies are around 1 per cent, and for other agricultural products output subsidies are zero or slightly negative.

The scenario Domestic Support assesses the effect of raising domestic support on agricultural output to the level of 5 per cent and in a separate scenario switching the same amount to an input subsidy. Data in GTAP do not necessarily match exactly with the OECD estimates or WTO notifications. One reason is that definitions of product-specific support vary. Also, GTAP taxes do not fully correspond to the various complex and country-specific support programmes. Furthermore, the producer support estimate aggregates output and input subsidies, while in GTAP these are separated. Table 10.22 shows the initial and new output subsidies on agricultural products in Mexico.

Table 10.22: Support to agricultural outputs, Mexico, Domestic Support scenario

Product	**Initial (%)**	**New (%)**
Paddy rice and processed rice	1.7	5.0
Other cereals	0.1	5.0
Sugar	–0.1	5.0
Oilseeds	4.8	5.0
Vegetable oils and fats	–0.1	5.0
Vegetables and fruit	0.8	5.0
Other crops	0.8	5.0
Milk	0.0	5.0
Dairy products	–0.1	5.0
Cattle and sheep	0.0	5.0
Pigs and poultry	0.0	5.0
Ruminant meat	–0.1	5.0
Non-ruminant meat	–0.1	5.0
Other processed agriculture	–0.2	5.0

Source: GTAP.

[19] Domestic support under the WTO agreement on agriculture differs from the OECD definition.

Table 10.23: Percentage changes in agricultural imports, exports, and real domestic output of Mexico, Domestic Support scenario

Product	Exports	Imports	Output
Paddy rice and processed rice	7.5	2.9	5.8
Other cereals	1.5	2.5	4.2
Sugar	21.7	–8.4	3.4
Oilseeds	–10.5	8.1	–0.1
Vegetable oils and fats	28.0	–8.6	7.4
Vegetables and fruit	0.4	4.9	1.3
Other crops	0.9	4.3	2.6
Milk	16.7	–8.8	5.6
Dairy products	47.9	–17.4	5.8
Cattle and sheep	13.7	–4.5	5.3
Pigs and poultry	6.2	–2.9	5.4
Ruminant meat	45.3	0.2	5.8
Non-ruminant meat	71.6	–21.4	10.1
Other processed agriculture	11.8	2.9	4.3

Source: GTAP simulation.

Increasing domestic support to 5 per cent of the value of output in agriculture leads to increasing exports and output for all agricultural products except oilseeds, where the initial support value was already 4.8 per cent (table 10.23). Imports increase for some products and decrease for others. Some imports increase due to their links in the value chain. For example, if output of meat products increases, demand for imported feed increases.

The impact of the Domestic Support scenario on employment in the agricultural sector is positive. Employment increases significantly in all agricultural sectors, and total unskilled employment in Mexico increases by 1.8 per cent. If the same amount of domestic support spent on output is spent instead on input subsidies, the total employment effects are very similar. Employment of unskilled labour in Mexico would increase by 1.7 per cent. The effects in various agricultural sectors would be very different from the sectoral effects of the output subsidy, however (table 10.24).

Subsidizing output or inputs supports the corresponding sector, but it is a costly policy for the rest of the economy. In trade theory it has been shown that under certain circumstances subsidies can be welfare-improving, e.g. when the subsidy has an impact on a country's terms of trade. This is unlikely for most agricultural products in Mexico. In general, output subsidies are distorting and move resources into sectors where they are not used most efficiently. External effects, however, may economically justify subsidies. For example, when rural-to-urban migration incurs costs to society that are not reflected in prices and when subsidies can discourage such migration, certain subsidies may be economically justifiable. However, although unskilled labour employment increases, and this is likely to reduce poverty, the policy may be poorly targeted, and large industrial farms might benefit disproportionately.

Table 10.24: Percentage change in employment of unskilled labour, with fixed wages, Mexico, Domestic Support scenario

Product	Output subsidy scenario	Input subsidy scenario
Paddy rice and processed rice	7.7	12.2
Other cereals	5.6	5.7
Sugar	5.5	5.7
Oilseeds	1.0	10.9
Vegetable oils and fats	8.7	4.8
Vegetables and fruit	2.5	5.5
Other crops	3.9	13.5
Milk	7.2	5.6
Dairy products	7.1	5.1
Cattle and sheep	6.8	5.6
Pigs and poultry	6.9	5.0
Ruminant meat	7.1	4.5
Non-ruminant meat	11.5	7.0
Other processed agriculture	5.6	5.0

Source: GTAP.

Despite the positive effects of subsidizing the agricultural sector on output and, thus, on self-sufficiency, employment, and trade, input and output subsidies are distorting and should be provided only in the case of substantial external effects or if the positive effects are politically deemed more important than the costs for the rest of the economy.

10.7 CONCLUSION

Agriculture remains a very important sector for Mexico. Mexico's agricultural trade reform has been associated with increasing agricultural imports and decreasing employment in agriculture, and poverty rates remain high in rural areas. Some have accused NAFTA of harming Mexican farmers and jeopardizing Mexico's food self-sufficiency. Others acknowledge the effects of expanded agricultural trade but argue that static and dynamic gains far exceed the related adjustment costs.

Imports have increased from all major trading partners and particularly from NAFTA members, who supply more than 80 per cent of Mexico's agricultural imports. In recent decades more staple crops and meat products have been imported and more fruits and vegetables and certain processed agricultural products have been exported. Most analysts acknowledge an adverse effect of US subsidies on Mexican farmers, but how much the subsidies depress prices is controversial and in any case varies from year to year.

It has been shown that the impact of globalization and more specifically NAFTA depends on farm size, proximity to the US border, types of agricultural goods produced, income levels, and share of agricultural income in total income. It appears that a majority of small farms were not much affected, while middle-income corn farmers were adversely affected. Greater market opportunities for vegetables have increased employment in the cultivation of vegetables, whereas the drop in the real price of corn has reduced employment in the corn sector. It is difficult to assess the overall effect on employment in agriculture, and it has been argued that agriculture cannot be looked at separately in the context of NAFTA.

Despite these mixed effects, the need to strengthen the rural sector in Mexico is evident, given its high unemployment and poverty rates. UNCTAD (2011) argues that, along with important structural change in developing countries, agricultural development can facilitate economic development, can promote higher value addition and provide export-led growth opportunities while generating positive externalities for society, such as poverty reduction and increases in employment and food security.

What policy measures are appropriate to strengthen the agricultural sector depends on the specific objectives. Policies to reduce poverty and rural-to-urban migration differ from those that increase export revenue or maximize agricultural output. Mexico's trade policy options are limited due its commitments in trade agreements. A stated objective is to use the existing policy space with a view to enhancing Mexico's benefits from its agricultural sector, including increasing jobs in the sector, reducing dependency on imports, and promoting exports.

We have analysed four different policy scenarios for strengthening the agricultural sector that have been publicly discussed. The well-known CGE model GTAP has been used to assess the potential impact on the agricultural sector as well as on the economy as a whole.

1. **Revising RTAs to enable Mexico to impose tariffs on agriculture** has been discussed in Mexico. Imposing MFN tariffs on agricultural imports from its largest trading partner, the US, would benefit the agricultural sector if no tariffs were imposed on Mexico's exports. Imports would decrease and output would increase. Employment would increase in the agricultural sector, but it would decrease in the non-agricultural sector. If tariffs were applied in the US on Mexico's agricultural exports, exports would decrease and opposite employment effects in agriculture would almost neutralize each other and leave only a small positive effect on agricultural employment of 0.2 per cent along with a small negative effect on total employment of 0.01 per cent.

2. **Removing the payroll tax in agriculture** would have only a small effect on trade and output, but it is an opportunity to increase employment in the sector. Removing the payroll tax leads to a small increase of the GDP. The total welfare effect in Mexico is estimated at US$940 million – small but positive.

3. Mexico's agricultural sector has low productivity, but the country spends relatively little on **research and development in agriculture**. Supporting activities that would lead to a higher productivity would increase output and exports. Imports would decrease, and thus the self-sufficiency rate would increase. The impact on employment would be positive but very small.

4. **Subsidizing output in agriculture or providing input subsidies** would increase production, exports, and employment in the agricultural sector but in the larger economy could shift resources to less efficient activities. Such subsidies would involve costs for the rest of the economy.

Several limitations ought to be kept in mind when interpreting these results. For instance, the R&D scenario does not take into account the cost of such a programme. The analysis addresses the distribution effects and does not focus on national welfare effects.

The analysis also assumes that the scenarios would be implemented as specified. The MFN scenario is purely hypothetical and is unlikely to be politically feasible. However, since it has been proposed by leading politicians, it is important to analyse it.

A further limitation is the data. No specific data are available on para-tariffs and non-tariff measures. As tariffs are changed, these other impediments to trade are likely to play a role. Finally, the model used here is static, with no account taken of dynamic gains relating to growth in technology, competition, and productivity. Nor has account been taken of the one-off costs of structural adjustment, such as temporary unemployment.

Nevertheless, the results have important implications for policy-makers. Policies that increase distortions may strengthen the agricultural sector in terms of higher output, exports, and employment, but they are likely to have adverse effects on the rest of the economy. In contrast, removing payroll taxes and adopting policies that increase agricultural productivity have positive effects for both the agricultural sector and the economy as a whole.

ANNEX

Table A10.1: Product definition

Name	SITC Rev.3
Barley	043
Beans	05423
Beef	011, 01251, 01252, 01681, 0176
Coffee	071
Eggs	025
Maize	044, 04721, 05677, 08124, 4216, 59212
Milk	0221, 0222, 02241
Pork	0122, 0161
Poultry	0123
Rice	042
Shrimp	03611
Sorghum	0453
Sugar cane	06111, 06151
Sugar	061
Tuna	03414, 03423, 03713
Wheat	041, 046, 08126, 59217

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