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Liberalizing trade under structural constraints in developing countries: A general equilibrium analysis of Tanzania

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ABSTRACT

This paper explores the impact of trade liberalization on growth and poverty alleviation in Tanzania, based on a single country computable general equilibrium (CGE) model that includes considerable factor disaggregation and household detail. The focus is on the impact of trade liberalization and other policies under different structural constraints, such as large marketing margins between producers and consumers. The first conclusion that obtains from the empirical results is that the nature of the macroeconomic and sectoral market adjustment makes a large difference on the results of the liberalization scenario. In particular, the functioning of the labor market appears to make for significant differences in the outcome of tariff cuts. A set of scenarios are run on the basis of the most empirically relevant closure. The policy that seems more appropriate for poverty alleviation is a reduction in marketing margins. By contrast, the scenario that assumes significant further unilateral trade liberalization does not appear to produce significant GDP changes, nor improvements in household welfare. Hence trade liberalization appears not to be a panacea for growth and poverty alleviation in Tanzania, at least in absence of considerable supply-side interventions.

RÉSUMÉ

Ce document examine l'impact de la libéralisation des échanges sur la croissance, ainsi que sur la réduction de la pauvreté en Tanzanie, sur la base d'un modèle informatique d'équilibre général, ciblant un seul pays, comportant une forte désagrégation des facteurs et des données détaillées sur les ménages. L'accent est mis sur l'impact de la libéralisation des échanges et d'autres politiques dans le cadre de diverses contraintes structurelles, telles que les marges commerciales importantes entre les prix à la production et les prix à la consommation. La première conclusion que l'on peut tirer des résultats empiriques est que la nature de l'ajustement macroéconomique et sectoriel du marché débouche sur de grandes variations des résultats du scénario de libéralisation. Concrètement, le fonctionnement du marché du travail semble produire des différences considérables en matière d'incidences de l'abaissement des tarifs douaniers. Une série de scénarios sont analysés sur la base du rapprochement empirique le plus pertinent. La politique qui semble être la plus adaptée pour la réduction de la pauvreté est la réduction des marges commerciales. En revanche, le scénario qui suppose une plus grande libéralisation unilatérale des échanges ne semble entraîner aucun changement notable du PIB, ni aucune amélioration de la situation des ménages. Par conséquent, la libéralisation des échanges ne semble pas être une panacée pour la croissance et la réduction de la pauvreté en Tanzanie, du moins en l'absence d'interventions massives du côté de l'offre.

RESUMEN

En este documento se analizan los efectos de la liberalización del comercio en el crecimiento y la mitigación de la pobreza en Tanzania, basándose en un modelo de equilibrio general computable para un solo país en el que los factores están muy desglosados y en el que figura información pormenorizada sobre los hogares. El análisis se centra en los efectos de la liberalización del comercio y otras políticas bajo diferentes limitaciones estructurales, como amplios márgenes de comercialización entre productores y consumidores. La primera conclusión que se extrae de los resultados empíricos es que el carácter del ajuste sectorial y macroeconómico del mercado influye considerablemente en los resultados de la liberalización. Concretamente, el funcionamiento del mercado laboral parece influir de manera significativa en los resultados de los recortes arancelarios. Se plantean diversas hipótesis basándose en el cierre más pertinente desde el punto de vista empírico. La política que parece más adecuada para mitigar la pobreza es la de reducir los márgenes de comercialización. Por otro lado, la hipótesis basada en una mayor liberalización unilateral del comercio no parece producir cambios significativos en el PIB ni mejoras en el bienestar de las familias. En consecuencia, no parece que la liberalización del comercio sea una panacea para el crecimiento y la mitigación de la pobreza en Tanzania, al menos sin una intervención considerable en relación con la oferta.

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1 INTRODUCTION

The purpose of this paper is to explore trade liberalization in the context of structural features that are endemic in low income agriculture dependent economies. In most developing countries, major policy changes like trade liberalization would necessarily take place against a background characterized by significant structural constraints, which affect the functioning of markets and their degree of completeness and competitiveness. Common characteristics of such contexts are backward technologies and poor infrastructural endowments, resulting in large market weaknesses. This is especially the case of agricultural production, and of the more traditional parts of the food chain. Where subsistence farming is widespread, a significant portion of households' consumption flows directly from production into self-consumption, bypassing the specialized processing and distribution systems. Food processing and marketing usually show high transaction costs arising from poor infrastructures, such as inadequate physical transport facilities, and by institutional and physical gaps in the organization of activities.

Any policy change, if taking place in a context of such structural features, is likely to bring about considerable economy-wide effects, which are complex in nature, and spread across institutions. The structural features that will be of major concern in this study are large marketing margins for agricultural products and the functioning of labor markets. Moreover, the extent to which the labour market is characterized by rigidities – such as those limiting changes in wages and/or in employment – can shape the social implications of a policy change, in terms of welfare of the different social groups in the country. There are few doubts that the more policy analysis allows for such potential effects to be taken into account and analyzed, the more policy design can be effective. Trade liberalization is a particularly sensitive policy issue, and it has been shown analytically that the potential impacts are deeply affected by assumptions concerning the structure of the economy (Ackerman, 2005; Taylor and von Arnim, 2006).

Most analyses of global and national trade liberalization, including those pertaining to agriculture, have not taken into account the existence of wide margins between producers and consumers, caused by inadequate infrastructure, such as transport costs, as well as transactions costs due to various market regulations. Furthermore, such analyses often assume perfect price transmission between world prices and domestic market prices, hence overlooking an important aspect of underdevelopment and rural poverty, especially in Africa. For instance, a recent analysis in Madagascar suggests that the existence of high transactions costs and transport margins between remote and central regions are associated with lower input use, reduced yields and (consequently) higher incidence of poverty (Stifel, Minten and Dorosh, 2003). Minot comes to similar conclusions for Tanzania (2005). Studies by Delgado, Minot and Tiongco (2003) and Kilima (2006) independently find that international and local markets in Tanzania are not well connected, rendering many staple food products essentially non-tradable.

Recent studies have included marketing margins in analyses of economy-wide policy impacts. Arndt *et. al.* (2000), for instance, found that in Mozambique the macroeconomic effects of reducing marketing margins are significant, and that they show synergies with increases in agricultural productivity and reductions in marketing margins; they did not, however, analyze trade policies. Also Wobst (2003) explicitly took into account marketing costs in his general equilibrium analysis of the impact of trade liberalization in five southern African countries, and found that a reduction in trade margins would improve considerably the export performance; however, poverty impacts were not analyzed in his work.

This paper discusses trade liberalization with reference to one specific east African country, Tanzania, and examines the effects of this policy in connection with changes in the marketing margins. The analysis is based on a 2001 Social Accounting Matrix (SAM) for Tanzania, built from the data provided by IFPRI (Thurlow and Wobst, 2003), which includes considerable factor, household, and sector detail. The simulations presented are run with a computable general equilibrium (CGE) model, under a wide set of closure rules, implying different assumptions concerning the way in which adjustment takes place in the economy.

Next section discusses the Tanzanian context, and the structural features of the economy, while Section 3 introduces the CGE model employed, and the dataset. Section 4 discusses the functioning of markets and the closure rules, that is, the way in which markets are modelled in the CGE. Section 5 reports the results of the simulations, while the last section concludes.

2 THE TANZANIAN CONTEXT

With a per capita income of about US\$280, Tanzania is among the world's poorest countries. During most of its post-independence history, the country pursued socialist policies which resulted in extended periods of below-potential economic performance. The reforms undertaken from the mid-1980s were not sustained, and by the early 1990s the economy was back into macro-economic disequilibrium and poor growth rates. However, efforts were resumed few years later, with more sustained commitments towards macro-economic stability and sound fiscal and monetary policies. Stabilization policies were accompanied by structural reforms, including privatization of state-owned enterprises, liberalization of the agricultural markets, efforts to improve the business environment and to strengthen public expenditure management. This second cycle of reforms has resulted in sustained growth, which in the last few years was above five percent annually.

Agriculture plays a dominant role in the economy, accounting for nearly 45 percent of GDP, for about three quarters of merchandise exports, employing around 70 percent of the labour force, and constituting a source of livelihood for about 80 percent of the population, particularly among the poorer and more vulnerable groups in rural areas. The average farm size varies between less than 1 and 3 hectares, and the vast majority of the crop area is cultivated by hand. Activities are still to a large extent dependent upon unpaid family labour, particularly of women and children, who account for at least 70 percent of total agricultural labour.

The main food crops are maize, rice, wheat, sorghum/millet, cassava and beans, occupying nearly 85 percent of the arable land. Bananas are grown mainly in the Kagera and Kilimanjaro areas, and like cassava, have a low value-to-bulk ratio, and are generally retained for home consumption. Export crops represent 12 percent of the value of total crop production.

In general, five factors contribute to low agricultural productivity: *(i)* low input use; *(ii)* low output prices compared to production costs; *(iii)* unfavourable weather conditions; *(iv)* pests and diseases; *(v)* poor knowledge of agronomic practices; *(vi)* low levels of capital, especially for small scale farmers. Moreover, agriculture is mostly rain fed, and both crops and livestock are adversely affected by periodical droughts.

Earlier studies (Government of the URT, World Bank and IFPRI, 2000) indicated that the country enjoys comparative advantage in all its major export crops, and in several food crops, despite the low levels of technology. These studies also highlighted the presence of significant linkages between the production of exportable agricultural goods, rural incomes and growth; agricultural development and increased productivity are therefore crucial for both economic growth and poverty alleviation.

Poverty levels are high in Tanzania. During the past decade, a reduction has occurred mainly in urban poverty, while rural areas have seen relatively little change. The aggregate poverty level in 2000/01 was 35.7 percent compared to 38.6 percent in 1991/2, but in rural areas 39.9 percent of households were below the basic needs line¹, accounting for about 81 percent of all the poor population. In 1991/2, the poverty level of this same type of households – depending on agriculture for their livelihood – was 42.3 percent.

Within agriculture, poverty levels are highest among households depending on livestock (59.1 percent), while is 40.6 percent for those depending on food crops, 38.6 percent for those depending on cash

¹ According to the 2000/01 National Household Budget Survey (HBS, National Bureau of Statistics, 2002).

crops², and 33.3 percent for those depending on livestock products. Such figures are not surprising, given that the agricultural sector only expanded at 3.5 percent per year over the past decade, corresponding to less than 1 percent per capita terms. This pattern suggests that agricultural development and better farm-gate prices can potentially result in significant poverty reductions.

A recent study by Levin and Mbamba (2004) showed that an expansion of agricultural production in Tanzania has the strongest potential effects in terms of employment and income generation, which would however benefit mostly the non-poor households, both in rural and urban areas. Despite such asymmetry, the growth of agricultural production still seems to imply the largest potential impact on poverty reduction. Furthermore, by selectively increasing total factor productivity (TFP) in agriculture, the study shows that the best growth prospects were offered by exportable crops, as these could lead to larger exportable surpluses. On the contrary, TFP increases in food crops would depress income, as food crops are mostly non tradable, and hence a production expansion, combined with a slow down of domestic demand, would reduce prices, negatively affecting the poor rural households.

3 THE CGE MODEL AND THE DATASET FOR TANZANIA

The simulations presented in this paper are run with a single country computable general equilibrium model, built as a modified version of the one presented in Lofgren *et al.* (2002). The framework is comparative static, and assumes profit maximization on the supply side, and utility maximization on the demand side.

Supply is modelled as a constant elasticity of substitution (CES) function, determining the level of each activity from aggregate value added and aggregate intermediate inputs. Individual intermediates are derived through fixed coefficients from the aggregate intermediates. Value added for each activity is defined as a CES function of factor inputs. Activities produce outputs of individual commodities, which are allocated to domestic and export uses via a constant elasticity of transformation (CET) function. Imports are assumed to be imperfect substitutes for domestic output, following the approach proposed by Armington (1969). Therefore, commodities available in the domestic market are modelled as composite goods, resulting from domestic and imported differentiated products. Non-land capital is assumed to be fixed in each sector at the base year level. Total arable land is also assumed to be fixed, but substitution is allowed among agricultural activities, based on relative price changes.

Demand is modelled separately for household self consumption – flowing directly from activities to the households without including marketing margins – and marketed consumption, in which household purchase composite commodities which do include margins and indirect taxes. Two separate demand systems account for home and marketed goods, both modelled as Linear Expenditure Systems. Investment demand is defined as an adjustment coefficient multiplying the physical amounts – akin to capital coefficients times the volume of total real investment – in the base period.

The model includes explicitly a trade activity which collects the marketing margins associated with all activities, and distinguishes three of such margins, namely those involved in exporting goods, in importing goods, and those required for selling into the domestic market. Margins enter the price formation equations as exogenous transaction cost coefficients.

The public sector is included in the model, with revenues accruing from value added, income, import and export taxes balanced against public demand for government consumption – produced by an activity called public administration – and investment.

Welfare is measured as “money metric utility”(MMU) (Deaton, 1980), that is by comparing the expenditure of a household under a simulated scenario, where the household has expenditure Y , and pays prices p , with the expenditure that would have been incurred to obtain the same level of welfare as in the base period at current prices p .

As any economy-wide model, the one employed in this work can be solved by following different closure rules, defining endogenous and exogenous variables, and hence the way in which the

² In Tanzania the terms “cash crops” normally refers to exportable crops grown by farmers for cash, such as coffee, cotton, cashew nuts, tobacco, tea, etc.

equilibrium is achieved. Despite this notoriously contentious matter is well beyond the scope of this paper³, it cannot be avoided in fact, as any simulation implies crucial assumptions on the adjustment mechanisms in the economy.

Particularly, the balancing the goods and factor markets can be done either through the standard neoclassical flex price assumption, which implies that demand equals supply so that the price adjusts to clear the market; or through the fix-price assumption, implying that either demand or supply adjust to clear the market under fixed prices, given an initial condition of under or over utilization. In the real world, commodity and factor markets most likely behave in an intermediate way, and the extent to which one or the other assumption is more appropriate depends on the specific case, over which views can legitimately differ.

On the government account, a key behavioral notion embedded in the closure is whether the government is or is not assumed to keep surpluses or deficits fixed. This implies, respectively, either an endogenous adjustment of taxes and expenditure, or fixed taxes rates with endogenous adjustment of surpluses and deficits. On the current account, the closure determines whether the exchange rate adjusts to a given stock of foreign exchange, or is assumed to be fixed with the current account adjusting endogenously by additional foreign borrowing or reserves accumulation. On the saving-investment side, the closure defines whether the savings determine the level of investment, following the classical approach, or this is determined exogenously by private agents and by the government, with savings adjusting endogenously.

The closure chosen for the simulations presented in this paper was based on a combination of available evidence and knowledge of the Tanzanian context. Commodity markets are assumed to clear with flex prices, as there are no major output price controls in the economy. In factor markets, however, the likely presence of excess unskilled labor and shortage of skilled labor suggested to assume that the wages of all unskilled labor classes are fixed in real terms, while those of the skilled labor classes are flexible, and respond to supply and demand. On investment, we side with the classical view that these are determined by available savings, as the availability of private savings constitutes a significant constraint in Tanzania. In the same vein, on the current account we assume a flexible exchange rate with a fixed availability of foreign savings. Finally, government budget is endogenously determined, so that the tax rates and other fiscal instruments are fixed. The sensitivity of the results to all such assumptions, however, was widely tested, as reported in section 5.

In terms of data, the simulations are based on the more recently available Social Accounting Matrix for Tanzania, which was computed by Thurlow and Wobst (2003), and is referred to year 2001. This original SAM was aggregated to include 24 different activities and commodities, of which nine are crops, two are primary livestock activities, four are processed food and beverages, four are secondary sector activities, and five are services, including trade and administration⁴.

In the factor market, the SAM utilized includes six labour types, four of which can be considered as unskilled⁵, plus agricultural and non-agricultural capital, and land, which is only employed in agriculture. Concerning institutions, the private sector is represented by an aggregate enterprise entity, and by six types of households, three urban and three rural⁶, plus a government sector. The SAM reports direct taxes, various types of indirect taxes, such as those on value added, on factor use, imports tariffs and export subsidies.

³ Extensive reviews of this topic can be found in Rattso (1982), Robinson (1991) and Taylor (1990).

⁴ The complete list of activities/commodities includes: maize, other cereals, beans, other cash crops, cassava and roots, coffee, cashew, other fruits and vegetables, other crops, livestock, fishing and hunting, mining, meats, processed grains, other processed foods, beverages, other secondary activities, construction activities, utilities, trade, hotels, transportation, other services, and public administration.

⁵ The complete list of labour types includes: subsistence labour, child labour, non-educated male labour, non-educated female labour – which altogether form the unskilled group – plus educated male labour and educated female labour.

⁶ The complete list of households includes, for both the rural and the urban sectors, poor, non-poor-non-educated, and non-poor-educated, distinguished on the basis of the status of the reference person in the household.

A comparison with microeconomic evidence from independent surveys conducted in Tanzania (Sarris *et al.*, 2006) showed that the original SAM provided by Thurlow and Wobst (2003) includes a low level of transaction costs for the domestic market, as well as for exports and imports. This arises from the types of margins considered, which are only those between the wholesale and the retail level, while those between the farm gate and the wholesale are absent. The latter are both the largest, and those causing the higher concerns, given that they can more directly affect farmers' incentives⁷.

For this reason, the original SAM from Thurlow and Wobst (2003) was modified accordingly. Given the absence of systematic information on transaction costs, it was decided to re-compute them as percentages of the values of the marketed as well as of the exported and imported commodities. The difference in the resulting income in the SAM was subtracted from the income of the respective producers, with the result that the whole SAM had to be rebalanced. For exported commodities it was assumed that the margin associated with transaction costs would amount to 50 percent of the marketed values. For imports the same margin was set at 20 percent of import values, and for domestic sales to households at 30 percent of purchased values.

To minimize information losses, the rebalancing was run by maintaining at their original level the data which was considered to be more reliable, particularly those on foreign trade and on the public sector. The rebalancing was implemented with different methods, and the results were ranked in terms of the percentage change in the original figures. The smaller and more widespread changes were achieved by minimizing the sum of the squared residuals of the changes in the SAM elements.

Table 1 exhibits a summary of the structural characteristics of the Tanzanian economy as inferred from the rebalanced 2001 SAM. Maize and cereals appears as dominant activities in terms of GDP but less so for export, which are dominated by coffee and cashew, while large shares of most agricultural products that are not marketed. The most important is transport on the export side, and the secondary products on the import side. Despite their small importance in total trade, maize and cereals imports constitute a significant share of consumption.

4 HOW DO MARKETS WORK? THE CLOSURE RULE

Any economy-wide model must include three basic macroeconomic accounts. The first is the government savings account, namely the difference between government revenue and expenditure. The second is the current account, which is the sum of the balance of trade, and of official and private remittances from abroad. The third and fundamental one is the savings investment balance. The equilibrium of the economy in any period requires that the value of total savings – the sum of domestic private and public savings and of foreign savings, which is the negative of the current account balance – equals the value of total investments; this results from the equilibrium in all product and factor markets.

The closure rule, in other words, sets the way in which equilibrium in the various markets is achieved, and embeds assumptions about how the macro-economy works. For this reason, it is a highly controversial and contentious issue, which gave rise to wide debates in economics over the past decades. Even the controversy between Keynes and the classical economists in the middle of the previous century was on this same issue; more recently the debate has pitted neoclassical macroeconomists versus those who believe that the real economy works more along Keynesian lines. Reviewing and discussing such an extensive debate, or argue for one or another closure, is beyond the scope of this paper; extensive reviews can be found in Rattso (1982), Robinson (1991) and Taylor (1990). Nevertheless, the issue itself cannot be avoided whenever one uses an aggregate economy-wide model, as one must eventually decide on what adjustment mechanism is more appropriate to the country context at hand.

⁷ For instance, if the average price of coffee received by farmers as inferred from micro surveys is compared to the average (wholesale export) market price obtained in the Moshi auction the margin is larger than 50 percent in Kilimanjaro, a region close to Moshi, and even higher for Ruvuma a region much further away from Moshi than Kilimanjaro.

Balancing the goods and factor markets can be done in essentially two ways. One is a flex price way, which assumes that total demand of a commodity or a factor is equal to total supply – which in turn can be fixed or variable in some pre-specified way – so that the commodity or factor price can adjust to clear the supply-demand equation. This is the standard neoclassical assumption about market functioning.

A second way is a fix-price one, which assumes that one or more quantity variables adjust to achieve supply-demand balance under fixed prices. In this case, the underlying rationale is that, at a fixed price, there is an initial underutilization of a commodity (via preexisting stocks) or a factor (via some kind of unemployment). Hence when demand for a commodity or factor, for instance, increases, there can be more utilization of the good or factor without changes in its price. Similarly when there is decreased demand the stock of the commodity increases or unemployment of the resource is the outcome without price changes.

It is probably fair to say that in the real world commodity and factor markets are likely to behave in an intermediate way; both price and quantity adjustments work toward achieving market equilibrium, and the importance of one or the other mechanism depends on the time horizon over which equilibrium is assumed to be achieved. In commodity markets, price adjustments are probably quite large in the short run, while in the longer run, given supply adjustments, the price adjustments tend to be moderated. The opposite is probably true of labor markets. In such markets there is probably some wage rigidity in the short run, and hence employment tends to vary. The longer the time horizon one considers, however, the more likely it becomes that price adjustments take place. Much depends in fact on the structure of the commodity and factor market at hand, and it is not easy to identify which markets behave in one or another way. This is probably the reason why there has been so much controversy: the assumptions about how the markets work in the real world is essentially empirical. Views on it can legitimately differ, and it is not easy to come to a definite conclusion.

On the government side, the key behavioral issue is whether in the period of adjustment assumed in the model the government surplus or deficit is kept somehow fixed – by active fiscal policy, namely by endogenous manipulation of some tax or other public revenue and expenditure instruments – or the fiscal policy is assumed to be passive, with exogenous tax and other expenditure rates and levels, and an endogenous government surplus/deficit which maybe accommodated by monetary or other domestic and international borrowing adjustments. On the external side, the key behavioral issue is whether the exchange rate adjusts to achieve given external availability of foreign exchange, and hence a fixed current account balance, or whether the exchange rate is kept fixed, and the current account passively adjusts by additional foreign exchange resources through foreign borrowing, or by accumulating foreign exchange reserves. On the investment side, the key behavioral issues concern the level of real investment (private and public), and whether this is determined by aggregate available savings in a classical way, or it is set by exogenous forces (such as the Keynesian private “animal spirits” and government policy), with savings adjusting endogenously to achieve the required amount of investment.

In the simulations presented in this paper we firstly examined the implications of trade liberalization and other policy scenarios under a variety of closures, to analyze the impact of the different structural assumptions on the results. Secondly, we selected one particular closure, that we believe is the most appropriate in the Tanzania context, and analyzed in more details the results obtained with this rule.

The “preferred” closure was chosen on the basis of empirical evidence. Concerning commodity markets, we assumed that they clear with flexible prices, as there are no major price controls in place in the product markets. For factor markets, however, we departed from the standard CGE practice, particularly for labor, since Tanzania, as most low-income countries, tend to show excess of unskilled labor and shortage of skilled labor. This suggested that skilled labor wages are more responsive to changes in supply and demand, while unskilled wages are less. Therefore we assumed that the wages of all unskilled labor classes are fixed in real terms, while those of the skilled labor classes are flexible, and respond to supply and demand. On investment we sided with the classical view that investment is determined by available savings, since especially private savings are a major constraint to investment in the country. The exchange rate was assumed to be flexible, while the availability of foreign savings – namely foreign loans and grants – were assumed to be fixed. Finally, the government budget

was considered to be endogenously determined, implying that the government is not assumed to adjust taxes and other fiscal instruments the short term to keep the public deficit at a fixed level.

5 TRADE LIBERALIZATION UNDER DIFFERENT CLOSURE RULES

Due to space limitations, in this section we present the results of one particular scenario, which explores the impact of a 50 percent cut in all import tariffs, under a number of different closures. A total of seventeen different closures were adopted, which are summarized in Table 2.

In the first closure, it is assumed that all commodity and factor markets clear with a flexible price. This is the standard approach in almost all CGE-based analyses, implying that the labor market is characterized by variable factor returns under fixed total factor supplies. The external sector is assumed to balance via a flexible exchange rate, under the hypothesis that foreign savings are fixed. Government savings are endogenously determined, as tax rates are assumed to be fixed, and do not adjust to maintain a constant government balance. Finally, this first closure postulates that the level of real investment is determined by the available savings in the economy, following in this sense the neoclassical approach.

Closure 2 modifies this last hypothesis, and makes total real investment exogenous, while endogenizing the domestic saving rates of non-governmental institutions enterprises and households that need to match the initial level of investment. Closure 3 maintains all the assumptions of the first closure, except that the exchange rate is assumed to be fixed, and the level of foreign savings is flexible and determined endogenously.

In the following four closures (4 to 7), we allow for different types of quantity adjustments in the labor markets. The modeling of these markets has been shown to be particularly important (Taylor, 1990), especially in terms of projected growth. When employment is allowed to vary beyond fixed levels in the model, in fact, the economy is allowed to generate additional value added, and hence GDP. Moreover, allowing quantity adjustment implies that unemployment has to be postulated, assuming that some unutilized or underutilized labor is available in the economy at fixed real wages.

It is probably reasonable, in general, that labor supply is not fixed, and that it can be stimulated by increases in real wage rates, either by inducing people to work more, or through increased labor market participation. In many developing economies considerable hidden unemployment or underemployment is reported in fact, even at current real wages. This suggests that there may be a potential for increasing employment even without increasing real wages. In Tanzania, there are large subsistence and “informal” activities that could be sources of unskilled labor at a fixed very low or “subsistence” unskilled wages, a la Lewis. Sarris *et al.* (2006), found that the marginal product of family labor in farm production is considerably smaller than the market wage of agricultural labor for all the classes of rural households they considered; this implies the presence of considerable excess labor among farm households. Also in the skilled labor market quantities may not necessarily be fixed, since skilled workers too could increase the level of their participation when additional opportunities arise. Hence a fix-price assumption in some parts of the labor markets in Tanzania is not unreasonable.

To explore the consequences of the assumptions in the labor market, closure 4 postulates fixed real wages for all labor categories – there are six labor types in the SAM – and hence endogenous levels of employment in all labor types. As it is not *a priori* clear whether the fix-price assumption is the more appropriate in the skilled or unskilled labor category, closure 5 assumes that the four types of unskilled labor markets function with fixed prices, while the two skilled labor categories exhibit flexible wages under and fixed supplies. This is supposed to simulate the situation of “unlimited supplies of unskilled labor”, combined with fixed skilled labor supply. Closure 6 reverses this setting, and assumes that all unskilled labor types are flex price, while all skilled labor types are fix price.

Closure 7 is similar to closure 1, except that it allows for full substitution between all unskilled labor categories, as well as for full substitution among all skilled labor categories. Here we fixed the wage differentials among the various unskilled labor types, while allowing total “unskilled wage” to adjust to a fixed supply of total unskilled labor, which is equal to the sum of the base levels of unskilled labor

supply in all categories. The same assumption was adopted for the two skilled labor types. This closure rule reproduces full substitutability among labor types within the same skill level.

Closure 8 combines the assumption of fixed real wages already explored in rule 4 – implying endogenous levels of employment – with flexibility in foreign savings, and a fixed exchange rate, as explored in rule 3.

The following six closures (from 9 to 14), assume that the government runs an active fiscal policy, while being unwilling to run an endogenous budget level of surplus or deficit. This implies that some tax rates must become endogenous, while the government budget is assumed to be predetermined at the level of the base run. Particularly, closures 9, 11 and 13 postulate that the direct tax rates are variable, while the indirect ones are set exogenously; the contrary applies in closures 10, 12 and 14. These assumptions on public finance are combined with different hypotheses concerning the labor market and the external financing, already described above.

Finally, the last three closures, numbers 15, 16, and 17, adopt in the labor market what is probably the more realistic approach for the Tanzanian case. In the unskilled labor market we apply the same approach of closure 5, namely fixed wages for all unskilled labor classes and quantity adjustments. For the skilled labor classes we adopt the assumption of closure 7, namely that the total amount of skilled labor is fixed, and the overall average wage of this class adjusts to the supply, but there is a fixed differentials among the wages of the two skilled labor classes, and hence substitution between the two skilled classes. This approach reflects the idea that the more skilled segments of the labor market are characterized by a limited supply of workers, while the unskilled labor categories – including unskilled, child and subsistence workers – are instead assumed to be characterized by a variable degree of engagement in the labor market and/or by the presence of idle labor, which is willing to enter the market for a fixed wage close to subsistence. In the last three closures this criterion is combined with exogenous taxation, closure 15, and with endogenous direct and indirect taxations, closures 16 and 17 respectively. As mentioned earlier our preferred closure for Tanzania is closure 15.

The simulations presented in Section 5 are aimed at showing, among other points, the extent to which the assumptions embedded in the closure rules can make a difference in terms of the results. In turn, this helps in identifying the results which are relatively more robust to changes in the basic assumptions.

Table 3 reports the main results of the scenario in which all tariffs are cut by 50 percent, implemented under the 17 different closures just described. This policy change, akin to significant trade liberalization, produces almost no changes in GDP under the closures that postulate fixed supplies of labor. It produces small increases in GDP under closures that assume fixed wages. The largest increase in GDP is shown under our preferred scenario 15.

On the foreign trade front, it implies a depreciation of the exchange rate under all closures, except of course with the ones that assume a fixed exchange rate. Under all closures the economy experiences a significant expansion of agricultural and total imports, and a marginal increase (which under some closures is a decrease) of agricultural and total exports. Real aggregate investment (private and public) seems to follow the changes of public savings, which are a large component of total savings.

The policy change has a strong negative impact on public savings, under all closures that allow government savings to be determined endogenously, which are closures 1-8, and closure 15. Another variable which appears to be affected significantly by the closure is agricultural trade. The percentage changes in imports seem to be affected by the assumption of fixed or variable foreign savings. This suggests that the consequences of trade liberalization should not be assessed independently from the exchange rate policy and the conditions that determine the availability of foreign exchange in the country.

Concerning labor, all closures allowing for unemployment show minor GDP percentage changes from the base run. It is worth noticing that, in the closures with unemployment in all labor classes, while the changes in total skilled labor are systematically positive, those for unskilled labor vary considerably. Employment of unskilled labor is reduced by the cut in the tariff when we budget neutrality, and hence allow taxation to compensate for the reduction in Government's saving, that is in closures 11-14 and 16-17. For Tanzania, this implies that if the government wishes to keep budget neutrality while

reducing a source of public revenue such as import tariffs, the increased taxation will reduce employment in the informal sector, and even more so if we postulate that the stock of educated manpower is fixed and operates with variable wages, as it is the case of closures 16 and 17. But more in general, the result indicates that the effects of a cut in import tariffs can vary widely depending on the domestic policy framework, and on how the Government will compensate for the revenue loss determined by the tariff reduction.

Table 4 shows how the reduction in tariffs affects welfare across the six household groups reported in the SAM, under the various closure rules. It is worth emphasizing how the differences arising from the assumptions embedded in the closures can determine a switch from a positive to a negative outcome for some households. Particularly evident is the fact that welfare appears to be reduced for the poor rural households in all closures assuming budget neutrality and an endogenous adjustment of direct or indirect taxation (closures 9-14). A relatively stronger reduction in welfare takes place in the more well-off urban households when taxation is adjusted to budget neutrality without allowing employment to vary within the skilled labor market segment, as it is the case of closures 16 and 17. The stronger welfare increases are shown by closures 8 and 15 especially for the better off urban households. For the latter closure, this stems from the relatively strong increase in employment shown in Table 4, arising from the assumption of fixed wages in the skilled workers. For closure 8, instead, the welfare increase appears related to the GDP growth, which is the highest across all closures, and stems from the combination of increased employment and trade. More in general, the evidence on welfare shows that the closure rule can indeed affect the distributional implications of any policy simulation exercise.

6 RESULTS OF POLICY AND OTHER STRUCTURAL AND EXOGENOUS SHOCK SCENARIOS

In this section we switch back to the “preferred” closure for Tanzania – namely, closure 15 in Table 2 – to run a number of experiments aimed at analyzing the relative impact of a number of policy scenarios. Particularly, the following seven scenarios have been analyzed, which are also summarized in Table 5:

1. an exogenous 10 percent decrease in the marketing margins, designed to explore the impacts of an improvement in transportation and marketing infrastructures;
2. a 50 percent cut in import tariffs;
3. combines scenarios 1 and 2, namely the tariff cuts and the reductions in marketing margin;
4. a 10 percent increase in the price of export crops;
5. a 10 percent increase in the price of imported food and agricultural goods;
6. combines scenarios 4 and 5, namely a 10 percent increase in the price of export crops and a 10 percent increase in the price of imported food and agricultural goods;
7. combines scenarios 2, 4 and 5, namely price increase implied in scenarios 4 and 5 and the tariff cuts implied in scenario 2; this is meant to mimic the expected effects of a multilateral trade liberalization exercise, albeit with indicative figures.

Table 6 reports the results of these experiments for a set of macro variables, while welfare results for the six types of households are in Table 7.

In the first scenario (MARG DECR), the 10 percent decline in the marketing margins raises producer prices of agricultural commodities, including those of the exportable crops, whose production expands, inducing significant increases in exports. Given the assumption of variable employment in the unskilled labour market, the increased prices imply additional agricultural production and income. Part of this flows into home consumption, but also demand for domestic products, and substitutes a part of agricultural imports, while increasing imports (and consumption) of non agricultural and hence more income-sensitive goods. This happens notwithstanding the depreciation of the exchange rate, which boosts the production of import-competing goods, particularly manufactures in this case. In turn, the positive effects on both production and consumption explain the good performances of GDP and

investment. The latter is supported by increasing government revenues from tariffs on increased imports. Aggregate employment increases considerably in the unskilled labour market, and this boosts GDP. Considering household welfare (Table 7), this scenario implies significant and fairly generalized welfare improvements, as a result of increased demand for unskilled labour.

In the second scenario – (TARCUT) which implies a 50 percent reduction in all tariffs – the level of Government savings is significantly reduced, by almost 50 percent as a consequence of the reduced revenues (Table 6). and this has detrimental effects on aggregate investment. As expected, trade increases, particularly on the import side, despite a 1.6 percent depreciation of the exchange rate accounting for the good performance of exports. The reduced demand for domestic goods, however, leads to a lower level of investment, but GDP still grows to some extent, as a consequence of the small increased level of employment in the unskilled labour market. In terms of welfare (Table 7) the scenario yields mixed results. Net gainers are the urban poor and the less educated households, together with the better off rural households. The increased employment of the unskilled workforce explains the result for the urban poor households, while the improved position of the rural more educated households stems from the increased exports, which are mostly made of agricultural cash crops such as coffee and cashew.

The third scenario (MARG & TARCUT) combines the previous two. It is worth noticing that the effects on GDP, trade and the level of employment are higher than the sum of the effects of the two previous scenarios (Table 6); moreover the reduction in public savings – arising from the decreased tariff revenue – is partly counteracted by the increased tax revenues on production and consumption. Therefore, the combination of tariff and marketing margin reductions yields positive interactive effects. Also in terms of welfare this scenario exhibits a generalized improvement across household types (Table 7), particularly for the better off rural household, as a consequence of the large increase in agricultural exports.

In the fourth scenario (EXP PR INCR), the 10 percent price increase was implemented for the four products that account for the bulk of Tanzanian agricultural exports, namely coffee, cashew nuts, other cash crops – which includes cotton and oilseeds – and for fishing and hunting. The results indicate a small increase in GDP (Table 6), together with a significant exchange rate appreciation, as expected under a fixed foreign exchange availability constraint. Agricultural exports increase slightly, while total exports decrease due to the restructuring of the export producing sectors. Total imports also increase, to keep foreign savings constant, while investment increases marginally, and public savings deteriorate, following the shift of production towards export crops, which are less taxed. The small increase in investment arises from the increase in private savings. In terms of welfare (Table 7) also this scenario, like the previous one, implies a generalized improvement, which in this case is particularly significant for the better off households, both urban and rural.

The 10 percent price increase in the world prices of five imported products – namely other cereals, other crops, processed grains, beverages, and other foods – simulated in the fifth scenario (IMP PR INCR) - also brings about a slight GDP expansion, together with a minor appreciation of the exchange rate, a significant decrease of agricultural imports, and a decrease in imports, as well as in agricultural and total exports. Investment increases marginally, following the increased public savings. In terms of welfare (Table 7), this scenario favours the urban poor and uneducated households, together with the better off rural households. The impact of international price increases appear altogether limited, due also to the smaller share of imports in the major staple foods.

The following scenario (IMP EXP PR INCR) combines the previous two, and implies growth in employment, investment and welfare (Tables 6 and 7). A modest GDP expansion arises together with minor changes in the trade pattern; whereas a more significant change takes place in unskilled labour. Welfare increases in all rural households, as well as in the poorer urban group, largely as a result of the increased employment in the lower labour market segments. As a policy implication, this implies that an increase in world market prices without obligations to cut import tariffs would produce a considerable expansion in Tanzanian agriculture; and such expansion would be pro-poor, as confirmed also by the analyses reviewed in Section 3.

The last scenario (MULT TRADE LIB), that combines scenarios 2, 5 and 6 to mimic a multilateral trade liberalization, shows stronger GDP growth than any of the others, and large increases in

agricultural imports. However, aggregate investment would contract significantly, due to a reduction of public savings. In terms of welfare, it is still the case that the rural poor and uneducated are very little or negatively affected. While promoting growth, multilateral trade liberalization would bring about adverse distributional impacts.

The more significant results in terms of the macro variables as well as welfare improvements are shown by the simulation of the scenarios involving a reduction in marketing margins, which appear to dominate those involving changes in trade policies. This suggests that interventions aimed at improving infrastructure and reducing transaction cost may have positive consequences both in terms of growth and poverty.

It is also interesting to explore more closely the results of some of the scenarios. To this end, Figure 1 traces the effects of progressive tariff reductions on GDP, trade, investment and labour – following the values reported in Table 8 – with the aim of understanding whether the effects of a tariff reduction change linearly with its intensity. In fact, the percentage changes increase linearly with the deepening of the cut in the tariffs. Public savings become negative under a scenario in which agricultural tariffs are completely eliminated. Consistently, welfare results also follow a regular pattern (Graph 2), in which the relatively worse off rural households suffer increasing losses from progressive agricultural tariff reductions, while all the others benefit, to a greater extent.

Similar type of evidence is presented also with reference to the reduction in the marketing margins. In this case, scenarios were built assuming progressive reductions from 5 percent to 20 percent. Figure 3 shows that additional reductions in marketing margins would yield more than proportional changes in some key variables, such as GDP, exports and unskilled labour. For instance, the marginal percentage increase in GDP between the 5 percent and the 10 percent scenarios is 1.9, while it becomes 2.6 between the 15 percent and the 20 scenarios; the same applies to unskilled labour, where the marginal increase in employment is 8.2 between the 5 percent and the 10 percent scenarios, while it is 12.2 between the 5 percent and the 10 percent scenarios. Welfare results (Figure 4) are consistent with this picture. Poor rural households appear to gain less than their urban counterparts, but for all households types, doubling the decrease in marketing margins imply more than doubled welfare increases.

7 SENSITIVITY ANALYSIS

The robustness of the results presented was analyzed in several ways. Concerning marketing margins, as mentioned these were increased in the base SAM compared to the original SAM supplied by IFPRI, on the basis of additional micro-level information on the difference between farm-gate and wholesale prices. The same policy scenarios presented in last section were run also on the original dataset supplied by IFPRI. Despite the relative size of the results was different, still a reduction in marketing margins would yield larger and more evenly-distributed results compared to that of a cut in the tariffs. This check rules out the possibility that the economy-wide effect of a reduction in the margins arises only from their size, which was overstated compared to the original dataset supplied by Thurlow and Wobst (2003).

Concerning the closure rules, as mentioned, the experiment presented in the previous section were run with the all the 17 closures reported in Table 1. Also in this case, the relative effects of marketing margins reduction *vis à vis* tariff reductions turned out to be fairly robust to changes in the assumptions, despite the fact that the distributional impacts in the economy varied considerably, following a pattern similar to the one highlighted in Section 4, in the discussion of the results for the different closures.

Concerning the parameters, major unknowns are the substitution and transformation elasticities, particularly those governing the substitution in consumption between domestically produced and imported commodities, the substitution in production between domestic and exportable products, and the substitution among the factors in the production across the activities. Such parameters, which are calibrated to a base dataset, determine the extent to which substitutions occur within the economy, and

they are expected to be larger the longer the time horizon assumed as underlying the simulations. We repeated all the experiments described in last section earlier with different parameter sets.

In particular, we firstly run the model with the Armington elasticities of substitution between domestic and imported commodities set at 50 percent of their base value, while all the other parameters were unchanged. Secondly, we increased the same elasticities by 50 percent of their base level values. The third and the fourth sensitivity runs assumed the same changes in the elasticities of transformation in production between domestic and exported commodities, while all other parameters were unchanged. The fifth and the sixth experiments assumed that the elasticities of substitution between factors in the production in the various activities were 25 percent lower and 25 percent higher than their original values respectively, with all the other parameters unchanged. Due to space reasons, we do not report all these results, which are available from the authors upon request. In general, they do not indicate significant changes compared to the results obtained with the base parameter values.

8 CONCLUDING REMARKS

The exercise presented indicates that reducing marketing margins would be an effective policy choice in Tanzania, in terms of growth, welfare, and distribution. All households, and particularly the rural poor, may gain substantially from an improvement in this area, despite the observed variability in the exact growth and welfare change, which is sensitive to the closure rule adopted and the other assumptions. There appear to be few doubts that trying to lower producers to consumers price margins would be an efficient investment.

By contrast, scenarios assuming trade policy changes such as tariff cuts and foreign price changes following from multilateral trade liberalization do not seem to produce significant growth, nor significant changes in household welfare, even when large tariff cuts are hypothesized. Rather, they produce a large decline in public revenues, which in turn affects negatively the total available savings in the economy, and hence the volume of real investment.

It is also worth noticing that increasing reductions in marketing margins determine more than proportional welfare increases, and that the same applies to the combination of margins reduction and tariff cuts. Such positive marginal effects indicate that the two policies should be combined. More in general, one should conclude that trade liberalization is not a panacea for growth and poverty alleviation, at least in Tanzania, and at least in absence of considerable supply side interventions, such as those aimed at improving marketing and trade infrastructures. In turn, this result speaks in favour of the aid for trade approach: potential benefits from an increased openness to foreign trade, especially in developing countries, require a conducive domestic environment in terms of improved infrastructures and reduced transactions cost.

Another conclusion that obtains from the empirical results is that the nature of the closure rules, that is the assumptions about the functioning of the economy, makes a large difference in terms of the results of the simulations; key variables, such as welfare, GDP and trade may move in opposite directions. Two major regularities could be observed in this respect. Firstly, allowing for the presence of unemployment at least in some part of the labor market tends to magnify the results in terms of growth and welfare. Secondly, when fiscal discipline is imposed in the model, so that the public budget is kept exogenous with variable tax rates, the welfare consequences for the poorer households tend to be negative. These observations call for a close scrutiny of such assumptions, and of the extent to which they are reasonable.

The evaluation of growth-enhancing and poverty-reduction policies, therefore, cannot be done without a thorough discussion and consideration of the way in which the various parts of the economy adjust to new signals. This seems to apply especially to the functioning of the labor market, and in particular to whether it adjusts in a flex-price mode, namely via real wage adjustments in combination with low employment variability, or in a more fix price mode, namely with stable real wages and adjustment in employment. Empirical microeconomic evidence for Tanzania to date supports the fix-price type of adjustment; however, more efforts may be required in this area, to understand in more details the functioning of the markets, particularly those for the different types of labor.

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TABLES

Table 1. Production and trade structure of the Tanzanian economy in 2001

	Share in total value added (percentage)	Share in total exports (percentage)	Share in total imports (percentage)	Share of exports in production (percentage)	Share of marketed production in total production (percentage)	Share of imports in total domestic consumption (percentage)	Ratio of domestic margin to marketed production (percentage)
Maize	9.9	0.1	0.8	0.2	48.2	3.6	13.3
Other cereals	5.6	0.2	2.0	0.5	76.7	7.7	4.2
Beans	2.3	0.1	0.0	0.6	73.6	0.0	25.6
Other cash crops	4.6	10.2	2.5	22.1	93.3	8.8	7.3
Cassava and roots	3.6	0.0	0.0	0.0	40.2	0.0	31.4
Coffee	0.8	7.3	0.0	92.7	96.0	0.0	1.1
Cashew	1.0	7.2	0.0	98.6	100.0	0.0	0.0
Other fruits and vegetables	6.6	2.1	0.4	6.9	65.9	2.0	31.8
Other crops	0.8	0.3	0.0	9.5	58.6	0.3	25.8
Livestock	3.3	0.5	0.1	2.4	83.7	1.1	13.7
Fishing and hunting	7.7	5.4	0.0	13.3	77.5	0.1	28.6
Mining	1.5	1.5	0.7	12.7	100.0	9.0	4.2
Meats	2.3	0.0	0.2	0.2	75.1	1.5	40.8
Processed grains	0.7	0.5	0.8	1.0	100.0	2.3	33.1
Other processed foods	2.0	0.5	3.7	1.3	97.3	14.8	44.0
Beverages	0.9	0.1	0.8	0.5	95.9	8.2	38.6
Other secondary	6.2	3.3	62.7	1.6	100.0	52.9	3.0
Utilities	1.7	0.0	0.0	0.0	100.0	0.0	0.0
construction	4.5	0.0	0.1	0.0	100.0	0.3	0.0
Trade	10.5	0.0	0.0	0.0	100.0	0.0	0.0
Hotels	2.6	0.0	0.0	0.0	100.0	0.0	0.0
Transportation	5.8	44.3	19.5	53.7	100.0	36.4	0.0
Other services	9.0	10.9	4.7	7.4	74.9	4.9	0.0
Administration	6.2	5.5	0.9	4.4	100.0	1.1	0.0

Source. Computed by authors

Table 2. Assumptions of the different closure rules simulated

	Unskilled labor market	Skilled labor market	Exchange rate	Investment	Government savings
Closure 1	Flex price	Flex price	Flexible	Savings driven	exogenous taxes endogenous savings
Closure 2	Flex price	Flex price	Flexible	Exogenous	exogenous taxes endogenous savings
Closure 3	Flex price	Flex price	Fixed	Savings driven	exogenous taxes endogenous savings
Closure 4	Fix price	Fix price	Flexible	Savings driven	exogenous taxes endogenous savings
Closure 5	Fix price	Flex price	Flexible	Savings driven	exogenous taxes endogenous savings
Closure 6	Flex price	Fix price	Flexible	Savings driven	exogenous taxes endogenous savings
Closure 7	Flex price. Full substitution within class	Flex price. Full substitution within class	Flexible	Savings driven	exogenous taxes endogenous savings
Closure 8	Fix price	Fix price	Fixed	Savings driven	exogenous taxes endogenous savings
Closure 9	Flex price	Flex price	Flexible	Savings driven	endogenous direct taxes and fixed savings
Closure 10	Flex price	Flex price	Flexible	Savings driven	endogenous indirect taxes and fixed savings
Closure 11	Fix price	Fix price	Flexible	Savings driven	endogenous direct taxes and fixed savings
Closure 12	Fix price	Fix price	Flexible	Savings driven	endogenous indirect taxes and fixed savings
Closure 13	Fix price	Fix price	Fixed	Savings driven	endogenous direct taxes and fixed savings
Closure 14	Fix price	Fix price	Fixed	Savings driven	endogenous indirect taxes and fixed savings
Closure 15	Fix price	Flex price. Full substitution within class	Flexible	Savings driven	exogenous taxes endogenous savings
Closure 16	Fix price	Flex price. Full substitution within class	Flexible	Savings driven	endogenous direct taxes and fixed savings
Closure 17	Fix price	Flex price. Full substitution within class	Flexible	Savings driven	endogenous indirect taxes and fixed savings

Source: Authors' calculations

Table 3. Results of a 50 percent tariff cut with different closure rules
(percentage change from base)

Closures	GPD	Agricultural import	Total imports	Agricultural export	Total exports	Aggregate investment	Government savings	Skilled labour	Unskilled labour	Exchange rate
1	0.00	8.56	0.43	0.29	0.54	-2.53	-55.98	0.00	0.00	0.84
2	0.00	5.92	0.76	1.58	0.92	0.00	-53.15	0.00	0.00	1.57
3	0.00	10.11	1.75	-2.64	-0.62	0.89	-56.71	0.00	0.00	0.00
4	0.14	7.62	0.55	0.45	0.76	-2.50	-52.44	0.21	0.30	1.21
5	0.10	7.75	0.51	0.37	0.69	-2.62	-54.17	0.00	0.33	1.16
6	0.04	8.36	0.47	0.37	0.60	-2.45	-54.41	0.17	0.00	0.90
7	0.00	8.43	0.44	0.23	0.56	-2.66	-55.79	0.00	0.00	0.97
8	0.31	9.85	3.08	-4.61	-0.97	4.17	-47.19	0.95	0.30	0.00
9	0.00	5.76	0.89	1.86	1.11	0.46	0.00	0.00	0.00	1.56
10	0.00	5.85	0.89	1.85	1.10	0.44	0.00	0.00	0.00	1.54
11	0.03	6.03	0.94	1.84	1.21	0.59	0.00	0.32	-0.12	1.55
12	0.04	6.08	0.94	1.83	1.21	0.55	0.00	0.32	-0.11	1.55
13	0.27	8.92	4.16	-5.04	-1.30	9.01	0.00	1.29	-0.08	0.00
14	0.27	8.97	4.16	-5.04	-1.30	8.98	0.00	1.29	-0.06	0.00
15	0.41	8.69	0.79	0.70	1.21	-2.65	-49.43	0.00	1.32	1.66
16	-0.47	8.69	0.62	1.48	0.59	0.88	0.00	0.00	-1.47	0.80
17	-0.45	8.65	0.63	1.48	0.61	0.82	0.00	0.00	-1.39	0.82

Source: Authors' calculations

Table 4. Welfare results of a 50 percent tariff cut with different closure rules
(percentage change from base)

Closures	Rural Poor	Rural NP uned	Rural NP Educ	Urban Poor	Urban NP Uned	Urban NP Educ
1	0.43	0.56	0.41	0.36	0.28	0.40
2	-0.40	-0.25	0.17	0.70	0.46	0.03
3	0.38	0.50	0.55	0.55	0.34	0.62
4	0.26	0.33	0.75	0.99	0.81	0.70
5	0.26	0.33	0.71	0.91	0.73	0.68
6	0.42	0.55	0.47	0.48	0.38	0.44
7	0.38	0.49	0.47	0.50	0.42	0.47
8	0.18	0.23	1.13	1.61	1.18	1.17
9	-0.65	-0.58	0.17	0.39	0.21	0.27
10	-0.47	-0.30	0.21	0.27	0.11	-0.09
11	-0.57	-0.48	0.16	0.39	0.24	0.24
12	-0.40	-0.23	0.21	0.30	0.16	-0.09
13	-0.56	-0.50	0.74	1.26	0.79	0.91
14	-0.41	-0.28	0.79	1.19	0.73	0.62
15	-0.09	-0.16	1.47	2.23	1.72	1.36
16	-0.28	-0.01	-0.98	-1.53	-1.24	-0.75
17	-0.09	0.27	-0.88	-1.56	-1.28	-1.10

Source: Authors' calculations

Table 5. The scenarios simulated

Name of the scenario	Description
MARG DECR	10% decrease in all margins
TARCUT	50% cut in all import tariffs
EXP PR INCR	10% increase in prices of export crops
IMP PR INCR	10% increase in prices of imports of food and agric. Products
IMP EXP PR INCR	10% increase in prices of export crops and 10% increase in prices of imports of food and agric. Products
MULT TRADE LIB	10% increase in prices of export crops, 10% increase in prices of imports of food and agric. products and 50% cut in all tariffs

Table 6. Aggregate results of simulation experiments under the preferred closure

Experiments	GPD	Agricultural import	Total imports	Agricultural export	Total exports	Aggregate investment	Government savings	Unskilled labour	Exchange rate
BASE	7.80	247.86	2093.46	225.72	1078.05	1.00	92.49	2.46	1.00
MARG DECR	3.71	-1.58	6.88	31.38	6.30	0.66	16.2	12.78	3.96
TARCUT	0.41	8.69	0.79	0.70	1.21	-2.65	-49.4	1.32	1.66
MARG & TARCUT	4.21	7.16	7.80	32.52	7.65	-2.10	-37.9	14.65	5.68
EXP PR INCR	0.40	7.27	1.49	1.44	-1.41	0.95	-1.15	1.35	-4.72
IMP PR INCR	0.31	-10.76	-1.13	-0.76	-0.11	0.16	1.99	0.99	-0.49
IMP EXP PR INCR	0.71	-4.00	0.29	0.76	-1.50	1.11	0.89	2.36	-5.18
MULT TRADE LIB	1.09	1.49	1.03	1.56	-0.32	-1.50	-46.7	3.65	-3.63

Source: Authors' calculations

Table 7. Welfare results of simulation experiments under the preferred closure
(percentage change from base)

	Rural Poor	Rural NP Uned	Rural NP Educ	Urban Poor	Urban NP Uned	Urban NP Educ
MARG DECR	5.07	3.69	7.43	9.35	7.86	7.03
TARCUT	-0.09	-0.16	1.47	2.23	1.72	1.36
MARG & TARCUT	5.03	3.56	9.15	11.97	9.88	8.59
EXP PR INCR	0.41	0.16	1.31	2.32	1.52	0.93
IMP PR INCR	0.06	-0.10	0.10	0.16	0.12	-0.06
IMP EXP PR INCR	0.46	0.06	1.40	2.48	1.63	0.86
MULT TRADE LIB	0.35	-0.12	2.82	4.65	3.30	2.17

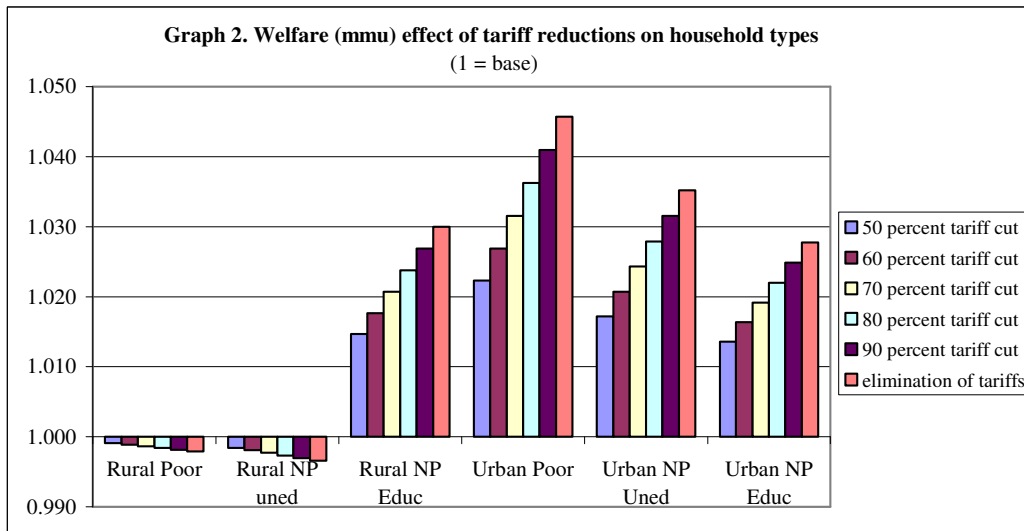
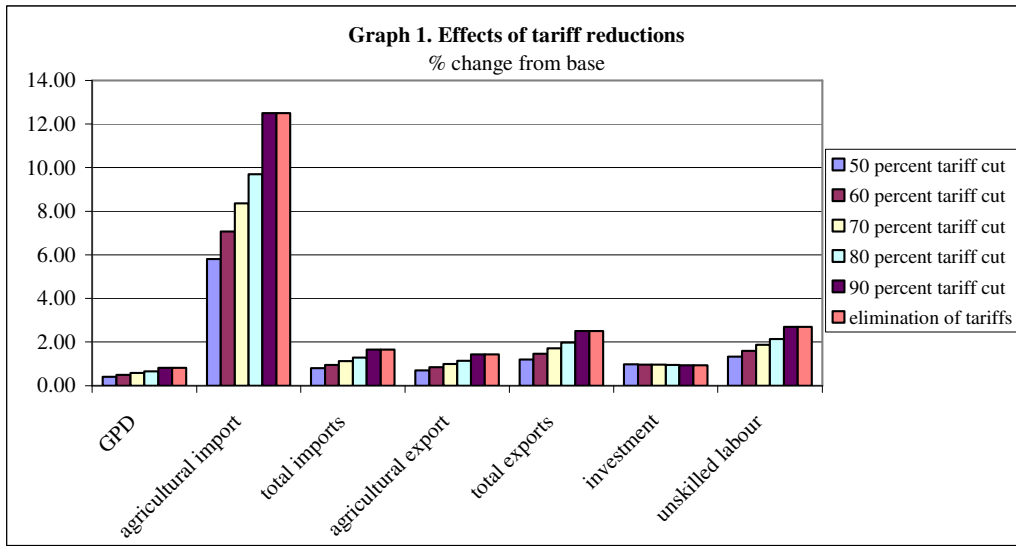
Source: Authors' calculations

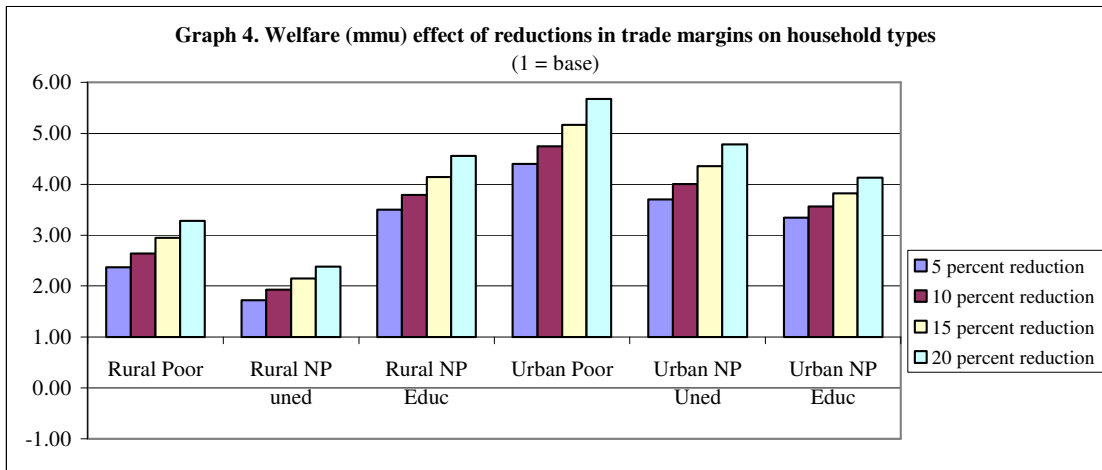
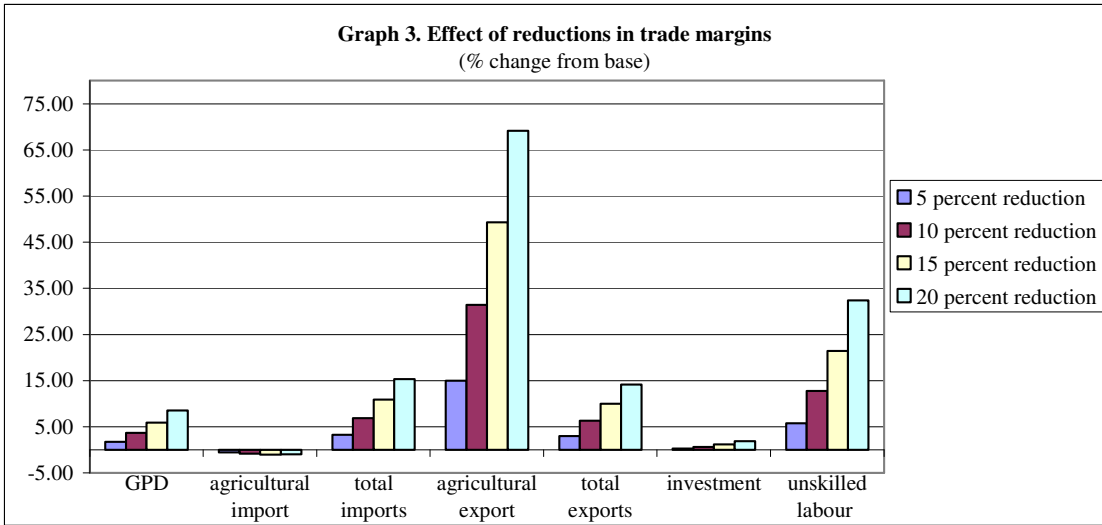
Table 8. Simulations with increasing degrees of tariff cut
(figures are percent deviations from base levels)

Experiments	GPD	Agricultural imports	Total imports	Agricultural exports	Total exports	Aggregate investment	Government savings	Unskilled labour	Exchange rate
BASE LEVELS	7.80	247.86	2093.46	225.72	1078.05	1.00	92.49	2.46	1.00
50 percent tariff cut	0.41	5.81	0.79	0.70	1.21	-2.65	46.8	1.32	1.66
60 percent tariff cut	0.49	7.07	0.96	0.85	1.46	-3.21	37.2	1.59	2.00
70 percent tariff cut	0.57	8.36	1.12	0.99	1.71	-3.78	27.5	1.87	2.35
80 percent tariff cut	0.65	9.70	1.29	1.14	1.97	-4.36	17.7	2.14	2.70
90 percent tariff cut	0.74	11.08	1.47	1.29	2.23	-4.95	7.7	2.42	3.05
elimination of tariffs	0.82	12.49	1.65	1.44	2.50	-5.55	-2.5	2.70	3.41

Source: Authors' calculations

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