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AGRICULTURE AND ECONOMIC TRANSFORMATION IN THE MIDDLE EAST AND NORTH AFRICA

A Review of the Past with Lessons for the Future

ALEJANDRO NIN PRATT, HODA EL-ENBABY, JOSE LUIS FIGUEROA, HAGAR ELDIDI, AND CLEMENS BREISINGER

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CONTENTS

TABLES

FIGURES

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1. INTRODUCTION

SINCE THE BEGINNING OF THE ARAB REVOLUTIONS IN 2010 AND 2011, global attention to the Middle East and North Africa (MENA) has focused mainly on political transitions, instability, and the resulting refugee crisis. Often neglected, however, are the economic implications that these developments have for MENA countries, especially for those that are not directly affected by conflict. In many of these countries, foreign direct investment and tourists are staying away, exports and imports are declining, and domestic consumption is falling (IMF 2016; World Bank 2016b). In addition to the impact of armed conflict and insecurity, external factors have also buffeted the MENA region in recent years. The global economic downturn of 2008 diminished oil demand, further decreasing the price of the region's main export and forcing the governments of oil-rich Arab countries to make significant budget cuts or increase debt levels. Oil-importing countries, including Egypt, Jordan, and Lebanon, are beginning to suffer from the resulting decreased demand for goods and services and decreased remittances from the countries of the Gulf Cooperation Council (GCC), a factor that is counteracting some of the positive impact of lower fuel import bills (Khouri and Breisinger 2016).

The recent political events are evidence of the serious development challenges that many countries in the MENA region face. Some of these challenges have been deeply rooted in the region for decades, such as dependence on oil exports, slow progress in export and production diversification, fast population growth, high unemployment, rising inequality, and persistent high food insecurity and rural poverty. Low job creation rates, high unemployment (particularly among youth), rising food prices, and higher rates of dissatisfaction with living standards have characterized many MENA countries during the 2000s and likely contributed to the 2011 uprisings (Breisinger, Ecker, and Al-Riffai 2011; Korotayev and Zinkina 2011; Ross 2012). Other political and institutional grievances also contributed to the revolutions, such as the extractive nature of political and economic institutions (Galal and Selim 2012). Tackling the region's development challenges will not only be important for getting countries back on the economic growth track and for improving people's lives, but also will contribute to stability. Therefore, now may be a good time for MENA countries to address some of their longstanding challenges.

In this context, and despite its relatively small contribution to gross domestic product (GDP) (13 percent on average in 2010–2014), agriculture has a strategic importance for the region. First, the region's limited available water and land is behind the growing con-

cern about food security and how to feed a fast-growing population with changing eating habits. MENA is one of the most water-scarce regions in the world, with a regional annual average of 386 cubic meters (m^3) of renewable internal freshwater resources per capita in 2014, only 6 percent of the world average of 5,922 m^3 (FAO 2016). Agriculture is central to water use, conservation, and security, as 85 percent of total water used in the region goes to irrigation; consequently, policies that contribute to the use of improved agricultural technology and more efficient water use practices will save water that can be used elsewhere. With growing food demand and high uncertainty about the future impact of climate change, efficient water use will become even more important for the region in the coming years. Arid and semi-arid regions are affected by droughts and wide climate variability, and the challenges are expected to worsen as population and income increase (Ibrahim and Mensah 2017).

Second, agricultural growth can help to improve food trade balances and to diversify exports. In several MENA countries, agricultural exports already constitute a substantial share of total exports. The comparative advantage of several crops such as fruits and vegetables can be explained mainly by favorable climate and the timing of the growing seasons combined with the geographic location. The climate favors the production of key agricultural exports such as olives, cotton, and fruits and vegetables. For fruits and vegetables specifically, the geographic proximity to Europe and the GCC allows for lower transportation costs compared to other world regions such as Latin America. In addition, the growing season in several MENA countries, especially in North Africa, starts earlier than in Europe, giving these countries the opportunity to provide food earlier to European markets than the European producers. However, many countries have neglected development of high-value agriculture for exports, instead prioritizing costly self-sufficiency policies promoting cereal production that have had high levels of inefficiency and yet have failed to achieve self-sufficiency. MENA has a high food import dependency; the region is the largest importer of wheat in the world, and most MENA countries import at least 50 percent of the food calories they consume (Paciello 2015). Because of the region's heavy reliance on food imports, increases in international food prices since 2007 have had severe adverse effects, causing inflation, trade deficits, fiscal pressure, increased poverty, and political instability (see Paciello 2015; Harrigan 2011; and Kamrava and Babar 2012).

Third, population growth in the past four decades has dramatically changed the demographic profile of the region. Between 1996 and 2006, the labor force in MENA has grown three times as much as in other developing regions. An overwhelming proportion of the population now consists of young people under the age of 30 (Malik and Awadallah 2013). In this context, agriculture and agro-processing still play a significant role in employment in low-income (LI) and lower middle-income (LMI) countries, where 50 percent of the total population in the region lives. The average MENA country employs 26 percent of its workers in the agricultural sector, whereas agriculture in the average LI and LMI countries employs 50 percent of the total labor force. The role of agriculture in employment is even more important when considering the region's high structural unemployment rate of 13 percent, compared with 6 percent on average for middle-income countries in other regions. Additionally, sluggish growth in agriculture pushes migration from rural areas to the cities, which are not able to create enough jobs to absorb the massive labor force that has resulted from 40 years of fast population growth.

Fourth, 70 percent of MENA's poor live in rural areas, as is the case in Yemen. In other countries, rural poverty is prevalent among certain types of households, like households headed by women and landless farm workers, and in regions such as Upper Egypt and specific areas of Iraq, Morocco, and Tunisia. Despite economic growth and structural changes in these economies, income distribution has not changed much, and there are indications of a worsening tendency in recent years (Hakimian, Karshenas, and Alami 2014). Agriculture and agriculture-related processing activities can thus be an important source of income generation in rural areas and can contribute to poverty reduction.

Finally, agricultural development in MENA's LI and LMI countries also has consequences for overall economic growth and development, as it affects the process of structural change. The movement of workers from low-productivity to high-productivity activities is an essential ingredient of inclusive growth and a defining characteristic of the development process, both a cause and an effect of economic growth (Syrquin 2006).

Given the strategic importance of agriculture in the region, the objectives of this report are to examine the drivers, constraints, and social implications of agricultural development in MENA, and to explore possible starting points for new sustainable development strategies. Specifically, it aims to provide a better understanding of the performance of the agricultural sector by elaborating on potential differences within MENA and between MENA and other regions. It addresses the following questions:

- For which agricultural activities do MENA countries have a comparative advantage in international markets? How important are these activities at present and what do they contribute to total output?
- What role could agriculture play in a future development strategy for the region, and what central elements should guide agricultural policies?
- What development strategies and policies did governments in MENA put in place in the past three decades and how did they affect the performance of agriculture?
- Which factors explain the relatively high levels of agricultural employment and low labor productivity in LMI countries and how did the economic transformation process in the region affect agricultural development?
- What policy changes are needed to increase agricultural productivity and facilitate labor reallocation to more highly productive jobs?

These research questions are relevant in the context of a conceptual framework that is founded on three well-established key concepts of agricultural development, extensively discussed by Barrett, Carter, and Timmer (2010). The first concept is that structural transformation is necessary if overall economic growth is to take place, as it is the only sustainable pathway out of poverty. At the start of this process in LI countries, labor reallocates from low-productivity agriculture to more productive manufacturing and services activities, increasing overall productivity and expanding income. Simultaneously, a demographic transition takes place, with birth and death rates declining as incomes grow and the importance of the urban economy rises.

The second concept from the agricultural development literature is the existence of two-way linkages between agriculture and other sectors. These linkages make agricultural transformation essential to overall economic development; simultaneously, the transformation and growth of industry and services are necessary conditions for agricultural development. For example, growth in nonagricultural activities is usually accompanied by increased urbanization, as the economy's center shifts from rural to urban areas and rural-to-urban migration rises, expanding incomes and changing consumer preferences. As consumers increasingly demand higher-quality, higher value-added agricultural goods and animal protein, producers respond by adapting their supply to these new demands through technical change and improved product quality, while demand and supply changes transform markets and institutions along the value chain between producers and consumers. Conversely, agricultural growth plays a key role in stimulating the nonagricultural economy by providing labor and capital freed up by higher agricultural productivity and by supplying raw materials for industry, food for nonagricultural workers, markets for industrial outputs, and exports to obtain the foreign exchange needed to import capital goods. Barrett, Carter and Timmer (2010) call these linkages "indirect Johnston and Mellor linkages" (see Johnston and Mellor 1961).

A third relevant concept relates to the distributional impacts of economic growth and agricultural development, which make the process of economic transformation painful for farm households and often generates a political response to compensate those households for their losses (Barrett, Carter, and Timmer 2010). The expected outcome of the four interrelated processes that define structural transformation (declining share

of agriculture in GDP and employment, rural-to-urban migration, the rise of a modern industrial and service economy, and the demographic transition to low birth and death rates) is the convergence of labor and capital productivity of agriculture, industry, and services, as observed today in high-income developed countries.

However, structural transformation is rarely a smooth process because of market and government failures, differences in factor endowments, and unevenness in the economic environment in which changes in different regions take place. Because of these frictions, there is a substantial gap between the share of labor in agriculture and the share of agriculture in GDP at early stages of the process. When GDP grows rapidly, the share of agriculture in GDP falls much faster than the share of agriculture in total employment, resulting in lagging agricultural income and political tensions. The standard government response to these tensions is to protect the agricultural sector from international competition or to use different policy instruments to support farmers. Only a few countries that were LI countries after World War II have made significant progress in this economic transformation process. For example, the transfer of workers from agriculture to manufacturing in the early industrializing Asian economies was rapid, leading to sharp increases in economic growth that were sustained for a prolonged period and to very low employment shares of agriculture. In 2010, employment in agriculture reached 7 percent in the Republic of Korea and 13 percent in Malaysia. The pace of structural transformation was slower in the late industrializing Asian countries, where large shares of employment in agriculture could still be observed in 2010 (for example, 38 percent in China and 51 percent in India as pointed out by Sen [2016]).

To answer the proposed research questions, this study combines cross-country comparative statistics with country case studies and is organized as follows: Section 2 presents a typology of MENA countries based on per capita income levels and highlights the strategic importance of the rural sector in MENA, especially for issues of food and water security, employment, and poverty reduction. It also looks at the region's comparative advantage in some agricultural activities that could use water and land more efficiently. Identifying activities for which the region shows a comparative advantage and comparing the importance of these activities to activities for which it has no comparative advantage is useful to define the role that agriculture could play in future development strategies. For example, a high share in total output of crops with no comparative advantage could indicate that policy is biased against activities with comparative advantage, which means that policy changes could result in increased importance of activities with comparative advantage, higher efficiency, and increased agricultural exports and output diversification. It is important then to identify the actual policies and policy changes that governments in the region have implemented, shown in section 3. Delving into individual country details, section 4 presents different productivity measures of the agricultural sector, relating performance to the policy and demographic changes discussed in section 3. The analysis uses different indicators, including the main sources of economic growth as first described in the Solow (1970) model: labor, capital, and total factor productivity (TFP). Unlike the neoclassical tradition, however, this report decomposes TFP into efficiency and technical change, allowing for inefficiency in production. The analysis of agricultural performance together with information on policies from section 3 are used to determine how country policies and the demographic changes of the past 20 years have affected agricultural development. Section 5 complements the previous section's analysis of agricultural sector performance by looking at the process of structural transformation in the region, and addresses the final two research questions proposed above. The analysis in section 5 uses traditional indicators such as labor and land productivity and sectoral shares in employment and GDP, along with more recent measures of labor productivity growth decomposition (McMillan and Rodrik 2012) and of the rural-urban productivity gap (Timmer 2007). Section 6 expands the transformation analysis to the subnational and household levels using Egypt and Tunisia as country case studies and taking a more in-depth look at the implications of economic changes for rural households in these countries. Section 7 summarizes the results and presents a conclusion.

2. AGRICULTURE IN THE MENA ECONOMY

AGRICULTURE IN THE MIDDLE EAST AND NORTH AFRICA (MENA) REGION contributes a relatively small share of the region's gross domestic product (GDP), about 13 percent on average (2010–2014), with 17 of the 24 countries in the region showing shares smaller than 13 percent. However, as discussed in the introduction of this report, this relatively small share does not fully reflect the strategic importance of the rural sector in MENA. Food insecurity and high dependence on imported food; the high impact of food price volatility on inflation and on the income of the poor; and the agricultural sector's disproportionate role in employment and in water use, conservation, and water security all contribute to the economic and political importance of agriculture in the MENA region, particularly for middle-income countries. This section briefly summarizes the economy and the agricultural sector of MENA countries.

THE MENA ECONOMIES

For the purposes of this overview, this section evaluates MENA countries based on their per capita income, highlighting differences in key structural features and the role that agriculture plays in these economies. This report classifies the MENA countries into three groups based on GDP per capita: high income (HI), upper middle income (UMI), and lower middle income (LMI).[1] Table 1 shows basic indicators and compares economic characteristics of countries in the three income groups.

The group of HI countries—Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE)—is a special case given the role of mineral resources in the countries' economic development. The share of this group in MENA's total population is only 11 percent but their share of regional GDP is almost 40 percent. With an average per capita income of $61,500, all countries in this group receive rents from exports of natural resources that represent, on average, 41.5 percent of their GDP, compared to 23 and 15 percent in the UMI and LMI groups respectively.[2] Historically, countries in the HI group were mostly subsistence economies that did not pass through the development stages that other countries usually experienced (Shihab 2001). The combination of low initial population numbers and high revenues from oil and gas exports that enabled them to import knowledge and modern technology have allowed rich oil-exporting countries to shortcut the usually difficult and lengthy process of saving and capital accumulation (including human capital) required for economic development.

The case of the UAE, included in the HI group, is a good example of the particular growth path these economies were able to follow, one that other countries in the region are unlikely to replicate. In 1970, before it became an oil exporter, the UAE (then known as the Trucial States) had a population of only 0.23 million people and an economy that depended mainly on subsistence agriculture,

TABLE 1 INCOME AND POPULATION IN MENA (2013)

Country	GDP per capita (1000s 2011$ PPP)	Share in regional GDP (percentage)	Population (millions)	Share in regional population (percentage)	Population growth (percentage)	Urban population (percentage)	Population density (per km^2)	Rents from natural resources (percentage of GDP)
Qatar	133.7	7	2	0.4	6.7	99	176	37
Kuwait	74.4	5	4	0.9	5.8	98	196	58
UAE	61.1	13	9	2.0	1.5	85	107	25
Saudi Arabia	48.7	24	30	6.7	1.4	83	14	47
Bahrain	41.3	1	1	0.2	1.5	89	1,739	24
Oman	39.8	3	4	0.9	6.9	77	12	38
HI	**66.5**	**52**	**49**	**11.0**	**4.0**	**88**	**374**	**38**
Libya	17.0	1	6	1.3	0.1	78	4	49
Iran	16.8	13	77	17.1	1.3	72	47	29
Lebanon	16.5	1	4	0.9	6.9	88	437	0
Iraq	14.3	7	33	7.3	3.3	69	77	44
Algeria	13.3	7	38	8.4	2.0	69	16	29
Jordan	11.4	1	6	1.3	2.8	83	72	2
Tunisia	10.5	1	11	2.4	1.2	66	70	6
UMI	**14.3**	**31**	**175**	**38.7**	**2.5**	**75**	**103**	**23**
Egypt	10.1	9	87	19.3	2.2	43	87	11
Syria	7.9	–	22	4.9	-2.7	57	118	24
Morocco	7.1	3	33	7.3	1.5	59	74	4
West Bank & Gaza	4.3	0	4	1.0	3.0	75	672	–
Sudan	3.9	2	38	8.4	2.4	33	16	8
Yemen	3.6	–	25	5.6	2.7	33	48	20
Mauritania	3.6	0	4	0.9	3.1	59	4	43
Djibouti	2.9	0	1	0.2	1.7	77	37	2
Comoros	1.4	0	1	0.2	2.4	28	399	3
Somalia	0.9	0	10	2.2	2.9	39	16	–
LMI	**2.9**	**14**	**225**	**50.0**	**1.9**	**49**	**170**	**15**

Source: Elaborated by authors based on World Bank (2016b).

Note: – = data not available. UAE = United Arab Emirates.

nomadic animal husbandry, pearl extraction, and fishing. Shihab (2001) points out that because of the abundance of oil and gas, the UAE developed resource-based industries and the social and economic infrastructure that allowed it to achieve significant economic development within the very brief timeframe of nine years between 1973 and 1982, a period of relatively high oil prices. Owing to the natural conditions of the country, agriculture has made only a small contribution to development in the UAE. However, the UAE has seen a consistent and substantial increase in the amount of land devoted to agriculture and forestry over the past 30 years, the result of sustained government efforts to promote agricultural development using different policy instruments and incentives.

Almost 40 percent of MENA's total population lives in UMI countries and produces about 30 percent of regional GDP. This group can be divided into two subgroups. The first subgroup includes oil exporters with high rents from natural resources: Libya with oil rents representing almost 50 percent of its GDP, Iraq with 44 percent, and Iran and Algeria with 30 percent. The second subgroup includes countries with oil rents below 11 percent of GDP: Lebanon, Jordan, and Tunisia.

Among the oil-exporting countries in this group, Iran is the second-largest economy in the MENA region after Saudi Arabia and has the second-largest population after Egypt. Iran's economy is characterized by a large oil sector, ranking second in the world in natural gas reserves and fourth in proven crude oil reserves, and small-scale agricultural and service sectors. As a result of the lifting of sanctions and the development of a more business-oriented environment, Iran's real GDP growth is projected to reach rates above 4 percent in the coming years, driven mainly by higher hydrocarbon production (World Bank 2016a). Algeria, also an oil exporter, is an interesting case in the UMI group because of the importance of its agricultural sector. Growth reached almost 4 percent in 2015, mostly driven by agriculture (especially vegetable production) and a rebound in oil and gas activity. However, the Algerian economy is still mostly dominated by oil exports and the drop in oil prices has affected its external position. The African Development Bank (AfDB 2016) concludes that Algeria should be speeding up reforms to diversify the economy and accelerate economic transformation, as it faces serious challenges to sustaining its development—especially in its urban areas, which are home to 70 percent of the total population.

In the group of countries with lower dependence on oil exports, the Tunisian economy has remained stagnant since the 2011 popular uprising. Key reasons for the stagnation are the slowdown in the tourism sector, which is mainly a consequence of weak growth in the European Union and attacks on foreign tourists in recent years (AfDB 2016); a decline in agricultural output because of adverse weather and a cyclical downturn in the olive harvest; and the shrinking of the oil and gas sector due to a decline in investment by foreign oil firms. The country had limited recovery prospects as of 2017, as growth in Europe—Tunisia's main trading partner—was expected to remain low and perceived uncertainties about the security situation may persist (EIU 2016i).

The group of 10 LMI countries is home to 50 percent of the region's population and includes four countries for which natural resources have a relatively high economic importance: Sudan, Syria, Mauritania, and Yemen. The main resources of Sudan are crude and refined petroleum, oilseeds, and sugar; wheat is one of its top imports. A study by Siddig (2012) shows that after 1999, when Sudan started exporting oil, its economy went through major structural changes: the contribution of oil to GDP increased from 2 percent in 1999 to 21 percent in 2007 and to an average of 8 percent thereafter (as shown in Table 1); and the dominant economic sector changed from agriculture to petroleum. Syria (before the ongoing civil war) also exported crude petroleum, raw cotton, calcium phosphates, and fruits, and received 24 percent of GDP in rents from natural resources. Similarly, Yemen, with natural resource rents representing 20 percent of GDP, continues to depend to a large extent on exports of crude and refined petroleum. At present, internal conflict has exacerbated already challenging economic conditions and a poor humanitarian situation in the latter two countries. According to official reporting cited by the World Bank (2016b), Yemen's GDP contracted in 2015 by approximately 28 percent as the result of widespread disruptions of economic activities and infrastructure destruction.

The third country in the natural resource export dependent group is Mauritania. Unlike other countries in the region, natural resource rents come from exports of iron and copper ore and gold, with oil being Mauritania's top import commodity. Its economy has experienced fast growth in recent years driven by the high price of iron ore and a well-managed macro economy with low inflation, viable fiscal deficits, and high foreign-exchange reserves. Rapid growth has resulted in a fast increase of the share of services in GDP (45 percent in recent years) and improvements in

household living conditions. As in other countries in the region, Mauritania's major development challenges are managing rapid urbanization, given that urban-population growth has increased the urban share in total population to about 50 percent in recent years.

The group of LMI countries less dependent on mineral resources are Egypt, Morocco, Djibouti, Comoros, and Somalia. The largest economy in this group is Egypt, the third-largest MENA economy (after Saudi Arabia and Iran), measured by the size of its GDP. As in many MENA countries since 2011, Egypt's economic growth had slowed, but recent improvements in political and economic stability plus an ambitious macroeconomic reform package has led growth to pick up again and is widely expected to reduce Egypt's persistent fiscal and chronic balance-of-payment deficits. In addition to the macroeconomic reforms and accompanying improvements in the social safety net, including the introduction of a cash transfer program for the poorest, further acceleration of inclusive and sustainable growth in rural and urban areas will be important for development (AfDB 2016).

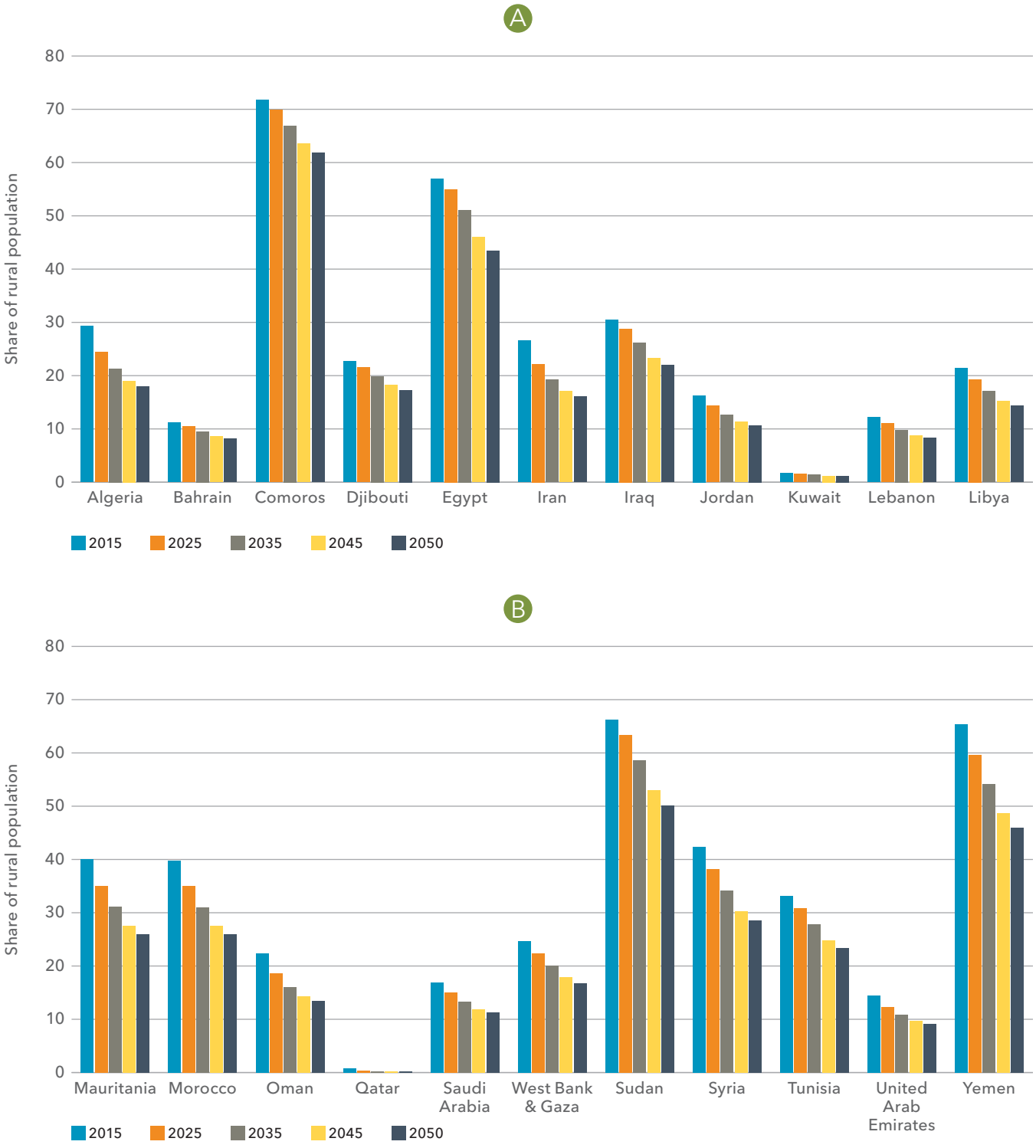
Morocco is the second economy in the LMI group with a share of 3 percent in regional GDP. At present, it is applying a proactive policy to improve its business climate and transform its economy. Major investments in port infrastructure and the TGV high-speed rail line are behind the automobile sector becoming the country's main exporter in 2015. One of the weaknesses to be overcome, according to the AfDB, is to reduce Morocco's dependence on the agricultural sector. Low rainfall in 2016 was expected to have a strong effect on agriculture and on overall GDP growth (AfDB 2016).

Somalia, by contrast, maintains an informal economy largely based on livestock, remittance/money transfer companies, and telecommunications, while Djibouti and Comoros, the smallest economies in MENA, account for only 2 percent of total population in the region. The size of their economies is the only common characteristic of these countries. Djibouti's economy, with little arable land and almost no agricultural tradition, is based upon service activities associated with the port at the capital city of Djibouti and the military bases rented by foreigners seeking a strategic location in the Horn of Africa, where the Gulf of Aden meets the Red Sea. Its main agricultural activity is traditional transhumant pastoralism. Chinese investment in recent years could change Djibouti's economic structure by developing special economic zones to attract processing industries as part of global value chains. The country is developing its ports infrastructure, and its economy has been growing by 7 percent annually in recent years. However, extreme poverty and unemployment remain endemic. Comoros is an outlier in the region, with a tropical climate, minor climatic variations due to differing island topography, and a humid hot season characterized by heavy rainfall. The main engines of growth in the past were agriculture, construction, tourism, public administration, and other services. The Comoran economy is currently facing a politically sensitive time following its recent presidential elections. The government also has to deal with electricity shortages, which will affect economic activity. In addition, fiscal deterioration might prompt it to undergo talks with the International Monetary Fund (IMF) for a new loan (EIU 2016c).

Population growth is high in most of the rich oil countries (Table 1).[3] In the UAE, for instance, this growth is the result of a combination of high natural rates of increase among the country's indigenous population and a massive inward migration of expatriates who comprise more than three-quarters of the population (Shihab 2001). Thus, a small indigenous population, a large expatriate population, and immense wealth generated by oil are among the dominant socioeconomic features of the UAE.

All countries in the region have experienced a decrease in the share of the population in rural areas in recent decades and projections for the coming years suggest that these trends will continue. Figure 1 presents projections for the share of the rural population for the period 2015–2050. As of 2015, around 40 percent of the population in these countries was rural. Only four MENA countries were markedly rural in 2015: Comoros, Egypt, Sudan, and Yemen, where more than half of the population lived in rural areas. In all other countries, the share of the rural population

FIGURE 1 SHARE OF RURAL POPULATION FOR MENA COUNTRIES (PERCENTAGE)



Source: Calculations based on United Nations (2014).

in 2015 was close to or below 40 percent and below 5 percent in Kuwait and Qatar. The four rural countries are the only cases where the share of the rural population is still expected to exceed one-third by 2050.

The incidence and depth of poverty in the region, measured as poverty gaps, declined between 1990 and 2008 (Table 2). These trends hold for two different poverty lines at $1.90 and $3.10 a day (2011 PPP). Similar conclusions can be drawn from other indicators such as the headcount ratio, although this indicator is not informative about the severity of poverty as it indicates only the number of people below a poverty threshold. For example, using $3.10 a day as the poverty line, it is notable that although 24 percent of the MENA population lived in poverty in 1990, this percentage had decreased to 14.3 percent in 2008. However, according to World Bank estimates, the pace at which poverty decreased in the region is slow if compared to that of Latin America. This slow decrease coupled with large population increases in the region resulted in a negligible decline in the actual number of poor since 1990 (World Bank 2017). Furthermore, trends after 2008 suggest that the MENA region is the only developing region where poverty has practically remained the same, whereas extreme poverty slightly increased (UN/LAS 2015). Nonetheless, inequality trends show a diverse landscape across countries in the region. For example, estimates by Hassine (2015) suggest moderate inequality levels in 12 Arab countries (average Gini index of 0.385), while total expenditure inequality has declined in some countries (Egypt, Jordan, and Tunisia) and increased in others (Syria, West Bank and Gaza, Djibouti, and Yemen). It has been difficult to measure inequality in the region, and information still remains scarce. In that sense, Ianchovichina, Mottaghi, and Devarajan (2015) refer to the difficulty in measuring economic inequality in the MENA region owing to the lack of administrative information on income and wealth, limited access to household surveys, and lack of other reliable sources of information such as tax records.

MENA'S COMPARATIVE (DIS)ADVANTAGE IN AGRICULTURE

The MENA region has a comparative disadvantage in agriculture, but several countries may still be able to increase exports or to reduce the amount of imports through sustained growth in agriculture (Table 3). The index of revealed comparative advantage (RCA) is a measure used in international economics for calculating the relative advantage or disadvantage of a certain country in a certain class of goods or services as "revealed" by observed trade flows, as originally

TABLE 2 POVERTY TRENDS IN THE MENA REGION

Indicator Name	Year					
	1990	1993	1996	1999	2005	2008
Poverty gap at $1.90 a day (2011 PPP) (%)	1.12	0.99	0.85	0.70	0.57	0.39
Poverty gap at $3.10 a day (2011 PPP) (%)	6.32	6.38	5.93	4.67	3.99	3.07
Poverty headcount ratio at $3.10 a day (2011 PPP) (% of population)	23.94	25.21	24.42	19.62	17.56	14.26
Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)	6.03	5.60	4.82	3.82	3.02	2.08

Source: Elaborated by authors based on World Bank (2017).

introduced by Balassa (1965). The RCA of commodity *j* is calculated as the share of *j* in the country's total exports divided by the share of *j* in total world exports. RCA index (RCAx) values greater than 1 mean that the country has a comparative advantage in commodity or sector *j*. For the purposes of this report, a country shows a competitive export advantage for *j* if its RCA is greater than 2.

Table 3 shows that all HI countries have a strong comparative disadvantage in agriculture, with the sole exception of UAE with RCAx > 1. Among UMI and LMI countries, only Jordan, Egypt, and Syria, with RCAs greater than 2, are competitive exporters of agriculture. Lebanon, Tunisia, and Morocco also have RCAx values greater than 1 and seem capable of competing in international markets. LMI countries like Somalia

TABLE 3 AGRICULTURE IN MENA (2010–2014)

	Share of agriculture in		Revealed comparative advantage in agriculture		Rural population (millions)	Arable land per 1000 people (ha.)	Agricultural land as percentage of country area
	GDP	Employment	Number of items	RCA			
Qatar	0.3	3.0	0	0.00	0.02	18	5.5
Kuwait	0.4	1.7	3	0.03	0.06	3	8.1
UAE	1.3	6.9	67	1.43	1.35	15	4.6
Saudi Arabia	3.4	6.3	8	0.14	5.17	167	69.2
Bahrain	0.4	1.9	7	0.35	0.14	3	12.0
Oman	1.6	7.6	13	0.28	0.86	15	3.9
HI	**1.2**	**4.6**	**16**	**0.37**	**7.60**	**37**	**17.2**
Libya	2.2	19.3	1	0.00	1.35	372	8.8
Iran	6.5	15.3	33	0.65	21.43	264	35.7
Lebanon	3.8	7.3	60	1.57	0.65	52	60.7
Iraq	6.0	18.6	2	0.01	10.41	235	20.7
Algeria	8.2	19.8	4	0.06	11.68	257	16.8
Jordan	3.9	5.0	60	2.31	1.41	57	12.0
Tunisia	11.3	25.1	28	1.16	3.69	331	60.3
UMI	**6.0**	**15.8**	**27**	**0.82**	**50.62**	**224**	**30.7**
Egypt	15.5	33.6	69	2.01	51.16	41	3.1
Syria	21.3	23.8	90	2.60	8.54	339	75.2
Morocco	16.5	43.6	42	1.47	13.80	310	67.6
West Bank & Gaza	4.5	12.0	3	0.18	1.05	29	43.5
Sudan	37.8	44.6	11	0.68	24.51	492	52.6
Yemen	12.7	43.6	20	0.34	17.02	97	44.6
Mauritania	40.1	58.7	3	0.17	1.63	161	38.5
Djibouti	3.6	75.2	8	8.43	0.20	2	65.0
Comoros	42.2	74.1	5	11.14	0.53	135	66.0
Somalia	68.0	70.0	10	8.55	8.06	148	70.0
LMI	**27.5**	**49.5**	**26**	**3.60**	**126.50**	**190**	**58.1**

Source: Elaborated by authors based on World Bank (2016b), ILO (2016).

Note: RCA = revealed comparative advantage in agriculture measured as the share of agriculture in the country's total exports divided by the share of agriculture in total world exports. Values > 1 mean that the country has a comparative advantage in agriculture. RCA for Syria is calculated for the period 2007–2010, before the conflict that started in 2011.

and Comoros show very high RCAs in agriculture, but this may reflect the fact that these countries' exports are concentrated in a few items (between three and eight exported items) and seem to be the result of poor, underdeveloped economies. The agricultural sector of LMI countries contributes 27 percent to GDP and employs almost half of the population. Although this ratio is not unusual, Djibouti is an extreme case, where agriculture contributes only 3.5 percent of GDP but employs three-quarters of the population.

The region shows a comparative advantage for specific commodities. Table 4 presents a list of commodities that represent 50 percent of the region's total agricultural exports. Fruits, vegetables, oil crops, and some livestock products seem to have the highest potential to expand exports of agricultural products.

TABLE 4 MAIN EXPORT COMMODITIES FROM MENA COUNTRIES, RCA, AND SHARE IN TOTAL AGRICULTURAL EXPORTS (AVERAGE VALUES 2010–2013)

Rank	Item	RCAx	Share in ag. exports (percent)
	Agricultural products, total	**1.1**	**50.0**
1	Pistachios	51.0	3.0
2	Tomatoes	44.6	2.9
3	Oranges	49.9	2.4
4	Dates	103.6	2.2
5	Oil, olive, virgin	56.2	2.0
6	Cheese, processed	45.2	1.7
7	Food prep nes	2.8	1.7
8	Spices, nes	43.8	1.6
9	Sugar, refined	35.1	1.6
10	Pastry	2.7	1.5
11	Crude materials	2.8	1.5
12	Juice, fruit nes	3.8	1.3
13	Tangerines, mandarins, clementines, satsumas	56.4	1.2
14	Potatoes	18.8	1.1
15	Oil, rapeseed	2.1	1.1
16	Sugar, confectionery	3.9	1.0
17	Cheese, whole cow milk	3.3	1.0
18	Tea	2.2	1.0
19	Tomatoes, paste	9.2	0.9
20	Cotton lint	6.2	0.9
21	Oil, maize	46.6	0.9
22	Milk, whole dried	8.9	0.9
23	Chilies and peppers, green	9.3	0.8
24	Raisins	20.6	0.8
25	Apples	11.6	0.8
26	Sesame seed	189.4	0.8
27	Onions, dry	35.6	0.8
28	Beans, green	137.9	0.8
29	Cucumbers and gherkins	40.8	0.8
30	Grapes	14.8	0.8
31	Olives, preserved	45.2	0.7
32	Flour, wheat	5.1	0.7
33	Fruit, prepared nes	4.9	0.7
34	Oil, soybean	6.1	0.7
35	Rice total (Rice milled equivalent)	4.8	0.7
36	Buttermilk, curdled, acidified milk	3.6	0.7
37	Ice cream and edible ice	8.4	0.6
38	Yogurt, concentrated or not	10.2	0.6
39	Macaroni	9.7	0.5
40	Peaches and nectarines	22.7	0.4
41	Strawberries	17.8	0.4
42	Watermelons	9.5	0.4
43	Milk, skimmed cow	7.3	0.4
44	Anise, badian, fennel, coriander	184.1	0.4
45	Beverages, nonalcoholic	6.2	0.4
46	Melons, other (including cantaloupes)	19.1	0.4
47	Oil, sunflower	4.6	0.4
48	Fruit, fresh nes	16.9	0.4
49	Cigarettes	3.0	0.4
50	Vegetables, frozen	10.4	0.3

Source: Elaborated by authors using data from FAO (2016).

Note: RCAx is an index of revealed comparative advantage calculated as: RCAx = (X*ij*/X*j*)/(X*iw*/X*w*) where X=exports, *i* = exported item, *j* = country, *w* = world. For this table, a country shows a comparative advantage for an export item if RCAx > 2. nes = not elsewhere specified.

Water is the key factor constraining agricultural production in most MENA countries. Given the mostly arid climate of the region, there is not enough land to expand production where irrigation water is sufficient or available. HI countries are in the group with the lowest levels of rainfall and internally generated renewable water (Table 5), which explains their high comparative disadvantage in agriculture. LMIs on average have a more favorable climate and depend less on irrigation relative to the two other groups, except for Egypt, the country that has the lowest (available) effective rainfall in the MENA region and depends fully on irrigation. The UMI group has a high variation in levels of effective rainfall, with Lebanon having the highest levels of effective rainfall in the group and a low percentage of arid croplands. Yet Lebanon also

TABLE 5 WATER IN THE MENA REGION (1981–2012 AVERAGE)

	PEF	PET	IRW	Irrigated area (%)	Crop area in arid / semi-arid AEZ (%)	Average LGP	Water resources per capita (m^3)	
							1972	2014
Qatar	57	1,911	7.8	76.0	100	30	451	17
Kuwait	–	–	–	63.2	100	30	1,803	353
UAE	–	–	–	100.0	100	30	429	24
Saudi Arabia	41	1,769	6.5	45.9	100	30	375	78
Bahrain	–	–	–	65.2	100	30	0	0
Oman	–	–	–	83.0	100	76	17	3
HI	**49**	**1,769**	**6.0**	**72.0**	**100**	**38**	**513**	**79**
Libya	21	1,680	12.0	20.2	46.3	168	301	113
Iran	135	1,313	50.2	44.8	89.5	81	4,273	1639
Lebanon	357	1,383	3.0	30.6	11.1	118	1,986	857
Iraq	107	1,567	14.1	61.3	30.4	129	3,321	1006
Algeria	41	1,493	27.9	6.1	1.9	30	732	288
Jordan	60	1,573	1.4	24.9	40.4	121	363	77
Tunisia	171	1,416	8.2	7.7	10.1	158	793	376
UMI	**127**	**1,489**	**17.0**	**28.0**	**33.0**	**115**	**1,681**	**622**
Egypt	9	1,652	0.3	100	100	35	49	20
Somalia	–	–	–	–	–	–	1,727	444
Syria	157	1,459	9.2	18.5	13	51	1,049	371
Morocco	126	1,451	23.8	14.6	12	50	1,737	845
West Bank & Gaza	–	–	–	5.3	18	138	–	189
Sudan	174	1,748	52.5	11.5	59	117	–	102
Yemen	128	1,997	6.4	31.3	100	30	328	80
Mauritania	67	1,822	7.9	10.5	100	30	328	98
Djibouti	126	2,108	0.8	87.1	100	30	1674	329
Comoros	–	–	–	0.1	7	30	5,016	1,580
LMI	**112**	**1,748**	**14.0**	**31.0**	**56**	**57**	**1,488**	**406**

Source: Elaborated by authors based on Lee et al. (2009).

Notes: – = data not available. PEF = Effective rainfall (mm/yr) : portion of total rainfall available for crop growth averaged over a country. PET = Reference evapotranspiration (mm/yr): maximum crop evapotranspiration for a reference crop averaged over a country. IRW = Internal renewable water resources (in billion m^3/yr): available water resource generated within the boundaries of a country. AEZ = Agroecological zone. LGP = Length of growing period. Water resources = renewable internal freshwater resources per capita (m^3).

faces a slightly different land constraint, as its sloping mountainous topography and limited areas hinder agricultural land expansion. Moreover, the Maghreb countries (Algeria, Morocco, and Tunisia) are affected by constraints related to high variability in rainfall.

The last two columns in Table 5 show the level of internal renewable water resources per capita in 1972 and 2014. Growing population pressure has reduced significantly the amount of water availability in the region. On average, LMI and UMI countries reduced water resources from 1488 to 406 cubic meters (m^3) and from 1681 to 622 m^3 per inhabitant, respectively. Reig, Maddocks, and Gassert (2013) found that 36 countries face "extremely high" levels of baseline water stress, which means that more than 80 percent of the water available to agricultural, domestic, and industrial users is withdrawn annually, leaving businesses, farms, and communities vulnerable to scarcity. Fifteen countries with extremely high levels of water stress are in the MENA region: Bahrain, Comoros, Iran, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, West Bank and Gaza, Qatar, Saudi Arabia, Somalia, UAE, and Yemen.

The comparative disadvantage for food production in the region, due to poor agroecological conditions and rapid population growth, explains the high and growing level of cereal import dependency. Agricultural development is important not only for economic growth and prosperity, but also for national food security, as the MENA region is highly exposed to food-related "external shocks" (Breisinger et al. 2012). Additionally, the food import bill in MENA is among the largest in the world, as it accounts for 13.6 percent of MENA's total merchandise imports—comparable to but still higher than sub-Saharan Africa's 12 percent and much higher than every other world region (Breisinger et al. 2012). Most MENA countries have more than a 40 percent rate of cereal import dependency; Egypt in particular is the world's largest wheat importer (FAOSTAT 2016). Sudan is the least dependent on cereal imports, importing only 26 percent of its needs.

However, high food import dependency does not necessarily mean national food insecurity, particularly for HIs. National food security does not only depend on having sufficient locally produced food. The Global Food Security Index (EIU 2016e) presented in Table 6 measures "the state in which people at all times have physical, social and economic access to sufficient and nutritious food that meets their dietary needs for a healthy and active life." The index is calculated using three indices—affordability, availability, and quality and safety of food—each of which include several variables. The HI MENA countries are among the most food secure countries in the world, with overall index values between 80 and 90 percent of those in the United States. A second group of countries with index values of about two-thirds of those in the United States includes Egypt, Jordan, Morocco, and Algeria. Syria, Sudan, and Yemen were among the most food insecure countries in the world in 2016.

TABLE 6 GLOBAL FOOD SECURITY INDEX (2016), VALUES RELATIVE TO THE UNITED STATES (MOST FOOD SECURE COUNTRY) INDEX

Global ranking	Country	Overall score	Affordability	Availability	Quality and Safety
20	Qatar	89	109	72	89
26	Oman	85	87	84	84
27	Kuwait	85	97	74	85
30	UAE	83	100	69	79
32	Saudi Arabia	82	89	77	79
33	Bahrain	81	92	74	71
53	Tunisia	67	66	66	72
58	Egypt	66	54	77	66
60	Jordan	66	67	67	60
62	Morocco	64	61	67	65
66	Algeria	63	61	66	58
96	Syria	42	38	47	39
99	Sudan	40	34	41	51
100	Yemen	39	44	40	26
113	World's most insecure (Burundi)	28	18	33	39

Source: Elaborated by authors from EIU (2016e).

Note: Affordability = Ability of consumers to purchase food, their vulnerability to price shocks, and the presence of programs and policies to support customers when shocks occur. Availability = Sufficiency of the national food supply, the risk of supply disruption, national capacity to disseminate food, and research efforts to expand agricultural output. Quality and safety = Measures of the variety and nutritional quality of average diets, as well as the safety of food.

3. ECONOMIC AND FOOD POLICIES IN MENA: AN OVERVIEW

AS DESCRIBED IN THE PREVIOUS SECTION, THE COUNTRIES OF THE MENA region have diverse economies in terms of resources, policies, history, and ideological orientation. Despite these differences, Malik and Awadallah (2013) argue that their common denominators justify an overall look at these countries' economic development, policies, and trends because doing so can provide further insights into the region's economic performance. These common denominators are (1) concentration of economic and political power, with a centralized state and a strong public sector; (2) primacy of external revenues: oil, aid, and remittances; (3) profound demographic shifts; and (4) importance of food security and water scarcity. The first three factors are discussed in Malik and Awadallah (2013). This report adds the food and water security factor, as it has played a major policy and political role in the region and is directly related to the discussion of development strategy (Yousef 2004). These common denominators have proved deeply resilient and have conditioned MENA policy developments for the past 40 years.

The origins of the strong public sector and the concentration of economic and political power can be traced back, per Yousef (2004), to the development strategy that most countries in the region followed after independence in the 1940s. This strategy was based on the view that economic transformation could be accelerated by a defined series of public policies and interventions. Its core elements included investment in large-scale infrastructure and state-owned enterprises, utilization of rural labor surplus, adoption of import substitution industrialization strategies, and protectionist policy interventions in international trade and domestic markets (Breisinger and Diao 2008). Although many other developing countries adopted similar strategies during this period, Yousef argues that the MENA experience has a distinctive character because it was associated with the political, social, and economic changes that reshaped the political economies of the region, including the high level of military expenditures, antagonistic relations between states and private sectors, and high levels of regional conflict. In this context, the protectionist policies were more than instruments in a development strategy; rather, they were means through which governments of the newly independent countries built their political power. According to Yousef, in that era countries in the MENA region viewed the political arena as an instrument for nation building and an expression of the unity of the nation rather than a site of political contestation. Through subsidies, economic controls, and other uncompetitive practices, the state became the most important economic actor in most MENA countries.

External revenues, such as oil exports, played a central role in this state-led development strategy. MENA states developed welfare systems that became mechanisms for distributing wealth to citizens, wealth that originated from the flow of external revenues from oil, aid, and remittances. Algeria, Iraq, and Saudi Arabia benefited from oil revenues, whereas labor-exporting countries like Egypt, Jordan, and Yemen used remittances from millions of migrant workers in the oil-exporting countries. Loans, grants, and other forms of assistance from oil-producing states to non-oil producers boosted government revenues and sustained distributive commitments. These financial flows from oil producers to labor exporters created a new pan-Arab economy where states without oil became dependent on the income earned by their migrant workers (Halliday 1984).

Demography, according to Malik and Awadallah (2013), is the third common denominator that has shaped the economies of the MENA region. In the past 40 years, the region has been undergoing a demographic transition, reducing its fertility rate from 7.0 children per woman between 1950 and 1970 (the highest in the world) to 2.7 in 2014. High fertility rates and population growth significantly affected the regional economy through changes in the age distribution of population that directly affected per capita GDP growth.

Finally, food security and water scarcity are a major concern in the region, as the challenge of securing sufficient food for a fast-growing population with limited available water and land is becoming a major challenge for many MENA countries, in particular middle-income countries. Agriculture and related sectors are also important for several other reasons. They are a source of employment; they often are the focus of poverty reduction policies, as poverty is prevalent in certain areas and associated with certain types of households; and they often factor into political stability, which could be threatened by increases in food prices and growing income differences between rural and urban workers.

DEVELOPMENT STRATEGY AND POLICY CHANGES, 1955–2013

Following Yousef (2004), this report identifies three different periods of policy development between the 1950s and 2000: (1) high public investment from the 1950s to 1972, (2) the oil bust and economic crisis from 1973 to 1984, and (3) policy changes from 1985 to 2000. To these, it adds a fourth period: accelerated growth and the post-2008 crisis, from 2001 to 2015. Figure 2 shows the evolution of labor productivity in the MENA region between 1955 and 2015 as an indicator of economic performance. It illustrates the first period of high growth from 1955 to 1972, when labor productivity increased at an average rate of 4.7 percent, followed by declining growth rates after the oil crisis period that reached a historical low of −6.0 percent in 1987. The slow recovery started after implementation of reforms and policy changes by the end of the 1980s. Labor productivity growth accelerated in the 2000s with an average growth rate of 5.0 percent between 2001 and 2008, but the 2008 crisis reversed the accelerating trend of labor productivity growth rates with average growth of 4.0 percent in the past six years.

After independence, and until 1972, the MENA region went through a period of nation-state consolidation, a time during which most countries established state interventionist policies with massive public investments in infrastructure, health, and education, as well as in state-owned enterprises in protected industries (Yousef 2004). In this period, the total number of workers increased by 52 percent, while labor productivity increased by an average of 4.7 percent. As a result of these investments, rapid economic growth was accompanied by dramatic gains in a number of social indicators, open unemployment was low, and workers increasingly became more educated owing to resources devoted to human capital accumulation. Yousef (2004) reports that during this period, MENA countries witnessed dramatically reduced infant mortality, increased life expectancy, school enrollment levels approaching 100 percent, and increased literacy levels from an average of 40 percent to almost 60 percent of the adult

population. Government spending was sustained by large oil revenues and migrant worker remittances.

Declining oil prices in the 1980s were the trigger of the regional economic crisis, and revealed the problems with the development strategy that MENA countries had followed. With lower oil prices, demand for migrant labor shrank, and with it so did the flows of remittances, public revenues, and government capacity to sustain distributive commitments and public investment. The crisis was aggravated by domestic regulatory environments that discouraged private investment and created obstacles for development of non-oil exports and for the regional economy's integration into global markets. As Figure 2 shows, growth in labor productivity collapsed from 7.6 percent annually in 1972 to −6.0 percent in 1987.

The collapse of this early development strategy prompted countries in the MENA region to embark on policy reform and economic stabilization programs in the mid-1980s. By reducing public expenditure and reforming exchange rate regimes, MENA governments were able to reduce debt levels and bring inflation under control by the early 1990s. Structural reforms included privatization of state-owned enterprises, trade liberalization, deregulation, and strengthening of the institutional foundations for a market-led economy (Dogruel and Tecke 2011). However, these structural economic reforms were not implemented completely. A 2002 study by Dasgupta, Keller, and Srinivasan concluded that the MENA region's economic reforms were limited and that the private investment response was slow. Sustained improvement in productivity performance appeared to be tied to the regional economy's rapid and successful diversification into traded goods and services and away from excessive dependence on oil exports. Overall, the region's economic performance between 1985 and 2000 was weak. During this period, labor productivity growth averaged −0.9 percent annually. This slow economic recovery was accompanied by growing unemployment, a result of the increasing economically active population and governments' reduced capacity to generate public employment (Figure 2). According to Yousef (2004), first-time job seekers between the ages of 15 and 24 made up more than

FIGURE 2 MENA LABOR PRODUCTIVITY TRENDS AND GROWTH RATES

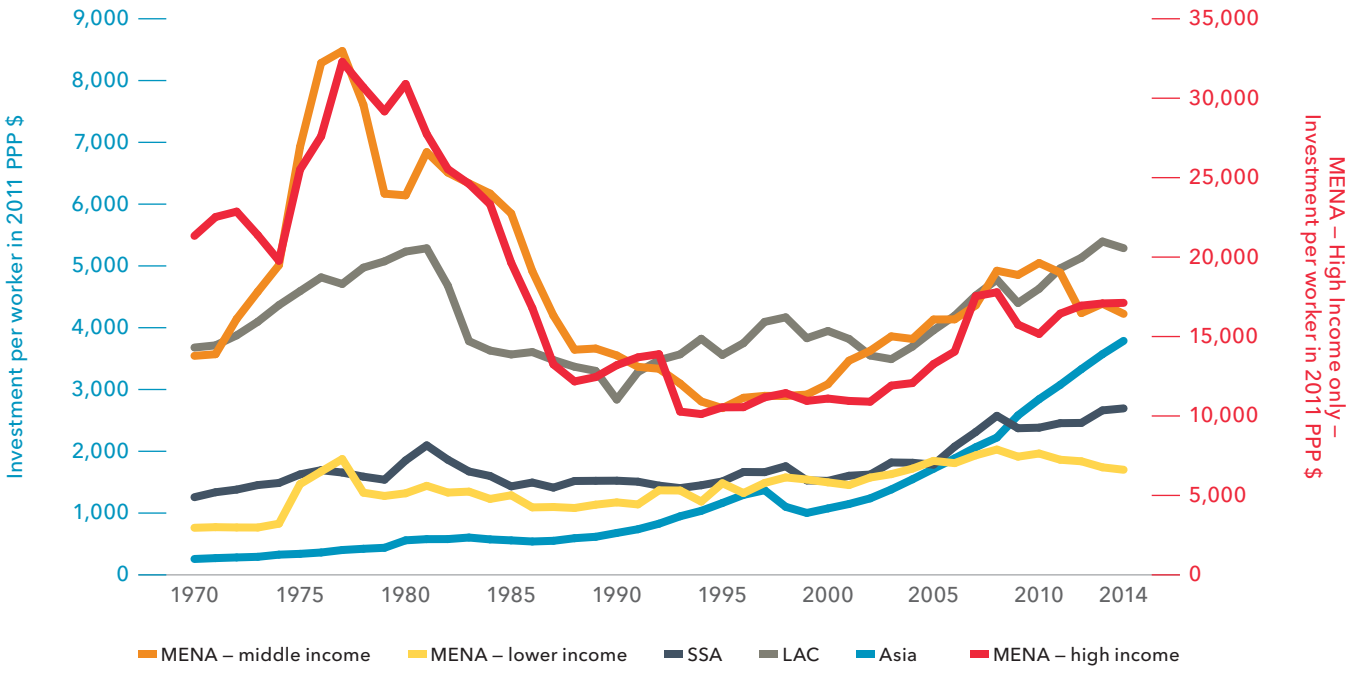
Source: Elaborated by authors based on Feenstra, Inklaar, and Timmer (2015).

50 percent of the unemployed. Poor labor market outcomes in the 1990s also extended to real wages, which either stagnated or declined in most countries, extending a trend that had begun in the 1980s (Yousef 2004).

Investment in MENA followed the economic patterns of boom and bust, with high growth during the period of high oil prices in the 1970s (5.5 percent), a long period of contraction after the collapse of the state-led development model (−9.5 percent between 1981 and 1990, −2.2 percent in the 1990s), and recovery after the reforms and policy adjustments, with almost 4.0 percent growth between 2001 and 2010 and 2.5 percent growth between 2011 and 2014. The average growth rate of investment per worker for the period 1971–2014 was negative (−0.3 percent), compared to 1.7 percent in Africa south of the Sahara (SSA), 0.8 percent in Latin America and the Caribbean (LAC), and 6.2 percent in Asia.

Despite weak and varying performance, investment per worker in MENA followed the same pattern in oil-rich, UMI, and LMI countries. Figure 3 compares levels of investment per worker in MENA countries with such investment in other developing regions. The peak of investment in the region occurred in 1977, followed by a period of negative growth and a recovery that started earlier in LMIs (1996, compared to early 2000s in HIs and UMIs). LMI countries reached levels of investment comparable to those of the 1970s whereas investment per worker in HI and UMI countries reached levels only roughly half of those at the 1977 peak. On average for the period considered here, the LMIs performed best, increasing investment per capita at 1.8 percent annually between 1971 and 2014. Growth in UMIs was low and close to zero (0.39 percent), and HIs showed negative growth on average for the period (−0.49 percent).

FIGURE 3 TRENDS IN INVESTMENT PER WORKER, MENA COUNTRIES GROUPED BY INCOME AND OTHER DEVELOPING REGIONS (1970–2014)



Source: Elaborated by authors based on Feenstra, Inklaar, and Timmer (2015).

Note: Asia includes developing countries in South, Southeast, and East Asia. Investment includes residential and nonresidential structures, machinery and equipment, and other assets. SSA = Africa south of the Sahara. LAC = Latin America and the Caribbean.

Table 7 shows growth rates of investment per worker by country, grouped by income level. The best performers among HIs were Oman (2.1 percent) and Kuwait (1.4 percent), with other countries showing low or negative growth rates of investment. Egypt, with an average growth rate of 4.2 percent, was the best performer among LMIs. Iraq (2.5 percent), along with Jordan and Tunisia (1.7 percent), also showed relatively high investment growth compared to other countries in the region. Sudan, included in the LMI group, saw the MENA region's highest average growth rate in investment per worker between 1971 and 2014 (5.4 percent). In the LMI country group, Djibouti (3.4 percent) and Yemen (3.6 percent) also showed high growth rates.

The economic performance of the past 15 years reflects the struggle that MENA economies went through to resume economic growth after policy and structural changes that did not go far enough to dismantle the region's state-led development strategy. After the Arab revolutions that began in late 2010, civil conflicts and their spillover effects have continued to limit progress in improving economic development and social outcomes and in achieving the Millennium Development Goals (Khouri and Breisinger 2016). Even relatively stable countries in transition, such as Egypt and Tunisia, continue to suffer from macroeconomic uncertainty, slow growth, and high unemployment, which can be partly explained by dramatic drops in tourism and foreign direct invest-

TABLE 7 GROWTH RATES OF INVESTMENT PER WORKER FOR MENA COUNTRIES IN DIFFERENT PERIODS (PERCENTAGE)

	1971–1980	1981–1990	1991–2000	2001–2010	2011–2014	1971–2014
HI						
Bahrain	−1.9	−3.0	−0.9	2.6	−9.0	−1.6
Kuwait	5.6	−8.6	−0.7	9.9	0.5	1.4
Oman	4.0	−3.8	2.8	8.3	−4.8	2.1
Qatar	−4.6	−9.8	7.4	8.6	5.7	0.5
Saudi Arabia	3.9	−11.3	1.8	7.2	2.1	0.4
UAE	−1.6	−7.4	−3.4	−3.5	4.0	−3.3
UMI						
Algeria	3.5	−4.6	−2.3	3.9	3.2	0.4
Iran	4.0	−5.5	3.4	5.0	−8.3	0.8
Iraq	11.9	−4.3	−14.1	17.6	6.1	2.5
Jordan	14.0	−6.4	−3.5	2.5	2.3	1.7
Lebanon	–	2.7	−1.3	4.5	−5.4	1.0
Tunisia	7.3	−2.8	1.4	2.1	−2.1	1.7
LMI						
Egypt	13.6	1.8	1.2	3.6	−4.7	4.2
Comoros	–	−9.3	−4.8	2.4	−24.6	−6.5
Djibouti	–	2.6	−11.1	14.5	20.0	3.4
Morocco	3.1	−0.1	3.0	1.4	0.2	1.7
Sudan	1.6	−3.2	17.3	13.0	−7.7	5.4
Syria	11.0	−6.9	0.5	6.2	−14.3	1.0
Yemen	–	−4.5	5.9	7.3	−7.8	3.6

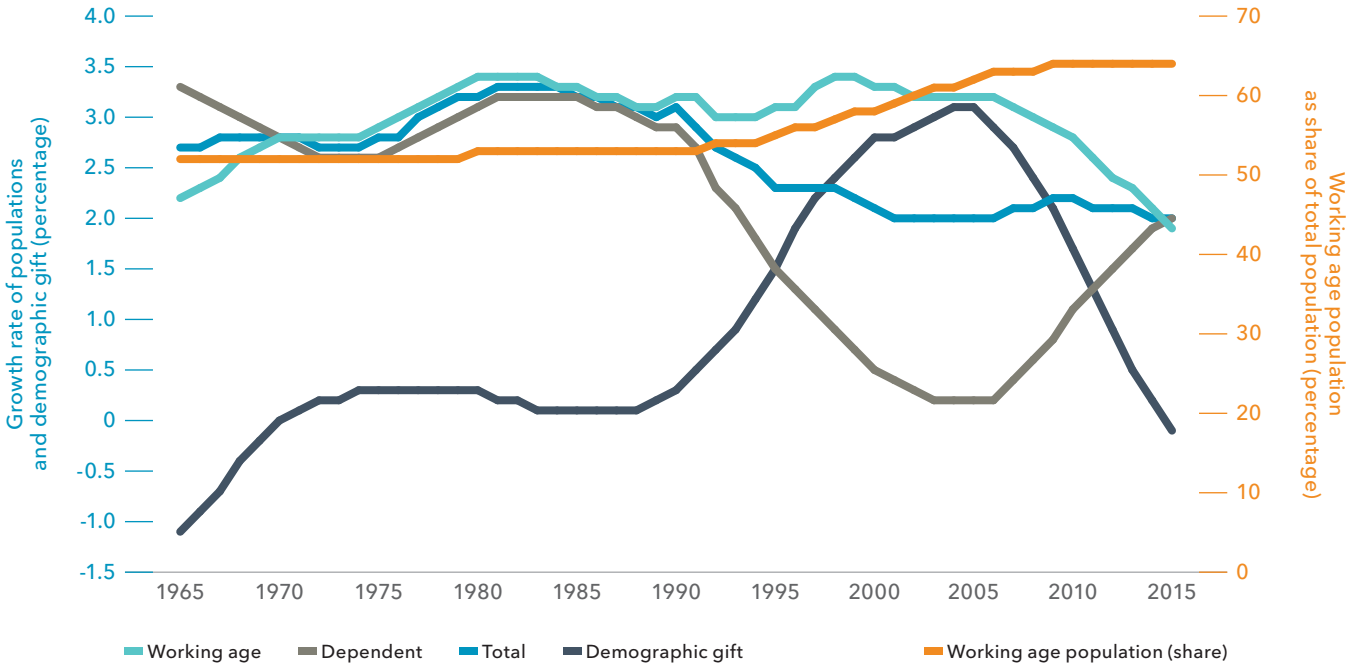
Source: Elaborated by authors based on Feenstra, Inklaar, and Timmer (2015).

Note: – = data not available.

ment. In fact, the uncertainty and insecurity in many countries have made it more difficult to implement policies that promote inclusive transformation.

Malik and Awadallah (2013) and Yousef (2004) offer explanations for the slow recovery of MENA economies and the difficulties that governments still face in implementing reforms. These explanations recall the common denominators of the MENA regional economy: strong government, external revenues, and demography. As discussed earlier, the demographics of the region are behind the rapid growth of the labor supply. Figure 4 shows growth rates of the working-age population (between ages 15 and 64), the dependent population (younger than 15 and older than 64 years of age), and the total population, as well as the percentage of 15- to 64-year-olds in the total population. This working-age population in MENA grew at an annual rate of 3.0 percent between 1965 and 2015, while the dependent population increased at an average rate of 2.1 percent. Because of this growth, the share of the working-age population increased from about 50 percent to 64 percent between 2000 and 2015, a value similar to that of East Asia in the 1980s. Thus, between 2000 and 2015 MENA enjoyed what is called a demographic gift or demographic dividend—a boost in labor productivity that occurs when the number of people in the workforce increases relative to the number of dependents. With the working-age population growing by 2.8 percent and dependent-age population growing by only 0.9 percent, the MENA region benefited from a demographic dividend of almost 2.0 percent per year between the late 1990s and 2005. This benefit coincided with the period of fastest labor productivity growth between 1995 and 2005, as shown in Figure 2. As Figure 4 shows, however, these demographic trends reversed after 2005, with the growth rate of the dependent population increasing and that of the active population decreasing.

FIGURE 4 GROWTH RATES OF WORKING-AGE, DEPENDENT, AND TOTAL POPULATIONS IN MENA, THE DEMOGRAPHIC GIFT, AND SHARE OF WORKING-AGE POPULATION IN TOTAL POPULATION



Source: Elaborated by authors based on World Bank (2017).

Note: Demographic gift = ratio of active to dependent populations.

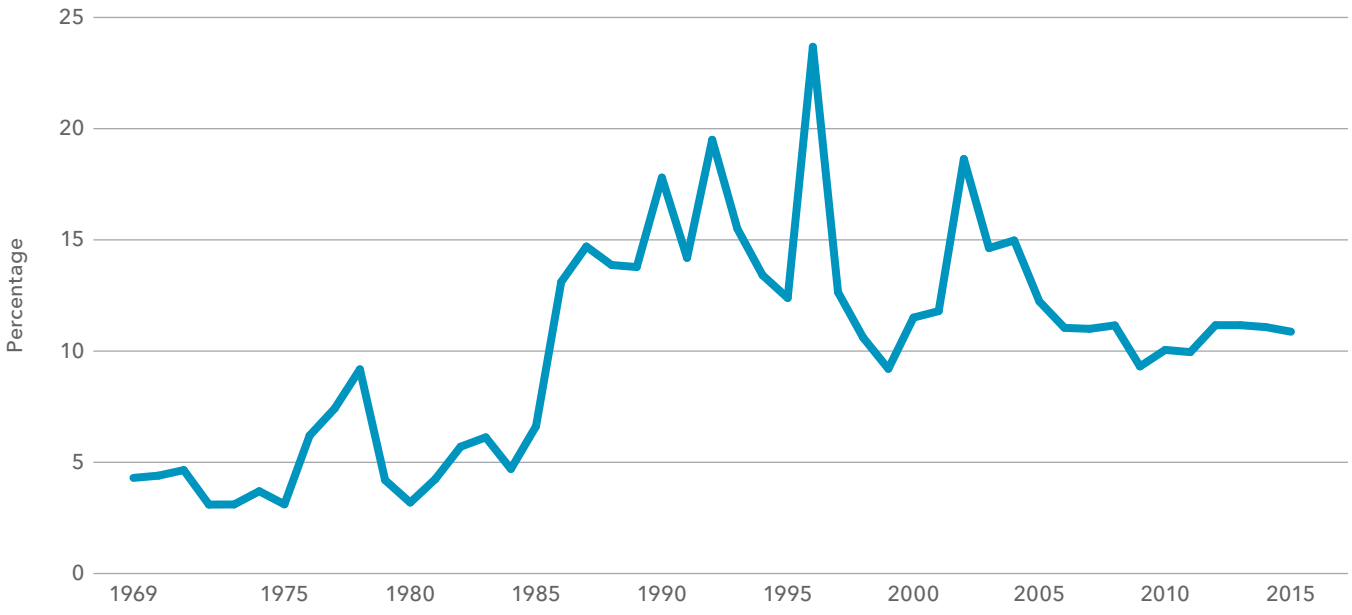
By 2015, the two rates were equal, and the dependency ratio should increase in the coming years. MENA's demographic dividend has run its course.

The population trends shown in Figure 4 also have had an enormous impact on labor supply in the region, creating intense pressures on labor markets. The region's average labor force growth accelerated from 2.0 percent between 1962 and 1971 to 3.5 percent between 1980 and 2000, and to 3.7 percent after 2005. These rates show that labor force growth in MENA is substantially higher than in any other region in the world. Yousef (2000) indicates that MENA labor force growth rates will not fall to the more moderate rates seen in the 1960s until the year 2020.

For Yousef (2004), the efforts that governments have made to limit hiring and downsize the public sector cannot go far enough without government bureaucracies in the region losing their dominant position in labor markets. The share of government employment in MENA continues to be high by international standards, and educated workers continue to queue for public sector jobs. Labor markets in the region still have a wide range of structural rigidities that limit private sector hiring incentives. When implementing structural reforms in the 1990s, MENA region governments made few attempts to deregulate labor markets or to encourage employment creation. This limited reform of labor markets led to the growth of informal employment and the expansion of unregulated employment in the formal private sector (Wahba and Mokhtar 2002). As Figure 2 shows, the MENA economy did not show clear signs of recovery until the 2000s, when GDP per capita growth rates increased from 3 to 11 percent.

How did policy reforms affect employment? As Figure 5 shows, the low unemployment rates of the 1960s were not replicated in the following decades. After the policy reforms, and coinciding with the slow recovery of the economy, unemployment rates remained above 15 percent. Unemployment decreased during the region's accelerated growth after 2000 but remained above 10 percent, showing that high growth rates were needed to absorb the growing labor supply.

FIGURE 5 MENA REGION UNEMPLOYMENT RATE



Source: Elaborated by authors based on World Bank (2017).

The slow recovery of the MENA economies is tied to the so-called Dutch disease, also referred to as the "curse of natural resources" (Sachs and Warner 2001). Economies that are rich in natural resources often underperform in the long run because the increased income from natural resource exports has two negative effects. First, it raises demand for nontradable products, increasing the allocation of skilled workers and physical capital to nontradables and constraining the growth of non-oil competitive sectors. Second, this reduced competitiveness is reinforced by the appreciation of the real exchange rate. Adding to the economic effects of the curse of natural resources, countries that have high levels of natural resources often exhibit policy distortions and weak institutional structures that limit the progress of reforms intended to reduce government expenditures and reorient economic activity (Yousef 2004). Poor governance is one of the key challenges facing countries in the MENA region. When ranked against the rest of the world nearly all MENA countries are below the 50th percentile in terms of government effectiveness, with only a few exceptions. Poor governance not only undermines the effect of public policies and reform initiatives, but also wastes countries' resources because it reduces the effectiveness of public spending. Several studies have shown that the impact of public policies on development and growth is dependent on the quality of a country's institutions (Fatás and Mihov 2010; Easterly and Levine 2003).

Institutions and governance can also affect public spending patterns and effectiveness. Public spending in the MENA region is known to be among the highest in the world. For instance, Arab countries spend more than double what Eastern European and Central Asian countries spend on social protection, and spend four times more than countries in Africa south of the Sahara. Subsidies in particular are much higher in MENA than in other regions. For example, in 2011, total pre-tax energy subsidies cost $237 billion—equivalent to 48 percent of world subsidies, 8.6 percent of regional GDP, or 22 percent of government revenue (Fattouh and El-Katiri 2013).[4] These spending and subsidy levels have remained high even though the region's total per capita expenditure growth slowed to 5 percent per year in the 2000s from 10 percent in the 1990s (Breisinger et al. 2012). Average public expenditure in agriculture is about the same in MENA as that for low- to middle-income countries around the world, with expenditure accounting for around 7 percent of agricultural value added (Breisinger et al. 2012).

One of the consequences of strong governments and weak institutions is the region's failure to take advantage of the expansion in world trade and foreign direct investment in the past two decades, becoming one of the least integrated regions in the global economy. Yousef (2004) shows that, excluding oil, the MENA region's trade declined from 53 percent of GDP in the early 1980s to 43 percent in 2000. Although economic reforms have substantially reduced tariff barriers, they have failed to eliminate nontariff barriers (NTBs) to trade. According to Malik and Awadallah (2013), the MENA region has today the most restrictive NTBs in the world. (This issue will be discussed further later in this section.)

Despite these difficult conditions, countries in the region are interchangeably implementing a bundle of policies to tackle their economic challenges and promote investment and growth. First, most countries in the region are seeking fiscal consolidation, introducing subsidy reforms, and increasing taxes. Algeria is trying to increase its revenue base by increasing value-added taxes (VAT) and gradually cutting subsidies (EIU 2016a). Egypt has also introduced a VAT and is embarking on other fiscal adjustment measures such as reducing energy subsidies (EIU 2016d). Additionally, the Central Bank of Egypt floated the exchange rate in November 2016, which is in line with the IMF loan under discussion. Bahrain, Iraq, and Kuwait also are cutting (or are likely to be cutting) subsidies to tackle the increasing budget deficits caused by low oil prices (EIU 2016b; 2016f; 2016g). Egypt, Algeria, Bahrain, Morocco, and Ye-

men have increased their spending on infrastructure (EIU 2016d; 2016a; 2016b; 2016h; 2016i). Yet political will and government effectiveness are still needed to support these reform processes. Additionally, if the government does not undertake structural reforms to improve its weak institutional capacity, fiscal and monetary policy reforms likely will make only slow progress.

AGRICULTURAL POLICIES

In line with the state-led development strategy that prevailed in MENA countries after their independence in the 1940s and 1950s, states intervened in the commercialization of cereals, vegetables, oil, and sugar, purchasing and financing substantial amounts of these commodities. They also provided output support to farmers and agro-industries, and subsidized purchases of inputs and machinery. As a case study, Cassing and others (2007) have thoroughly documented the distortions of Egypt's agricultural incentives. The 1950s and 1960s were characterized by "Arab socialism," in which governments mandated delivery quotas for crops at fixed prices that were substantially lower than international prices, and subsidized consumer prices of basic food commodities. Institutionally, agricultural cooperatives were created in each village to control the production and marketing of major crops, provide agricultural inputs to farmers, impose crop rotation schedules, procure the crop quotas, and ultimately market the major crops.

As discussed in Cassing and others (2007), when the state-led model started facing economic difficulties as a result of the drop in oil prices, fast-growing populations, and government budget constraints, it became evident that these inefficient agricultural and industrial policies were unsustainable. Consequently, several governments in the region started to reform their agricultural policies alongside their major trade reforms. The explicit goal behind structural adjustment was to move the state away from marketing both agricultural outputs and inputs and to redirect efforts to provide market and price information, enhance market infrastructure, promote private sector and cooperative involvement in production and marketing activities, and support national agricultural research systems. Chaherli (2002) refers to two major groups of countries based on the extent of their reform processes. A first group of countries, including Algeria, Jordan, Morocco, and Tunisia, undertook "sweeping macroeconomic and sectoral reforms," relying on international financial institutions to conduct stabilization and structural adjustment programs (Chaherli 2002, 11). The second group, which includes Iraq, Libya, and Syria—to which this report also adds Egypt—kept a prominent role for the state but promoted the involvement of the private sector, which was expected to play a more important role in the economy under a more efficient and productive public sector (Chaherli 2002).

Agricultural and trade policy reforms of varying extensiveness and speed began in MENA in the mid-1980s. For example, reduced tariffs increased the integration of domestic and international markets. However, "strategic commodities"—which included wheat in most countries, sugar beet and tobacco in Syria and Lebanon, and cotton in Syria—still had guaranteed production prices. Cereal producers in Morocco and Algeria continued to benefit from subsidies even after the reforms, and feed subsidies remained one of the major government expenditures on agriculture. Fruits and vegetables were among the activities with minimal government intervention (Chaherli 2002).

In Egypt, a first wave of reforms beginning in 1986 partially liberalized prices, quotas, some crop restrictions, and marketing controls for 10 crops. The state eliminated the compulsory delivery program for all crops and procurement prices were replaced by floor prices, often tied to a moving average of lagging prices. The second phase of the reform in Egypt coincided with the Economic Reform and Structural Adjustment Program launched in 1991. In this phase, cotton marketing was liberalized and all remaining input subsidies were eliminated, and in 1997 land rental markets were liberalized as well (Cassing et al. 2007).

On the demand side, consumer subsidies played a central role in government policies before the reforms, with major impacts on agricultural production. Because of the political relevance of these policies, abrupt reduction or elimination of food subsidies was politically unfeasible, with most countries facing "bread riot" episodes at various stages of policy reform implementation. These difficulties have paved the way toward more subtle programs of slow subsidy phaseout combined with targeted schemes. Chaherli (2002) highlights some of the main characteristics of subsidies in different countries. For example, Tunisia has had relatively successful programs by targeting specific segments of the population in need of food aid and keeping subsidies on items that are consumed by the poor. Algeria eliminated its generalized system of subsidies in 1994 as part of a major market liberalization program, and as of 2001 the list of administrated prices affecting the agricultural sector is limited to pasteurized milk, bread-making flour, bread, drinking water, and water for agriculture use, as well as energy products.

In the case of Morocco, the government set high tariffs and high producer prices for cereals to encourage production, but then had to provide subsidies for wheat flour to reduce the negative impact of these production incentives on consumers. After structural adjustment programs, this subsidy was limited to 10 million quintals. Similar subsidy schemes were applied to oilseeds and sugar; the Moroccan government is trying to eliminate those programs and has recently liberalized oilseed prices and removed the support to sugar for industrial use. The prices of all other commodities were liberalized as part of Morocco's structural adjustment programs.

The food subsidy system in Egypt, initially introduced during World War II, is one of the oldest food price policies in place in the world.[5] This system still maintains the subsidies originally provided for bread (*baladi*), cooking oil, and sugar. These subsidies are administered and provided by two national programs: the *baladi* bread and flour program that provides a loaf of bread and subsidized flour at a low fixed cost to all consumers, and the food ration program that is restricted to households with a ration card. Cardholders had fixed quotas of rice, sugar, cooking oil, and black tea at very low prices. In the last major reform step to date, food subsidies are now administered through a voucher-based system, using smart cards, that gives consumers a broader choice from around 30 food items (Ecker et al. 2016). Previous analyses of Egypt's food subsidy system have pointed out its major inefficiencies (see, for instance, Ahmed et al. 2001; Alderman, von Braun, and Sakr 1982; Alderman and von Braun 1984; Al-Shawarby and El-Laithy 2010; and Löfgren and El-Said 2001).

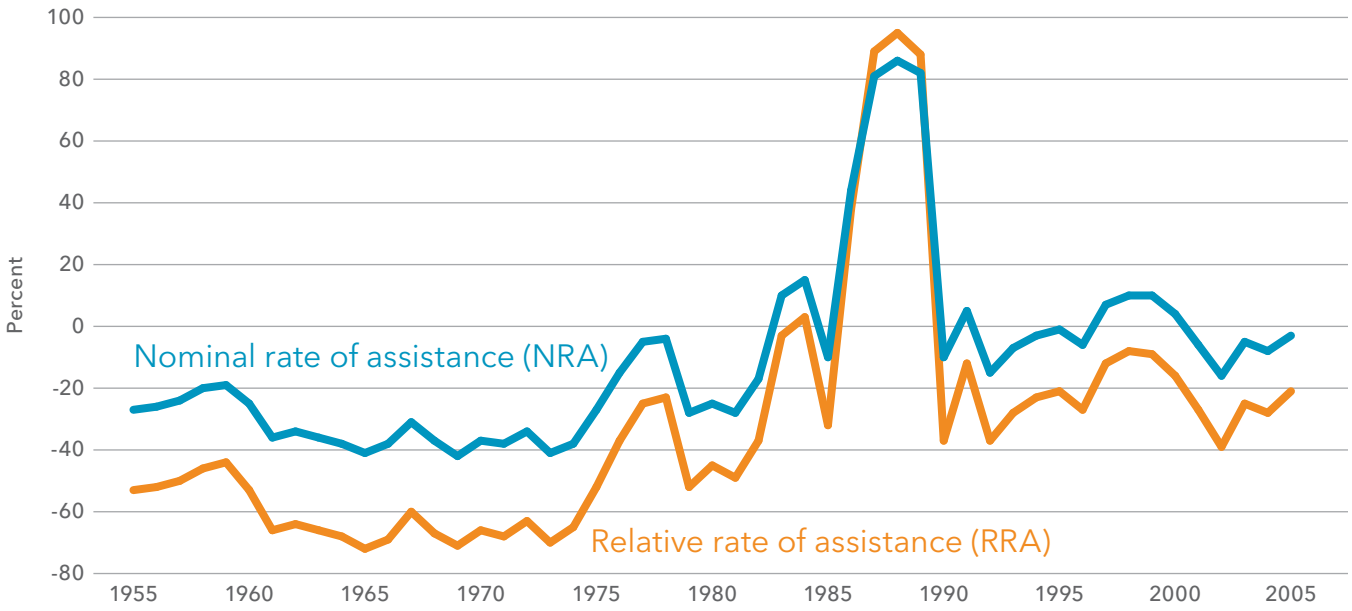
Tariffs and NTBs applied before policy reforms in the 1980s and 1990s imposed substantial costs on consumers, distorted production and trade patterns, and reduced economic efficiency among MENA countries. New trade policy strategies after reforms were designed to facilitate agricultural growth and competitiveness, but despite trade liberalization and significant reduction of tariff barriers (which are now comparable to tariffs in other regions) protection in most UMI and LMI countries is still high, largely because of NTBs (Ianchovichina, Gourdon, and Kee 2011). Oliva (2000) shows that LMI and UMI countries tend to have higher levels of protection than HI countries and lag substantially behind other regions in the speed of their liberalization. At the country level, Ianchovichina, Gourdon, and Kee (2011) find that agriculture protection is high in all countries mostly because of substantial NTBs—with the exception of Jordan, where markets for agricultural goods are open to imports. Only Tunisia and Morocco use tariffs above 20 percent to protect agriculture. Oil-exporting HI countries have liberalized their trade, and Lebanon and Morocco have opened their markets for manufactured imports. Tariffs on manufactures are low in Jordan, but NTBs substantially increase the rate of protection there. In the case of Tunisia, tariffs on manufactures are above 10 percent and are high relative to the world average. NTBs also create high levels of protection in Egypt and Algeria.

Figure 6 shows the evolution of protection in Egypt. The figure is based on an extensive dataset from Anderson and Nelgen (2013), analyzed in the study by Cassing and others (2007). The study computes a nominal rate of assistance (NRA) for farmers, including an adjustment for direct interventions on inputs and an NRA for nonagricultural tradables, to calculate a relative rate of assistance (RRA; see Anderson et al. 2008). NRA measures are calculated for the overall agricultural sector and for five import-competing products (maize, meat, milk, sugar, and wheat) and two exported crops (cotton and rice). These products constitute around 70 percent of primary agricultural output. The figure therefore depicts the evolution of the NRA and RRA measures for agriculture and the NRA for import-competing and export crops in Egypt. Negative NRA and RRA values indicate an unfavorable effect of policy on agriculture (equivalent to a tax), and positive values mean that policy favors this activity (a subsidy). A value of zero means that the policy is neutral toward this activity (no effect).

Two key points of interest are presented in Figure 6. First, until the mid-1980s, the implemented policies discriminated against agriculture. Discrimination was stronger against exported products, for which the NRA remained negative even after reforms, while the NRA for import-competing crops and for agriculture fluctuated around zero values. Second, the RRA estimates are considerably below the NRA estimates for agriculture because import protections and an overvalued exchange rate favored the nonagricultural sector over the study period (Cassing et al. 2007).

Based on the analysis in this section, successful policy reforms seem to require at least three factors: (1) confidence in government, (2) adequate state capacity for implementation, and (3) effective mechanisms of accountability. Taking these three elements into account reveals the broad diversity of governance quality within the MENA region. For those countries that underwent regime change during the so-called Arab awakening, trust in government is a particular challenge because current ruling

FIGURE 6 EVOLUTION OF THE NRA AND RRA FOR AGRICULTURE PROTECTION IN EGYPT (1955–2005)



Source: Elaborated by authors based on data from Anderson and Nelgen (2013).

parties and leaders are relatively new and unknown to citizens and do not have a proven track record. But the Tunisian case highlights that low levels of confidence in government can coexist with relatively high levels of state capacity. In 2014, Tunisia remained the region's highest-ranked country for the quality of the civil service and for policy formulation and implementation, followed by Morocco and Jordan. In addition, Tunisia had the highest rankings for voice and accountability, aided by (albeit flawed) multiparty elections and novel governance tools—one such example is the Marsoum 41 website, which allows citizens to directly access public documents. At the other extreme are Libya and Yemen, which are among the lowest ranked in terms of capacity and remain plagued by high levels of social polarization and instability.

Thus, in addition to more commitment for policy reform, more emphasis needs to be placed on tailoring these reforms to countries' existing governance characteristics. For example, where confidence in government is low, mechanisms to facilitate consensus and spur buy-in from all major political factions may be necessary. Where state capacity is low, less technical options that involve gradual changes, such as small-scale pilot reforms, may be the only feasible pathway. Well-designed, targeted policies can redistribute wealth and protect the poor from economic shocks, and even break the cycle of poverty in the long run. In contrast, poorly designed policies are likely to bring harmful if often unintended consequences for large sectors of the population. In this regard, food policies are no different.

4. AGRICULTURAL PERFORMANCE

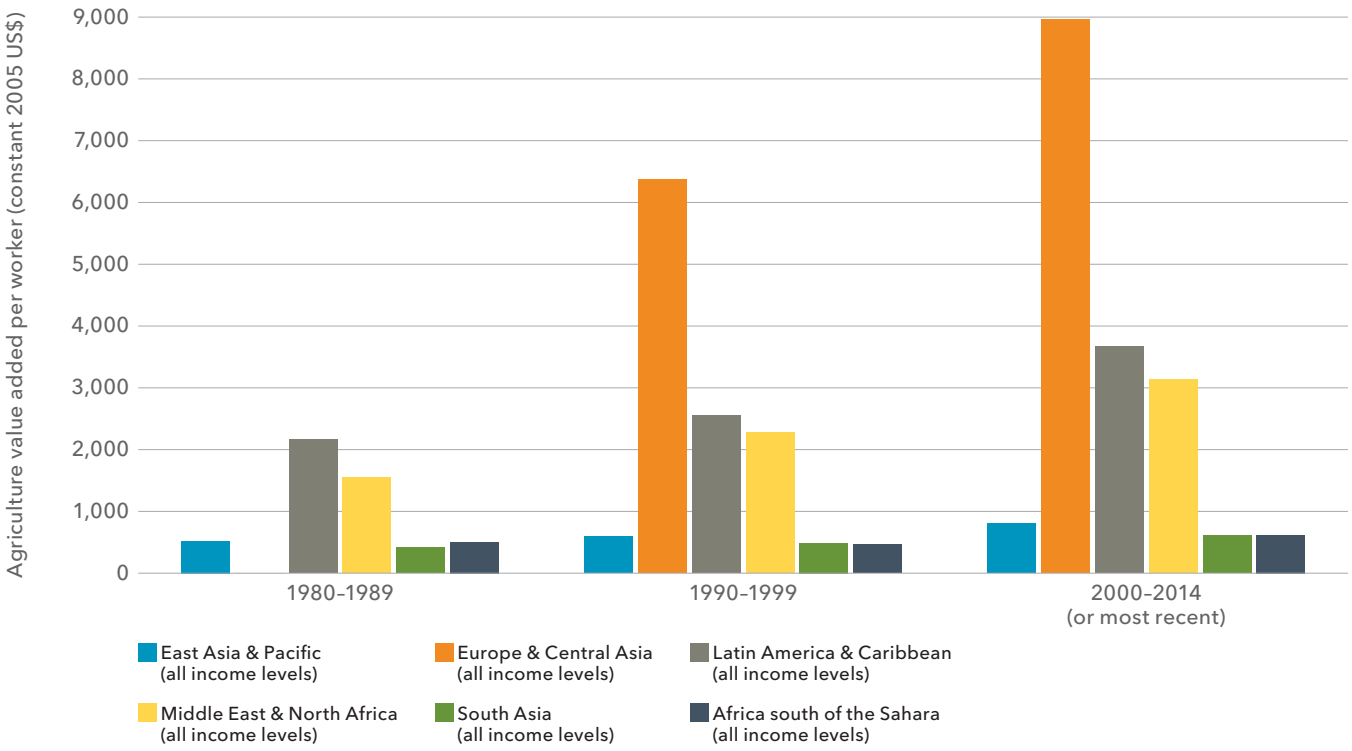
IN THE MENA REGION, AGRICULTURAL OUTPUT GROWTH IN THE PAST 15 years has been driven almost entirely by increases in total factor productivity (TFP), which has also been the main determinant of land and labor productivity. This section will examine MENA trends regarding each of these factors in detail. Land productivity in the region is driven mostly by productivity growth in Egypt, whose land productivity levels are four times higher than those of other MENA countries. Bahrain and UAE are exceptions, as they also have significantly higher levels of land productivity than most countries in the region and rank second and third respectively after Egypt.

LAND AND LABOR PRODUCTIVITY

Compared to other regions, agricultural labor productivity in MENA falls in the middle of the spectrum, with real value added per worker lower only than North America and Europe, similar to that of Latin America and the Caribbean, and two to three times higher than that of South Asia, East Asia, and Africa south of the Sahara (Figure 7). Agricultural labor and land productivity have been rising worldwide in recent decades, showing steady growth in MENA from the 1980s to the present. Labor productivity growth between 1990 and 1999 and between 2000 and 2014 was modest compared to the productivity surge in North America and Europe, but was comparable with the growth levels of Latin America and higher than growth in South Asia, East Asia, and Africa south of the Sahara. Cereal yields and yield growth, however, exceed only those of Africa, and amount to less than 40 percent of North American yields and half of East Asian and Pacific yields (Figure 8). It is noteworthy that cereal trends in MENA are driven mainly by two countries, Egypt and Iran, which produce more than a third of the region's wheat (FAOSTAT 2016).

The performance of the MENA region measured by growth in labor productivity can be linked to the policy and demographic changes discussed in the previous sections. Land and labor productivity grew at almost the same rate between 1975 and 1995, with growth accelerating from about 2 percent per year in the late 1970s to a peak of 5 percent in 1985 for land productivity and in 1994 for labor productivity (Figure 9). Growth patterns changed during the period of structural reforms that started in the mid-1980s. Although land productivity growth has fluctuated at around 3 percent per year, labor productivity has slowed, showing a negative trend in growth rates since 1995. (Note that this is the period of slow economic recovery and fast labor-supply growth discussed earlier.) To have sustained balanced growth in land and labor productivity after 1995, either new lands should have been incorporated into production faster than population growth or out-migration from agriculture should have proceeded fast enough to cause an absolute reduction in the agricultural work force. This was not the case in the MENA region, where labor force growth was

FIGURE 7 AGRICULTURAL LABOR PRODUCTIVITY



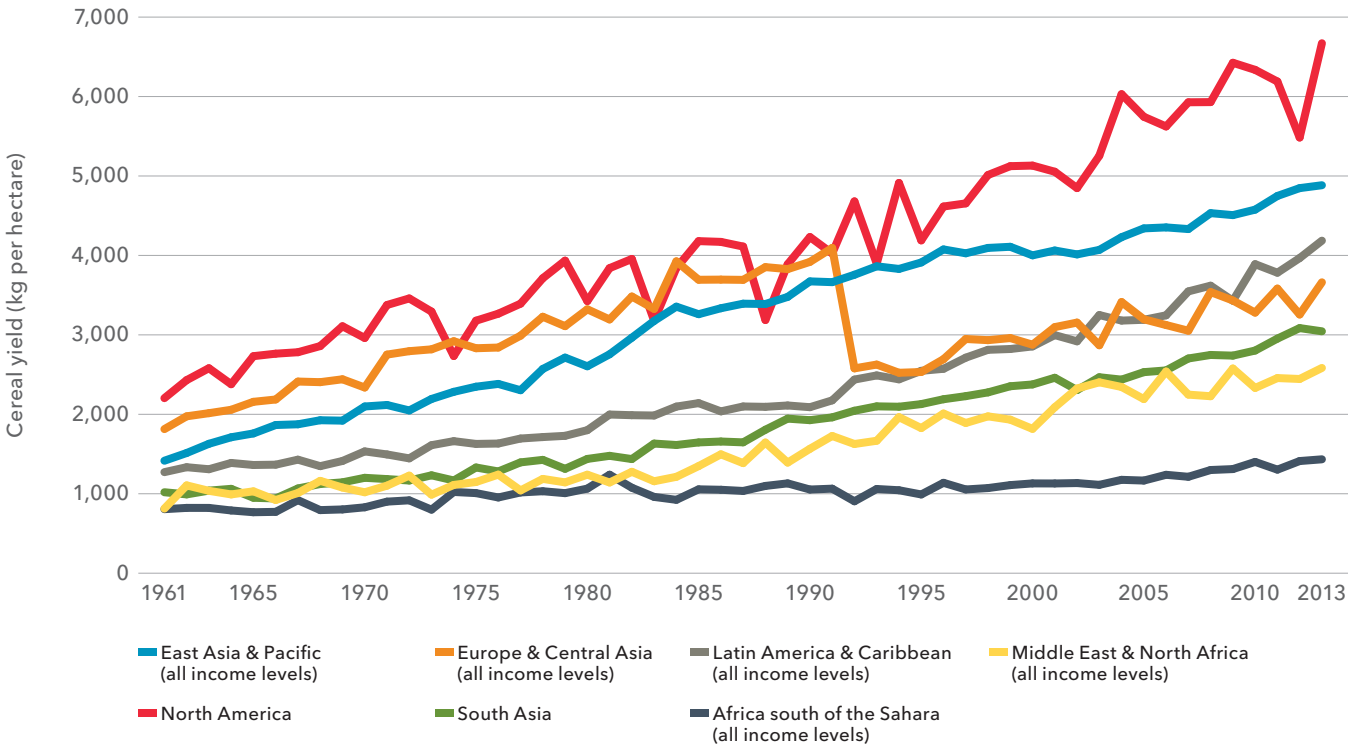
Source: World Bank (2016b).

Note: North America has been removed for better visualization.

among the highest in the world and land resources were limited. Thus, the land-labor ratio shows negative growth rates for most of the period, and agricultural growth is therefore the result of land productivity growth, which itself was driven by TFP productivity growth—although these patterns vary by country (as will be discussed below).

The MENA region in 1975–2012 appears to present two different growth patterns determined by land availability. Land productivity in Egypt in 1975 was at least five times greater than land productivity in all other countries in 2012, with the exceptions of Bahrain and UAE. Lebanon and Jordan show the highest labor productivity and the highest labor productivity growth rates, several times larger than in most other MENA countries. Libya and Saudi Arabia are intermediate cases, ranked third and fourth in labor productivity. Djibouti, Yemen, and Mauritania show the lowest labor productivity, and simultaneously are among the countries with the lowest land productivity in MENA, along with Sudan, Saudi Arabia, Algeria, and Libya. Notably, Egypt, Bahrain, UAE, Djibouti, Yemen, Kuwait, Mauritania, Syria, Iran, and Oman all seem to be following a clear "land productivity" growth path, meaning that land productivity increased faster than labor productivity and that the land/labor ratio decreased with productivity growth. In contrast, Lebanon, Iraq, Algeria, Sudan, and Libya followed a labor-growth path in the analyzed period. Labor productivity increased faster than land productivity together with the number of hectares per worker. Labor and land productivity in Jordan, Morocco, and Tunisia grew at similar rates, with an almost constant land-labor ratio.

FIGURE 8 LAND PRODUCTIVITY



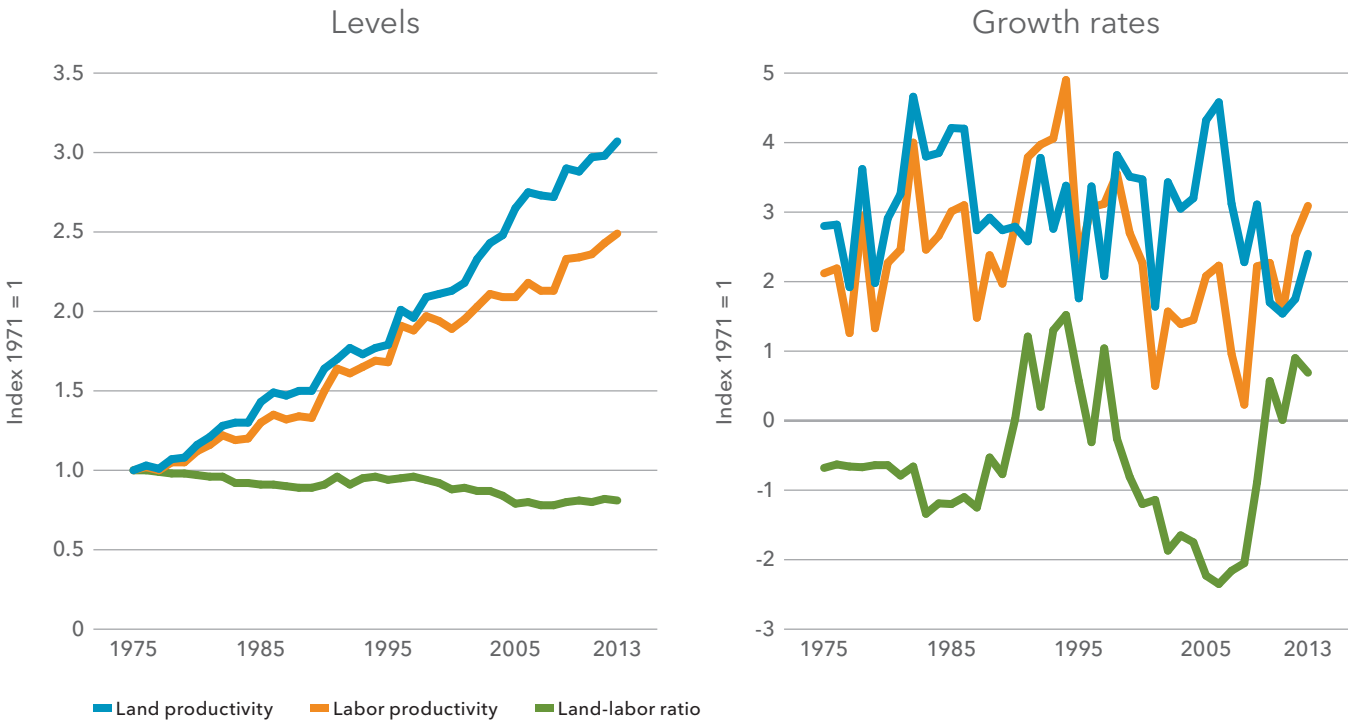
Source: Authors' calculation based on World Bank (2016b).

TOTAL FACTOR PRODUCTIVITY

At the regional level, labor productivity grew steadily and more than doubled between 1980 and 2013, although it remained below land productivity growth, as mentioned above. Labor productivity growth can be decomposed into growth in input per worker and growth in TFP, which represents the amount of output that is obtained per unit of total aggregated input used in production. Growth in TFP means that the country can produce more output with the same inputs or can produce the same output using fewer inputs. This TFP growth has allowed sustained global growth of food and agriculture even with limited and dwindling stocks of natural resources such as land and water.

Looking at the drivers of labor productivity growth in MENA, the data reveal a clear association between growth patterns and the policy periods identified in the previous section. During the economic crisis that resulted from the exhaustion of the state-led development strategy between 1973 and the mid-1990s, TFP remained stagnant (Figure 10) and labor productivity growth was driven by the growth in input per worker. A short-lived recovery of TFP growth began with the policy reforms of the 1990s, and then took off in the mid-2000s, replacing growth in input per worker as the main driver of labor productivity. Accelerated TFP growth coincided with the adoption of new technologies such as portable submersible pumps and ground wells, and improved access to better seed varieties and fertilizer (FAO 2009). However, according to FAO (2009) the MENA region's adoption of the concept of the "Green Revolution" has been modest, and much more can be done to upgrade irrigation infrastructure and

FIGURE 9 MENA TRENDS IN LAND AND LABOR PRODUCTIVITY AND LAND-LABOR RATIO



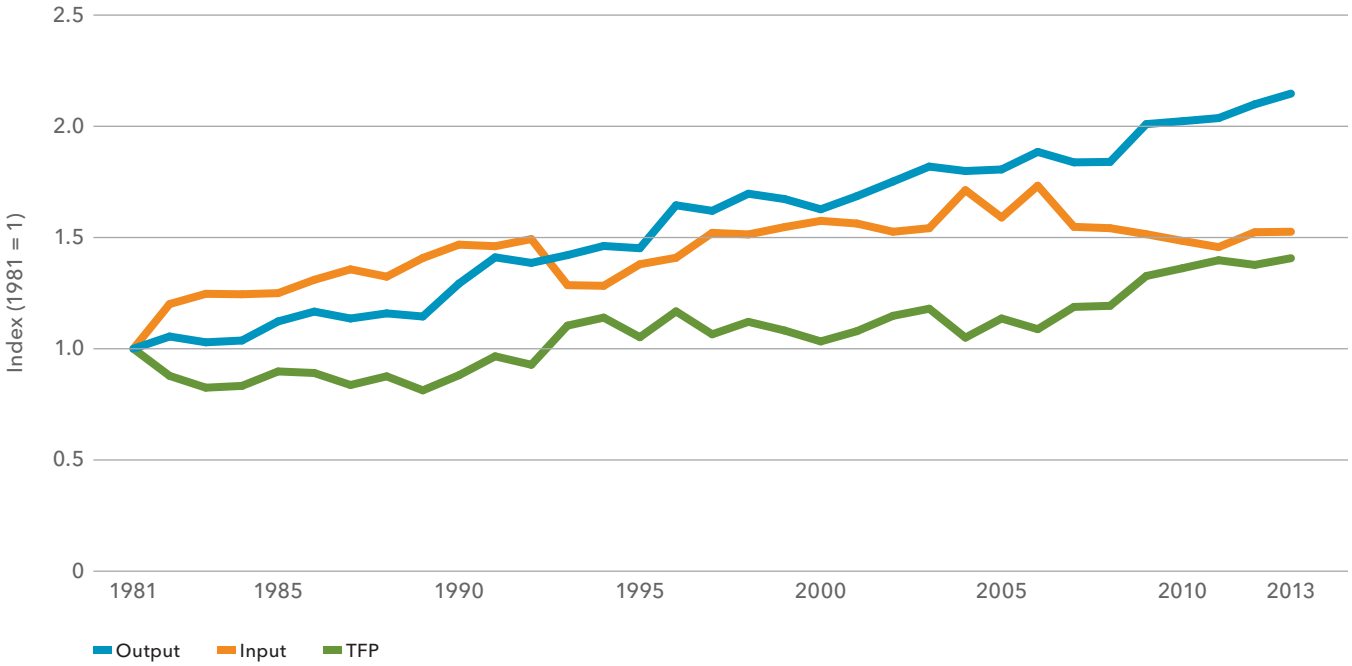
Source: Elaborated by authors based on FAOSTAT (2016) and World Bank (2016b).

embrace best agricultural practices. Improved irrigation infrastructure and practices not only lead to water savings but also can contribute to productivity gains. For example, the widespread use of flood irrigation is not always optimal for plant growth and an approach to irrigation based on plants' water needs can produce higher yields. If such improved irrigation is combined with better agricultural practices, especially related to soil preparation and fertilizer and agro-chemical use, productivity gains can be even larger.

TFP can be further decomposed into technical efficiency and maximum TFP potential determined by the available global technology in a particular year. If countries are making an efficient use of the available technology given their resources and their mix of inputs and outputs, it may be said that they are producing at the technological frontier, or equivalently that they are obtaining the maximum amount of output per unit of inputs given present knowledge applied to agricultural production.

Countries that produce below the frontier can benefit from the extra growth that comes from catching up to the frontier by improving their production efficiency. Efficient countries can increase their TFP only through technical change—that is, by moving the technological frontier outward by generating new technologies that can produce a greater output per unit of input. A country's technical efficiency is measured by comparing its TFP level against the TFP levels of a country at the technological frontier, using a similar combination of inputs and outputs. Technical efficiency is thus assigned a value between 0 and 1, with a value of 1 meaning

FIGURE 10 DECOMPOSITION OF OUTPUT PER WORKER INTO INPUT PER WORKER AND TFP FOR THE MENA REGION



Source: Elaborated by authors based on FAOSTAT (2016).

Note: TFP = total factor productivity.

that the country is efficient and produces at the technological frontier, and a value closer to 0 indicating high inefficiency. TFP then can be expressed as the product of technical efficiency and the level of TFP at the frontier (technology), which also can be seen as the potential TFP that a country can achieve with its specific input and output mix. In the case of an efficient country, its TFP equals its maximum potential TFP, and further TFP growth can result only from technical change.

The decomposition of TFP growth in MENA helps to explain the observed patterns of TFP growth after the policy reforms. The first impulse to TFP growth in the early 1990s is the result of increased efficiency, a one-time effect of the policy changes. Growth in technical change had begun in the early 1990s, but reduced efficiency during the years of high labor supply growth in the late 1990s and until 2005 prevented TFP from growing. The MENA region has been producing with relatively high levels of technical efficiency (close to 0.9 in recent years), so there is little margin left to improve TFP by increasing technical efficiency. Agricultural growth will depend on future technical change.

The region's observed TFP growth patterns stem mainly from Iran, Egypt, and Sudan, which account for 32 percent, 30 percent, and 22 percent of regional TFP growth respectively (Table 8). The remaining 15 percent comes from Algeria, Tunisia, Libya, Saudi Arabia, Lebanon, and Yemen. Iran explains almost half of the growth in technical efficiency between 1981 and 2013, while Egypt explains 44 percent of the observed technical change in the same period. Iran, Sudan, Algeria, and Tunisia also contributed significantly to growth in technical change. On the other hand, Iraq and Syria show negative TFP growth (−7.2 percent and −5.6 percent respectively). Overall, the UMI group accounts for most of the efficiency growth, while technical changes were driven by countries in the LMI group.

TABLE 8 COUNTRY CONTRIBUTIONS TO REGIONAL TFP, EFFICIENCY, AND TECHNICAL CHANGE GROWTH (1981–2013)

	TFP	Efficiency	Technical change
Qatar	0.1	0.1	0.1
Kuwait	−0.1	0.1	−0.2
UAE	−0.5	1.1	−1.3
Saudi Arabia	3.4	−0.6	5.4
Bahrain	0.0	0.0	−0.1
Oman	0.0	0.0	−0.1
HI	**0.5**	**0.1**	**0.6**
Libya	4.0	3.6	4.2
Iran	31.9	48.7	23.6
Lebanon	3.1	1.8	3.8
Iraq	−7.2	27.2	−24.1
Algeria	9.3	−5.2	16.4
Jordan	0.9	0.0	1.3
Tunisia	5.2	−5.0	10.3
UMI	**6.7**	**10.2**	**5.1**
Egypt	29.7	0.1	44.4
Syria	−5.6	−15.6	−0.7
Morocco	0.8	10.7	−4.1
Sudan	22.4	28.9	19.2
Yemen	1.9	3.4	1.2
Mauritania	0.6	0.7	0.5
Djibouti	0.1	–	0.2
LMI	**7.1**	**4.0**	**8.7**

Source: Elaborated by authors based on FAOSTAT (2016).

Note: – = data not available.

Given the importance of land productivity in the MENA region, Table 9 presents the decomposition of land productivity to show the contribution of different components to total growth in land productivity. The decomposition of land productivity is as follows:

$$Y/Ag = Yc/Ag + Yl/Ag$$

$$Yc/Ag = Yc/Ar \times Ar/Ag \quad \text{where} \quad Yc/Ar = Yc/Ah \times Ah/Ar$$

where Y is total agricultural output, Yc and Yl are crop and livestock output respectively, Ar is arable land and Ah is harvested area. Total land productivity is divided into the contribution of crop and livestock output to overall land productivity. Crop production per hectare of total land is decomposed into production per hectare of arable land and the proportion of arable land in total agricultural land. Finally, Yc/Ar results from multiplying the production per hectare of harvested area by the proportion of harvested area in total arable land. These two factors are indicators of intensity (Harvested area/Arable land > 1 means that multiple harvests are obtained from the same area).

TABLE 9 GROWTH DECOMPOSITION OF LAND PRODUCTIVITY, 1981–1984 TO 2008–2013

Component	Contribution to total growth (%)
Crop output/agricultural land	100
Arable land/agricultural land	−4
Crop output/arable land	104
Crop output/arable land	104
Harvested area/arable land	14
Crop output/harvested area	90
Crop output/harvested area	90
Total factor productivity (TFP)	67
Inputs	22

Source: Authors' calculations based on FAOSTAT (2016).

Results of the land productivity decomposition in Table 9 show that 90 percent of total growth in crop production per hectare of agricultural land is explained by increases in output per hectare of harvested land. The growth of arable land in total land was negative and the area harvested relative to total arable land (cropping intensity) explains only 14 percent of total growth. Of the 90 percent growth explained by output per hectare of harvested land, 67 percentage points are the result of TFP growth and 23 points come from increased inputs. This confirms the idea that agricultural growth in MENA has been driven by increases in TFP (67 percent of total growth in output per hectare), with a smaller and decreasing contribution of input per hectare (22 percent) and of increased cropping intensity (14 percent). Cultivated land did not increase during the period, showing a small reduction of 4 percent.

Growth in agricultural output is driven mainly by increased yields in a few high-value crops. A decomposition of total crop output per hectare of harvested area into changes in yields of individual crops weighted by the share of the crop in total harvested area, and changes in shares weighted by yield levels, shows that most growth is explained by greater yields of individual crops rather than by changes in crop area (Table 10). Growth in yields is explained mainly by yield increases in potatoes (61 percent of total growth in land productivity) and in tomatoes (26 percent), and to a lesser extent in fruits and other crops. By contrast, wheat and cereal production remained almost constant during this period, with no significant extra gains.

The productivity growth decomposition analysis shows that during the state-led strategy applied before the mid-1980s, technical efficiency in agriculture was low, without significant growth in TFP. During this period, growth in labor productivity resulted from growth in inputs per worker and inputs per hectare. This growth was sustainable as far as land productivity grew faster than the labor supply, or equivalently, faster than the number of workers per hectare. Once growth in the labor supply accelerated in the mid-1990s, the land/labor ratio shows a sharp decrease; even though land productivity still grows at 3 percent per year, labor productivity drops. After 2005, labor productivity recovers, driven by technical change. The main drivers of this new growth are new technologies and investments (such as improved irrigation in combination with improved agricultural practices) and the development of potato and tomato cultivation. These two crops have high production and revenue per hectare, and can have promising social outcomes by raising the real incomes of farmers.

Table 11 summarizes the performance of agriculture in MENA countries between 1981 and 2013, showing average growth rates of output, TFP, and labor and land productivity. Countries are sorted by average TFP growth from 1981 to 2013. The group of fast-growing countries includes countries with TFP growth rates greater than or equal to 2 percent. Algeria and Jordan are the best-performing countries, with average TFP growth rates of 4.9 percent and 3.1 percent for the period, as well as the highest growth rates of labor productivity (5.8 and 4.0 percent respectively), with all other countries showing labor productivity growth rates below 3 percent. The correlation between labor productivity and TFP is much higher (0.8) than the correlation between TFP and land productivity (0.5), with the worst-performing countries showing negative growth rates for labor productivity. Egypt and Iran, the most populous countries and largest economies (after Saudi Arabia), are both in the group of fast-growing countries.

Tunisia, Libya, Mauritania, and Morocco form the group with average growth. These countries performed poorly at the beginning of the period, but improved their performance after 1995, with average TFP growth rates greater than 2 percent. The group of slow-growing countries includes some of the HI countries, with Saudi Arabia, Qatar, Kuwait, and Bahrain showing generally poor performance as measured by TFP growth and labor productivity, and higher growth rates in land productivity. Other countries, such as Somalia, Iraq, West Bank and Gaza, and more recently Syria, are countries that experienced conflicts or wars during the analyzed period. Djibouti and Comoros have small agricultural sectors and limited potential for agricultural production.

TABLE 10 CROP GROWTH DECOMPOSITION, 1981–1985 TO 2008–2013

Crops	Changes in yields	Changes in area share	Total
Potato	61.2	−1.1	60.1
Tomato	26.4	1.4	27.8
Other crops	3.2	0.1	3.3
Grapes	1.9	0.3	2.2
Fruits	2.2	−0.1	2.0
Other cereals	1.6	0.0	1.6
Vegetables	1.3	0.0	1.3
Dates	0.8	0.3	1.1
Wheat	0.3	0.0	0.3
Pulses	0.3	0.0	0.3
Roots and tubers	0.2	0.0	0.2
Olive	0.1	0.0	0.1
Oil crops	−0.5	0.0	−0.5
Total	**99.0**	**1.0**	**100.0**

Source: Authors' calculations based on FAOSTAT (2016).

TABLE 11 AVERAGE GROWTH OF OUTPUT, TFP, AND LABOR AND LAND PRODUCTIVITY FOR DIFFERENT PERIODS

	1981–1995				1996–2013				1981–2013			
	Output	TFP	Labor	Land	Output	TFP	Labor	Land	Output	TFP	Labor	Land
Algeria	3.5	5.7	4.3	4.1	5.0	4.3	7.0	4.7	4.3	4.9	5.8	4.5
Jordan	6.2	3.4	1.6	6.3	3.0	2.9	6.0	3.3	4.4	3.1	4.0	4.6
United Arab Emirates	10.4	7.6	9.5	6.8	0.4	−1.5	−4.0	0.4	5.0	2.6	1.9	3.3
Oman	5.2	1.7	3.2	5.1	3.2	3.0	1.0	1.4	4.1	2.4	2.0	3.1
Sudan	2.7	1.0	−1.3	1.6	3.5	3.0	2.8	3.2	3.1	2.1	0.9	2.5
Yemen	2.5	0.6	0.2	2.4	4.2	3.2	3.0	4.2	3.4	2.0	1.7	3.4
Egypt	4.8	2.6	4.2	2.9	3.3	1.5	1.7	2.5	4.0	2.0	2.8	2.7
Iran	5.5	3.1	4.3	4.8	2.8	1.0	1.0	4.6	4.0	2.0	2.4	4.7
Fast growth	**5.1**	**3.2**	**3.2**	**4.3**	**3.1**	**2.2**	**2.3**	**3.0**	**4.0**	**2.6**	**2.7**	**3.6**
Tunisia	0.8	−0.1	0.0	0.3	3.9	2.7	4.4	3.5	2.5	1.4	2.4	2.1
Libya	2.9	−0.3	−1.5	2.7	1.2	2.6	3.9	1.3	2.0	1.2	1.4	1.9
Mauritania	1.1	0.0	−1.1	1.1	2.4	2.0	0.1	2.4	1.8	1.1	−0.5	1.8
Morocco	1.8	−1.7	−3.6	1.4	4.8	3.4	3.7	4.9	3.4	1.1	0.3	3.3
Average growth	**1.7**	**−0.5**	**−1.6**	**1.4**	**3.1**	**2.7**	**3.0**	**3.0**	**2.4**	**1.2**	**0.9**	**2.3**
Saudi Arabia	8.0	0.3	5.6	3.4	2.1	1.4	0.2	2.1	4.8	0.9	2.6	2.7
Syria	2.1	−2.1	−0.5	2.3	1.3	2.3	3.5	1.3	1.7	0.3	1.7	1.7
Somalia	0.5	−0.3	1.1	0.5	1.6	0.7	−0.3	1.6	1.1	0.3	0.4	1.1
Qatar	8.2	−0.9	7.8	7.0	1.7	1.1	−1.6	1.4	4.6	0.2	2.6	4.0
Iraq	1.8	0.3	8.9	2.0	1.5	0.1	−4.1	1.4	1.6	0.2	1.6	1.7
Djibouti	3.5	−0.6	−1.1	2.8	3.0	0.7	0.5	2.1	3.2	0.1	−0.2	2.4
Comoros	0.0	0.0	−0.3	1.0	0.0	0.0	−1.4	1.0	0.0	0.0	−0.9	1.0
Lebanon	4.6	1.9	1.9	4.5	−0.8	−2.0	−3.5	−1.2	1.7	−0.2	−1.1	1.4
Kuwait	2.9	−4.6	−8.0	2.6	6.5	3.0	4.9	6.0	4.9	−0.5	−1.2	4.5
Bahrain	−2.5	−8.9	−4.1	−1.8	3.1	4.4	2.3	3.3	0.5	−1.6	−0.7	1.0
West Bank & Gaza	0.1	−4.8	−2.0	0.1	3.5	0.9	1.5	5.6	2.0	−1.7	−0.1	3.1
Slow growth	**2.7**	**−1.8**	**0.9**	**2.2**	**2.1**	**1.1**	**0.2**	**2.2**	**2.4**	**−0.2**	**0.4**	**2.2**

Source: Elaborated by authors, based on data from FAO (2016).

Note: TFP = total factor productivity.

5. AGRICULTURE IN THE CONTEXT OF ECONOMIC TRANSFORMATION

DEVELOPMENT ENTAILS STRUCTURAL CHANGE, WHICH IS DEFINED AS the reallocation of economic activity across the three broad sectors (agriculture, manufacturing, and services) that accompanies the process of modern economic growth (Herrendorf, Rogerson, and Valentinyi 2013; Burch et al. 2007). The countries that manage to pull out of poverty and become richer are those that can diversify away from agriculture and other traditional products. As labor and other resources move from agriculture into more productive activities, overall productivity rises and incomes expand. The speed with which this transformation takes place is the key factor that differentiates successful countries from unsuccessful ones (McMillan and Rodrik 2012). These changes are usually accompanied by an increasing degree of urbanization, as the economy's center shifts from rural to urban areas and as rural-to-urban migration rises (see, among others, Kuznets 1966; Maddison 1980; and Stern, Rogers, and Dethier 2005).

This section compares the MENA region's agricultural performance with the path of its economic transformation. McMillan and Rodrik (2012) identify three factors that can negatively affect the extent to which transformation goes in the "right" direction and contributes to overall productivity growth: (1) a *large share of natural resources in exports*, (2) an *overvalued exchange rate*, and (3) *compartmented and rigid labor markets*. These three factors are structural characteristics of the MENA economy, and when present they reduce the scope of productivity-enhancing structural change. Also considered alongside these factors are the fast growth of the labor force and the food security implications of the limited land and water supply for food production. These factors have not only affected the speed and direction of transformation but also conditioned sectoral policies that affected the performance of agriculture.

As mentioned in Section 3, policy priorities in the 1950s and 1960s were to jump-start development that promoted manufacturing, a policy that had a negative effect on agriculture but limited or no results on the development of competitive industries. These policies exacerbated the substantial disequilibrium between agriculture and industry that occurs at early stages of the development process (Kuznets 1966; Chenery and Taylor 1968; Chenery and Syrquin 1975) and is reflected in differences in labor productivity and income between the rural and urban sectors. This growing rural-urban income gap and concerns about food security explain why governments made the choice to tax agriculture to benefit manufactures even as they implemented price policies to promote production, established tariffs and quotas to protect domestic production from imports, and gave subsi-

dies to consumers to compensate them for high agricultural prices. As also discussed in the prior section, the policy reforms of the 1990s made some changes to this development strategy but kept in place a significant part of the agricultural protectionist policies.

As a result, the sectoral composition of employment in MENA has changed very little in the past 40 years. The region still relies heavily on a single industry (oil) even though it produces a lower share of GDP than it has in the past. It has a small manufacturing sector and a relatively large but less productive service sector, and exhibits significantly lower agricultural labor productivity than other countries at all levels of income. In most cases, labor reallocation across sectors has resulted in reduced overall labor productivity (Doemeland and Schiffbauer 2016). This section describes the structure of MENA economies compared to that of other countries, the contribution that structural change has made to productivity growth in the past, and the way in which transformation has affected labor productivity growth in agriculture through labor allocation and policies meant to reduce the growing income gap between rural and urban workers.

ECONOMIC STRUCTURE IN MENA

The importance of agriculture in GDP and total employment in MENA falls within the expected stylized facts of structural change, with high shares in total employment among LMI countries (43 percent), low shares in HI countries (3 percent), and intermediate shares in UMI countries (14 percent), as shown in Table 12.[6] The share of agriculture in GDP is as low as 0.1 percent in Qatar, the country with the highest income in the region, and as high as 63 percent in Somalia, the country with the lowest income. On average, agriculture accounts for 25 percent of GDP in the LMI group, around 6 percent in the UMI group, and 1 percent in the HI group.

Even though there are differences in the share of services by income levels as expected, the differences are small compared to what is observed in agriculture. On average, services account for around half of the value added in GDP across all MENA income groups. These shares range from 50 percent for HI countries to 55 percent for LMI countries. There are also differences among countries within income groups. For instance, services account for 83 percent of GDP in Lebanon but only 31 percent in Iraq, even though both are UMI countries.

Countries in the three income groups have relatively similar shares of manufacturing in GDP, a pattern that differs from the expected patterns observed at different income levels in other regions. For the manufacturing sector, Herrendorf, Rogerson, and Valentinyi (2013) stress the fact that manufactures' employment and value-added shares often increase for lower levels and decrease for higher levels of development. This analysis of manufacturing in MENA relies mainly on sectoral GDP data, as regionwide information on employment is available only at the level of aggregate "industry," a category that includes oil and mining, manufacturing, and construction. It is reasonable to assume that the high share of industry in employment in HI countries in the region is related to mineral resources and construction rather than manufacturing.

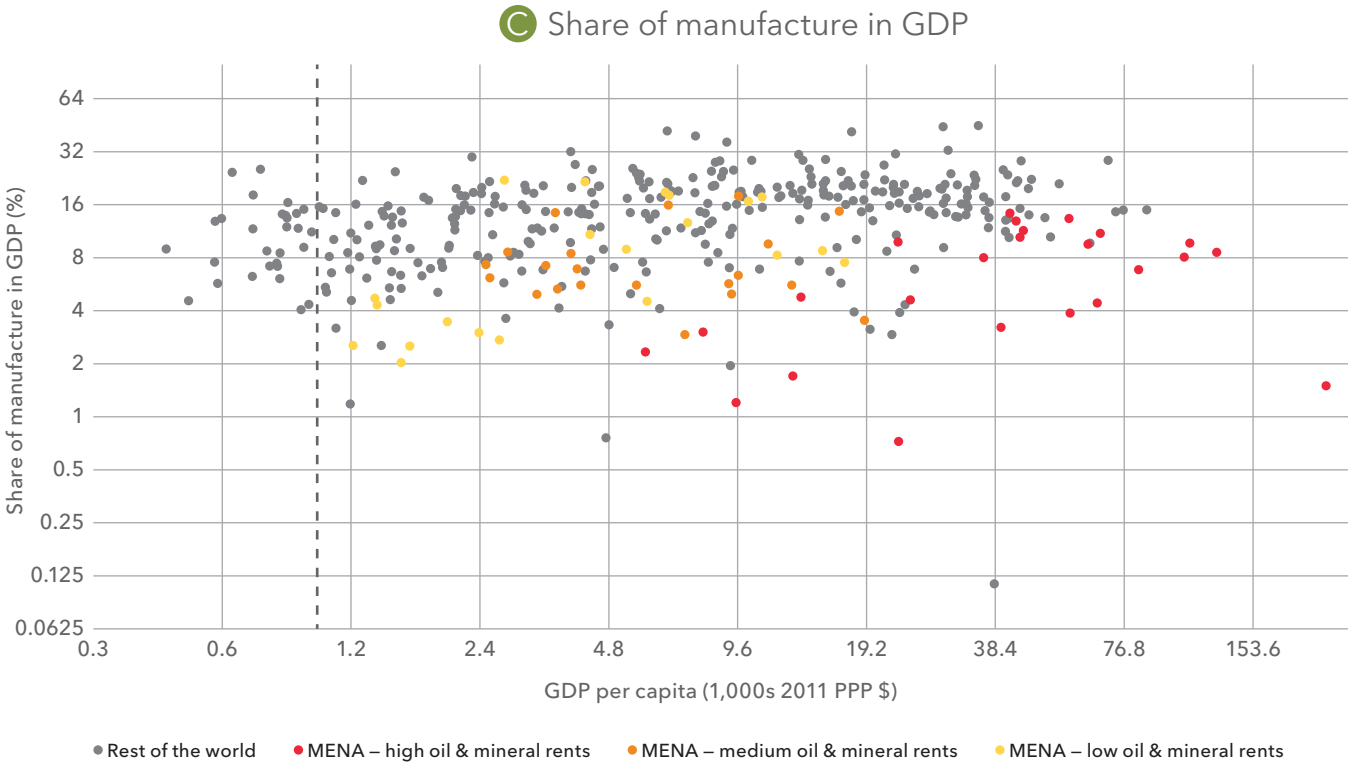
A comparison of MENA countries' economic structure with that of other countries shows that in manufacturing, most MENA countries seem to be below the inverted-U shape formed by other countries (Figure 11C). This means that at any level of income, MENA countries show lower shares of manufacturing in GDP than other countries. This is true not only for oil-exporting countries but also for most MENA countries. In general, agriculture conforms to the stylized facts of transformation. The shares of agriculture in GDP and in employment (Figure 11A and B) decrease with the level of development for all countries, whereas the share of services tends to increase with development (Figure 11E and F). However, there is higher variability in the share of services in GDP than in the share of services in employment. MENA countries that show smaller shares of services in GDP seem to be predominantly oil-exporting countries. This is not the case for the share of services in employment, which seems to indicate that the difference in the share of services in GDP of oil-exporting countries is related to lower productivity in services rather than to differences in the number of workers employed.

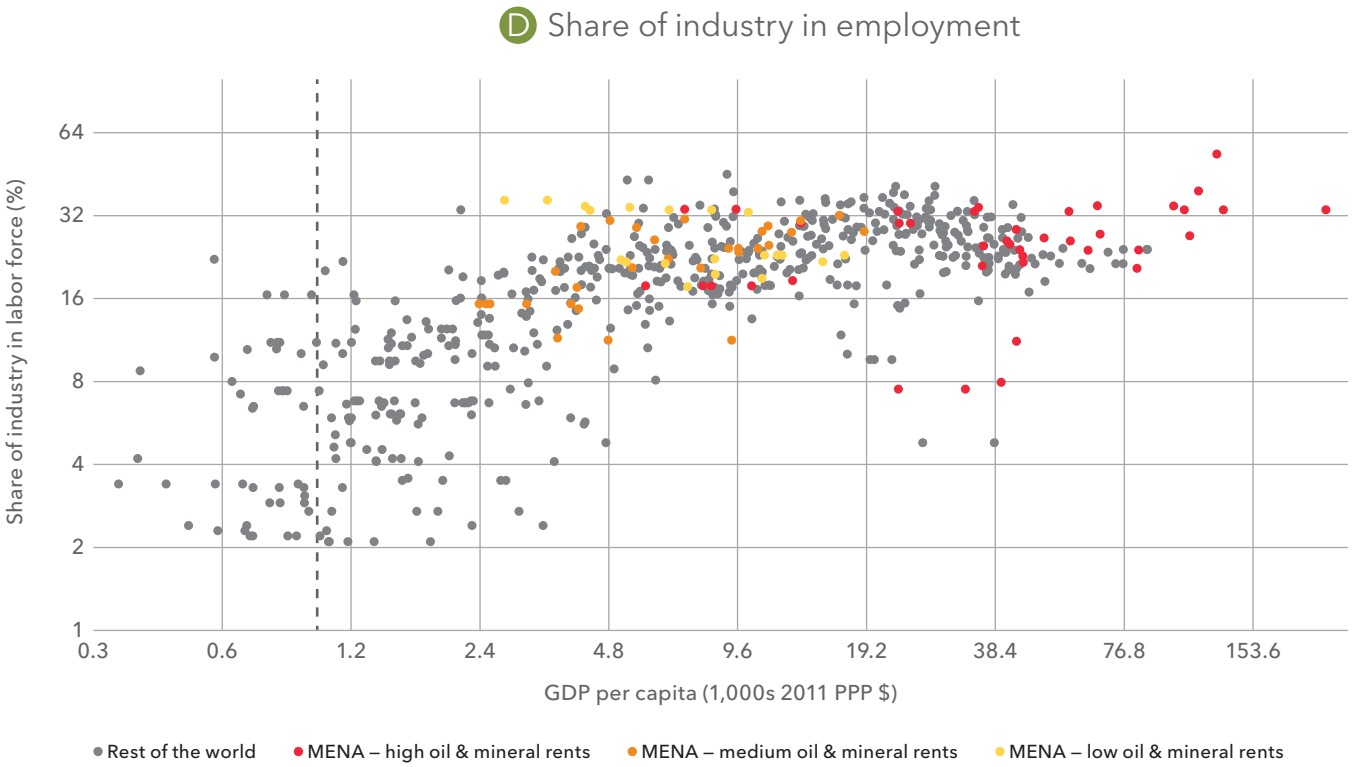
TABLE 12 SECTORAL SHARES OF EMPLOYMENT AND VALUE ADDED FOR MENA COUNTRIES (AVERAGE VALUES 2010–2014)

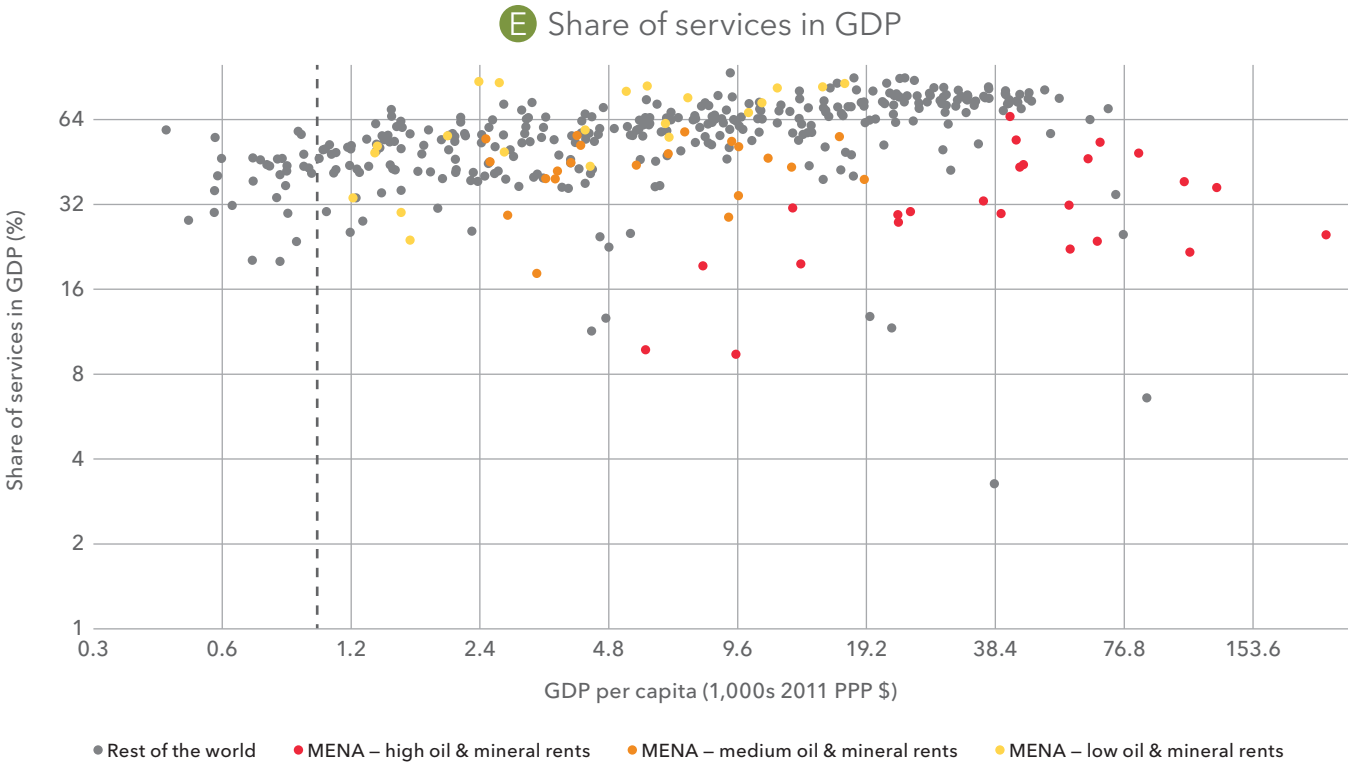
	Share in total employment			Share in GDP					
	Agriculture	Industry	Services	Agriculture	Industry	Oil and Mining	Construc-tion	Manufac-tures	Services
Qatar	1.4	52.3	46.3	0.1	61.7	53.1	13.8	8.6	38.2
Kuwait	2.2	28.9	68.9	0.5	51.7	44.3	1.6	7.4	47.8
UAE	3.8	23.1	73.0	0.8	44.9	34.2	12.7	10.8	54.3
Saudi Arabia	4.7	23.9	71.4	2.7	50.1	38.3	6.2	11.8	47.2
Bahrain	1.1	35.3	62.4	0.3	32.6	18.4	7.6	14.2	67.2
Oman	5.2	36.9	57.9	1.4	53.1	43.0	9.6	10.1	45.5
HI	**3.1**	**33.4**	**63.3**	**1.0**	**49.0**	**38.6**	**8.6**	**10.5**	**50.0**
Libya	19.7	30.0	50.2	2.2	60.4	56.4	4.7	4.0	37.5
Iran	18.9	32.6	48.5	5.6	35.6	20.3	6.3	15.3	58.8
Lebanon	6.8	21.0	72.6	3.1	13.9	4.7	6.6	9.2	83.1
Iraq	23.4	18.2	58.3	3.8	65.4	63.5	6.8	1.9	30.9
Algeria	10.8	30.9	58.4	11.9	39.0	32.7	11.7	6.3	49.0
Jordan	1.9	18.4	79.7	3.2	22.8	5.5	4.6	17.3	74.1
Tunisia	15.6	33.3	50.7	9.9	20.5	4.5	5.0	16.0	69.6
UMI	**13.9**	**26.3**	**59.8**	**5.7**	**36.8**	**26.8**	**6.5**	**10.0**	**57.6**
Egypt	28.1	24.2	47.8	13.7	33.9	16.1	6.6	17.8	52.4
Syria	19.9	27.7	52.4	18.8	33.0	–	–	15.0	48.2
Morocco	39.4	21.5	39.1	15.6	22.3	4.0	6.8	18.3	62.2
West Bank & Gaza	11.8	24.6	63.6	4.5	23.2	–	–	14.0	72.2
Sudan	44.6	15.3	40.1	37.9	17.9	9.0	5.0	8.9	44.3
Yemen	24.7	18.8	56.2	15.0	27.6	20.1	5.8	7.4	57.5
Mauritania	50.4	–	–	30.3	29.6	21.7	7.8	7.9	40.2
Djibouti	74.1	–	–	3.8	9.6	7.0	10.3	2.6	86.6
Comoros	69.6	–	–	44.5	6.8	1.7	6.7	5.0	48.8
Somalia	66.4	–	–	63.0	3.2	0.7	4.3	2.5	33.8
LMI	**42.9**	**22.0**	**49.9**	**24.7**	**20.7**	**10.0**	**6.7**	**9.9**	**55.3**

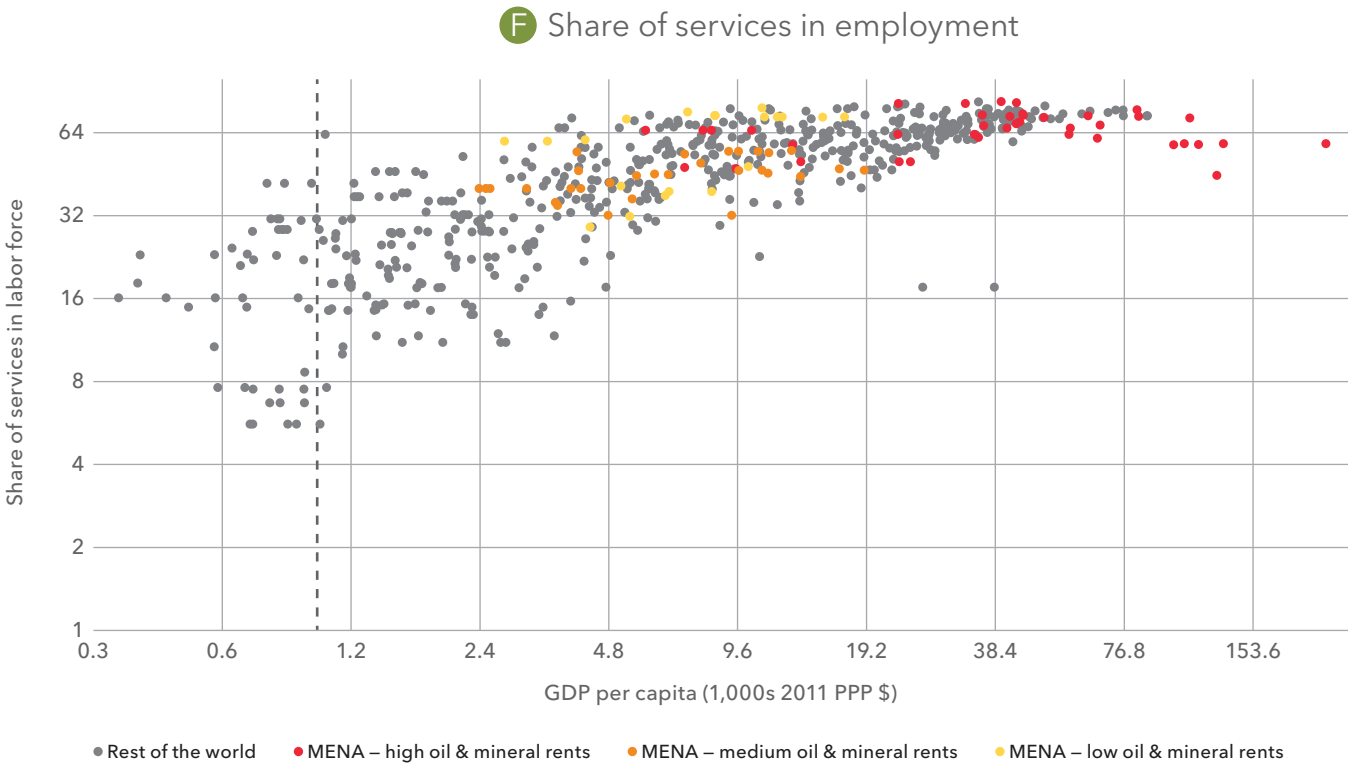
Source: Elaborated by authors based on World Bank (2016b), ILO (2016), and UNSD (2016).

FIGURE 11 SECTORAL SHARES OF VALUE ADDED AND EMPLOYMENT AT THE COUNTRY LEVEL


C Share of manufacture in GDP
Share of manufacture in GDP (%)
64
32
16
8
4
2
1
0.5
0.25
0.125
0.0625
0.3
0.6
1.2
2.4
4.8
9.6
19.2
38.4
76.8
153.6
GDP per capita (1,000s 2011 PPP $)
Rest of the world
MENA – high oil & mineral rents
MENA – medium oil & mineral rents
MENA – low oil & mineral rents


D Share of industry in employment
Share of industry in labor force (%)
64
32
16
8
4
2
1
0.3
0.6
1.2
2.4
4.8
9.6
19.2
38.4
76.8
153.6
GDP per capita (1,000s 2011 PPP $)
Rest of the world
MENA – high oil & mineral rents
MENA – medium oil & mineral rents
MENA – low oil & mineral rents





Source: Elaborated by authors based on World Bank (2016b), ILO (2016), and UNSD (2016).

Note: Figure shows five observations per country each representing averages for the following periods when data available: 1971–1980, 1981–1990, 1991–2000, 2001–2005, and 2006–2013.

To check for these observed differences in the sectoral share in GDP and employment in a more rigorous way, we use a Wilcoxon-Mann-Whitney test, which is a nonparametric analog to the independent samples t-test that can be used when it is not possible to assume that the dependent variable is normally distributed. In this case, the dependent variable is the share of an economic sector in GDP or employment in other countries and the independent variable is the respective share of that sector in MENA countries (MENA countries versus other countries). The test is conducted separately for the three different income groups defined above, with results presented in Table 13. By construction, negative values of the *z* statistic mean that sectoral shares of MENA countries are bigger than those of other countries. The opposite is true for positive values of *z*.

The test confirms that MENA countries exhibit a significantly smaller share of manufacturing in GDP than other countries at all levels of income. There is no difference in the share of agriculture in total employment, but shares of agriculture in GDP in middle- and high-income countries are lower than in other countries. A similar result is obtained for services, the only difference being that HI countries have a higher share of employment in services than other countries. Similar employment shares but considerably lower shares in GDP indicate that agriculture and services in MENA countries are less productive than in other countries (at all levels of income), a feature that will be examined in more detail below.

Although the MENA region has the lowest shares of manufacturing among all world regions, this share has been increasing in recent years. On average for the analyzed period (1970–2013), the shares of agriculture and services in MENA countries are the lowest whereas the share of industry (which includes oil) is the highest among all regions. The most interesting result is the negative trend observed in the share of industry in MENA, from more than 60 percent in 1970 to 40 percent in 2013. The 2013 value of the share of industry is almost the same shown by East Asia and Pacific, although the composition of industry is very

TABLE 13 TWO-SAMPLE WILCOXON RANK-SUM (MANN-WHITNEY) TEST FOR THE DIFFERENCE IN SECTORAL SHARES BETWEEN MENA AND OTHER COUNTRIES, USING FIVE-YEAR AVERAGES (1971–1980, 2006–2013)

	Low income		Middle income		High income	
Variable	z	p-value	z	p-value	z	p-value
Share of agriculture in employment	−0.215	0.830	0.488	0.625	0.381	0.703
Share of agriculture in GDP	−1.819	0.069	3.405	0.001	13.688	0.000
Share of manufacture in GDP	15.546	0.000	19.808	0.000	20.653	0.000
Share of services in employment	1.030	0.303	1.721	0.085	−10.974	0.000
Share of services in GDP	17.799	0.000	9.763	0.000	3.010	0.003

Source: Elaborated by authors based on data from World Bank (2016b).

Note: The null hypothesis is that there is no difference between sector shares in MENA and other countries. Negative values of z mean that MENA countries are more likely to show higher values of the shares than other countries. Data are built using five observations per country each representing averages for the following periods when data were available: 1971–1980, 1981–1990, 1991–2000, 2001–2005, and 2006–2013.

different from that in MENA. East Asia and Pacific also has increased its share in manufacturing to almost 35 percent, making it the region with the highest share of this sector in GDP, while MENA almost doubled its share in manufacturing between 1970 and 2013, although from a low value of 5 percent to about 10 percent at present. This development may indicate that there is room for manufacturing-led growth in MENA, a point that will be further discussed in the conclusion.

In summary, the composition of GDP in MENA has changed in the past 40 years following similar patterns to those followed by other regions but showing lower shares of employment in manufactures for all levels of income, higher shares of employment in services in higher-income countries, and higher employment in agriculture among lower-income countries. These changes, however, did not modify the main structure of the economy. The region still relies heavily on industry (oil) despite the reduction of its share.

Are the observed changes in the share of value added reflected in changes in employment? The observed patterns of change in sectoral shares of value added do not have a correlate in the employment shares. On the contrary, the employment share in industry remained stable at 25 percent during most of the 40-year period analyzed here, increasing to 30 percent in recent years. Something similar happened with the share of services in total employment, which remained stable at about 60 percent. Increases in the share of industry and services in employment occurred together with a reduction in the share of agriculture in GDP from 20 percent in the mid-1990s to 15 percent in 2013. In contrast with these changes, the share of employment in Asia reflects significant structural change and, in general, employment and GDP shares have moved in the same direction. The clearest case is that of South Asia. This region reduced its share of agriculture in the labor force from 60 percent in 1970 to about 45 percent in recent years. At the same time, it increased the share of manufacturing from 15 to 25 percent and services from 25 to 30 percent. These changes in employment are reflected in even higher increases in the share of manufactures and services in value added.

THE CONTRIBUTION OF STRUCTURAL CHANGE TO LABOR PRODUCTIVITY

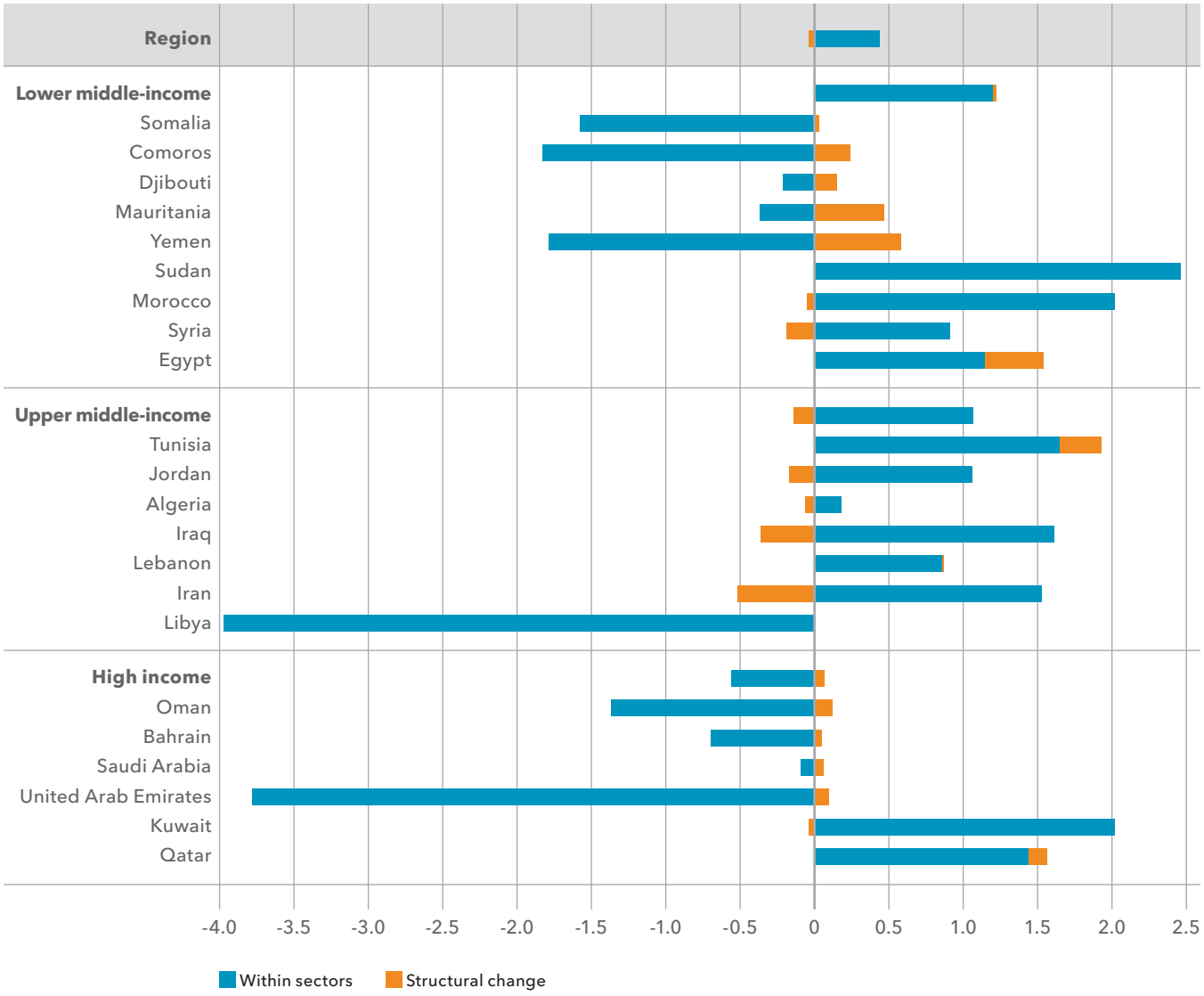
More evidence on these findings can be obtained by decomposing economywide growth in labor productivity following McMillan and Rodrik (2012):

$$dY_t = \sum_{j=m} \beta_{j,t-s} dy_{j,t} + \sum_{j=m} y_{j,t} d\beta_{j,t} \quad (1)$$

This equation shows the decomposition of changes (d) in economywide labor productivity (Y_t) into changes in sectoral productivity (y_{jt}) weighted by the initial share of employment in each sector (β_{jt}), and changes in sectoral employment weighted by productivity levels, where j is the sector and t the period. The first term in the equation is the weighted sum of productivity growth within sectors, what McMillan and Rodrik (2012) call the "within" sector component of labor productivity growth. The second term is the structural change effect, which captures the productivity effect of labor reallocations across different sectors, calculated as the change in the labor share weighted by the productivity level of each sector. When changes in employment shares are positively correlated—for example, when the labor share of the sector with the highest productivity increases and the labor share of the sector with the lowest productivity decreases—the second term in the equation is positive, and structural change increases economywide labor productivity. Productivity growth rates and their decomposition into the within sector and structural change effects are shown in Figure 13.

Labor productivity growth between 1995 and 2013 was low (0.4 percent), with a very small and negative contribution of structural change (Figure 12). Looking at the individual countries, a clear pattern is associated with income. Countries with the lowest income (Somalia, Comoros, Djibouti, Mauritania, and Yemen) show negative growth in labor productivity. However, this is the result of a reduction in output per worker within sectors, while structural change contributes positively to productivity growth. In countries with incomes higher than those in Sudan, including middle-income countries, labor productivity is driven by growth in sectoral productivity (always positive, with the exception of Libya), in general with a negative contribution of structural change. Paradoxically, at high

FIGURE 12 LABOR PRODUCTIVITY GROWTH RATE AND THE CONTRIBUTION OF SECTORAL PRODUCTIVITY GROWTH AND OF REALLOCATION OF EMPLOYMENT BETWEEN SECTORS (1995–2013 YEARLY AVERAGE)



Source: Elaborated by authors based on World Bank (2016b), ILO (2016).

Note: The "within sector" component is the contribution of sectoral productivity growth weighted by the initial share of sectoral labor in total employment; the structural change component is the change in the sectoral employment share weighted by the level of sectoral labor productivity.

levels of income, productivity patterns look similar to those in lower-income countries: negative growth in sectoral productivity and a positive contribution of structural change, although that contribution is small and below that of poor countries. A possible interpretation of these results is that they are an outcome of the particular and longstanding characteristics of the MENA region: the importance of natural resources, the high productivity and low employment possibilities of natural resource–related industries, and the low productivity and competitiveness of alternative sectors for relatively fast-growing populations.

Countries at very low levels of income still have a very high proportion of their population working in agriculture with low levels of labor productivity. Oil and mineral exports generate a high economic surplus (at least during times of high oil prices) that contributes to economywide growth, creating employment opportunities mainly related to domestic consumption (private and government) and mostly in services and in the informal economy. Because of the very low level of productivity in agriculture, these changes result in a positive contribution of structural change to overall labor productivity. These mineral resource rents in general have led to oversized public sectors in many countries and allowed governments to sustain the old social contract, where governments provide employment and affordable food and fuel (through subsidies) to their citizens.

In mineral-rich countries, growth in consumption driven by oil rents is likely pulling workers out of the agricultural sector and shifting employment to other sectors. Evidence of this pull effect from the rest of the economy comes from the negative sectoral productivity growth among low-income countries. People move out of agriculture not as a result of increased agricultural productivity, but as a consequence of growing opportunities in more productive sectors. Because new employment opportunities are related to growth in the domestic market, as natural resource competitive activities cannot absorb agricultural workers, this process of structural change is limited to the low-income countries.

After a country reaches a certain level of income (as in the case of Morocco), the movement of workers from agriculture to industries and services, which until then had positive structural change effects on productivity, seems to reach a ceiling. Two things may be happening here. First, agriculture has increased productivity compared to productivity levels in poor countries. Second, the domestic economy's difficulty in absorbing new workers results in a decrease in labor productivity in services because of increasing informality and growth of low productivity services in the domestic market. As a consequence, the difference in productivity between agriculture and other sectors tends to decrease, and the benefits from shifting employment are also reduced significantly. This finding matches that found in the growth patterns of UMI countries like Sudan, Morocco, Syria, Tunisia, Jordan, Algeria, Iraq, Lebanon, and Iran, shown in Figure 12.[7] As discussed earlier, the HI oil-exporting countries were able to circumvent this process of transformation because of their specific historical and structural conditions. Consequently, the region does not have a clear model for a development path that other countries can follow. Iran, Lebanon, Algeria, and Jordan have all reached higher levels of income if we do not consider the rich oil-exporting countries, and they all show such patterns of low or negative contribution of transformation to productivity growth.

LABOR PRODUCTIVITY GROWTH AND THE RURAL-URBAN INCOME GAP

The differences observed in the shares of agriculture in GDP and employment are a defining characteristic of development and a central element of the transformation process. The outcome of this process is an integrated economy, one that has no differences between labor and capital productivity of different sectors, including agriculture (as observed in developed countries). When the gap between the share of agriculture in GDP and employment approaches zero, it means that agriculture and nonagriculture have been integrated by well-functioning labor and capital markets (Timmer 2007). At low levels of income, there is a substantial gap between the share of the labor force employed in agriculture and the share of GDP generated by that labor force. This report follows Timmer (2007) to define the agricultural GDP–employment gap as the difference between the share of agriculture in GDP and its share in employment. As shown in Timmer (2007), using the difference in shares is convenient because the negative value of this gap translates into a "sectoral Gini coefficient" that indicates income inequality as measured by labor productivity in agriculture and nonagriculture.[8]

The GDP–employment share gap narrows with higher incomes, but with fast GDP growth, the share of agriculture in GDP falls much faster than the share

of agriculture in the labor force. As a result, the gap becomes larger before it closes, and it will take a long time to fully integrate agriculture with the rest of the economy. Therefore, the gap is politically relevant, as it means that rural incomes fall behind those of workers in nonagricultural activities, representing a significant part of a country's income inequality (Timmer 2007).

This analysis stresses that this income gap cannot be analyzed simply as an agricultural policy problem. The path to close this gap will require the use of new technologies, increased investment in physical and human capital, enhanced infrastructure, well-functioning factor markets, and more efficient allocation of resources between sectors. As Timmer (2007) puts it, the way to raise rural productivity in the long run is to raise urban productivity: without the growth of the nonagricultural economy, agricultural development cannot advance. At the same time, agriculture plays an important role in stimulating the nonagricultural economy. At the start of this process in low-income countries, labor reallocates from low-productivity agriculture to more productive activities in manufacturing and services, increasing overall productivity and expanding income. These changes are usually accompanied by increased urbanization, as the economy's center shifts from rural to urban areas and rural-to-urban migration rises, increasing demand for higher-quality, higher value-added agricultural goods and animal protein, thus incentivizing productivity growth in agriculture. Conversely, agricultural productivity growth provides more competitively priced inputs and raises the purchasing power of workers in agriculture. Labor reallocation across sectors and the linkages between a more productive agricultural sector and growing industry and service sectors are essential ingredients of inclusive growth and defining characteristics of the development process (Syrquin 2006). In other words, the process of transformation is a key driver of productivity in the agricultural sector. Changes in labor productivity in agriculture depend not only on within-sector agricultural growth and productivity but also on how the nonagricultural sector performs and on the integration of labor markets, among other variables.

The following assessment uses a simple framework to look at labor productivity growth in agriculture and nonagriculture and their interactions affecting labor productivity of the whole economy. In particular, it looks at how different growth patterns in agriculture, industry, and services result in different outcomes for the income gap, using what Timmer (2007) calls the "simple mathematics" of transformation. We first look at the implications of different growth patterns in what could be seen as a typical natural resource–abundant country, like the average UMI country in Table 12 at present. Forty-five years of growth are projected for this average country, simulating first the historical growth patterns in MENA by using average growth rates observed for 1970–2012. We then calculate the income gap measured as the difference between the share of agriculture in GDP and its share in employment—the Gini coefficient of income differences between workers in agriculture and nonagriculture. The growth patterns that result from the simulations are shown in Figure 13.

Figure 13 tells a story of transformation in an oil-rich region. With a relatively low population and a high specialization in oil production, economic and population growth lead to diversification away from oil and into services. This is reflected in the share of industry in GDP, where oil industries are predominant and manufacturing plays a minor role (Figure 13A). The share of industry falls from 65 percent to 42 percent of GDP while the share of services increases from 30 percent to 50 percent. The share of agriculture in GDP decreases from 10 percent to 7 percent in 45 years. These changes in GDP do not correlate with that of employment; the total labor force increases at an average rate of 2.7 percent and the share of the three sectors in total employment changes very little, despite the high labor force growth of 3.5 percent per year, which is the same for each of the three sectors. Approximately 60 percent of the labor force is employed in services, 14 percent in agriculture, and 26 percent in industry.

Without major changes in the structure of employment, labor productivity is driven by GDP growth (Figure 13C). The largest change in productivity occurs

FIGURE 13 CHANGES IN THE COMPOSITION OF GDP AND EMPLOYMENT, LABOR PRODUCTIVITY, AND THE RURAL-URBAN INCOME GAP FOR A NATURAL RESOURCE–ABUNDANT COUNTRY GROWING AT MENA'S HISTORICAL GROWTH RATE (AVERAGE RATES FOR 1970–2014)

Source: Elaborated by authors using data from World Bank (2016b) and Feenstra, Inklaar, and Timmer (2015).

in services, where output per worker increased by more than four times between 1970 and 2014, growing at an average rate of 3 percent. Labor productivity in industry and agriculture showed relatively modest growth. Overall, labor productivity increases at an annual rate of 1.4 percent. These growth patterns result in an increasing income gap between agriculture and nonagriculture, from 5 to 8 percentage points, a relatively small Gini coefficient of 0.08.

A different perspective appears in two counterfactual scenarios for the same period, as defined by Timmer (2007). The first scenario is what Timmer calls the "Lewis scenario," as it follows the logic of W. Arthur Lewis's (1954) development model, where the nonagricultural sectors absorb the abundant available labor of low-productivity agriculture. This is an extreme case of Southeast Asian–type development, where labor-intensive industrial and service sectors absorbed labor from the agricultural sector. Projections between 1970 and 2012 in this counterfactual scenario are made by assuming that employment in industry and services in a natural resource–abundant country increases at the same rate as their respective GDPs, while employment in agriculture is the residual between total labor force and nonagricultural employment. This is the labor-intensive growth scenario (Figure 14).

The second scenario is an extreme case of growth driven by a capital-intensive oil industry with low job creation in nonagriculture (Figure 15). For this case, industry and services do not absorb new labor at all, labor productivity in these sectors grows at the same rate as the sectors themselves, and the entire increase in the labor force remains in agriculture. This is the capital-intensive growth scenario, or what Timmer (2007) calls the "SSA [Africa south of the Sahara] scenario." Note that in both counterfactual scenarios, growth rates for the labor force and sectoral GDP growth are the same, and equal to those of MENA for the period 1970–2014. The only difference between the historical growth and the two scenarios is the assumption about labor allocation with growth.

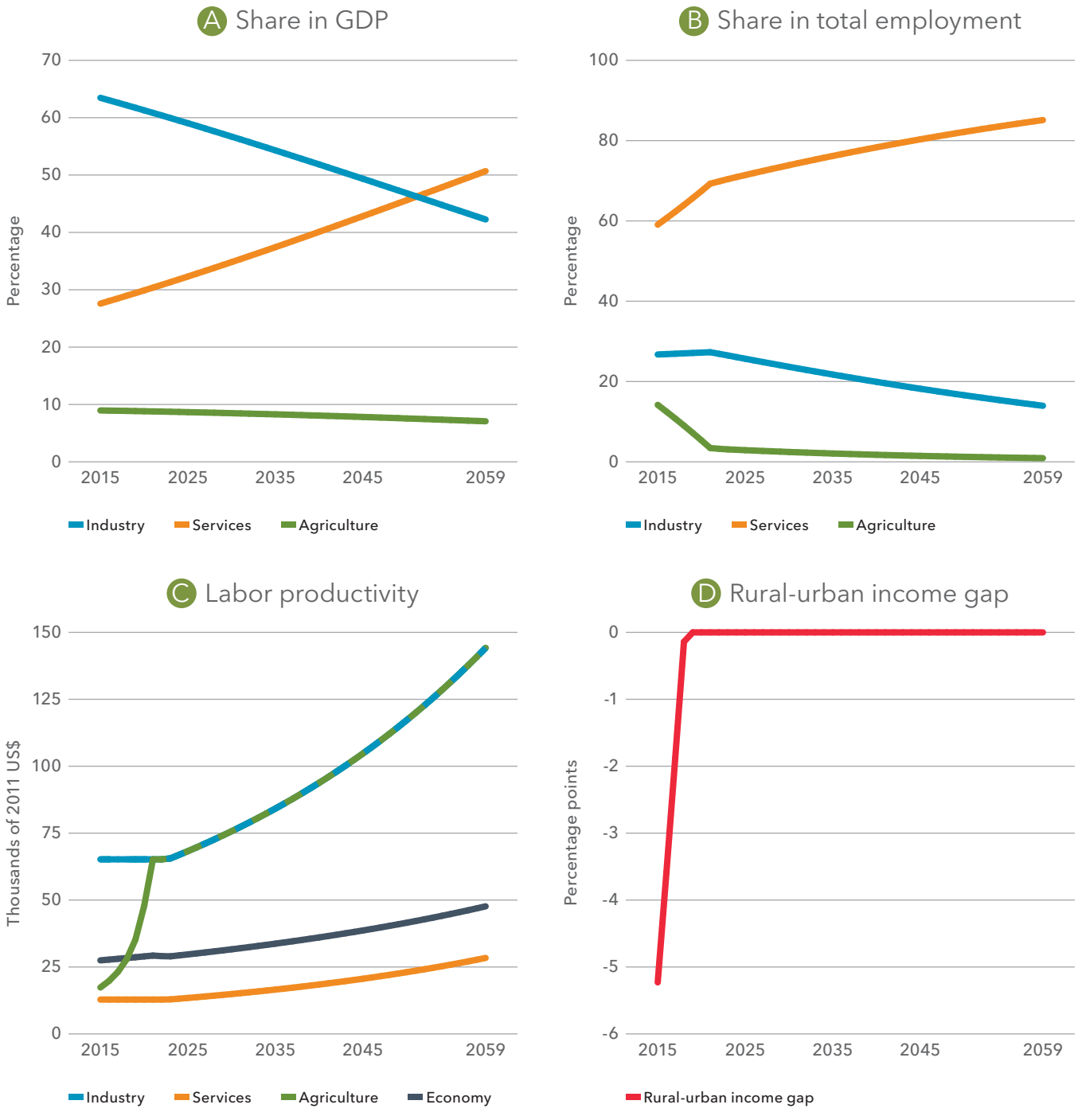
Figures 14 and 15 show results of the labor-intensive and capital-intensive growth scenarios respectively. Trends in the agricultural sector's share in GDP are the same in all cases, as growth rates of sectoral GDPs do not differ between scenarios. As shown in Figure 14, when the economy can create productive jobs, economic growth quickly pulls people away from agriculture, productivity in agricultural growth accelerates and converges with productivity in industry, employment in agriculture is reduced to a minimum, and the rural-urban income gap closes very fast. In this extreme case of very labor-intensive growth in nonagriculture, it takes five years to close the income gap. The only difference with MENA's historical growth path is that in the counterfactual scenario, employment in services increases at 6 percent, the same rate as GDP growth in services, while in the actual historical case growth in employment in services is only 3 percent, half the rate of growth in GDP. Employment growth in industry is almost the same in the historical case and in the counterfactual scenario.

The other extreme case is the capital-intensive scenario in Figure 15. With a capital-intensive nonagricultural sector that does not create jobs, agriculture absorbs the growth in the labor supply. The result is the fast growth of the share of agriculture in employment, low productivity growth in agriculture and fast productivity growth in nonagriculture, and a fast-growing rural-urban income gap, which by the end of the period reaches almost 80 percent.

Table 14 summarizes the results of growth in a natural resource–abundant country at MENA's historical growth rates and the two counterfactual scenarios. It reveals differences in labor productivity growth at the sectoral level, recalling that GDP growth for each sector is the same in all scenarios. Also, it indicates that at MENA's historical rates, this case country was able to cope with the rural-urban gap, which is still small but has almost doubled during the period (Gini=0.08). However, with a growing labor force, budget constraints to creating government jobs, and no development of labor-intensive manufactures, future growth in the MENA region could look more like the capital-intensive scenario in Table 14, with slow growth in agricultural labor productivity and a growing income gap.

The usual government response to the political tensions generated by an income gap such as the one shown in the capital-intensive growth

FIGURE 14 CHANGES IN THE COMPOSITION OF GDP AND EMPLOYMENT, LABOR PRODUCTIVITY, AND THE RURAL-URBAN INCOME GAP FOR A NATURAL RESOURCE-ABUNDANT COUNTRY WITH LABOR-INTENSIVE GROWTH IN INDUSTRY AND SERVICES



Source: Elaborated by authors, based on data from World Bank (2016b).

Note: Employment in industry and services increase at the same growth rates of GDP of each sector. Labor employment in agriculture is the difference between employment in nonagriculture and total employment.

FIGURE 15 CHANGES IN THE COMPOSITION OF GDP AND EMPLOYMENT, LABOR PRODUCTIVITY, AND THE RURAL-URBAN INCOME GAP FOR A NATURAL RESOURCE-ABUNDANT COUNTRY WITH CAPITAL-INTENSIVE GROWTH IN INDUSTRY AND SERVICES

Source: Elaborated by authors based on data from World Bank (2016b).

Note: Industry and services do not generate new employment, and labor employment in agriculture is the difference between employment in nonagriculture and total employment.

TABLE 14 HISTORICAL LABOR PRODUCTIVITY GROWTH AND RURAL-URBAN INCOME GINI COEFFICIENT AT THE END OF THE PERIOD FOR THE MENA COMPARED TO COUNTERFACTUAL GROWTH SCENARIOS (1971–2014)

	Labor productivity				Rural-urban Gini coefficient
	Industry	Services	Agriculture	GDP	
MENA historical	0.3	2.8	0.7	1.8	0.08
Labor-intensive growth	1.8	1.8	4.8	1.9	0.0
Capital-intensive growth	3.8	6.1	−3.2	0.6	0.7

Source: Elaborated by authors based on data from World Bank (2016b).

Note: Employment in industry and services increase at the same rates as the GDP of each sector in the labor-intensive scenario; industry and services do not generate new employment in the capital-intensive scenario; labor employment in agriculture is the difference between employment in nonagriculture and total employment in both counterfactual scenarios.

scenario has been to protect the agricultural sector from international competition and to provide direct income subsidies to farmers, as discussed in Timmer (2007) and above for the MENA region. These interventions are based on the evidence that agricultural price policy can be used to influence the domestic trade terms of agriculture; in other words, that policies should compensate farmers for income differences and losses generated by the process of growth and transformation. As Timmer (2007) argues, however, these interventions do not deliver the expected results and could be costly because political efforts to control prices face market counterforces that require large subsidies to make them effective—as has happened in MENA countries. Instead, Timmer (1988) refers to a series of diversification steps to define a successful agricultural transformation path, one that will be part of a broader transformation that includes diversification from production of staple crops to higher-value commodities and increased productivity of staple crops as well as diversification from commodity production to high-value products to access supply chains, help rural workers migrate to urban jobs, and integrate national economies with global markets.

For the case of low-income and LMI countries in MENA, these results suggest that the region should gradually move away from the traditional price policies to policies that facilitate the diversification of agriculture, as in the first two steps proposed by Timmer (2007). Yet diversification is not a policy, but rather is the potential outcome of the implementation of different policies. In the case of MENA, a first step toward a more diversified and efficient agricultural sector would be to abandon the price policies used to protect domestic production of staple crops, to compensate farmers for income differences and losses generated by the process of growth, and to reduce NTBs that protect the agricultural sector from international competition. Past policies have not delivered expected results and have been costly for MENA governments. Reducing protections for staple crops should increase the contribution in total output of crops for which the region has a comparative advantage—fruits, vegetables, and oil crops—while efforts to promote technical change, infrastructure investment, developed production chains, and enhanced quality of final output could result in increased value added of agricultural production and increased exports. Further, deregulation and development of labor, land, and water markets should contribute to a more efficient allocation of labor within agriculture and between sectors.

Table 15 presents average rural-urban income Gini coefficients, together with shares of agriculture in GDP and employment, for the MENA countries by income group. As noted before, agriculture in HI countries is small in terms of both GDP and employment, and the rural-income gap is not an issue for these countries. The two groups of middle-income countries have a wide range of different situations. The average Gini coefficient for the UMI countries is also very small, but Iraq, Libya, and to some extent Iran still show a relatively large gap between rural and urban incomes and about 20 percent of employment in agriculture. Algeria and Jordan, the countries with the best performing agricultural sectors in the region, have also managed to close the rural-income gap, showing similar shares of agriculture in GDP and employment. Lebanon and Tunisia are intermediate cases in this group.

In the group of LMI countries, Egypt and Morocco are interesting cases. These two countries, together with Syria, are the countries with the highest incomes in LMI group. However, and unlike Syria, they still have high levels of employment in agriculture: almost 34 percent in the case of Egypt and almost 44 percent in Morocco. The situation in Yemen is similar to that of Egypt if measured by the share of agriculture in employment and the Gini coefficient. Among the poorest countries, the case of Djibouti is striking: 75 percent of its population is involved in pastoralist livestock production and the country has a Gini coefficient of 0.7.

TABLE 15 SHARE OF AGRICULTURE IN GDP AND EMPLOYMENT, AND RURAL-URBAN GINI COEFFICIENT (2010–2014)

Country	GDP	Employment	Rural-urban income Gini coefficient
Qatar	0.3	3.0	0.01
Kuwait	0.4	1.7	0.02
UAE	1.3	6.9	0.03
Saudi Arabia	3.4	6.3	0.02
Bahrain	0.4	1.9	0.01
Oman	1.6	7.6	0.04
HI	**1.2**	**4.6**	**0.02**
Libya	2.2	19.3	0.18
Iran	6.5	15.3	0.13
Lebanon	3.8	7.3	0.04
Iraq	6.0	18.6	0.20
Algeria	8.2	19.8	−0.01
Jordan	3.9	5.0	−0.01
Tunisia	11.3	25.1	0.06
UMI	**6.0**	**15.8**	**0.08**
Egypt	15.5	33.6	0.14
Syria	21.3	23.8	−0.03
Morocco	16.5	43.6	0.24
Sudan	37.8	44.6	0.07
Yemen	12.7	43.6	0.10
Mauritania	40.1	58.7	0.20
Djibouti	3.6	75.2	0.70
Comoros	42.2	74.1	0.25
Somalia	68.0	70.0	0.03
LMI	**27.5**	**49.5**	**0.19**

Source: Elaborated by authors using data from World Bank (2016b).

6. INSIGHTS FROM COUNTRY CASE STUDIES

EGYPT

PREVIOUS SECTIONS HAVE SHOWN THAT THE MANUFACTURING SECTOR plays a lesser role in MENA compared to other regions, that productivity growth has been slow, and that agriculture does not seem to have contributed to improving social outcomes as it has in other developing regions. It is also clear that the development pathways followed by HI MENA countries may not be entirely useful in other MENA countries. For several countries in the UMI and HI groups, oil exports seem to have played a role in shaping their transformation trajectories. Therefore, this section of the report examines the economic transformation experience of Egypt, an LMI country where mineral resources have played a limited economic role. Egypt has potential for agriculture and manufacturing development and potential for transformation given its ambitious national development strategies and relative stability (Abdelaziz et al. 2016). In addition to reviewing Egypt's transformation path in depth, this country case study puts special emphasis on the role of agriculture and manufacturing, including agro-processing.

Egypt has been running large fiscal budget and balance-of-payments deficits in recent years, requiring substantial reforms. The budget deficit has been caused largely by high levels of subsidies and inefficient public spending, recently aggravated by slow economic growth. In recent years, the Egyptian government introduced universal subsidy reforms and transformed its social protection scheme by introducing a new (conditional) cash transfer program. To consolidate public finances, in 2016 the government launched a program to phase out energy subsidies and increase tax revenues by introducing a VAT. Meanwhile, energy subsidy reforms were supposed to take place over five years, according to a government program introduced in 2014 (EIU 2016d). Yet in May 2016, the government proposed a revised plan that would stretch out subsidy removal to at least 2020 (EIU 2016d). Despite this reluctance to implement socially sensitive spending reforms, some phasing-out took place in 2016 and subsequently in 2017, when fuel prices were increased by about 47 percent. Along with these reforms, the government announced that it would float the Egyptian pound in November 2016, a measure that resulted in a steep depreciation of the domestic currency. The combination of these factors has led to double-digit inflation rates since May 2016. In fact, inflation is expected to keep rising in 2017–2018, as the Egyptian pound weakens and subsidy cuts progress (EIU 2016d).[9]

To protect the poor from the expected negative impacts of these reforms, the government has introduced the Takaful and Karama program (T&K), a cash transfer program to accompany the subsidy reforms. The T&K program is designed to offset the inefficient universality in the subsidy system and poor targeting in the established social protection programs. It uses a combined-targeting method that includes geographical targeting—for the poorest districts—and a proxy means-testing mechanism to identify eligible households within those selected districts (World Bank 2015). The program's goal is to reach 1.5 million poor households by the end of 2017. Implementation started in Upper Egypt. Yet, with the foreseen negative consequences of the economic reforms, the government decided to expand the program to 1.7 million households by June 2017, the end of the 2016–2017 fiscal year. Additionally, the T&K program is conditional on school attendance and visits to the health clinic. This program would thus have several benefits for the process of rural transformation. The decision to target Upper Egypt first shows the government's commitment to supporting the poorest rural households, among which are agriculture-only households. Similar programs in other countries had positive developmental impacts. For instance, the Brazilian program Bolsa Família has improved school participation and grade progression for girls, led to some improvements in women's decision-making power in urban areas (de Brauw et al. 2014), and did not produce any disincentive effects for household labor-force participation or hours worked (de Brauw et al. 2015).

Egypt has ambitious plans for inclusive transformation by accelerating economic growth and improving the lives of its people, including reducing poverty and malnutrition. Based on the government's recent Sustainable Development Strategy (SDS), Egypt's 2030 Vision aims to achieve an average economic growth rate of 7 percent, raise investment rates to 30 percent on average, increase the contribution of services to GDP to 70 percent, and reduce unemployment to 5 percent (Government of Egypt 2015). Over the medium term, the government plans to implement a range of policy interventions to ensure that growth is sustainable, inclusive, and investment-led. These interventions include reforming public spending strategies by phasing out energy subsidies and reforming the tax system. Parallel to these fiscal spending changes, the government plans on fostering inclusiveness by creating jobs, particularly for the youth, and adopting a comprehensive social protection strategy. As part of Egypt's Vision 2030, the government plans to reclaim 1.5 million feddans (acres) of land, while integrating it with an agro-industrial park for specific crops, fruits, and vegetables and packaging and processing houses.[10] Additionally, the agricultural development plan suggests increasing the role of agriculture in the economy by increasing the productivity of "old lands" by the Nile Valley and the Delta; improving water management systems and irrigation networks; and investing in land preparation and water resource development for the "new reclaimed lands," focusing on the eastern and western deserts (Government of Egypt 2015). The government also is increasingly aware of the importance of agribusiness development. Egypt's SDS highlights the country's interest in creating strategically located collection and storage facilities; promoting investment in aquaculture; and developing agro-industrial parks, tomato processing plants, and olive oil producers. It is thus timely to review Egypt's past economic transformation experience to learn lessons that may support the achievement of the ambitious goals laid out in the SDS, with a special focus on agriculture and agribusiness.

THE ROLE OF AGRICULTURE AND AGRO-PROCESSING IN THE EGYPTIAN ECONOMY

Agriculture still plays an important role in the Egyptian economy, in terms of value added and trade. Table 16 shows the structure of Egypt's economy for the year 2010–2011.[11] About half of agricultural value added is in crops, and the other half is in livestock and fisheries.Agriculture contributes 5.6 percent to exports and accounts for 10.1 percent of total imports. In terms of value, 15.6 percent of agricultural commodities consumed in Egypt are imported, with this share reaching about 56 percent for wheat, the second major crop grown in Egypt. As mentioned earlier, import dependence is one factor influencing a country's national level of food security, as any country with high import

TABLE 16 EGYPT: ECONOMIC STRUCTURE (2010–2011)

	Share of total GDP	Share of total production	Share of labor value added	Exports		Imports	
				Share in exports	Export intensity*	Share in imports	Import intensity**
AGRICULTURE	**12.1**	**9.4**	**15.7**	**5.6**	**7.3**	**10.1**	**15.6**
Crops	**6.3**	**5.0**	**9.3**	**5.5**	**13.6**	**9.8**	**26.7**
Wheat	0.8	0.6	0.6	–	–	4.6	55.9
Maize	0.7	0.6	1.2	–	0.2	2.2	38.4
Sorghum	0.1	0.1	0.1	–	2.7	–	3.2
Rice	0.4	0.3	0.4	–	–	–	0.2
Other cereals	–	–	–	–	14.4	–	13.8
Root crops	0.2	0.1	0.3	0.6	64.7	0.2	41.2
Pulses	–	–	–	0.3	113.7	0.3	110.1
Vegetables	0.9	1.1	1.6	0.9	10.7	–	0.3
Fruits	1.3	0.9	2.1	2.0	28.9	0.3	8.1
Groundnuts	0.1	–	0.1	0.1	18.9	0.0	4.8
Oilseeds	–	–	–	0.1	52.9	1.1	92.3
Sugarcane	0.3	0.2	0.6	–	–	–	–
Forage crops	–	0.2	0.1	–	2.7	–	–
Cotton and fibers	0.2	0.1	0.2	1.2	105.6	0.3	119.1
Other crops	1.2	0.7	2.0	0.2	3.3	0.8	14.8
Livestock & fisheries	5.8	4.4	6.5	0.1	0.3	0.3	1.0
Cattle	3.8	2.5	4.6	–	0.1	0.2	1.3
Poultry	0.4	0.8	0.5	–	–	–	–
Other livestock	0.6	0.5	0.9	0.1	1.5	0.1	2.1
Fish	1.0	0.6	0.5	–	0.6	–	0.1
NONAGRICULTURE	**87.9**	**90.6**	**84.3**	**94.4**	**12.9**	**89.8**	**15.3**
Agro-processing	**6.1**	**11.1**	**6.4**	**14.2**	**15.9**	**15.8**	**21.3**
Food and beverages	*2.8*	*6.9*	*2.6*	*5.5*	*9.9*	*8.1*	*17.2*
Food	0.8	1.7	0.7	1.5	10.9	5.7	37.8
Dairy	0.4	1.0	0.3	1.8	22.6	1.0	17.2
Grains & other food	1.4	4.0	1.4	2.2	6.7	1.4	5.5
Beverages	0.2	0.3	0.2	0.1	5.4	0.1	5.9
Nonfood	*3.3*	*4.1*	*3.8*	*8.6*	*25.8*	*7.7*	*28.4*
Tobacco	0.2	0.3	0.2	0.2	9.9	0.4	18.0
Textiles	0.6	0.9	0.9	3.5	45.8	2.2	41.3
Clothing	0.5	0.8	0.9	2.9	45.8	0.9	24.8
Leather & footwear	0.3	0.3	0.2	0.5	18.8	0.3	14.5
Wood & paper	1.7	1.8	1.6	1.6	10.9	3.9	27.7
Other manufacturing	**9.5**	**19.6**	**6.4**	**31.8**	**1.2**	**61.1**	**38.3**
Construction	**4.8**	**5.7**	**6.4**	**1.2**	**2.7**	**0.4**	**1.2**
Other industry	**15.7**	**13.5**	**4.2**	**10.0**	**9.2**	**4.2**	**5.2**
Services	**51.8**	**40.8**	**60.9**	**37.2**	**11.3**	**8.4**	**3.5**
Total	**100**	**100**	**100**	**100**	**12.4**	**100**	**15.4**

Source: Al-Riffai et al. (2016).

Note: – = data not available. * = share of exported goods and services to total domestic output. ** = share of imported goods and services relative to domestic consumption.

dependency remains vulnerable to international food price fluctuations. Nonetheless, Egypt exports 7.3 percent of its agricultural output, mostly fruits and vegetables. Agro-processing plays a less important role in terms of GDP but a more important one in terms of trade. It accounts for 6.1 percent of GDP, with more than half of this share being nonfood production, and 14.2 percent of exports and 15.8 percent of imports.[12] Nonfood products also have the largest share of both exports and imports, making up about 60 percent of agro-processing exports and close to 49 percent of agro-processing imports.

The single largest component of agricultural GDP in Egypt is cattle, which accounts for almost a third of agricultural GDP. In terms of crops, about 10 percent of agricultural GDP comes from fruits, which constitute 2 percent of Egypt's exports and have an export intensity of about 29 percent. Wheat and maize also have a large share in agricultural output, each accounting for nearly 6 percent of agricultural GDP. These two crops also show very high import intensities of 56 and 38 percent respectively, and have the largest shares in imports among all agricultural crops. Wheat and maize imports account for 4.6 percent and 2.2 percent of total Egyptian imports respectively.

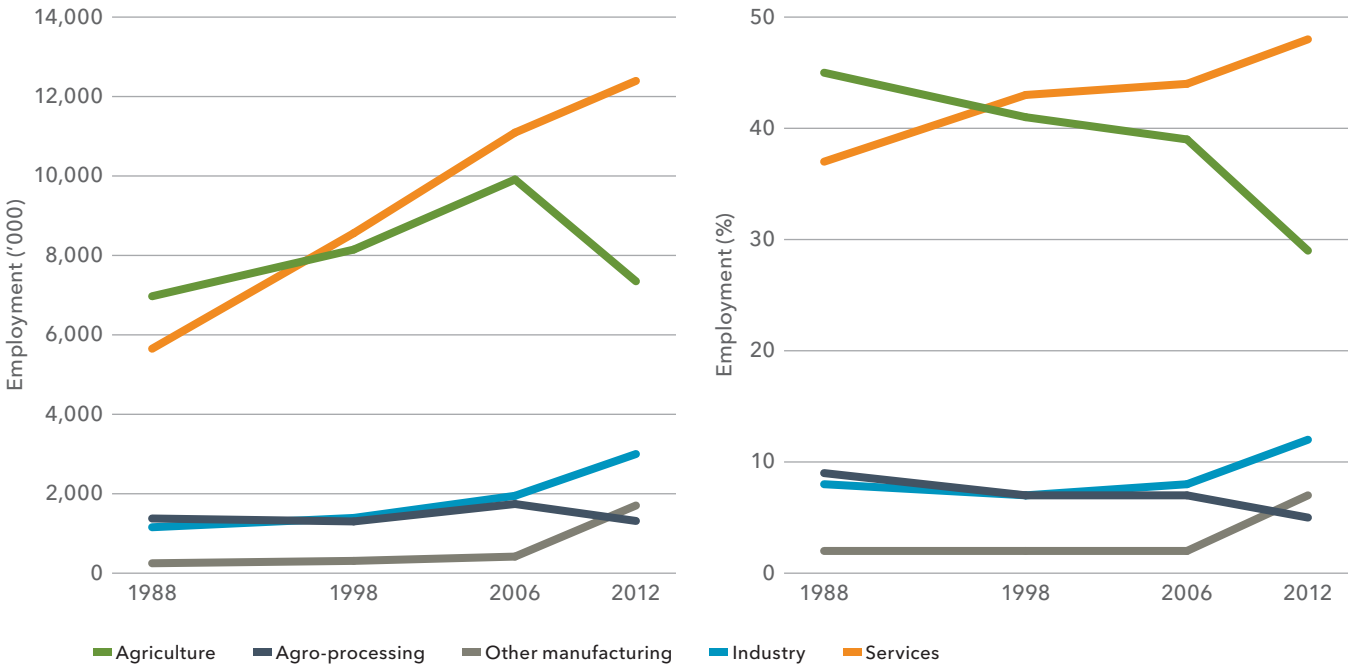
The contribution of the agro-processing sector to trade is larger than its contribution to GDP. Within agro-processing, nonfood has the largest share of output, where wood and paper production make up more than one-fourth of total agro-processing output. Textiles and clothing are the second- and third-largest nonfood agro-processing products after wood and paper. They both also contribute strongly to exports, and around 46 percent of production is exported. Overall, nonfood agro-processing accounts for close to 9 percent of Egyptian exports and 8 percent of imports. Food follows as the second largest agro-processing import good, accounting for 5.7 percent of imports while it only contributes 1.5 percent of exports. The role of agro-processing in employment has declined in Egypt over time in both absolute and relative terms.

The following assessment uses the Egypt Labor Market Panel Survey (ELMPS) with an extended definition for employment.[13] Figure 16 (right panel) shows that the share of agriculture in terms of employment has declined from 45 percent in 1988 to 29 percent in 2012. Employment is also declining in agro-processing, while services, industry, and manufacturing have been employing more of the workforce. In recent years, the absolute numbers of individuals employed in the agriculture and agro-processing industries also have been declining (Figure 16, left panel), which means that not only did the growth of other sectors decrease the share of employment in agriculture, but also that people have been moving out of agriculture. The same trend is taking place in agro-processing, which had the same number and share of people employed as in industry but is now the smallest sector in terms of share and absolute employment.

Most agricultural land in Egypt is farmed by smallholders. Egyptian agriculture is characterized by two types of land, old lands and newly reclaimed lands. Old lands represent 85 percent of cropped areas. The remaining 15 percent are newly reclaimed lands, mostly larger in size (exceeding 10 feddans) and using a more capital-intensive technology than farms in the old lands (Kheir-El-Din and El-Laithy 2008). Based on the Agriculture Farm Income Survey (AFIS), Kheir-El-Din and El-Laithy (2008) estimate that landholdings of less than 5 feddans in old lands constitute 73 percent of the land in Lower Egypt and about 89 percent in Upper Egypt. ELMPS estimates from 2012 show even higher shares of smallholders. Using the ELMPS, it was estimated that about 96.4 percent of household landholdings are 5 feddans or less, 3.4 percent are between 5 and 20 feddans, and only 0.3 percent are larger than 20 feddans.[14] In terms of ownership, the survey showed that among all households in Egypt, 11 percent own land and 4 percent rent it. The remaining 85 percent neither rent nor own land.

Cropping patterns have seen little change in Egypt over time, except for a (limited) shift from cereals and coarse grains to fruits. The biggest items, cereals and vegetables, have seen relatively little change (Figure 17). The share of fruits in total production almost doubled between 1961 and 2013, from 7.8 percent to 15 percent. The share of citrus fruits also increased significantly, accounting for 5.6 percent of total agri-

FIGURE 16 EGYPT: EMPLOYMENT BY SECTOR (1988–2012)



Source: Authors' calculations based on ELMPS 1988, 1998, 2006, 2012 (OAMDI 2016a).

FIGURE 17 EGYPT: COMPOSITION OF TOTAL CROP PRODUCTION

Source: Authors' calculations based on FAOSTAT (2016).

cultural production in 2013 as opposed to 1.8 percent in 1961. Meanwhile, the shares of cereals and coarse grains in production decreased. Cereals still account for the largest share of output, at 33.2 percent of production, although this share has been decreasing since it reached 38 percent in 1961. Coarse grains production also declined from 18.5 percent to 12.3 percent in 1961 and 2013 respectively. Vegetables and melons remained the second-largest production item, accounting for an average of 27.8 percent of total production throughout the five decades considered.

In summary, both in absolute and relative terms, the contribution of Egyptian agriculture to employment is decreasing. This sector is still heavily dominated by smallholders. Changes in output composition within the sector have been limited in terms of shifting from staple crops to more high-value exportable crops. The next section will explore differences at the subnational level, particularly between Lower and Upper Egypt.

POTENTIAL FOR AGRICULTURAL GROWTH IN EGYPT: ENVIRONMENTAL SUSTAINABILITY AND RESOURCE USE

Egypt's agricultural sector is already characterized by high land productivity, crop yields, and cropping intensity. Both in terms of labor productivity and in terms of yields, Egypt's productivity is much higher than in other UMI and LMI countries; however, in recent years yield growth has slowed and even declined for some major crops (El-Enbaby et al. 2016). All the same, in terms of sustainability, efficiency can be improved. Factors affecting the environmental sustainability of the resource base also should be taken into account to ensure sustained growth. Several water and land use practices currently affect the agricultural sector's productivity and growth.

Egypt is considered water scarce. The per capita share of fresh water is less than 700 m^3/year and is expected to drop to 500 m^3/year, below the water poverty line (ICARDA 2011). Owing to the country's arid climate and low rainfall, agriculture depends almost entirely on irrigation. The sector dominates water consumption, using up 80 to 85 percent of Egypt's water resources (ICARDA 2011). The fixed water share from the Nile River (55.5 billion cubic meters) is already fully utilized and supplies most of the water for irrigation (Conniff et al. 2012). About 10 percent of the areas equipped for irrigation rely on renewable and nonrenewable groundwater, and 10 percent of drainage water from agriculture is reused for irrigation (FAO 2011), suggesting high water-use efficiency on the national scale. This has allowed for sustained agricultural intensification despite high competition for water use between sectors and high population growth rates. However, the use of drainage water is associated with environmental risks of downstream water quality degradation and soil salinization, which need to be addressed (ICARDA 2011).

Egypt already uses its full share of Nile water resources, and with increased agricultural intensification and large-scale land reclamation, groundwater resources are likely to become more strained. The increasing use of groundwater comes with risks of resource depletion and deterioration of aquifers, some of which are nonrenewable (FAO 2011). Although the Delta lands are mainly dependent on the Nile streams, the Nile aquifer, replenished from yearly Nile water flows, has also been increasingly utilized, with an average pumping rate of about 3 billion m^3/year (ICARDA 2011). However, reclaimed desert lands are dependent on desert aquifers, some of which are nonrenewable, like the Nubian Sandston Aquifer. The average pumping rate from desert aquifers, now estimated at about 1.5 billion to 1.85 billion m^3/year, is alarming (ICARDA 2011). Further, with groundwater extraction and the increased use of portable irrigation pumps and agricultural machinery, energy use in agriculture has been on the rise, accounting for increased emissions of greenhouse gases.

Significant areas of fertile, alluvial land in the Nile Delta are being lost to urban encroachment, and are being replaced by infertile land reclaimed for agriculture in the desert. According to ICARDA (2011), encroachment on fertile agricultural land in the Nile Delta and Valley reached a rate of 8,400 hectares/year (20,000 feddan/year). A study on the eastern Nile Delta shows that between 2002 and 2010, as much as 399,474 acres of fertile agricultural lands were lost to urbanization (Elnaggar 2013).

About 35 percent of agricultural land suffers from a relatively high level of salinity due to salt accumulation. Most of the salt-affected soils are located in the eastern and western sides as well as the north-central area of the Nile Delta (ICARDA 2011). Further, although the construction of the Aswan High Dam in 1967 marked the start of a great leap in agricultural productivity and intensification in Egypt, a negative side effect was a decrease in soil quality as the dam prevented a significant amount of silt from flowing down to fertilize the lands downstream. Consequently, fertilizer use, particularly nitrogen fertilizer, has more than tripled in the three decades between 1968/1969 and 1998/1999 and continues to rise. This increased fertilizer use is also partially explained by new lands incorporated into production, higher cropping intensity, and the use of new high-yielding varieties with higher response to fertilizer (FAO 2005).

There is room for improvement in farm-level irrigation and drainage, as poor water and soil management have negatively affected land productivity and resource sustainability. Water-use efficiency at the farm level is estimated to be as low as 50 percent (ICARDA 2011). Other related factors negatively affecting agricultural sector sustainability include excessive irrigation, poor land leveling, and poor drainage, as well as the misuse of heavy machinery, which has led to soil compaction in the Delta.

The development of aquaculture in Egypt is considered a good step forward in terms of a more efficient and sustainable use of the country's water resources. Aquaculture reuses drainage water flows while providing additional sources of income and contributing to a more diversified diet, and it is a booming sector in the Nile Delta, particularly in salt-affected areas (Conniff et al. 2012).

According to a United Nations Development Programme (UNDP) study in collaboration with the government of Egypt, yields of major crops in Egypt could decrease significantly under climate change conditions (Table 17) and crop water requirements would increase. The study considers different potential climate change and sea-level rise scenarios, estimating a decrease of 8 percent to 47 percent in agricultural production by 2060, which likely will reduce agriculture-related employment by 39 percent (Smith et al. 2013). This potential decline poses major risks for the country's future food security, as well as significant structural economic challenges.

The findings in this section indicate that even though Egypt still has room for agricultural productivity growth, the future presents significant challenges for sustainable growth. However, the nature of these challenges requires a closer look at the agricultural sector in different areas of the country, as different areas often have different levels of economic development and thus are at different stages of the transformation process. The next section looks at the role of agriculture at the subnational level, and in particular will discuss differences between regions at different stages of the transformation process.

TRANSFORMATION AT THE GOVERNORATE LEVEL

Egypt is a heterogeneous country, with structural differences across its regions and governorates.[15] Income per capita varies significantly across groups of governorates. Frontier governorates (such as South Sinai, Matrouh, Red Sea, North Sinai, and El-Wadi El-Gedid) have the highest average income per capita but are home to only about 2 percent of the population (Table 18). About 89 percent of GDP in these governorates comes from oil and mining. Yet, as this sector is largely capital intensive, most of the employment in these governorates is in services and agriculture, with 20 percent of the employed labor force working in agriculture.

The major cities in Egypt—Cairo, Alexandria, Suez, and Port Said—are the group of governorates with the second-highest income per capita and the highest share of national GDP. These four governorates produce around 42 percent of the country's output, of which 55 percent comes from services and 16 percent from manufacturing. About 66 percent of the labor force in these governorates is employed in services and 18 percent in manufacturing. Most of the residents of these governorates live in urban areas, as agriculture accounts for only 2 percent of the group's GDP and 2 percent of its employment.

TABLE 17 EGYPT: PROJECTED CHANGES IN CROP PRODUCTION OF SOME MAJOR CROPS UNDER CLIMATE CHANGE

Crop	Change %		Reference[a]
	2050s	2100s	
Wheat	-15[b]	-36[c]	Abou-Hadid, 2006
Rice	-11		Eid and El-Marsafawy, 2002
Maize	-19		Eid et al., 1997
	-14	-20	Hassanein and Medany, 2007
Soybean	-28		Eid and El-Marsafawy, 2002
Barley	-20		Eid et al., 1997
Cotton	+17[b]	+31[b]	Eid et al., 1997
Potato	-0.9 to -2.3	+0.2 to +2.3	Medany and Hassanein, 2006

Source: Smith et al. (2013) citing EEAA (2010).

Note: [a] Further information on these studies can be found in EEAA (2010). [b] Temperature increase by 2°C. [c] Temperature increase by 4°C.

The Upper and Lower Egypt governorates contain the vast majority of the country's population. The two regions share several structural characteristics but display some striking differences in development indicators.[16] Both regions have income per capita of around 11,000 Egyptian pounds, producing around a fifth of national GDP. Nearly 40 percent of the national population lives in each region, and each region accounts for 32 percent of employment in agriculture (Table 18). Yet a closer look at other indicators shows differences between and among those governorates. First, despite having comparable shares of employment in agriculture, agriculture accounts for a larger share of GDP in Lower Egypt. Agriculture's value added in Lower Egypt is 30 percent of GDP but only 18 percent of GDP in Upper Egypt. Upper Egypt has the governorates with the highest shares of employment in agriculture and those with the highest poverty rates (Tables 18 and 19). Concurrently, the share of services is higher in Upper Egypt, accounting for 35 percent of GDP, compared to 26 percent in Lower Egypt. The share of construction in Upper Egypt is also higher than in Lower Egypt, accounting for 10 and 6 percent of GDP respectively. The regions show similar shares of manufacturing in GDP, at 14 percent and 15 percent for Upper and Lower Egypt, respectively. The difference in employment in manufacturing is, however, larger than that between the GDP shares; manufacturing is 7 percent of employment in Upper Egypt and 12 percent in Lower Egypt.

Consistent with the national trends, the share of agriculture in GDP and employment has been declining in most governorates, but to different degrees. As Figure 18A shows, employment in agriculture

TABLE 18 EGYPT: SUMMARY INFORMATION ON GOVERNORATES

Governorate	GDP per capita (EGP '000) 2012/13	Population 2013	GDP (EGP '000) 2012/13	Share in national GDP 2012/13	Share in national population 2013	Population growth 1990–2014	Share of population that is urban, 2006 Census	Poverty rate (%) 2012/13	Unemployment (%) 2012/13
EGYPT	**21.3**	**84,628,982**	**1,806,513,702**			**2.1**	**42.6**	**26**	**13**
Major cities	**51.4**	**14,906,945**	**766,399,691**	**41.9**	**17.6**	**1.6**	**100.0**	–	–
Cairo	68.2	9,002,783	613,640,226	33.6	10.6	1.4	100.0	18	16.0
Port Said	69.1	646,461	44,700,000	2.4	0.8	1.8	100.0	19	25.9
Alexandria	20.5	4,658,381	95,630,331	5.2	5.5	1.7	99.0	12	18.4
Suez	20.7	599,320	12,429,134	0.7	0.7	2.3	100.0	5	17.7
Lower Egypt	**11.8**	**36,340,612**	**429,257,826**	**23.5**	**42.9**	**2.0**	**28.0**	–	–
Damietta	20.7	1,284,710	26,656,892	1.5	1.5	2.0	38.7	10	10.6
Kafr El-Sheikh	15.3	3,054,770	46,599,236	2.6	3.6	1.9	23.1	18	11.7
Ismailia	14.6	1,128,373	16,458,856	0.9	1.3	2.7	45.3	15	13.1
Dakahlia	12.1	5,748,965	69,781,754	3.8	6.8	1.8	28.0	14	11.8
Sharkia	11.5	6,242,810	71,676,444	3.9	7.4	2.2	23.1	14	13.8
Gharbia	11.5	4,592,222	52,906,506	2.9	5.4	1.7	29.9	11	15.1
Menoufia	10.7	3,799,149	40,651,632	2.2	4.5	2.0	20.5	15	11.1
Behera	9.9	5,563,465	55,131,468	3.0	6.6	1.9	19.1	20	8.2
Kalyoubia	10.0	4,926,148	49,395,038	2.7	5.8	2.5	44.7	21	13.7
Upper Egypt	**11.0**	**31,836,015**	**349,768,109**	**19.1**	**37.6**	**2.4**	**32.8**	–	–
Giza	19.5	7,291,017	142,181,999	7.8	8.6	2.5	92.0	32	12.7
Fayoum	14.5	3,021,448	43,799,149	2.4	3.6	2.4	22.5	36	12.2
Aswan	9.9	1,374,985	13,668,948	0.7	1.6	1.9	42.5	39	15.3
Asyout	8.1	4,062,821	32,778,485	1.8	4.8	2.2	26.5	60	12.8
Menia	7.9	4,930,641	38,902,749	2.1	5.8	2.3	18.9	30	12.5
Beni Suef	7.6	2,727,614	20,647,632	1.1	3.2	2.3	23.2	39	10.9
Qena	7.4	2,918,086	21,591,096	1.2	3.4	0.7	21.3	58	9.3
Suhag	6.9	4,404,545	30,251,375	1.7	5.2	2.1	21.4	55	13.1
Luxor	5.4	1,104,858	5,946,676	0.3	1.3	6.6	47.8	47	12.5
Frontier governorates	**168.9**	**1,545,410**	**261,088,076**	**14.3**	**1.8**	**3.9**	**67.9**	–	–
South Sinai	282.1	163,092	46,016,085	2.5	0.2	7.0	50.9	–	3.1
Matrouh	268.2	417,294	111,931,128	6.1	0.5	3.6	70.4	23	10.7
Red Sea	231.6	332,741	77,072,597	4.2	0.4	5.3	95.5	2	14.2
North Sinai	56.1	415,532	23,328,938	1.3	0.5	3.3	60.4	46	11.3
El-Wadi El-Gedid	12.6	216,751	2,739,328	0.1	0.3	2.4	48.1	25	9.6

Source: Authors' calculations based on El-Enbaby et al. (2016), Ministry of Planning (2016), and CAPMAS (2013).

TABLE 19 EGYPT: SECTORAL SHARES OF EMPLOYMENT AND VALUE ADDED FOR GOVERNORATES

Governorate	Share in total employment						Share in GDP					
	Agriculture	Manufacturing	Utilities	Oil & Mining	Construction	Services	Agriculture	Manufacturing	Utilities	Oil & Mining	Construction	Services
EGYPT	**27.1**	**11.1**	**1.7**	**0.2**	**11.8**	**48.1**	**11.6**	**13.1**	**1.8**	**15.8**	**4.8**	**52.8**
Major cities	**2.4**	**17.8**	**2.5**	**0.1**	**11.3**	**65.8**	**1.9**	**16.2**	**1.8**	**1.4**	**3.5**	**75.2**
Cairo	0.3	17.3	2.0	0.1	12.0	68.2	0.8	13.9	1.5	1.2	3.5	79.2
Port Said	12.4	14.3	1.8	0.0	3.8	67.8	6.0	6.4	1.8	36.2	0.5	49.2
Alexandria	5.0	18.8	3.5	0.1	11.2	61.4	6.6	30.4	3.9	−11.5	5.0	65.6
Suez	2.8	23.3	3.6	0.3	9.1	60.9	5.7	56.7	4.9	−17.1	3.1	46.7
Lower Egypt	**32.3**	**12.1**	**1.6**	**0.1**	**9.0**	**45.1**	**30.3**	**15.0**	**2.7**	**5.9**	**5.7**	**40.5**
Damietta	21.4	30.5	1.1	0.1	5.8	41.0	12.3	14.7	0.5	36.1	2.6	33.8
Kafr El-Sheikh	44.1	4.6	0.7	0.1	8.6	42.0	48.2	4.7	1.5	16.7	3.9	25.0
Ismailia	25.7	9.0	2.9	0.1	8.5	53.7	26.2	10.9	19.8	0.9	4.5	37.8
Dakahlia	25.4	11.0	1.2	0.1	11.5	50.7	29.8	6.5	1.5	12.0	7.1	43.1
Sharkia	31.0	13.5	1.7	0.1	7.4	46.2	33.2	22.7	0.4	0.1	4.6	38.9
Gharbia	21.9	14.3	1.2	0.0	10.6	51.9	24.4	15.9	3.2	−0.6	6.1	50.9
Menoufia	37.7	10.9	2.0	0.0	8.9	40.4	27.3	22.6	0.9	0.0	6.1	43.2
Behera	54.9	6.0	1.6	0.0	5.4	32.0	44.2	3.2	6.9	2.9	5.9	36.9
Kalyoubia	7.6	20.8	1.9	0.1	13.1	56.6	14.2	32.9	0.4	−4.4	8.3	48.7
Upper Egypt	**32.2**	**7.2**	**1.5**	**0.3**	**15.7**	**43.0**	**17.8**	**13.7**	**2.1**	**5.2**	**10.0**	**51.1**
Giza	7.8	15.8	2.9	0.2	13.6	59.7	6.4	21.5	1.5	0.0	5.3	65.3
Fayoum	36.9	5.9	1.4	0.2	18.8	36.8	22.8	2.1	1.7	42.2	10.2	21.1
Aswan	33.3	5.1	4.2	0.7	12.4	44.3	13.5	7.5	12.6	7.6	6.1	52.7
Asyout	33.7	5.2	1.2	0.1	17.0	42.8	29.3	16.5	0.6	−5.5	14.5	44.7
Menia	47.0	4.9	0.6	1.1	12.9	33.5	31.0	9.3	4.3	1.2	10.4	43.8
Beni Suef	54.6	3.9	0.8	0.1	8.8	31.7	27.3	9.4	1.1	0.1	12.3	50.0
Qena	27.2	5.0	1.3	0.2	24.3	42.0	19.7	12.0	1.8	0.2	19.1	47.2
Suhag	30.6	5.0	0.8	0.0	21.9	41.8	29.6	4.1	0.9	0.1	19.7	45.7
Luxor	32.7	2.8	1.4	0.0	15.2	47.8	16.9	6.9	0.8	0.2	16.4	58.7
Frontier governorates	**20.3**	**3.0**	**3.3**	**0.4**	**12.6**	**60.5**	**1.0**	**0.5**	**0.1**	**88.7**	**0.4**	**9.3**
South Sinai	4.9	5.0	3.9	0.0	12.3	73.9	0.3	0.2	0.1	75.1	0.5	23.8
Matrouh	44.5	0.8	3.6	0.0	12.7	38.4	1.2	0.1	0.1	95.7	0.4	2.5
Red Sea	3.5	7.4	1.5	1.1	10.6	75.9	0.8	0.1	0.1	90.8	0.2	8.0
North Sinai	14.0	2.7	4.6	0.5	17.2	61.0	1.5	3.5	0.1	82.9	1.1	10.9
El-Wadi El-Gedid	18.9	0.3	2.8	0.3	8.5	69.2	6.2	2.6	0.3	23.3	2.0	65.5

Source: Authors' calculations based on El-Enbaby et al. (2016), Ministry of Planning (2016), and CAPMAS (2013).

has declined in all Egyptian governorates except for Luxor.[17] The decline in agricultural employment took place in Upper and Lower Egypt alike, even though agriculture still plays a more important role in employment in Upper Egypt. In 1998, agriculture provided 45 percent of employment in Lower Egypt and 48 percent in Upper Egypt. This share has declined to 32 percent and around 38 percent in 2012 for Lower and Upper Egypt, respectively. Comparing these shares to previous shares of employment from national figures suggests that market standards are not accounting for a relatively large share of agricultural employment in Upper Egypt.

The share of agricultural employment has been declining in all governorates (Figure 18B). Agriculture accounts for a larger share of employment in rural areas, reaching 40 percent in Lower Egypt and 47 percent in Upper Egypt in 2012. In some governorates, such as Kafr El-Sheikh in Lower Egypt and Beni-Suef and Fayoum in Upper Egypt, agriculture accounts for more than 50 percent of rural employment. It is worth noting here that poverty in Egypt is mostly a rural phenomenon, particularly in Upper Egypt. Poverty in rural areas is 2.1 times greater than in urban areas. In rural areas, 32.3 percent of residents live below the poverty line; this figure translates to 16.8 percent in rural Lower Egypt and 50.7 percent in rural Upper Egypt (Verme et al. 2014).

As mentioned previously, employment in agriculture in Egypt declined in absolute terms between 1998 and 2012. People have been moving out of agriculture in almost all governorates. Luxor and Alexandria saw the most significant increases in agricultural employment. Increases have been more modest in the other six governorates where employment in agriculture in absolute terms did not decline.

Despite the importance of agriculture for both value added and employment, manufacturing of agricultural products is limited. Agro-processing employs a small share of the workforce in both Upper and Lower Egypt. Upper Egypt also seems to be lagging in this sector, as agro-processing employs more people in Lower Egypt.

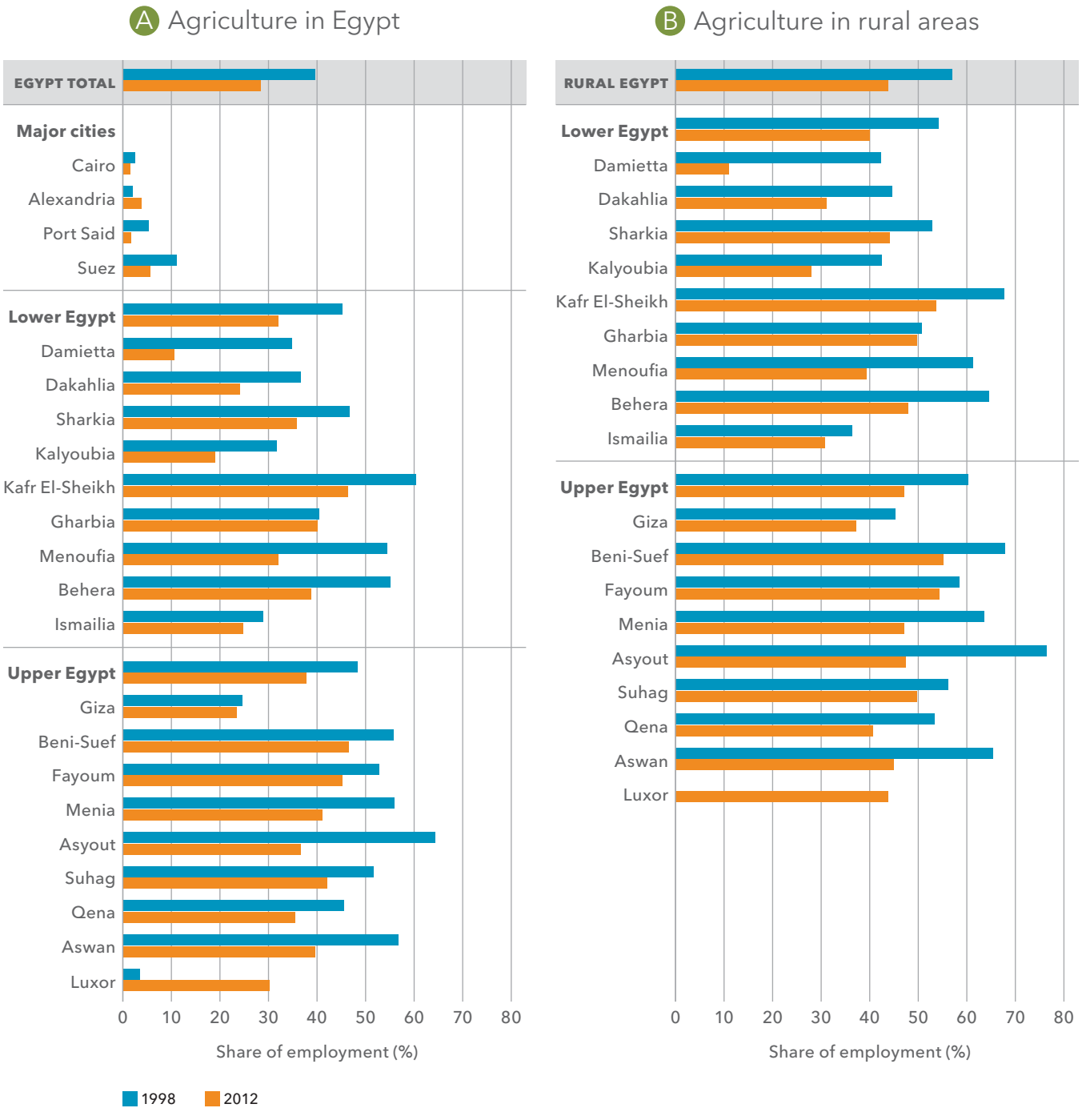
This subnational-level analysis shows the significant economic differences between Upper and Lower Egypt. Agriculture tends to play a more important role for the Upper Egyptian economy and poverty tends to be higher in Upper Egyptian governorates. In general, agro-processing and manufacturing play a more important role in Lower Egypt. The next section will explore how these transformation characteristics have translated into changes in household characteristics in Upper and Lower Egypt, with a focus on rural areas.

TRANSFORMATION IN EGYPT: WHAT DOES IT MEAN FOR RURAL HOUSEHOLDS?

As shown in previous sections, agriculture's contributions to GDP and employment have been decreasing in all countries as well as in most Egyptian governorates as part of the agricultural transformation process. This process did not occur simultaneously in all regions within a country, but has affected regions differently depending on initial household characteristics at earlier transformation stages and the changes in these household characteristics during transformation, as well as new opportunities in nonagricultural employment in other sectors and regions.

To analyze some of these changes in household characteristics and the ways in which they may be linked to whether households stay in or move out of agriculture, the following section starts by developing a typology of rural households in Egypt based on the Egyptian Household Income, Expenditure and Consumption Survey (HIECS). As observed in other contexts (see, for example, Diao et al. 2017), the transformation process typically results in households shifting from agricultural labor to activities in other sectors. This process, however, does not occur at the same pace for all households and does not occur for all household members at the same time. Thus, analyses that focus on the transformation process at the household level need to account for such heterogeneity. By analyzing the main factors that define the "agricultural" character of households, researchers can gain a better

FIGURE 18 EGYPT: EMPLOYMENT IN AGRICULTURE BY GOVERNORATE (1998 AND 2012)



Source: Authors' calculations based on ELMPS 2012 (OAMDI 2016a).

understanding of the causes that pull households out of agriculture and inform future policy development. Consequently, this report differentiates between three types of rural households based on the number of people who report agriculture as their main occupation:[18]

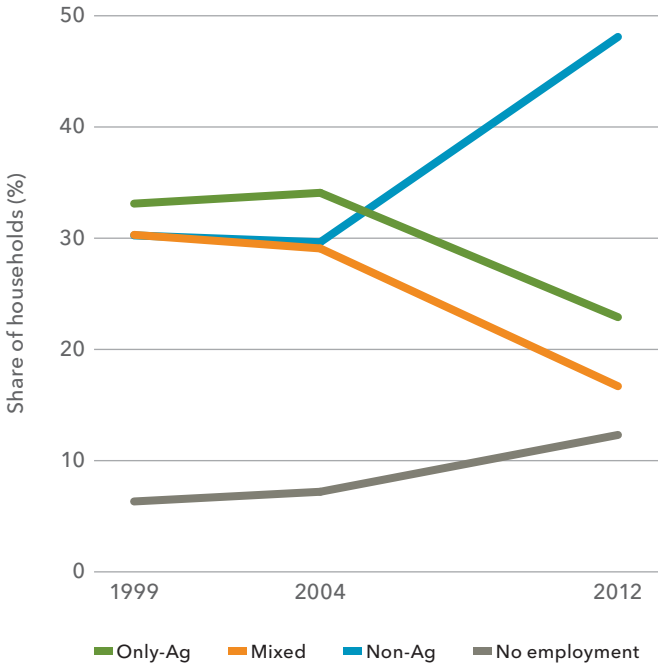
1. **Agricultural households (only-Ag households):** All household members are employed in agricultural activities.
2. **Nonagricultural households (non-Ag households):** None of the members work in agriculture (that is, all members work in other sectors).
3. **Mixed households:** Some members (at least one person) remain employed in agriculture while others (at least one person) are employed in other sectors.

The analysis looks at three points in time (1999, 2004, and 2012) using the HIECS.[19] Results for Upper and Lower Egypt are presented separately because of their importance for agriculture and rural development. Moreover, Upper Egypt is still lagging in most economic indicators, which makes it a key region for any policies and investments that address poverty reduction.

The share and number of rural households that exclusively or partly rely on agriculture for employment has decreased sharply. As Figure 19 shows, in 1999, 33 percent of rural households in Egypt were agricultural households, in which all members were working in activities related to agriculture (only-Ag households). In that same year, the shares of mixed households and non-Ag households were 30.3 percent and 30.25 percent respectively. By contrast, in 2012, only 22.9 percent of households were only-Ag households, and the share of non-Ag households increased to 49 percent. The decline of employment in agriculture is also evident when looking at mixed households: in 1999, one out of three households was mixed, as opposed to one out of six households in 2012. This shows not only that employment in agriculture has declined, but also that the importance of agriculture for households as a source of income has declined substantially.

The decline in only-Ag households in Upper Egypt has been slower than in Lower Egypt. An analysis of different governorates shows that the decline in the share of only-Ag households is different in Upper and Lower Egypt (not shown here). In Lower Egypt, for example, the decline observed between 1999 and 2012 is larger than in Upper Egypt (36 and 33 percentage points respectively). Nonetheless, only-Ag households are more common in Upper Egypt than in Lower Egypt. In 1999, 36 percent of rural households in Upper Egypt and 29 percent in Lower Egypt were only-Ag households. By 2012, the percentage of only-Ag households in Upper Egypt had decreased to 24 percent and in Lower Egypt to 18 percent.

FIGURE 19 EGYPT: SHARE OF RURAL HOUSEHOLDS BY MEMBERS' PRIMARY EMPLOYMENT



Source: Authors' calculation based on HIECS for 1999–2000, 2004–2005, and 2012–2013 (OAMDI 2014a; 2014b; 2014c).

Regarding the specific characteristics of each type of household, Table 20 shows the demographic composition by type of household in 2012. In general, household members who are involved in agriculture tend to be older than members in non-Ag households. In particular, the household head and spouse in agricultural families (only-Ag and mixed households) is, on average, older compared with heads from non-Ag households. Also, mixed households tend to be larger and slightly more crowded—that is, the number of household members per room is higher—in Upper Egypt than in Lower Egypt.

Education seems to be highly associated with household types. In 2012, 35 percent of only-Ag families had no formal education, and fewer than 5 percent had any postsecondary education. In contrast, only 10 percent of mixed households had no formal education, while more than 50 percent had at least graduated from secondary education and around 15 percent had at least one member with a university degree. The level of education of households is also lower in Upper Egypt than in Lower Egypt, as can be observed from the higher percentage of households included in lower categories for all types of households.

The role of women in the transformation process is important to highlight, given the disadvantages that women often face in terms of labor opportunities, access to education, and cultural and social barriers. On average, women are 30 percent of household earners in rural Egypt. Furthermore, the role of women is more critical for only-Ag households than for mixed and non-Ag households (Figure 20). In 2012, for example, more than 35 percent of only-Ag household earners in Upper Egypt were women, compared to 20 percent of non-Ag households and around 30 percent of mixed ones. Nonetheless, this role is becoming less important for agricultural families and more relevant for families out of agriculture, as the proportion of female earners among only-Ag and mixed households declined between 1999 and 2012, whereas the opposite occurred for non-Ag households. From 1999 to 2012, the proportion of female earners in non-Ag households in Upper Egypt increased by 5 percent. Lower Egypt saw the same trend, with a 3.5 percent increase in female earners in non-Ag households. The role of women, therefore, is becoming more important for households that are not involved in agriculture, although this role is still very significant for agricultural families.

An additional indicator that stresses the importance of women in the transformation process is the number of households led by women among families that are solely dependent on agriculture (Figure 21). In rural Egypt, around 15 percent of households are led by women. In 2012, this percentage was higher in Upper Egypt (21 percent, compared to 15 percent in Lower Egypt). Among only-Ag families, the proportion of female heads has decreased from 1999 to 2012, yet this proportion is higher when compared with mixed and non-Ag households. Interestingly, the proportion of families led by women has been increasing over time among mixed and non-Ag households.

Despite women's importance in the household economy in rural Egypt, they are generally disadvantaged in terms of their ability to generate income compared to men, particularly in rural areas where cultural norms might hinder their capacity for profitable activities. This situation may be troublesome for rural Egypt's female-headed households. The marital status of household earners for the different years shows a dramatic increase in the proportion of widows in Upper Egypt, from 4.2 percent in 1999 to more than 10 percent in 2012. The increasing number of widowed household heads in rural areas may result in such households becoming more vulnerable, as they depend on a disadvantaged member for income.

A multivariate regression analysis can provide a more rigorous assessment of these findings. Nonlinear models are useful to measure the relationship of a nominal dependent variable with a group of independent variables. In this case, we model the relationship of household type with a set of socioeconomic and demographic characteristics, which

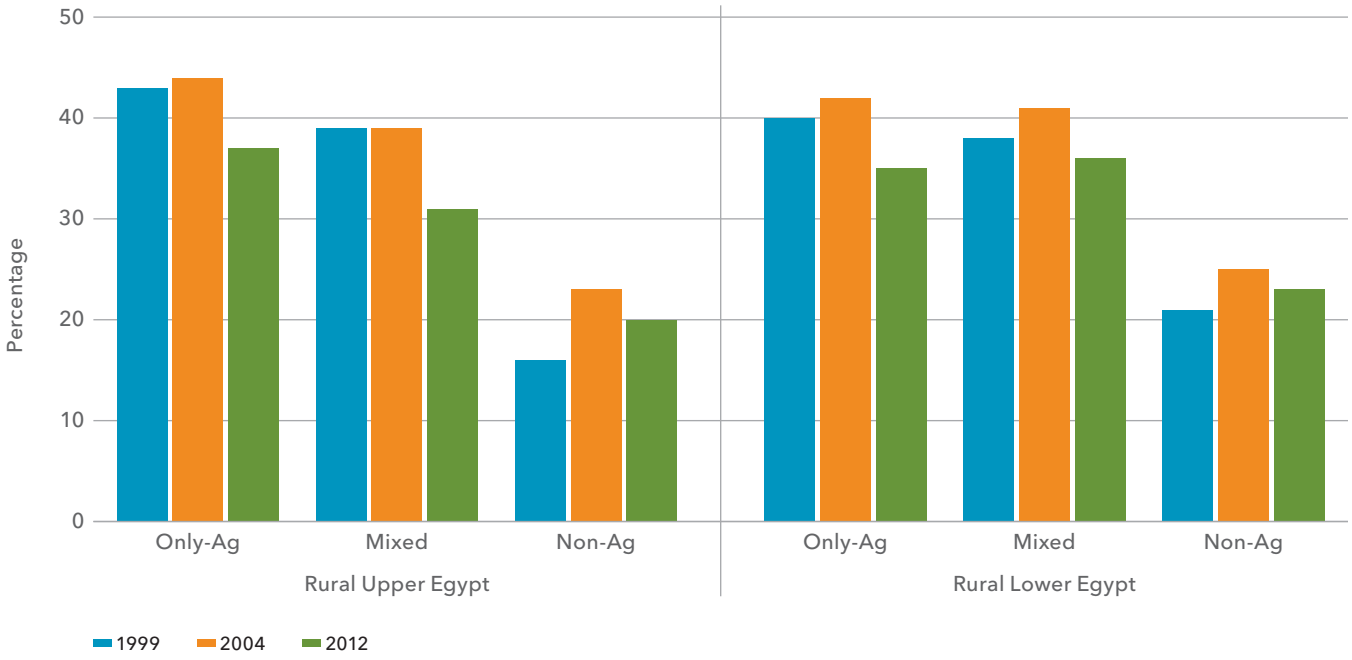
TABLE 20 EGYPT: DEMOGRAPHIC CHARACTERISTICS OF RURAL HOUSEHOLDS (2012)

	Rural Upper Egypt			Rural Lower Egypt		
	Only-Ag	Mixed	Non-Ag	Only-Ag	Mixed	Non-Ag
Age of head (mean)	48.48	51.04	43.50	48.67	48.83	43.57
Age of spouse (mean)	39.69	42.92	34.85	40.68	41.98	35.85
People in household/rooms (mean)	1.48	1.61	1.59	1.18	1.34	1.31
People in household (mean)	5.02	6.27	5.17	4.36	5.15	4.58
Number of earners (mean)	1.43	2.58	1.64	1.38	2.34	1.58
Disposable income (mean)	22,683	32,077	26,778	24,961	33,294	29,643
Male household head (%)	81.60	91.10	90.30	87.60	93.20	92.10
Education of head (%)						
None	78.46	65.05	43.33	72.04	58.68	32.28
Primary/Lower secondary	7.57	8.61	5.95	10.11	13.00	13.51
Secondary	12.63	23.10	32.41	14.84	21.31	34.82
Postsecondary	0.20	1.53	6.05	0.78	1.78	5.60
University	1.15	1.33	12.11	2.23	5.24	13.42
Postgrad	0.00	0.38	0.16	0.00	0.00	0.37
Education of spouse (%)						
None	85.36	80.48	50.42	77.55	67.07	36.42
Primary/Lower secondary	4.66	7.35	12.95	7.81	9.54	10.11
Secondary	9.42	10.23	26.14	14.22	19.69	39.10
Postsecondary	0.24	0.43	4.01	0.42	1.02	3.83
University	0.32	1.50	6.31	0.00	2.70	10.45
Postgrad	0.00	0.00	0.18	0.00	0.00	0.07
Highest level of education in household (%)						
None	34.12	10.32	14.03	31.93	9.53	9.74
Primary/Lower secondary	28.64	24.54	15.94	27.69	21.39	15.53
Secondary	32.40	46.74	44.59	33.64	47.63	44.62
Postsecondary	1.34	2.93	6.17	1.37	4.41	7.12
University	3.50	15.09	18.96	5.36	17.04	22.36
Postgrad	0.00	0.38	0.31	0.00	0.00	0.63

Source: Authors' calculation based on HIECS 2012–2013 (OAMDI 2014c).

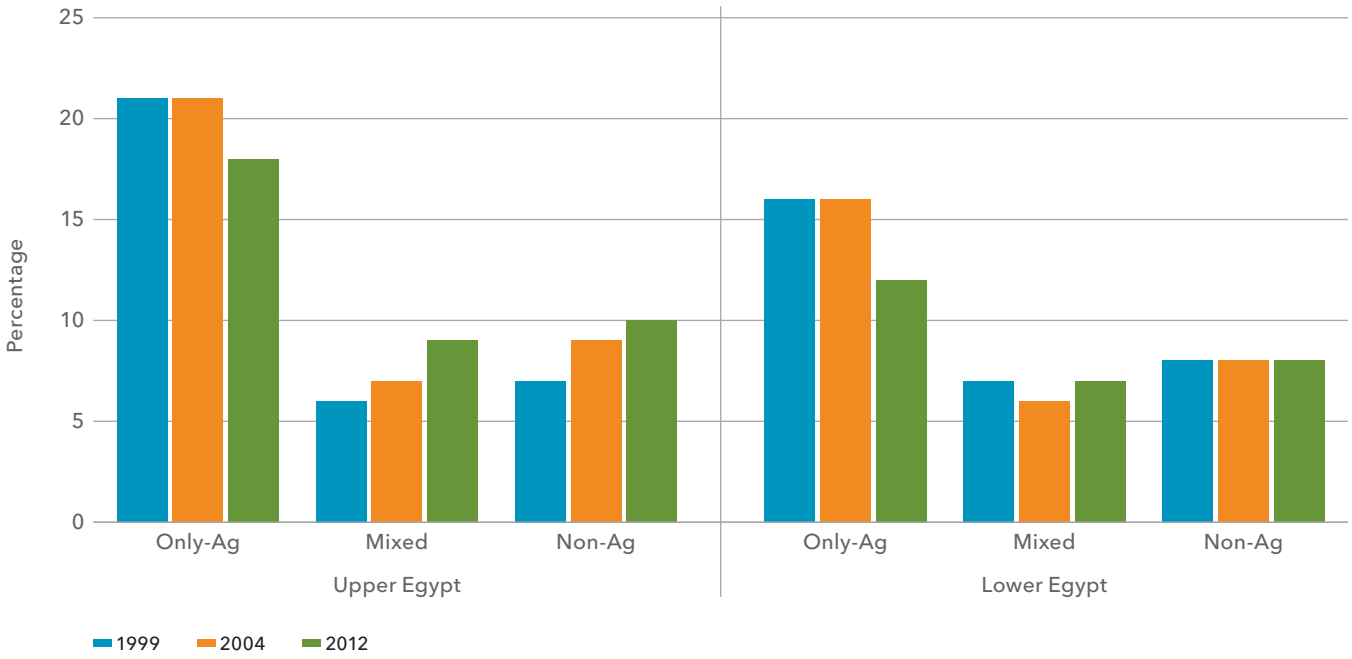
Note: Earnings are reported in the local currency, Egyptian pounds (EGP)

FIGURE 20 EGYPT: SHARE OF FEMALE EARNERS PER TYPE OF HOUSEHOLD



Source: Authors' calculation based on HIECS 2012–2013 (OAMDI 2014c).

FIGURE 21 EGYPT: SHARE OF FEMALE HEADS PER TYPE OF HOUSEHOLD



Source: Authors' calculation based on HIECS 2012–2013 (OAMDI 2014c).

presumably are correlated with the type—the agricultural nature—of households. Further, we want to ponder the contribution of these characteristics to better understand how they are associated with different household types. We use household type as the dependent variable (taking a value of 1 if the household is only-Ag, 2 if mixed, and 3 if non-Ag). Since the dependent variable is nominal, we use a multinomial logistic specification. This model is useful to estimate the probability of an event—in this case, type of household—by calculating the logarithm of the ratio of the probabilities of that event for different categories and fitting the model using a linear regression. As such, given a group of demographic and socioeconomic characteristics, we can predict the probability of a household to belong to the only-Ag, mixed, or non-Ag categories. We estimate the model using only-Ag households as the reference. This implies that the coefficients that describe the relationship between household characteristics and mixed and non-Ag households need to be interpreted in relation to only-Ag households. Inclusion of these characteristics is based on the results discussed in the previous subsection. The criteria to judge the effect of these characteristics on the probability of household type are the magnitude, sign, and statistical significance of the estimated coefficient. Appendix B presents the results of the econometric estimation of the model.

The regression results present the following conclusions. First, only-Ag households are more likely to be found in Upper Egypt than non-Ag households. Also, there are fewer earners in non-Ag households than in only-Ag households; the opposite occurs for mixed households, where the association is positive and statistically significant (−0.258 and 0.669 respectively). In the same fashion, mixed households are more likely to have a higher number of female earners than non-Ag households do, which confirms the descriptive analysis presented earlier. However, a higher number of earners does not entail better socioeconomic conditions; rather, this result suggests that in comparison with only-Ag households, mixed households must rely on more family members to generate income, and probably engage more often in lower-value activities than non-Ag families do.

Households in agriculture have a lower capacity to generate income and rely more on informal, low-value activities than households with members employed in nonagricultural activities. For example, when looking at the household head's main occupation and source of income, the results suggest that non-Ag households are more likely to rely on salaries and pensions but less likely to have a household head who reports being a housewife as main occupation (1.847, 1.464, and −1.638 respectively). Finally, education plays a key role defining the agricultural character of households in rural Egypt, as more years of education are associated with a higher probability of households moving out of agriculture. Age is significant only for only-Ag households, for which the household head is more likely to be older and the spouse younger.

Finally, the share of only-Ag households has been decreasing over time, while that of non-Ag households has been increasing, suggesting that the composition of rural households (which traditionally have relied on agricultural activities) is changing. It is difficult to determine from the study data whether these changes are driven by intrahousehold or interhousehold diversification. For example, Diao and others (2017) find that although the share of nonagricultural households in Ghana increased between 2000 and 2013, the share of nonagricultural households cultivating farm land decreased, which suggests that entire households rather than individuals abandoned agricultural activities. In this report, data on farm land are not available, making it difficult to perform a similar analysis. However, the analysis of household characteristics gives insights to understand which socioeconomic, demographic, and contextual characteristics explain these trends. For example, the results of this study suggest that only-Ag households are more likely to have lower levels of education, and that the role of women is increasingly important in non-Ag households.

These findings should be pondered to design ad hoc policies to foster inclusive economic development and well-being, particularly among rural populations (see e.g, Canagarajah et al. 2001). In that sense, poverty and lack of opportunities in Egypt have a predominantly rural character. Furthermore, because Egypt still has a large share of its population in rural areas depending on agricultural activities, policy makers need to better understand the characteristics associated with households' decisions to diversify their economic activities. Policies to promote rural inclusive development need to take into account the structure and characteristics of these households and how they are affected by the economic and social changes that come with the transformation process.

SUMMARY OF FINDINGS

This section assessed the role of agriculture in the Egyptian economy and households' welfare. Despite the expected natural decline in the share of the agricultural sector in Egypt's economy, agriculture apparently continues to play a key role in value added, employment, and trade. This importance can be attributed to high productivity within the sector. Yet the sector's high productivity has been stagnant or in some cases declining in recent years, and environmental sustainability is adding more challenges that could hamper the sector's growth over the coming years. Within the country, agriculture plays a more important role in Upper Egypt compared to Lower Egypt for both value-added and employment, but agro-processing is lagging in Upper Egypt. Supporting agriculture and agro-processing growth as part of Egypt's SDS is thus a key aspect of securing the sector's contribution to the country's development. By comparing households based on their members' employment in the agricultural sector, it is evident that the share of agricultural households has been declining in recent years (between 1999 and 2012), and that these households have some idiosyncratic characteristics that identify them as distinct from other households. Tackling the specific household characteristics where agricultural households are lagging would also be essential to Egypt's rural development.

TUNISIA

AFTER ANALYZING EGYPT'S TRANSFORMATION EXPERIENCE AT subnational and household levels, it is useful to look at another country's experience to understand how country-specific factors might influence economic and agricultural transformation and shape the future of rural development. The 2011 Arab awakenings began in Tunisia. The country had succeeded in reducing poverty at the beginning of the new millennium, but growth could not secure enough high-value employment for its youth. Tunisia also has large regional disparities. Rural development is key to achieving the development objectives outlined in the government's "Tunisia 2020" development strategy.

The Tunisian economy grew on average by 4.3 percent annually between 2000 and 2010. Within this same period, poverty declined by more than half, from 32.4 percent to 15.5 percent of the population living below the national poverty line (INS 2012a). Extreme poverty also fell from 12 percent to 4.6 percent between 2000 and 2010 (INS 2012a), yet inequality persisted. The Gini index declined but remained high, falling from 40.8 to 35.8 within the 2000s. Regional disparities between the country's north and south have also been blamed for its unfulfilling performance, particularly in terms of poverty.

Since the 1980s and the implementation of Tunisia's Structural Adjustment Program and the Agricultural Structural Adjustment Program, a series of policy reforms has reduced protections for the agricultural sector. These reforms included liberalizing input and output prices, cutting input subsidies, and abolishing import protection. However, these reforms remained incomplete as the government continued to intervene to protect the country's farmers and food security. It has been estimated that 11 percent of fiscal incentives went to the agricultural sector, with no positive discrimination in favor of exports (Ghali and Rezgui 2015). Some of these policies may jeopardize the sector's efficiency and competitiveness, because their implementation could reduce resource allocation efficiency.

To support the agricultural sector, new trade agreements have been signed in recent years. In the past few decades, several trade agreements have been signed between Tunisia and the European Union (EU), within the context of Euro-Mediterranean cooperation, to regulate trade and remove trade barriers, especially in agriculture. In 1995, Tunisia and the EU signed the Euro-Mediterranean Association Agreement, which entered into force in 1998. Several agreements followed, and with the current political and economic transitional period, the EU is determined to support Tunisia. The newly signed Deep and Comprehensive Free Trade Area agreement will deepen bilateral integration of Tunisia's economy into European markets. Within this agreement, the EU decided to offer a temporary unilateral duty-free tariff rate quota for Tunisian olive oil exports to the EU. A total of 35,000 tons annually were planned to be made available for two years, from the beginning

of 2016 to the end of 2017, to be opened once the duty-free tariff rate quota of 56,700 tons is exhausted (European Commission 2015). This agreement, along with the 2020 development strategy, is a powerful opportunity for the Tunisian olive oil sector. It prompts farmers to increase production and also promotes agro-processing and exports. Given the damage that terrorism and other concerns have inflicted on the Tunisian tourism sector, increased exports can provide an additional source of foreign currency. The case of Tunisia confirms the importance of looking at subnational differences within countries when designing strategies and policies. In some parts of Tunisia, especially in the poorer south, agriculture still plays an important economic role and could help reduce poverty levels.

Tunisia's development strategy fosters inclusion, sustainability, and efficiency. Within the strategy, the public sector plans to solely contribute to several economic activities while simultaneously engaging in public-private partnerships in other projects. The strategy aims to promote inclusive growth, employability, and competitiveness; reduce disparities between and within regions; strengthen local governance; and enhance the attractiveness of different regions for investment. Among other goals, the strategy will work to improve transparency, accountability, and governance.

Agriculture and agro-processing are key components of Tunisia's 2020 development strategy. The strategy strongly emphasizes public investment to develop the agricultural sector. It aims to improve rural infrastructure and natural resource management, develop agri-businesses, and market local products. In addition, the government plans to rehabilitate irrigated areas and to increase irrigated land by over 1,000 hectares. There is also increasing interest in developing one of Tunisia's most important agro-processing sectors: olive oil. Tunisia was among the world's largest olive oil exporters in 2014–2015 (UN COMTRADE 2016). Olive oil makes up about 50 percent of the value of the country's agricultural and food exports, and the Tunisian government intends to increase both production and exports of olive oil in the coming years.

THE ROLE OF AGRICULTURE AND AGRO-PROCESSING IN THE TUNISIAN ECONOMY

Agriculture in Tunisia constitutes nearly 9 percent of GDP, with crops contributing about 82 percent of agricultural value added. Olives, dates, and wheat have the largest shares in Tunisian agricultural GDP at 12 percent, 7 percent, and 7.8 percent (for two types of wheat), respectively. Cultivated wheat is produced for local consumption; olives are used for olive oil production, largely for export. Wheat imports account for about a third of agricultural imports, and together with barley and other cereals they add up to almost 60 percent of agricultural imports, with very high import intensities. Dates, by contrast, have the highest export intensity among all Tunisian agricultural crops and account for 65 percent of agricultural exports. Meanwhile, livestock constitutes only 18 percent of agricultural GDP, with sheep farming contributing more than half of this output. Livestock in Tunisia is all locally consumed, as none of it is exported, while agricultural output accounts for 1.7 percent of exports.

The contribution of agro-processing to GDP is less than half of that of agriculture (3.6 percent of GDP) but is almost four times the agricultural contribution to exports (6.6 percent of total exports). Almost 2 percent of Tunisian exports comes from olive oil. Olive oil has an export intensity of 43.4, the second highest under agro-processing exports, topped only by canned products with an intensity of 51.4. Agro-processing accounts for 3.2 percent of total employment—a value similar to that of agriculture, which accounts for 3.4 percent (Table 21).

Tunisia has been witnessing the expected structural change trend as agriculture's role in the economy has been declining. The share of agriculture in GDP declined by more than half between 1970 and 2014, from around 20 percent to about 9 percent of GDP, as shown in Figure 22. Meanwhile, the share of the other three sectors rose. Industry increased from 14 percent of GDP in 1970 to 19 percent in 2014. Within industry, manufacturing increased from 9 percent to 17 percent of GDP. Finally, services rose from around 57 percent to 62 percent of GDP. Industry

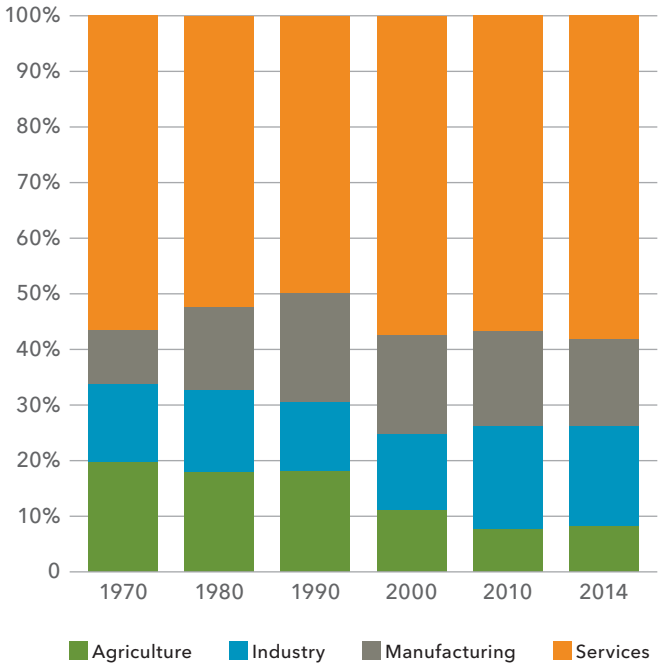
TABLE 21 TUNISIA: ECONOMIC STRUCTURE (2012)

	Share in GDP	Share in Ag GDP/ Share in agro-processing GDP	Share in employment	Exports		Imports	
				Share in exports	Export intensity*	Share in imports	Import intensity**
AGRICULTURE	**8.9**	**100**	**3.4**	**1.7**	**5.0**	**5.6**	**22.9**
Crops	**7.3**	**82.2**	**3.1**	**1.7**	**–**	**5.5**	**–**
Durum wheat	0.6	6.7	0.3	–	–	0.5	27.2
Soft wheat	0.1	1.1	0.1	–	–	1.4	87.6
Barley	0.2	2.3	0.1	–	–	0.2	32.5
Other cereals	0.0	0.3	0.0	0.0	13.8	1.2	95.8
Olives	1.1	11.9	0.4	–	–	–	–
Citrus	0.4	4.6	0.1	0.1	4.4	–	–
Dates	0.6	7.1	0.3	1.1	53.4	0.0	0.6
Other fruits	1.0	10.8	0.4	0.1	3.8	0.1	4.1
Tomatoes	0.5	5.7	0.1	0.1	5.4	–	–
Potatoes	0.2	2.7	0.0	0.0	2.1	0.1	15.1
Other vegetables	1.1	11.9	0.3	0.2	5.7	–	–
Other agriculture and forestry	1.5	17.1	1.0	0.1	4.0	2.0	43.4
Livestock	**1.6**	**17.8**	**0.3**	**–**	**–**	**0.1**	**–**
Cattle breeding	0.4	4.4	0.2	–	–	0.0	1.8
Sheep farming	1.0	10.8	0.1	–	–	0.1	3.4
Poultry farming	0.2	2.6	0.0	–	–	0.0	1.6
NON-AGRICULTURE	**91.1**		**96.6**	**98.3**	**26.0**	**94.4**	**32.0**
Agro-processing	**3.6**	**100**	**3.2**	**6.6**	**–**	**5.0**	**–**
Fishery	0.5	14.1	0.2	0.1	3.2	0.1	7.0
Dairy products	0.2	4.5	0.2	0.2	4.3	0.3	6.9
Meat	0.3	9.2	0.1	–	–	0.2	3.2
Olive oil	0.2	5.7	0.1	1.9	43.4	–	–
Canned products	0.2	5.9	0.1	1.1	51.4	0.4	32.5
Sugar	0.0	1.3	0.1	0.0	1.1	0.6	70.1
Milling	0.4	10.2	0.3	–	–	0.1	4.1
Beverages/tobacco	0.6	17.1	1.0	0.4	16.5	0.5	31.4
Other agri-food	1.1	31.9	1.3	2.8	25.2	2.9	32.0
Other manufacturing	**13.7**		**18.6**	**63.2**	**58.1**	**67.2**	**66.9**
Construction	**4.6**		**3.3**	**–**	**–**	**–**	**–**
Other nonmanufacturing	**9.5**		**11.0**	**15.6**	**55.7**	**17.8**	**64.4**
Services	**59.8**		**60.5**	**12.9**	**–**	**4.4**	**–**
Transport services	7.9		5.9	7.1	30.2	1.1	7.7
Hotels and restaurants	4.6		4.1	–	–	–	–
Other services	47.3		50.5	5.8	4.7	3.3	3.2
Total	**100**		**100**	**100**	**24.6**	**100**	**31.3**

Source: Thabet (2016).

Note: – = data not available. * = share of exported goods and services relative to total domestic output. ** = share of imported goods and services relative to domestic consumption.

FIGURE 22 TUNISIA: VALUE ADDED BY SECTOR (PERCENTAGE OF GDP)

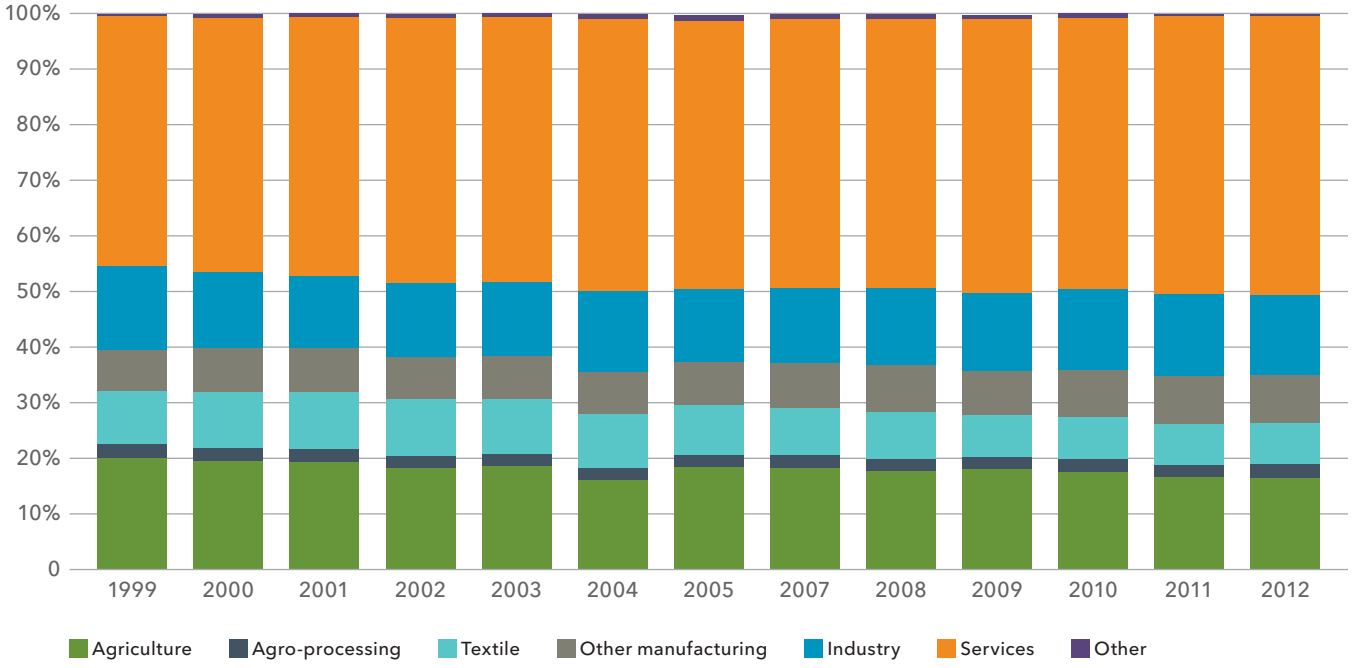


Source: Authors' calculations based on World Bank (2016b).

is the sector with the most fluctuations, growing to 23 percent of GDP in 1981 before declining to 10 percent in 1998, and then growing slightly to its current level.

Agriculture and manufacturing have also reduced their share in labor markets, at least since the beginning of the millennium (the period for which data are available). In 2012, only 16 percent of the labor force worked in agriculture, compared to 20 percent in 1999 (Figure 23). From 1999 until 2008, manufacturing employed almost 20 percent of the labor force. With the decline of exports to Europe after the 2008 financial crisis, manufacturing started employing fewer people, both in absolute terms and as a share of total employment, before recovering by 2012. Textiles has been one of the vital sectors for the Tunisian economy. Tunisia once was one of the world's top textile exporters, but production declined from 5.6 percent of GDP in 2000 to slightly more than 3 percent in 2012. The share of employment in textile manufacturing also declined from 10 percent to

FIGURE 23 TUNISIA: EMPLOYMENT BY SECTOR



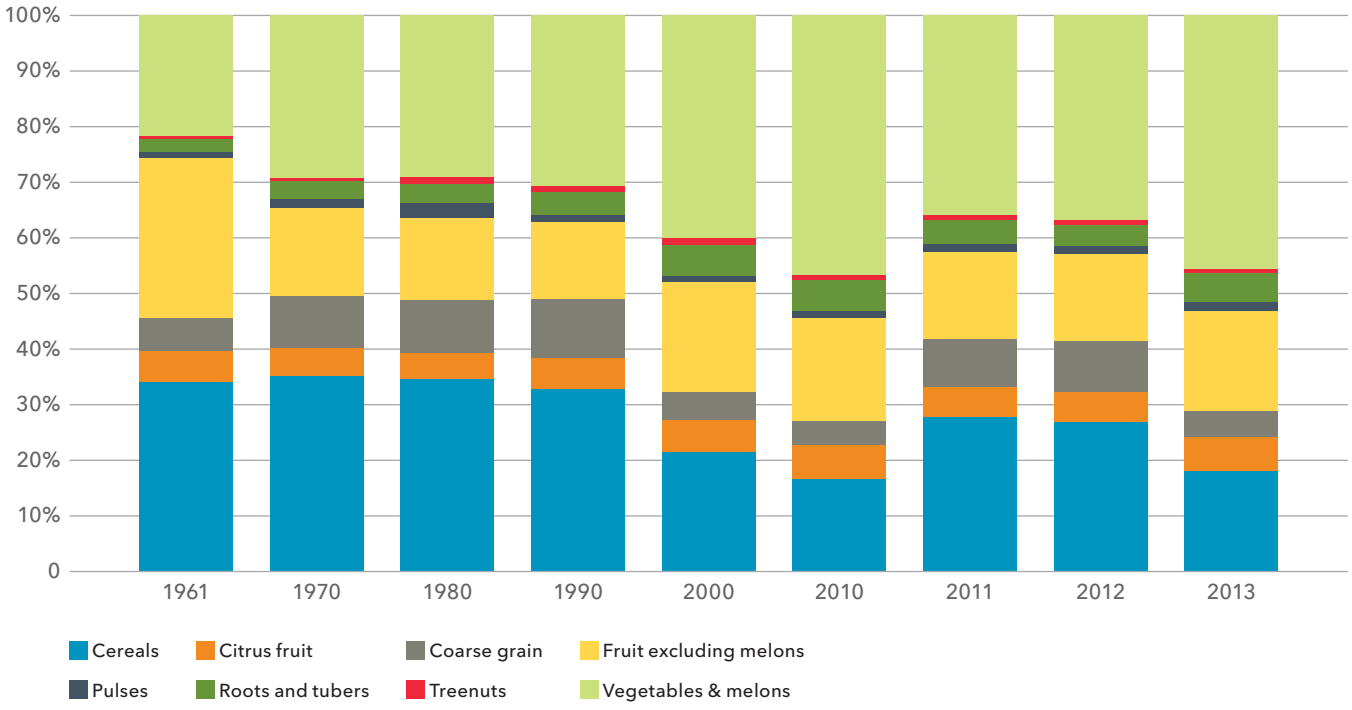
Source: Author's calculations based on INS (2006; 2008; 2009; 2011; 2012b; 2013).

7.5 percent in the same period. Despite this decline, the textile sector still contributes with more value added and employment than agro-processing. Between 2000 and 2012, agro-processing employed between 2.1 percent and 2.5 percent of the employed work force, and made up between 3.1 percent and 3.4 percent of GDP (INS 2012b).

Despite changes in employment and GDP shares across sectors, structural change in Tunisia was not dependent on productivity gaps between agriculture and other sectors. Studies have shown that Tunisia has a small productivity gap between manufacturing and agriculture. In 2005, labor productivity in manufacturing was 1.7 times that of agriculture, compared to 3.9 times in Asia and 2.8 in Latin America (Nucifora and Rijkers 2014). This small gap was attributed to low productivity in the manufacturing sector, which is mostly dependent on simple assembly activities (Nucifora and Rijkers 2014). Marouani and Mouelhi (2016) show that productivity in Tunisia increased at a relatively sustained pace in the past three decades. However, the structural change process did not yield the desired results, as high-productivity sectors such as communications did not witness an increase in labor share. Labor moved from agriculture to tourism and commerce, activities which have relatively low value added and are mostly informal.

As Figure 24 shows, Tunisia's cropping pattern has been changing in recent decades. Between 1961 and 2013, the share of cereals in total agricultural production declined from 34 percent of crop output to only 18 percent. Meanwhile, the share of vegetables more than doubled, increasing from 22 percent in 1961 to 46 percent in 2013. Roots and tubers also doubled, from 2.5 percent to 5.3 percent of production during the same period. The share of fruit production in total output, by contrast, declined from 29 percent in 1961 to 18 percent in 2013, while the share of other crops remained almost the same. At the same time, the sector has become more mechanized. According to INS (2012a), almost 80 percent of large farms are mechanized, and equipment rentals have given an increasing number of farmers access to mechanization.

FIGURE 24 TUNISIA: COMPOSITION OF TOTAL CROP OUTPUT



Source: Authors' calculations based on FAOSTAT (2016).

Despite the changes in agricultural GDP and employment at the national level, the agriculture sector's role remains prominent in some areas around the country. The most recent Tunisian Labor Market Panel Survey (TLMPS) (OAMDI 2016b) shows that the highest share of employment in agriculture is in the North West region. About half of employment in Siliana, Kairouan, Kebili, and Le Kef is in agriculture with the highest rate in Le Kef, where agriculture employs 52 percent of the labor force. On average, agriculture accounts for 47 percent of employment in the North West. The sector plays a relatively important role in the Center West region as well, where it accounts for 42.5 percent of employment, but in Greater Tunis and in Manouba it accounts for only 2.2 percent (Figure 25A). Similar patterns are observed in rural areas, but the lowest share of rural employment in agriculture is in Sousse rather than Manouba. Yet as expected, the employment share of agriculture is higher in all governorates when considering rural areas only—except Tunis, which is predominantly urban (Figure 25B). This is particularly true for the South West region, where most Tunisian oases are located and where agriculture remains the core economic activity in most governorates. The South West region includes Tozeur and Kebili, where the majority of the country's date production is located.

The agricultural sector is facing challenges of water scarcity owing to increased demand for irrigation, growing rainfall variability, and climate change. Tunisia's per capita share of fresh water is around 400 m^3/year, even lower than Egypt and well below the international water scarcity threshold (Wilby 2013). The country is characterized by limited renewable water resources, a semiarid climate, and high variability in rainfall, with periodic droughts (Dhehibi, Frija, and Aw Hassen 2014). As in Egypt, the agriculture sector is the largest consumer of water resources, taking up 75 percent of total freshwater resources. As more than 90 percent of Tunisia's agriculture is rainfed, the sector is highly vulnerable to variability of precipitation (Wilby 2013). The high variability and scarcity of rainfall are especially harmful for cereals, as they are the main rainfed crops (Breisinger et al. 2013).

Although irrigated areas make up only around 8 percent of Tunisia's total agricultural area, they account for 35 percent of the agricultural value, employ 27 percent of the agricultural workforce, and contribute 20 percent of agricultural exports. Groundwater from shallow and deep aquifers supplies 48 percent of the total irrigated area. However, groundwater resources are limited to about 2 billion m^3 and 32.5 percent of groundwater is estimated to be nonrenewable (Benabdallah 2007). Agricultural production under irrigation also has high energy requirements. Around 95 percent of the irrigated areas are equipped with a pumping system. In 2005, the total pumping capacity of irrigated agriculture was 160,000 kW (Dhehibi et al. 2014).

The southern region of Tunisia is particularly disadvantaged with regards to water quality and quantity. Covering 62 percent of the country's area and already an arid region, the south gets only around 190 million m^3, or 6 percent, of Tunisia's surface water (Benabdallah 2007). Further, around 28 percent of Tunisia's surface water is considered saline. The southern region is the lowest in surface water quality—only 3 percent of the water is classified as good, compared to 82 percent in the north (Benabdallah 2007).

Tunisia faces a high risk of a significant decline in water resources due to climate change, with an estimated decline of 5 percent for surface water resources and 28 percent for groundwater resources, besides being among the countries most exposed to accelerated sea-level rise (UNECA 2015). Agricultural yields are expected to be negatively affected by climate change. As shown in Table 22, yields of both irrigated and rainfed wheat would decline under different climate change scenarios.

Tunisia is highly dependent on food imports, especially cereals, importing 50 to 88 percent of its cereal consumption. This dependency presents a great challenge for Tunisia and makes it highly vulnerable to global climate change and food price increases (Breisinger et al. 2013). Climate change adaptation, stabilization of agricultural yields, and decreasing vulnerability to climate variability are all important goals for Tunisia.

FIGURE 25 TUNISIA: EMPLOYMENT IN AGRICULTURE BY GOVERNORATE

Source: Authors' calculations based on TLMPS 2014 (OAMDI 2016b).

TABLE 22 TUNISIA: PROJECTED AVERAGE ANNUAL YIELD CHANGES FOR SELECTED CROPS UNDER CLIMATE CHANGE (2000–2050)

Crop	MIROC Yield changes (%)		CSIRO Yield changes (%)	
	Irrigated	Rainfed	Irrigated	Rainfed
Wheat	-0.17	-0.18	-0.03	-0.11
Barley	n.a.	-0.10	n.a.	-0.12
Potato	-0.04	0.20	-0.02	0.05

Source: Breisinger et al. (2013).

Note: MIROC = Model for Interdisciplinary Research on Climate; CSIRO = Commonwealth Scientific and Industrial Research Organization.

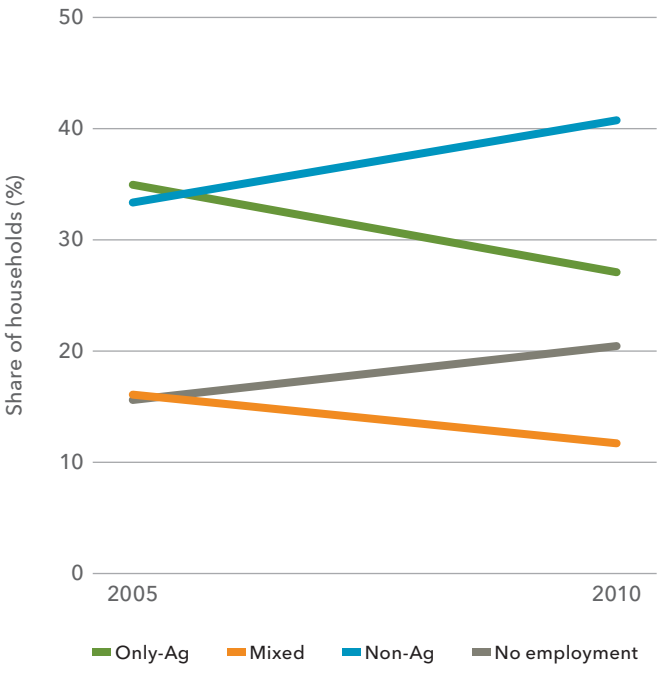
Climate conditions not only impose a major risk on agricultural production but also on poverty and food security. Tunisia ranks 53 out of 113 on the Global Food Security Index, with a "good" food security situation. However, it is the lowest-scoring MENA country in terms of volatility of agricultural production (EIU 2016i). With the high shares of agriculture-only dependent households, this volatility poses a major challenge to improving poverty levels and providing social protection. Tunisia has two main social protection instruments: universal food subsidies for products mainly consumed by the poor and direct transfers for the poorest families (INS 2012a). After the 2010–2011 revolution, transfers and subsidies increased to 7.6 percent of GDP from a prerevolution level of 3.6 percent (Matta, Appleton, and Bleaney 2016). However, more climate change adaptation mechanisms will need to be put in place, particularly for areas where a high share of households depend solely on agriculture.

TRANSFORMATION IN TUNISIA–WHAT DOES IT MEAN FOR RURAL HOUSEHOLDS?

This report analyzes Tunisian household characteristics using the same typology used for Egypt. It differentiates among three types of household, based on the number of people employed in agriculture in each household: agricultural households (only-Ag), mixed households, and nonagricultural households (non-Ag). A fourth category of households also exists where none of the household members are employed, referred to here as "no employment" households.[20]

As in Egypt, the share of rural households employed full- or part-time in agriculture in Tunisia has declined. In 2005, about 35 percent of rural households were working full-time in agriculture, and 16 percent were mixed households where at least one member was working in agricultural activities. However, in 2010 these shares decreased to 27 percent and 11 percent of rural households respectively. These changes resulted in an increase in the share of nonagricultural households up from 33 percent in 2005 to about 41 percent of rural households in 2010 (Figure 26).

FIGURE 26 TUNISIA: SHARE OF RURAL HOUSEHOLDS BY MEMBERS' PRIMARY EMPLOYMENT



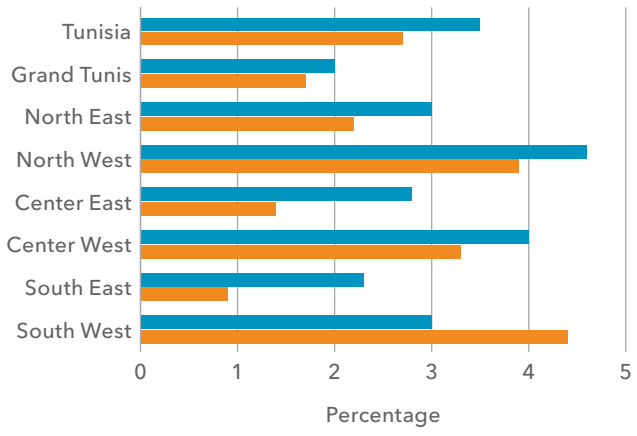
Source: Authors' calculations based on EBCNV (OAMDI 2014d; 2014e).

As Figure 27 shows, all regions experienced a reduction in the share of households that depend on agriculture as their source of income. The South East witnessed the steepest decline in the share of households solely working in agriculture, which dropped from 23 percent to 9 percent. The only exception in these changes is the South West region, where the share of only-Ag households increased from 30 percent to 44 percent of total rural households in the region. The South West is the region of Tunisia with the highest share of only-Ag rural households.

Does moving out of agriculture bring people out of poverty? Tunisia achieved one of the largest reductions in poverty across the region. Without claiming causality between moving out of agriculture and poverty reduction in Tunisia, Table 23 shows that poverty declined in all of the country's regions, as did the share of only-Ag households (with the exception of the South West).

Among households that work exclusively in agriculture, regional variations are minimal, with the exception of the South East region. Table 24 looks at demographic characteristics of agricultural rural households and the share of households in the first three deciles of average per capita expenditure in every region (last row in Table 24).

FIGURE 27 TUNISIA: SHARE OF AGRICULTURE-ONLY RURAL HOUSEHOLDS



Source: Authors' calculations based on EBCNV (OAMDI 2014d; 2014e).

TABLE 23 TUNISIA: POVERTY HEADCOUNT ACROSS THE REGIONS (PERCENTAGE)

	Poverty			Extreme poverty		
	2000	2005	2010	2000	2005	2010
Grand Tunis	21.0	14.6	9.1	4.3	2.3	1.1
North East	32.1	21.6	10.3	10.5	5.4	1.8
North West	35.3	26.9	25.7	12.1	8.9	8.8
Center East	21.4	12.6	8.0	6.4	2.6	1.6
Center West	49.3	46.5	32.3	25.5	23.2	14.3
South East	44.3	29.0	17.9	17.5	9.6	4.9
South West	47.8	33.2	21.5	21.7	12.1	6.4

Source: INS (2012a).

As in the case of Egypt, we conduct a multivariate regression analysis to model household involvement in agricultural labor. We estimate a multinomial logistic model using a nominal variable that indicates whether households are "only-Ag," "non-Ag," or "mixed," according to the number of people in the household whose primary occupation is in agriculture. The estimation results are presented in Appendix C.

Not surprisingly, compared to only-Ag households, those that do not depend on agriculture are more likely to be located in the urban area of Grand Tunis. However, interesting patterns emerge when analyzing mixed households: the association between location and agricultural type is positive and statistically significant for the North East and the Center East regions (0.163 and 0.477 respectively). This suggests that, compared with only-Ag households, mixed ones are more likely to be found in the two regions with

TABLE 24 TUNISIA: DEMOGRAPHIC CHARACTERISTICS OF AGRICULTURAL RURAL HOUSEHOLDS (2010)

	Grand Tunis	North East	North West	Center East	Center West	South East	South West
Age of head (mean)	52.40	54.81	57.24	51.49	55.52	58.98	56.82
Age of spouse (mean)	45.98	46.59	50.68	45.14	48.40	46.92	47.83
People in household/rooms (mean)	2.01	1.90	2.03	1.89	2.19	2.16	1.97
People in household (mean)	4.84	4.41	4.37	4.90	4.71	5.44	5.20
Male household head (%)	0.97	0.92	0.85	0.87	0.88	0.87	0.87
Education of head (%)							
None	90.20	99.18	96.00	96.29	99.65	98.67	97.03
Primary/Lower secondary		0.82	0.60	1.49		1.33	
Secondary	6.55		2.28	2.22	0.35		2.97
Postsecondary			0.26				
University	3.25		0.86				
Postgraduate							
Education of spouse (%)							
None	92.80	100.00	98.14	98.19	99.38	98.39	97.35
Primary/Lower secondary	3.19					1.61	
Secondary	4.01		1.15		0.62		2.05
Postsecondary							
University			0.71	1.81			0.60
Postgraduate							
Highest level of education in household (%)							
None	39.38	58.14	61.12	60.98	64.57	45.72	46.95
Primary/Lower secondary	29.45	28.65	19.98	24.60	22.90	36.56	22.04
Secondary	15.71	9.21	12.63	7.32	7.61	12.71	13.72
Postsecondary	9.33	1.86	2.60	2.60	1.74	5.01	8.12
University	6.13	2.14	3.38	4.50	3.19		8.81
Postgraduate			0.28				0.35
Share of households in first 3 deciles	0.22	0.36	0.59	0.37	0.59	0.48	0.49

Source: Authors' calculations based on EBCNV (OAMDI 2014d; 2014e).

the lowest levels of poverty (apart from Grand Tunis). Also, mixed households tend to have younger heads compared with households in agriculture but also tend to have a higher probability of older spouses.

Finally, a higher level of education is associated with households that do not depend on agriculture. Regardless of the education of the head of the household or the maximum level of education for all members altogether, higher levels of education are strongly correlated with non-Ag households in comparison with only-Ag ones. In the case of mixed households, there is also a correlation with education, although the results are less striking, as shown by the smaller magnitude of the coefficients for educational level of the head of the household. Also, a level of education above secondary school does not predict a household being categorized as mixed. Finally, in comparison with only-Ag households, households out of agriculture are more likely to rely on pensioners or to be headed by a housewife. As in Egypt, poverty and lack of opportunities are a rural problem, and a large share of the rural population continues to rely on agricultural activities.

SUMMARY OF FINDINGS

The share of the agricultural sector in the Tunisian economy has been declining. However, unlike Egypt, agriculture and agro-processing contribute more to trade than to GDP. At the household level, the analysis showed that the share of households dependent on agriculture for employment declined between 2005 and 2010. This was the case in most of Tunisia's regions, including the North West, South West, and Center West, where agriculture employs a larger share of the labor force compared to other regions. Meanwhile, both variations and similarities appear when comparing household characteristics by the household typology used.

7. KEY FINDINGS AND CONCLUSIONS

THIS STUDY EXAMINED THE DRIVERS, CONSTRAINTS, AND SOCIAL implications of agricultural development in the MENA region in order to contribute to a better understanding of the performance of the region's agricultural sector. It also explored possible cornerstones for new and sustainable development strategies for countries in the region. Conceptually, the report used elements of the agricultural development and economic structural change literature to examine MENA's path to agricultural development and economic transformation. To do so, the authors looked at the main characteristics of the MENA economies and their agricultural sectors, presented the policy context of the regional economies, and analyzed the performance of the agricultural sector over the past three decades. The study also looked at some of the stylized facts of MENA's economic transformation and their implications for agricultural growth. The two country case studies took a more in-depth look at the implications of economic changes for rural households.

The literature looking at policy developments in MENA shows that concentration of economic and political power, primacy of external revenues, and profound demographic shifts have marked the region's economic performance over the past 40 years. During the first half of this period, most countries followed a state-led development strategy defined by a series of public policies and interventions, where oil exports played a central role as countries used external revenues to develop the welfare systems used to distribute wealth to citizens. These policies discriminated against agriculture and led governments in the region to simultaneously provide output support to farmers and agro-industries, subsidies to purchase inputs and machinery, and subsidies to compensate consumers for the farmers' price policies. Declining oil prices in the 1980s triggered a regional economic crisis, prompting MENA countries to embark on policy reform and economic stabilization programs. By reducing public expenditure and reforming exchange rate regimes, governments in the region were able to reduce debt levels and bring inflation under control during the first half of the 1990s.

The reform of agricultural policy started at the same time as major trade reforms, with the goal of moving the state away from agricultural output and input markets and promoting private sector involvement. MENA countries took different approaches to reforming agricultural policy. Algeria, Jordan, Morocco, and Tunisia undertook far-reaching macroeconomic and sectoral reforms, whereas Egypt, Iraq, Libya, and Syria kept a prominent role for the state but promoted the private sector as well, as the latter was expected to play an enhanced role with the support of a more efficient and productive public sector. However, after the 1990s reforms and until the early

2000s, the region's economic performance, measured by growth in labor productivity, was weak and the economic recovery was slow and accompanied by growing unemployment. The slow recovery of the MENA economies was tied to the so-called Dutch disease, weak institutional structures that affected public spending patterns, and the region's failure to integrate into the global economy. Although policy changes led the region to a significant reduction of tariff barriers, protection in most UMI and LMI countries is still high, largely because of NTBs. Labor markets in the region were still suffering from structural rigidities that limited private sector desires to invest and hire, while the share of civilian government employment continued to be high by international standards and significant queuing continued among educated workers for public sector jobs. The limited scope of the labor market reforms resulted in rapid growth of informal employment and in the expansion of unregulated employment in the formal private sector. In the case of agriculture, the new trade policy strategies were designed to facilitate agricultural growth and competitiveness.

In this context, the performance of agriculture in the region, measured by growth in TFP, can be linked to policy and to demographic changes that increased the growth of the labor supply and the pressure on labor markets. Between 1973 and the mid-1990s, agricultural TFP remained stagnant and growth in labor productivity was driven by growth in input per worker. When policy reforms started in the 1990s, there was a short-lived recovery of TFP growth, mainly as the result of an increase in efficiency, the kind of one-time effect produced by policy changes. TFP growth took off only in the mid-2000s, fueled by the adoption of new technologies such as portable submersible pumps and ground wells, as well as improved access to better seed varieties and fertilizer. Almost 85 percent of increased growth in agriculture resulted from increased production of potatoes and tomatoes. Algeria and Jordan were the best-performing countries during the analyzed period as measured by agricultural TFP growth. Egypt and Iran also saw high growth in TFP. Libya, Mauritania, Morocco, and Tunisia performed poorly at the beginning of the period but improved their performance after 1995. The group of slow-growing countries includes HI countries, like Bahrain, Kuwait, Qatar, and Saudi Arabia, and countries that went through conflicts or wars during the analyzed period, such as Iraq, Somalia, and West Bank and Gaza, and more recently Syria.

When looking at the changes in the composition of GDP and employment in MENA, the study finds that in low- and middle-income countries, labor productivity in agriculture keeps falling behind productivity in other sectors, indicating that the process of structural transformation in these countries has not been smooth. The growing gap in labor productivity indicates poorly developed and integrated labor markets, constraints on the movement of workers between sectors, and production growth slower than labor force growth in agriculture. Policies prioritizing food self-sufficiency and protection of staple crops seem to have exacerbated this labor productivity gap and have been costly not only in terms of the government's budget but also in terms of efficiency and productivity growth. All the same, the market liberalization efforts of the 1990s took their own toll on the region, especially in LI countries with imperfect labor, land, and credit markets, fragmented regional markets, and poor infrastructure. Experience from the past policy reforms shows that abruptly reducing or eliminating food subsidies is politically costly, with many countries suffering "bread riots" during the reform implementation.

The case studies of Egypt and Tunisia show that even though these countries have similar per capita income levels (about $10,000 PPP), the GDP share of agriculture is lower in Tunisia (9.9 percent) than in Egypt (13.7 percent) and the share of people working in agriculture is only about half in Tunisia (15.6 percent) compared to Egypt (28.1 percent). Changes in crop output composition show that although the share of cereals in production remained relatively constant in Egypt over the past 50 years, cereal production halved in Tunisia during the same time. The case studies highlight the importance of taking within-

country heterogeneity into account when formulating national development strategies. The transformation experience and related outcomes across regions and households in Egypt and Tunisia differ substantially. In "lagging" poorer regions (Upper Egypt and southern Tunisia), agriculture tends to have a more important role in the regional economy and rural households compared to that in better-off regions. Overall, trends in Egypt and Tunisia follow the expected patterns of a reduced importance of agriculture in GDP and to a lesser extent in employment. Although there are no time-series data on agricultural GDP at the regional level, the share of agricultural employment in regional employment consistently declined in Egypt and Tunisia in recent years. The latest available data suggest that in Egypt, only about 23 percent of rural households depend exclusively on agriculture for their income. In Tunisia, the share of rural households that depend on agriculture is 27 percent. The share of rural households that do not have farming income has increased in both countries, reaching 50 percent in Egypt and 40 percent in Tunisia.

To better understand which factors might be triggering these trends, the authors analyzed characteristics of households in rural areas in Tunisia and Egypt. From a policy perspective, knowing which characteristics shape household decisions to remain in or leave agriculture is crucial for designing targeted interventions to foster economic development. Well-designed, focalized policies to promote rural development and inclusive economic growth need to consider the structure and characteristics of rural households and how they are affected or benefited by the economic and social changes of the transformation process. Examples from other countries have shown the importance of analyzing such determinants, showing that strategies to promote income from nonfarm activities in rural areas are crucial for alleviating poverty in developing countries. In that sense, the analysis of households presented for Egypt and Tunisia provides some useful insights. For instance, in Egypt, households that rely more on agriculture appear to be less educated and are more likely to be found in Upper Egypt. In Tunisia, more educated households participate less often in agriculture and are more likely to be located in Grand Tunis. This finding emphasizes the potential role of education policies that may allow households to diversify activities, which in turn can have positive impacts on poverty reduction.

Policy makers also need to pay more attention to the role of women among rural households. Such policies can be especially designed to reinforce or promote women's participation in economic activities, which can bring economic benefits to rural families. These policies also can prevent vulnerable households from depending on women's labor as a main source of income, helping them to avoid being trapped in poverty. Purely agricultural households are more likely to be female-headed, and in the case of Egypt, to rely more on female work to generate income. Also, households with no members in agriculture are more likely to participate in activities in the formal sector. However, this analysis establishes only statistical associations and not causality links, which calls for further research. Moreover, a more detailed analysis of households could clarify the links observed in the analysis and help provide more suitable, context-specific policy recommendations.

In sum, results suggest that to reduce the rural income gap, the MENA region should be gradually moving away from the traditional expensive price policies and subsidies that have not delivered the needed increase in agricultural productivity and efficiency. This study provides evidence of possible cornerstones for a strategy to improve the performance of agriculture in the region: (1) reducing protections on staple crops for which the region has no comparative advantage; (2) abandoning policies targeting self-sufficiency of staple crops, giving priority to demand factors related to food security (including income, risk, social protection, and health); (3) increasing productivity and efficiency in production of staple crops and crops with export potential by stimulating technical change and establishing policies and institutions to more efficiently use water for irrigation; and (4) deregulating labor markets to make labor allocation and investment more efficient.

Development strategies built on these cornerstones should contribute to the diversification of output by increasing the share of fruits and vegetables and other activities for which the region shows comparative advantages, and result in more efficient water and land use. Increased production of high-value crops, and the higher multiplicative effects of services and processing needed for some of these crops, could also contribute to higher labor productivity and better jobs than some of the low-productivity services in urban areas. At the same time, deregulation of labor markets should help improve labor allocation between and within sectors, directing labor toward more productive activities—a process that can speed up agricultural transformation.

Finally, the traditional policy of promoting growth of the water supply by tapping water resources seems to be unsustainable for most countries in the region and, in many cases, is leading to groundwater depletion. Fifteen MENA countries are in the list of 36 countries facing extremely high levels of baseline water stress, which means that more than 80 percent of the water available to agricultural, domestic, and industrial users is withdrawn annually, leaving businesses, farms, and communities vulnerable to scarcity. Policies, investments, and institutions that generate incentives for more efficient use of water instead of increasing water use should be prioritized.

APPENDIX A: ESTIMATING TFP FOR MENA

CONCEPTUAL FRAMEWORK

The TFP analysis in this study uses index numbers together with data envelopment analysis (DEA) to estimate levels of productivity and efficiency and to decompose changes in productivity into measures of technical change (measuring movements in the production frontier) and technical efficiency change (movements toward or away from the frontier), combining the framework developed by O'Donnell (2008) and the literature on appropriate technology (Basu and Weil 1998).

The method by O'Donnell (2008) is based on the definition of total factor productivity (TFP) of a multiple-output multiple-input production unit as the ratio of an aggregate output to an aggregate input. For the case of a production unit i using input vector xi=(x1i,…,xNi) to produce output qi=(q1i,…qMi), we define TFP as :

$$TFP_i \equiv \frac{Q_i}{X_i} \tag{1}$$

where $Qi=Q(qi)$ is aggregate output, $Xi=X(xi)$ is aggregate input and $Q(.)$ and $X(.)$ are non-negative, nondecreasing, and linearly homogeneous aggregator functions. Different indices can be constructed by choosing different aggregator functions. TFP estimates here at the country level are obtained by using what O'Donnell (2008) refers to as a Lowe-type TFP index. This is a simple linear function to aggregate inputs and outputs that satisfy most economically relevant index number axioms and tests:

$$Q_i = p'_o q_i \text{ and } X_i = w'_o x_i \tag{2}$$

where po and wo are predetermined country- and time-invariant reference prices. Notice that according to O'Donnell (2008), the expressions in (2) are "aggregators" and are not indices from a technical point of view. The associated indices that measure the output quantity, input quantity, and TFP of country j in period t relative to country i in period s are:

$$Q_{is,jt} = \frac{Q(q_{jt},p)}{Q(q_{is},p)} = \frac{p' q_{jt}}{p' q_{is}} \tag{3}$$

$$X_{ms,nt} = \frac{X(x_{jt},w)}{X(x_{is},w)} = \frac{w' x_{jt}}{w' x_{is}} \tag{4}$$

$$TFP_{ms,nt} = \frac{Q_{is,jt}}{X_{is,jt}} = \frac{p\ q_{jt}}{p' q_{is}} \times \frac{w' x_{is}}{w' x_{jt}} \tag{5}$$

This type of index is particularly useful for country comparisons because it is spatially and temporally transitive and can be used to make multilateral country comparisons of TFP across space and time. This means that a direct comparison of TFP levels of two countries should yield the same estimate of TFP change as an indirect comparison between these two countries through a third country.

Different price vectors can be used as the reference price vector in (2), meaning that the desired properties of the index do not depend on the choice of prices. Rather, the choice of prices depends on empirics and data availability. To define prices used to aggregate inputs and outputs, we followed O'Donnell (2017), who suggest using the arithmetic average of the shadow prices associated with the linear program (LP) used below to calculate technical efficiency, given that prices of inputs are not available. The input price vector wo is set equal to the average of the shadow prices associated with the input constraints in LP (4), while the output price vector po is set equal to the prices used by FAO (2016) to calculate their output values (international prices 2004–2006).

As in O'Donnell's (2008) example, we combine the index number measure of TFP with a nonparametric approach to determine the effects of technical efficiency and other TFP components, but we depart

from his approach to adopt a hybrid approach that also disentangles technical change along the technological frontier from changes in technical efficiency. Starting from equation (1):

$$Q_i = A_i \times X_i \text{ and where } A_i = TFP_i = E_i \times T_i \quad (6)$$

Notice that this hybrid model, unlike neoclassical growth accounting, deals exclusively with the best practice technology, not the average practice technology. In other words, the output and input indices represent quantities at the production frontier and where TFP is decomposed into efficiency and available technology levels. Using the growth accounting approach (dropping country index), we can express the output growth decomposition between period 0 and 1 as:

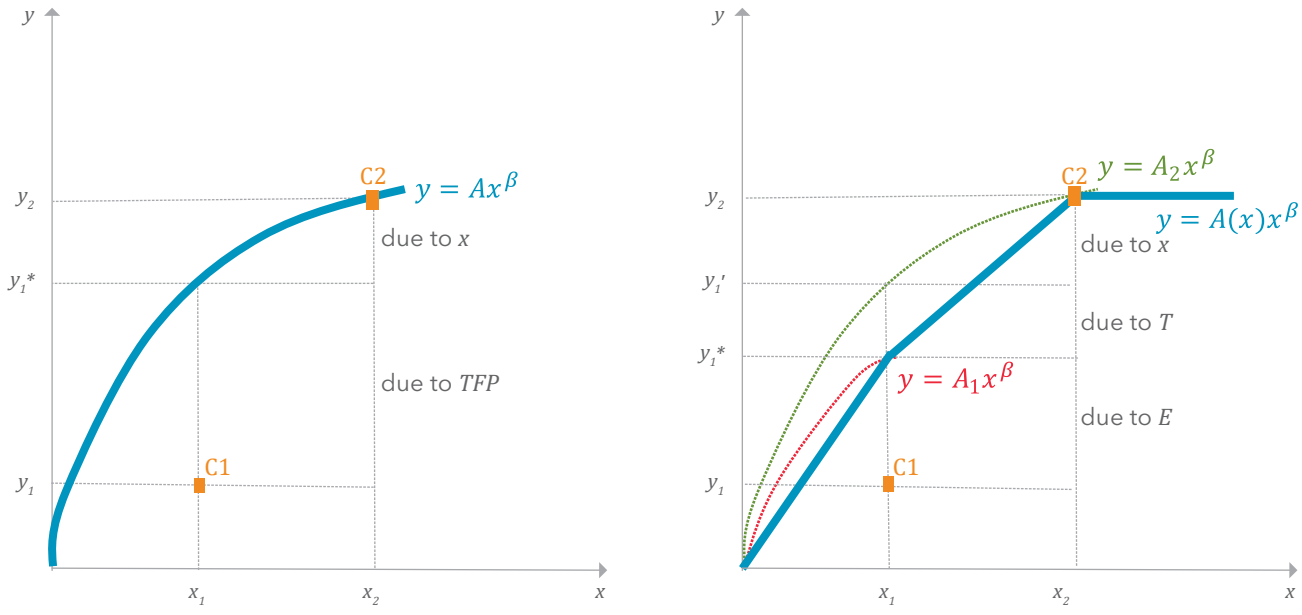
$$\frac{y_1}{y_0} = \frac{E_1}{E_0} \times \frac{\bar{T}_1}{T_0} \times \frac{X_1}{X_0} \quad (7)$$

The expression in (7) is known in the growth accounting literature as the "appropriate technology vs. efficiency" output growth decomposition (Basu and Weil 1998; Jerzmanowski 2007; Growiec 2012). This specification allows for two determinants of TFP differences: country-specific levels of efficiency and country-specific levels of available technology that is allowed to be factor specific: $T_i(x)$ (Figure A1).

The right panel of Figure A1 represents a model of production where all countries have access to the same technology, represented by the production function $y=Ax^{\alpha}$. In this setting, differences in output per worker between an efficient (C2) and an inefficient (C1) country are explained first by TFP levels, which result from inefficiency, measured as the distance of C1 to the frontier given the level of input x_1 used. Second, differences are due in part to the level of input x used, so increasing inputs from x_1 to x_2 will reduce the difference in output per worker to differences in efficiency only.

The right panel represents production with appropriate technology. In this case, the true frontier

FIGURE A1 STANDARD AND APPROPRIATE TECHNOLOGY LEVELS ACCOUNTING DECOMPOSITION



Source: Adapted from Jerzmanowski (2007).

Note: Left panel assumes that technology $y=Ax^{\alpha}$ is available to all countries and differences are due to input-labor level and TFP. Right panel: technology is a function of input per worker as country 1 (C1) cannot access country 2's (C2) technology.

is a function of input per worker. Each input-labor combination has a particular production function (A is a function of x). The difference with the left panel is that in the right panel, there is an intermediate level of output y_1' that C1 cannot achieve with its present level of inputs. The difference y_1'-y_1^* is due to appropriate technology. To achieve the productivity levels of C2, C1 can increase efficiency up to a point, but to catch up with C2, C1 needs to increase input per worker to operate on C2 production function and face TFP levels A_2 instead of A_1. The oxcart can be improved so much.

EFFICIENCY ESTIMATES

As discussed in the previous section, we use a non-parametric approach to measure technical efficiency for our sample of countries. The distance function of a group of countries k is:

$$D^k(x,y) = [sup\{\theta: (x,\theta y) \in S^k\}]^{-1} \quad (8)$$

To estimate the distance function for a particular country i^*, we solve the following linear programming problem:

$$D(x_{i*}, y_{i*}) = \max_{\theta,\lambda} \theta_{i*} \quad (9)$$

Subject to: $\theta_{i*} y_{i*} \leq \sum_{i=1}^{I} \lambda_i y_i$

and $x_{i*,j} \geq \sum_{i=1}^{I} \lambda_i x_{i,j}$

for inputs j={1,…J}, $\lambda_i \geq 0$ (10)

LAND PRODUCTIVITY DECOMPOSITION

The measure of land productivity (YA) used here as part of the analysis of agriculture in the MENA region is the ratio of total agricultural output and total agricultural land in a country. Given the different nature of their production process, we decompose this index into crop and livestock intensity indices as follows:

$$YA = \frac{YT}{A} = \frac{Y_c}{A} + \frac{Y_{lv}}{A} \quad (11)$$

where YT is total agricultural production, A is total agricultural area and Y_c and Y_{lv} are crop and livestock outputs respectively. We further decompose Yc/A as follows:

$$\frac{Yc}{A} = \left[\frac{A_r}{A} \times \frac{A_h}{A_r} \times \frac{Y_c}{A_h}\right] \quad (12)$$

The first term on the RHS is the ratio between arable land (Ar) and total agricultural land. The second term in brackets is the ratio of harvested land (Ah) and arable land (Ar), an indicator that could be used as a proxy for crop intensity as normally defined, the ratio of gross and net cropped area. The last term, Yc/Ah, reflects land productivity and measures crop output per hectare of harvested land.

We expect that in high-population-density countries or in arid areas where water, not land, is the main constraint to production, Yc/Ah would contribute the largest share to crop intensification. By contrast, we expect that crop production in low-density countries would increase through a combination of more land being incorporated in crop production (Ar/A) and a more intensive use of that land (e.g., increasing double cropping).

We also explain changes in Yc/Ah by using information from TFP estimates, calculating an input Lowe index for crop production, where the "p"s are the shadow prices for the respective inputs obtained from problem (9)(10) above:

$$\frac{Yc}{Ah} = TFPc \times \left[pf\frac{Fert}{Ah} + pk\frac{Capital}{Ah} + pl\frac{labor}{A_h}\right]$$

Finally, the livestock production intensity index has two components:

$$LII = \frac{Y_{lv}}{SK} \times \frac{SK}{A} \quad (13)$$

where SK is animal stock measured in cow equivalents. Comparing this to the crop index, SK/A is the equivalent to land being incorporated to livestock production, while Y_{lv}/SK, output per animal, is a productivity measure. Intensification in livestock production at low levels of population density is expected to occur through increases in SK/PA with no major changes in animal productivity. Increased animal productivity would require

more inputs per animal, similar to what is needed to increase yields in crop production. Note that at this level of aggregation output per hectare of harvested land could increase as the result of more intensive use of labor and inputs without changes in crop composition, or as the result of changes in the crop mix without changes in inputs or from a combination of both. The same reasoning applies to changes in output per animal in stock, as the stock composition could change.

DATA

Output and input data to estimate the parameters of the global production function used in this study are from FAO (2016), US Department of Agriculture (USDA-ERS 2016), World Bank (2016b), and ILO (2016) and cover a period of 34 years from 1981 to 2013. The final database includes 51 countries, one output (total agricultural production), and five inputs (fertilizer, feed, physical capital, agricultural land, and labor). Countries not from the MENA region were chosen because they belong to agroecological zones (AEZs) similar to those of MENA countries. The selection criterion was the average length of the growing period (LGP), which falls within the range of LGPs of MENA countries.

Output: The value of gross agricultural production expressed in constant 2004–2006 US$. It includes crop and livestock production. In the case of Nigeria, output available from FAO for the 2000s did not correspond to growth measured at the country level, so output for 2001–2012 was adjusted using agricultural GDP figures from World Development Indicators (World Bank 2016b).

Animal Feed: The amount of edible commodities (cereals, bran, oilseeds, oilcakes, fruits, vegetables, roots and tubers, pulses, molasses, animal fat, fish, meat meal, whey, milk, and other animal products from FAOSTAT food balance sheets) fed to livestock during the reference period. Quantities of the different types of feed are transformed into metric tons of maize equivalents using information on the energy content for each commodity.

Fertilizer: The quantity of nitrogen, phosphorus, and potassium (N, P, K) in metric tons of plant nutrients consumed in agriculture by country and year. These data are from ERS (2016).

Labor: Employed people in agriculture. The dataset was constructed using ILO as the core dataset and information on employment from different sources at the country level available from FAO (2016).

Land: Expressed in thousands of hectares, and includes land under temporary crops (double-cropped areas are counted only once); temporary meadows for mowing or pasture; land under market and kitchen gardens; land temporarily fallow (less than five years); and land cultivated with permanent crops such as flowering shrubs (coffee), fruit trees, nut trees, and vines; but excludes land under trees grown for wood or timber. Pasture land includes land used permanently (five years or more) for herbaceous forage crops, either cultivated or growing wild (wild prairie or grazing land). Total hectares available from FAO were adjusted by quality based on information on LGP from Lee et al (2009). These data include the crop and pasture area in different AEZs within countries. Using this information, we transformed arable and permanent crop land and pasture land into areas equivalent to 330 days of LGP. For example, we assumed that land (natural resources) in arid zones with 30 days of LGP is 0.09 times as productive as land in zones with 330 days of LGP. This approach could be improved in the future by using soil characteristics and other variables already available at the subcountry level. This approach does not adjust for land under irrigation because we control for water use in the efficiency analysis.

Capital stock: A new series of capital stock covering the period 1971–2014 calculated by FAO using the Double Declining Balance Method. In applying this method, assumptions were made regarding depreciation rates, which range from 0.05 to 0.1 depending on the economic level of the countries. Missing values were replaced using growth rates of machinery available from ERS (2016).

TABLE A1 COUNTRIES IN FAO DATA USED TO DEFINE THE GLOBAL AGRICULTURAL PRODUCTION TECHNOLOGY, BY REGION

Region	Country	Region	Country
MENA	Algeria	AFRICA, SUB-SAHARA	Botswana
MENA	Bahrain	AFRICA, SUB-SAHARA	Burkina Faso
MENA	Djibouti	AFRICA, SUB-SAHARA	Chad
MENA	Egypt	AFRICA, SUB-SAHARA	Kenya
MENA	Iran	AFRICA, SUB-SAHARA	Malawi
MENA	Iraq	AFRICA, SUB-SAHARA	Mali
MENA	Jordan	AFRICA, SUB-SAHARA	Mozambique
MENA	Kuwait	AFRICA, SUB-SAHARA	Namibia
MENA	Lebanon	AFRICA, SUB-SAHARA	Niger
MENA	Libya	AFRICA, SUB-SAHARA	Nigeria
MENA	Mauritania	AFRICA, SUB-SAHARA	Senegal
MENA	Morocco	AFRICA, SUB-SAHARA	Somalia
MENA	West Bank & Gaza	AFRICA, SUB-SAHARA	South Africa
MENA	Oman	AFRICA, SUB-SAHARA	Zambia
MENA	Qatar	AFRICA, SUB-SAHARA	Zimbabwe
MENA	Saudi Arabia	AMERICA, LAC	Argentina
MENA	Sudan (former)	AMERICA, LAC	Bolivia
MENA	Syria	AMERICA, LAC	Chile
MENA	Tunisia	AMERICA, LAC	Mexico
MENA	United Arab Emirates	AMERICA, LAC	Paraguay
MENA	Yemen	AMERICA, LAC	Peru
HIGH-INCOME	Australia	E & SE ASIA	Mongolia
HIGH-INCOME	Greece	SOUTH ASIA	India
HIGH-INCOME	Israel	SOUTH ASIA	Pakistan
HIGH-INCOME	Spain		
HIGH-INCOME	Turkey		
HIGH-INCOME	United States of America		

Source: Elaborated by authors

Note: In this study, Turkey is not included in the MENA region and was arbitrarily included in the group of HI-like southern European countries in this table. This classification does not affect the analysis that follows.

APPENDIX B: EGYPT

TABLE B1 MULTINOMIAL LOGISTIC REGRESSION FOR VARIABLES PREDICTING TYPE OF HOUSEHOLD IN 2012

Non-ag households			
Household characteristics		Household characteristics	
Upper Egypt	−0.618***	Head has primary education[3]	0.790***
	(0.0891)		(0.151)
Number of earners in hh	−0.258***	Head has secondary ed.[3]	1.014***
	(0.0690)		(0.143)
1 female earner in hh[1]	−0.818***	Head has more than sec. ed.[3]	1.366***
	(0.116)		(0.273)
2 or more female earners in hh[1]	−0.965***	Max. ed. level in hh is primary[3]	0.128
	(0.234)		(0.139)
Head is between 25–34 years[2]	−0.160	Max. ed level in hh is secondary[3]	0.758***
	(0.402)		(0.137)
Head is between 35–49 years[2]	0.121	Max. ed. level in hh is more than sec.[3]	1.610***
	(0.408)		(0.209)
Head is 50 years or older[2]	−0.0923	Salaries main source of income[4]	1.847***
	(0.415)		(0.0957)
Spouse is between 25–34 years[2]	0.406**	Remittance main source of income[4]	0.132
	(0.175)		(0.170)
Spouse is between 35–49 years[2]	0.762***	Head is housewife/homemaker [5]	−1.638***
	(0.206)		(0.354)
Spouse is 50 years or older[2]	0.213	Head is pensioner[5]	1.464***
	(0.229)		(0.199)
Head is male	−0.524***	Head does other activities[5]	1.195***
	(0.197)		(0.329)
		Constant	0.245
			(0.460)

Mixed households			
Household characteristics		Household characteristics	
Upper Egypt	−0.182	Head has primary education[3]	0.193
	(0.112)		(0.190)
Number of earners in hh	0.669***	Head has secondary ed.[3]	−0.0263
	(0.0711)		(0.177)
1 female earner in hh[1]	0.930***	Head has more than sec. ed.[3]	−0.618*
	(0.142)		(0.332)
2 or more female earners in hh[1]	0.141	Max. ed. level in hh is primary[3]	0.674***
	(0.251)		(0.186)
Head is between 25–34 years[2]	−0.416	Max. ed. level in hh is secondary[3]	1.267***
	(0.534)		(0.182)
Head is between 35–49 years[2]	−0.319	Max. ed. level in hh is more than sec.[3]	1.696***
	(0.538)		(0.254)
Head is 50 years or older[2]	−0.222	Salaries main source of income[4]	1.718***
	(0.543)		(0.122)
Spouse is between 25–34 years[2]	0.517*	Remittance main source of income[4]	−0.0959
	(0.267)		(0.275)
Spouse is between 35–49 years[2]	0.801***	Head is housewife/homemaker [5]	0.0236
	(0.296)		(0.382)
Spouse is 50 years or older[2]	0.330	Head is pensioner[5]	−0.983***
	(0.318)		(0.299)
Head is male	0.279	Head does other activities[5]	0.0840
	(0.261)		(0.470)
		Constant	−4.377***
			(0.623)
Observations: 5,350			

Base outcome: Only-ag households

Source: Authors' calculation based on HIECS 2012–2013 (OAMDI 2014c).

Note: [1] Reference is no female earners, [2] Reference is 15–24 years; [3] Reference is no education; [4] Reference is business; [5] Reference is employee.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX C: TUNISIA

TABLE C1 MULTINOMIAL LOGISTIC REGRESSION FOR VARIABLES PREDICTING TYPE OF HOUSEHOLD IN 2010

Non-ag households			
Household characteristics		Household characteristics	
North East[1]	−1.782***	Spouse is 50 years or older[2]	−0.172***
	(0.0111)		(0.0201)
North West[1]	−2.888***	Head is male	0.276***
	(0.0108)		(0.00951)
Center East[1]	−0.810***	Head has primary education[3]	1.156***
	(0.0117)		(0.0223)
Center West[1]	−2.607***	Head has secondary education[3]	1.451***
	(0.0108)		(0.0169)
South East[1]	−1.223***	Head has more than sec. ed.[3]	1.561***
	(0.0140)		(0.0342)
South West[1]	−2.582***	Max. ed. level in hh is primary[3]	0.238***
	(0.0126)		(0.00620)
Head is between 25–34 years[2]	0.109	Max. ed. level in hh is secondary[3]	0.897***
	(0.0717)		(0.00750)
Head is between 35–49 years[2]	−0.126*	Max. ed. level in hh is more than sec.[3]	0.845***
	(0.0715)		(0.0120)
Head is 50 years or older[2]	−0.398***	Head is housewife[4]	1.766***
	(0.0716)		(0.0179)
Spouse is between 25–34 years[2]	0.588***	Head is pensioner[4]	0.914***
	(0.0192)		(0.00763)
Spouse is between 35–49 years[2]	0.455***	Head does other activities[4]	0.381***
	(0.0196)		(0.0251)
		Constant	2.646***
			(0.0722)

Mixed households			
Household characteristics		Household characteristics	
North East[1]	0.163***	Spouse is 50 years or older[2]	0.714***
	(0.0166)		(0.0358)
North West[1]	−0.721***	Head is male	0.715***
	(0.0165)		(0.0158)
Center East[1]	0.477***	Head has primary education[3]	0.389***
	(0.0172)		(0.0319)
Center West[1]	−0.656***	Head has secondary ed.[3]	0.409***
	(0.0167)		(0.0230)
South East[1]	−0.618***	Head has more than sec. ed.[3]	0.00395
	(0.0235)		(0.0486)
South West[1]	−0.422***	Max. ed. level in hh is primary[3]	0.264***
	(0.0190)		(0.00914)
Head is between 25–34 years[2]	−0.921***	Max. ed. level in hh is secondary[3]	0.590***
	(0.0902)		(0.0105)
Head is between 35–49 years[2]	−1.020***	Max. ed. level in hh is more than sec.[3]	0.885***
	(0.0893)		(0.0155)
Head is 50 years or older[2]	−0.743***	Head is housewife[4]	0.669***
	(0.0893)		(0.0272)
Spouse is between 25–34 years[2]	−0.171***	Head is pensioner[4]	−0.557***
	(0.0356)		(0.0120)
Spouse is between 35–49 years[2]	0.546***	Head does other activities[4]	−1.570***
	(0.0354)		(0.0639)
		Constant	−1.011***
			(0.0918)
Observations: 8,497			

Base outcome: Only-ag households

Source: Authors' calculation based on EBCNV 2010 (OAMDI 2014e).

Note: [1] Reference is Grand Tunis, [2] Reference is 15–24 years; [3] Reference is no education; [4] Reference is employee; [5] Reference is employee.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

GLOSSARY

high income (HI) – the World Bank income group classification for economies with a per capita gross national income (GNI) of $12,476 or above (as of 2015), calculated using the World Bank Atlas method for the period July 2016–July 2017, including all economies with populations of more than 30,000.

Gini coefficient – a measurement of the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality and 100 represents perfect inequality (OECD 2017).

internal renewable water resources (IRW) – available water resources generated within the boundaries of a country.

length of growing period/season (LGP or LGS) – the period or season during a year (measured in number of days) when precipitation exceeds half the potential evapotranspiration. A period required to evapotranspire an assumed 100 mm of water from excess precipitation stored in the soil profile is sometimes added, as defined by the Agro-Ecological Zones methodology (FAO 1978).

lower middle-income (LMI) – the World Bank income group classification for economies with a per capita gross national income (GNI) of $1,026 to $4,035 2015 (as of 2015), calculated using the World Bank Atlas method for the period July 2016 to July 2017, including all economies with populations of more than 30,000.

nominal rate of assistance (NRA) – a rate developed to record the change in income, resulting from both price and direct income support, as a proportion of what income would be in the absence of support.

nontariff barriers (NTBs) –any policy measure other than tariffs that can impact trade flows, restricting the import or export of goods and services. NTBs include but are not limited to quotas, import licensing systems, sanitary regulations, and prohibitions. See "nontariff measures" (Staiger 2012).

peak expiratory flow (PEF) – the portion of total rainfall (in millimeters per year, averaged over a country) available for crop growth.

potential evapotranspiration (PET) – maximum crop evapotranspiration (in millimeters per year, averaged over a country) for a reference crop.

relative rate of assistance (RRA) – an international economic indicator for measuring the extent to which a country's policy regime has an anti- or pro-agricultural bias.

revealed comparative advantage (RCA) – an international economic measure used to calculate the relative advantage or disadvantage of a certain country in a certain class of goods or services as "revealed" by observed trade flows. This measure was originally introduced by Balassa (1965).

tariffs – customs duties on merchandise imports. Tariffs are levied on either an ad valorem (percentage of value) basis or a specific basis (for example, $7 per 100 kg). Tariffs give a price advantage to similar locally produced goods and raise revenues for the government (WTO glossary).

upper middle income (UMI) – the World Bank income group classification for economies with a per capita gross national income (GNI) of $4,036 to $12,475 (as of 2015), calculated using the World Bank Atlas method for the period July 2016 to July 2017, including all economies with populations of more than 30,000.

value-added tax (VAT) – a general, broadly based consumption tax assessed on the value added to goods and services.

NOTES

1 This is the World Bank's classification for the period from July 2016 to July 2017, which ranks all economies with populations of more than 30,000 into income groups according to 2015 gross national income (GNI) per capita, calculated using the World Bank Atlas method. The groups are classified as follows: LI ($1,025 or less); LMI ($1,026–$4,035); UMI ($4,036–$12,475); and HI ($12,476 or more). For this study, the two LI countries in our group of MENA countries, Comoros and Somalia, are included in the LMI group.

2 Throughout the text and unless specified, dollars refer to 2011 purchasing power parity (PPP) dollars.

3 Unless stated otherwise, averages of the three country groups (HI, UMI, LMI) are simple averages, disregarding population and agricultural land.

4 More recent estimates for MENA countries from 2013 indicate that pretax energy subsidies accounted for approximately 7 percent of regional GDP at a cost of $500 billion. However, these estimates include Pakistan and Afghanistan, which does not allow for direct comparisons with the numbers presented here for the year 2011. Estimates for subsequent years are unknown or not available to the authors.

5 The Egyptian food system went though reforms in 2014. The discussion in this section does not reflect the effects that such reforms might have had in recent years.

6 Information in this section for employment by sector is from the World Bank (2016b) , which it has reported since 1980 based on data published by the International Labour Organization (ILO) while sector value added is from the national accounts of the United Nations Statistics Division (UNSD 2016) starting in 1970. Table 12 summarizes the structure of the regional economy.

7 Libya is not included because its observed productivity growth should be related to the internal conflict of recent years.

8 See annex in Timmer (2007) for a proof of this relationship.

9 The inflation rate for the first six months of 2017 was 30.09 percent.

10 A feddan is an Egyptian unit of area equivalent to 1.038 acres or 0.42 hectare.

11 The share of agriculture in GDP slightly differs from the numbers presented in section 1 due to different base years and SAM balancing processes.

12 Nonfood production refers to manufacturing of tobacco products, textiles, clothing, leather and footwear, wood and paper, and other agriculture processing that does not include food, dairy, and beverages.

13 As Assaad (2002, xi) defines it, extended employment accounts for "the production and processing of primary products, whether for the market, for barter, or for their own consumption; the production of all other goods and services for the market; and the corresponding production for own consumption in the case of households producing such goods and services for the market." In that sense, the shares of employment in agriculture in particular would be higher than national estimates, which use a market definition of employment. The authors acknowledge this difference but decided that the extended definition of employment would give an extra insight into the movement of people within sectors, even for subsistence work, as the market definition still does not account for a large part of agricultural production.

14 The numbers are constructed from the questions on agricultural enterprises in the ELMPS. The survey asks if household members own/rent agricultural enterprises, and if they do, how much land is owned/rented.

15 Common regional groupings used in Egypt are "Major cities," "Lower Egypt," "Upper Egypt," and "Frontier governorates."

16 However, it is important to note that taking Giza out of "Upper Egypt" would change the comparison. Giza has a different setting compared to other Upper Egyptian governorates, as 92 percent of its population lives in urban areas. The share of urban population averages around 28 percent in the rest of Upper Egypt's governorates.

17 Luxor was part of Qena but was made a separate governorate in 2009. Thus, the data might not be accurate in terms of household division for this governorate.

18 We follow the same definition used by Diao and others (2017) and also employed in El-Enbaby and others (2016). See also Owusu, Abdulai, and Abdul-Rahman (2011) for additional examples of analyses that have categorized rural households in terms of the number of people employed in agricultural activities. This definition is based solely on the primary occupation of household members. Data for secondary activities, which can also define the agricultural character of households, were not available.

19 See OAMDI (2014a; 2014b; 2014c).

20 The characterization of type of household into "only-Ag," "mixed," and "non-Ag" is based on primary employment. Information on secondary occupation of household members and information on income sources was not available and thus was not included in the analysis.

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