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Economic Growth in the Euro-Med Area through Trade Integration: Focus on Agriculture and Food

The Case of Turkey

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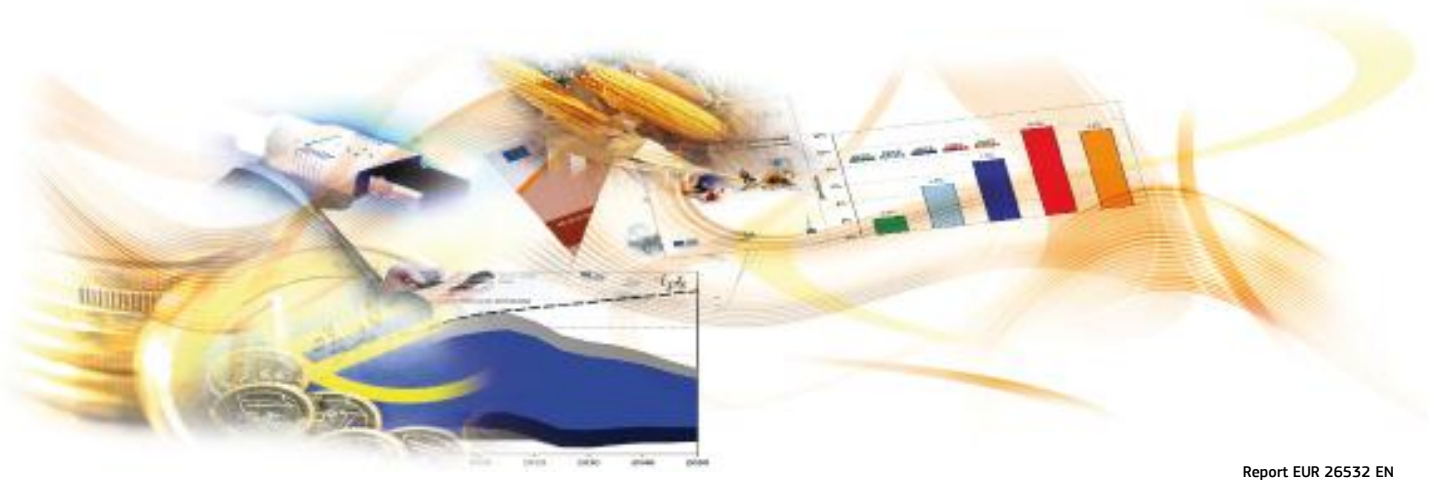

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Acronyms

AoA	Agreement on Agriculture
ACC	Accession scenario
BASE	Baseline scenario
CAP	Common Agricultural Policy
CES	Constant Elasticity of Substitution
CET	Constant Elasticity of Transformation
CGE	Computable General Equilibrium model
CU	Customs Union
DCP	Domestic Consumer Protection
DFW	Decreasing Food Waste
EC	European Commission
EU	European Union
EU	The 27 Member States of the European Union
EV	Equivalent variation
FAO	Food and Agriculture Organization
GTAP	Global Trade Analysis Project
GDP	Gross domestic product
I/O	Input / Output
IPCR	Inward processing customs regime
MAGNET	Modular Applied General Equilibrium Tool
MENA	Middle East and North Africa
NAF countries	Egypt, Morocco and Tunisia
NTM	Non-tariff measure elimination
OECD	Organisation for Economic Co-operation and Development
OEUR	Other European countries
SAM	Social accounting matrix
TFP	Total factor productivity
TRF	Tariff elimination
ROWR	Rest of the World
USD	US dollars
VA	Value Added
WPI	Wheat Price Increase
WS	Food Waste scenario
WTO	World Trade Organization

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Executive Summary

The main purpose of this study is to identify the potential economic impact of the liberalisation of trade in agricultural products between the EU and Turkey, an increase in world prices of main staple commodities and an increase in total factor productivity (TFP) in the agricultural sector. The results reported by Kavallari *et al*. (2013) were also used to briefly describe the effects of trade liberalisation between the European Union (EU) and selected Middle Eastern and North African (MENA) countries on the Turkish economy. The results suggest that trade liberalisation between the EU and Turkey does not have a significant impact on the overall economy but the agricultural sector is likely to be significantly affected depending on the degree of liberalisation. Factors of production are mobilised towards the most competitive agricultural activities while losses in production of other activities are compensated by imports, mostly from EU countries. Moreover, the increase in the world price of wheat does not significantly affect the overall economy and Turkey is able to cope with the adverse welfare effects of trade liberalisation. Lastly, total factor productivity (TFP) growth in agriculture is likely to boost not only agricultural production but also other economic activities by generating significant welfare gains for all economic agents.

Overview of the Agri-food Sector in Turkey

Agricultural policy in Turkey was selected to undergo heavy adjustments as part of the macroeconomic stabilisation and structural adjustment programme in 2000 with a reform programme that was comprehensive enough to encompass not only budgetary cuts but also changes in both trade policy and the structure of transfers to agriculture. Although full-fledged implementation was not possible, transparency in budgetary supports to agriculture and a change in the policy environment have been achieved.

Agricultural production in Turkey displays the characteristics of a developing economy with a high share of agriculture in employment (25 percent) although the absolute and relative levels of employment in agriculture have declined rapidly over the last decade. Nevertheless, the sector has retained its importance in the overall economy, notably accounting for 85 percent of rural employment. Agricultural production is dominated by cereal production although the value added per hectare is low. Agri-food exports are mostly dominated by horticulture production. Lastly, herd and land size per farm have not changed much in recent decades and remain small (e.g. 6 ha). Farms are mostly family-owned, small and fragmented.

The structure of production is far from reflecting the policy weights in agriculture. Turkey cultivates approximately 24 million ha of land of which 85 percent correspond to field crops, 10 percent to orchards and 3 percent to vegetables. Irrigated land constitutes only 20 percent of total cultivated land. Support policies are generally targeted towards cereals, oilseeds and industrial crops, whereas vegetables and fruits

have relatively smaller importance. High protection coupled with domestic intervention schemes in cereals gains precedence with negative repercussions for production in the animal sector.

Turkey has accomplished significant trade liberalisation in industrial products since the mid-1980s. Turkey and the EU bilaterally abolished all tariffs on imports of industrial goods under the Customs Union (CU) Decision of December 1995. The liberalisation of trade in agricultural products with the EU has been delayed due to the incompatibility of the support structure between the EU and Turkey. Since then, Turkey has been harmonising its tariffs with the EU's Common External Tariff. Accordingly, Turkey has also been expected to engage in negotiations and sign preferential trade arrangements with third countries. Turkey has either signed or completed free trade agreement negotiations with all MENA countries, except Lebanon and Libya.

Turkey has high levels of protection (statutory tariffs higher than 100 percent) in meat, dairy products, sugar and basic cereals, which are considered vital for the survival of small farms, while commodities used as intermediate inputs in export-oriented sectors, such as cotton, raw hides and skins, are duty free. Tariff overhang according to Turkey's commitments under the WTO Agreement on Agriculture (AoA) is around 20 percent. Export subsidies are offered for a limited number of agri-food products. Exports of processed products are mainly helped by the inward processing customs regime (IPCR) that allows domestic manufacturing companies to acquire their inputs at world prices.

Historically, Turkey has been a net exporter of agri-food products, mostly due to heavy tariff and non-tariff protection on certain major agricultural products and the strong performance of export-oriented agricultural production. The shares of agri-food exports and imports have declined slightly mainly due to the faster expansion of trade in non-agri-food exports. The average annual growth rate of agri-food imports was 2 percentage points higher than the corresponding rate in agri-food exports during the considered period, prompting a decline in Turkey's net trade position.

Turkey is a permanent importer of oilseeds and cotton and occasionally imports other agricultural commodities in the event of domestic supply shortages. Most of those imports originate from the United States of America (USA), EU and South America. The main destinations for exports of final products are EU countries, Near and Middle Eastern countries and Russia. In recent years, exports to North Africa and the Middle East have increased significantly.

Dynamic CGE model for Turkey: data and scenarios

Trade liberalisation is expected to increase welfare in Turkey, especially through its effects on consumers. However, findings published in literature are quite diverse and sensitive to the data and method of analysis used. Most studies rely on relatively old data such as Global Trade Analysis Project (GTAP) database with a base year of 1997, long before Customs Union became fully effective. Almost all studies employ static

models while ignoring the dynamic aspect of the problem. Thirdly, employed computable general equilibrium (CGE) models lack a detailed disaggregation of agriculture, while partial equilibrium models ignore feedback effects from other sectors. For this study, a recursive dynamic Walrasian CGE model was used to overcome these deficiencies. The model consists of production activities, households, firms, government and main trading partners of Turkey as the main economic agents and attempted to model the behaviour of these agents and their interactions.

The model takes into account 13 agricultural (wheat, maize, rice, other cereals, oilseeds, sugar beet, other field crops, fruits, vegetables, dairy, meat, other livestock and other agricultural production), 4 manufacturing (food, textiles, energy and other manufacturing production) and 2 services (private and public services) activities that produce consumption and intermediate goods by using labour, capital, rainfed land, irrigated land and water, together with intermediate inputs supplied from other sectors. There is only one type of household and these households spend their income on consumption goods and savings. Labour supply decision is endogenised by including leisure in the utility function and labour force participation is a function of real wage.

The rest of the world account consists of five trading partners who supply imports and demand exports, make and receive transfers and invest in Turkey. Imports follow the Armington specification while exports are modelled using a CET approach. Foreign exchange rates are fixed for all trading partners and the total trade balance is adjusted to close rest of the world accounts.

The 2008 social accounting matrix (SAM) was used to calibrate the model. The I/O table is a modified version of the most recent I/O table. The consumption part of the SAM was also modified to reflect a more realistic consumption pattern: households do not directly consume most agricultural products, which are used instead as intermediate inputs by the food processing industry. Transfers from and to rest of the world accounts, subsidies to agricultural activities and implemented tariff rates were also updated according to most recent OECD and GTAP databases.

Four types of scenarios were run with the model namely (i) baseline, (ii) trade liberalisation, (iii) increase in world prices of wheat, and (iv) TFP increase scenarios. For the baseline scenario, the model was calibrated to mimic the long-run growth pattern of the Turkish economy. For the trade liberalisation scenario, three simulations were run: (a) uni-lateral tariff elimination by Turkey (TRF scenario); (b) tariff and non-tariff measure elimination on the EU side on top of unilateral tariff elimination by Turkey (NTM scenario); and (c) Accession to EU scenarios (increased subsidies on top of the second scenario – ACC Scenario). For the wheat price increase scenario, two simulations were run: (a) wheat price increase (WPI scenario); and (b) domestic consumer protection scenarios (reducing wheat tariffs, on top of first scenario - DCP scenario). Lastly, (a) TFP growth in agriculture (TFPG scenario) and (b) food waste

decrease in production (TFP increase in agricultural and food processing sectors – WS scenario) scenarios were simulated.

Simulation results

An overview of the simulation results suggests that trade liberalisation in agriculture is likely to have a limited overall effect given the current structure of the Turkish economy. Welfare gains are positive but not as high as expected for consumers. On the production side, total value added does not change much from the baseline, implying a limited feedback effect. The main drivers of changes in GDP are imports and domestic consumption. The positive contribution of domestic demand is largely offset by the negative effects of imports on GDP. The results are more significant in the food waste and EU accession scenarios.

Trade liberalisation

Following trade liberalisation, import prices decline prompting an increase in imports. This in turn causes domestic prices to decline for all agricultural commodities, except sugar beet and vegetables. Removing non-tariff barriers does not have a big effect on domestic prices but effects may be significant under the ACC scenario. The most significant increase in agricultural imports is observed in wheat, dairy products and other cereals. Oilseed and maize imports decline slightly under the TRF and NTM scenarios, but the decline is relatively high under the ACC scenario. The increase is driven by boosted imports from EU countries, with wheat, rice, other cereals, fruit, dairy and meat imports being the most prominent. Imports from other regions decline, although the change is not very significant. Exports also increase with trade liberalisation, especially under the NTM elimination and ACC scenarios.

Changes in agricultural production are generally significant. The production of wheat, rice and other cereals declines, while the production of maize and oil seeds increases. Decreases in production decline while increases become steeper as the degree of integration improves. The main driver of this change is the substitution of imports for domestic production as import prices decline. The increase in fruit and vegetable production is relatively small due to the low level of protection. Other sectors are also affected by agricultural trade liberalisation. Manufacturing production declines with the exception of food production, while services production increases slightly. Increasing food production is mainly due to cheaper imports, which are mainly used as intermediate inputs.

Consumption increases under all three trade liberalisation scenarios as a result of declining agri-food prices and increasing – or at least non-decreasing – household incomes. Changes are negligible under TRF and NTM scenarios but rather significant under ACC scenarios. Increasing food consumption can be considered as an indicator of increasing food security, since this would ensure greater availability of food for a

growing population. On the other hand, while Turkey is a net exporter of food in the baseline scenario, the situation does not change much under trade liberalisation.

Increase in World Wheat Prices

Under the WPI scenario, the immediate effect of an increase in world prices is an increase in the level of wheat exports and a decrease in the level of wheat imports, causing the domestic price to rise in order to maintain the equilibrium in the wheat market. The increase in wheat prices due to a 5 percent rise in world prices is around 1.1 percent. Other cereal and food product prices also increase. Decreasing wheat tariffs by about 6 percent eliminates the effects of the world price increase on domestic prices and production.

Total Factor Productivity Growth

The impact of a 0.15% per annum increase in productivity in all sectors under the TFPG scenario is limited. The immediate impact of an increase in TFP under the WS scenario is a boost in the production of agricultural commodities. The increase is between 2.5 and 6.3 percent for crops and varies between 1.8 and 2.4 percent for livestock-related activities. Activities that can easily substitute factors with intermediate inputs can increase their production more but others fail to do so; if the activity in question is unable to substitute intermediate inputs with factors, the production increase is limited according to the availability of factors, especially rainfed land, the supply of which is fixed. The output of service sectors increases although there is no TFP growth for these sectors. Service producers benefit from price increases resulting from growing demand. Expansion in agriculture and services production occurs at the expense of manufacturing production due to the link between agricultural activities and manufacturing through the factor and intermediate input markets.

Agricultural commodities become more competitive in the international markets as a result of increased productivity. Exports of all agricultural commodities and food products increase significantly. Exports of wheat, oilseeds, maize and food products increase within the range of 10 to 18 percent. The effect on imports is rather limited and generally takes place through the substitutability of domestic commodities with foreign equivalents. The most significant declines in imports are in wheat, fruits and vegetables and food products as these commodities are the ones that benefit most from the increase in TFP. On the other hand, imports of dairy products and oilseeds increase slightly.

Trade liberalisation between EU and North African countries

The trade effects of trade liberalisation between EU and North African (NAF) countries have significant implications for trade between Turkey and NAF countries, but the effect on EU-Turkey trade is negligible, according to the results obtained by Kavallari, Rau & Rutten (2013) with the MAGNET model. Agricultural trade does not play a significant role in the resulting changes. The main driver is the manufacturing sector.

1 Introduction

Agricultural policy in Turkey was selected to undergo heavy adjustments as part of the macroeconomic stabilisation and structural adjustment programme in 2000. Agricultural reform was long overdue because of the increasing direct and indirect financial burden of agricultural support on the budget and the ineffectiveness of the implemented policies. The reform programme was sufficiently comprehensive, encompassing not only budgetary cuts but also changes in both trade policy and the structure of transfers to agriculture. As expected, full-fledged implementation of the programme was not possible and the programme ended in 2009. Nevertheless, transparency in the budgetary supports to agriculture has been achieved and the policy environment has been transformed despite some backlashes.

Agricultural production in Turkey displays the characteristics of a developing economy. Agriculture still accounts for a relatively high proportion of total employment. Average land and herd size per farm household are small. Despite accounting for a relatively small proportion of total value compared to area, cereal production dominates agricultural policy, while horticultural products dominate agri-food exports.

The link between agriculture and the food manufacturing industry is developing at a slow pace. The rapid development of supermarkets is bound to change the structure of agri-food production in Turkey. The aggressive attitude of exporters and potential competition from recent trade liberalisation attempts will put additional pressure on agriculture.

The agricultural sector retains its importance in the overall economy. Although the share of agricultural value added declined to 9 percent in 2012, the sector still employs 25 percent of the total workforce. The sector dominates the rural economy, accounting for approximately 70 percent of employment. The dualistic structure of production has all the basic traits of a developing economy, with a dominant share of production concentrated in small-holdings co-existing with commercial and mostly export-oriented producers.

Turkey has accomplished significant trade liberalisation in industrial products since the mid-1980s. Turkey has also been an official candidate country for accession to the EU since 1999. All tariffs on imports of industrial goods from the European Union (EU) were abolished under the Customs Union (CU) Decision in December 1995. Since then, Turkey has been harmonising its tariffs with the EU's Common External Tariff. Accordingly, Turkey has also been expected to engage in negotiations and sign preferential trade arrangements with third countries. The liberalisation of trade in agricultural products with the EU has been delayed due to the incompatibility of the support structure between EU and Turkey. Mutual trade liberalisation in agriculture has

been left to preferential trade agreements. Turkey has either signed or completed free trade agreement negotiations with all MENA countries, except Lebanon and Libya.

The main purpose of this study is to identify the potential economic impact of trade liberalisation in agricultural products. The following section provides a quick overview of the growth and performance indicators related to the agricultural sector. Section 3 describes the model, data and development of each scenario. Section 4 focuses on analysing the impacts using three sets of scenarios, namely trade liberalisation, world price increase of wheat and agricultural productivity growth. The implications for Turkey of trade liberalisation between EU and North African (NAF) countries are discussed in Section 5. The concluding section is reserved for an overall assessment.

2 Overview of the Agri-food Sector in Turkey

The agricultural sector continues to play an important role in the Turkish economy. The average annual growth rate of non-agricultural value added in Turkey during the past four decades (1968-2011) was about 5.0 percent. The agricultural sector grew by only 1.3 percent per year during the same period. The growth rates of agricultural production in different decades reveal that relatively high growth decades are followed by stagnant periods. The performance of the sector has been satisfactory in the last decade, possibly with the help of the stable macroeconomic environment and favourable climatic conditions (Table 2.1). Agricultural growth was less volatile compared to the previous three decades, except for a significant decline in production in 2007 due to an unprecedented drought.

Absolute and relative employment rates in agriculture have declined rapidly over the last decade. However, agriculture remains a major source of employment, accounting for a quarter of the total workforce and providing employment to approximately 70 percent of the rural workforce. The share of agriculture in Turkey's GDP has declined from 30 percent in the late 1970s to 9 percent in 2011 (Table 2.1). The agricultural sector is lagging behind the rest of the economy in terms of achieving comparable per capita incomes. The growth rate of agricultural value added is about one fourth of that in the rest of the economy, which explains the declining share of agriculture in GDP over the past three decades. Growth in partial productivity figures does not display any significant changes.[1]

Turkey has about 38 million hectares of agricultural land. Total arable land amounts to 24 million hectares (TurkStat, 2012a). Field crops have occupied slightly over 85 percent of the cultivated area since 1985. The share of vegetable area is approximately 3 percent but it has been increasing steadily. Orchards occupy 10 percent of cultivated land. Land left to fallow amounts to about 4 million hectares. The proportion of irrigated land is about 20 percent. Farms in Turkey are generally family-owned, small

[1] The results of the household labour force surveys were adjusted backward until 2005 according to the latest population census. The adjustment affected rural figures the most. The comparable labour productivity figure for 2004-05 is +23.5%.

and fragmented. The average cultivated area per farm is approximately 6 ha according to latest farm registry data.

Table 2.1 Selected Growth Rates and Structural Ratios, 1998-2011 (Average Annual Percent)

	1998-99	2004-05	2010-11
Macroeconomic Indicators			
GDP growth	-1.7	8.9	8.8
Per capita GDP growth	-2.3	7.5	7.2
Inflation	54.2	9.9	8.4
Exports/GDP	10.4	15.7	16.6
Exports/Imports	56.4	63.8	58.7
Agricultural Indicators			
Ag. VA growth	2.0	4.6	3.8
Ag. VA/GDP	12.0	10.3	9.0
Ag. Employment/Total	40.8	27.4	25.3
Agri-food Imports/Total	5.8	4.4	5.4
Agri-food Exports/Total	16.7	10.1	10.6
Land Productivity Growth	2.1	3.9	4.7
Labour Productivity Growth	-3.8	0.1[a]	-4.1

Sources: TurkStat, 2012a, 2012c, 2012d, 2012e, 2012f

Note: [a] average for 2006-07.

As expected from the figures for average farm size, agricultural employment still accounts for a relatively large share of total employment. The sector accounts for almost all female employment in rural areas, with almost 85 percent of women in rural areas being employed in agriculture. The share of employment in agriculture is declining steadily, accompanied by a downturn in absolute employment since the early 1990's. In the early 1990's, agricultural employment stood at around 9 million compared to 6 million in 2011.

Crop production has dominated Turkish agriculture, with the animal sector accounting for approximately one quarter of the total value of agricultural production (TurkStat, 2012a). The structure of production is far from reflecting the weight of policies in agriculture. Support policies are generally targeted towards cereals, oilseeds and industrial crops, while vegetables and fruits have relatively smaller importance. Fruits and vegetables account for about 40 percent of the total value of agricultural production. High protection coupled with domestic intervention schemes in cereals gains precedence with negative repercussions for production in the animal sector. The share of budgetary support to livestock production has increased in recent years.

Turkey has high levels of protection (statutory tariffs above 100 percent) in meat, dairy products, sugar and basic cereals. These commodities are considered vital for the survival of small farmers. Moreover, food security, which normally translates into self-sufficiency in all commodities in the minds of the policy makers, helps to contribute to the maintenance of rather high levels of protection in agri-food products. Primary commodities extensively used as intermediate inputs in export-oriented manufacturing industries diverge from this general scenario. Cotton, raw hides and skins are duty free. Turkey's tariff commitments under the WTO Agreement on Agriculture (AoA) reveal that the average bound rate over all products is 65 percent, whereas the average applied rate in 2011 reaches 50 percent, leaving a tariff overhang of around 20 percent.

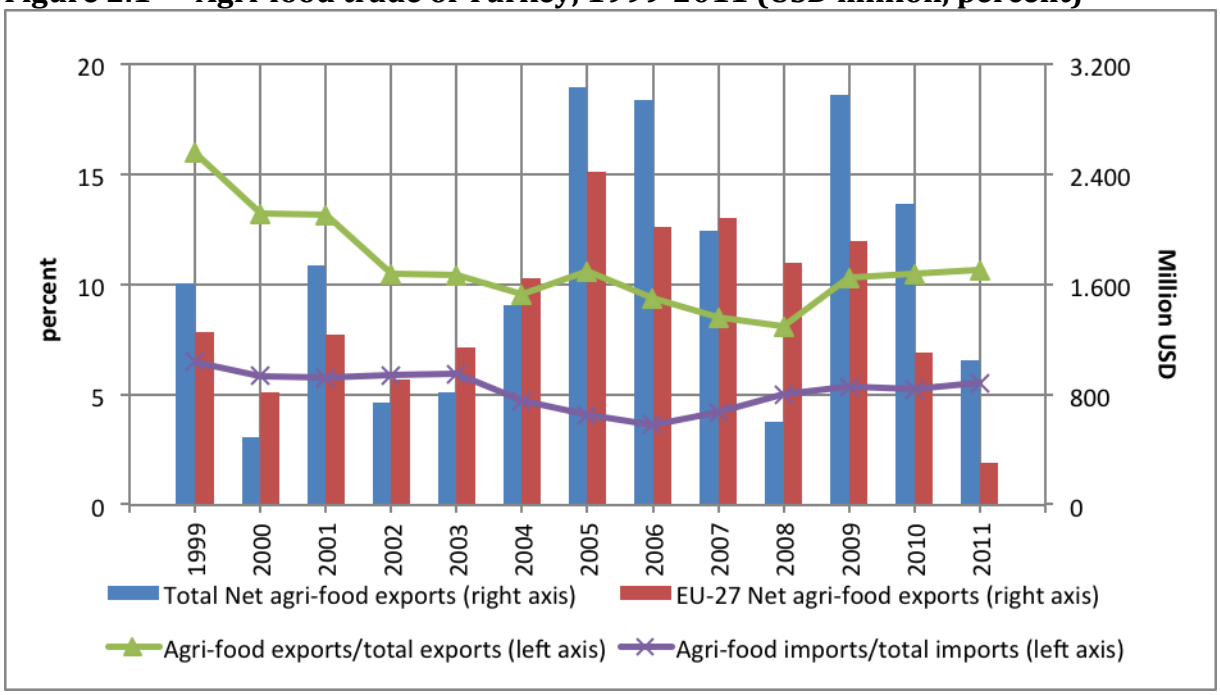
Export subsidies are offered for a limited number of agri-food products. Compliance with AoA commitments allows for extremely restricted levels of export subsidies. Exports of processed products are mainly helped by the inward processing customs regime (IPCR), allowing domestic manufacturing companies to acquire their inputs at world prices. The IPCR is applicable to commodities and intermediate inputs that are temporarily imported and subsequently re-exported in the form of processed products.

Historically, Turkey has been a net exporter of agri-food products (Figure 2.1). Net exports have started to decline in recent years. Turkey's position in this respect should be evaluated with caution because of the heavy tariff and non-tariff protection on certain major agricultural products. For instance, imports of meat, dairy products and cereals are rare due to prohibitive tariffs and non-tariff barriers on imports. Whenever necessary, the wedge between domestic and world prices has been reduced by granting duty free imports, mostly to state procurement agencies. The general tendency of agri-food import policy has been to allow imports in intermediate inputs of export-oriented manufacturing and strict control of imports of all other products. High protection coupled with high-performing export-oriented agricultural production has been the major factor in sustaining net exports in agri-food trade.

The shares of agri-food exports and imports in total declined slightly during the considered period, mainly due to the faster expansion of trade in non-agri-food exports. The average annual growth rate of agri-food imports was 2 percent higher than the corresponding rate in agri-food exports during the considered period.

The EU is Turkey's main trading partner in agri-food products. Net exports with the EU remained positive in the last decade. The EU's share in exports is declining, whereas the share of Near and Middle Eastern countries is expanding rapidly (TurkStat, 2012c). Exports to Iraq have increased so fast that Iraq became the second export destination after Germany in 2009.

Figure 2.1 Agri-food trade of Turkey, 1999-2011 (USD million, percent)



Source: TurkStat, 2012c.

Agri-food trade with North African countries has stagnated at low levels on the import side. Exports to North Africa increased 2.5-fold, reaching USD 400 million in 2009. Imports from the Turkic Republics have been increasing faster than exports. Russia has become a more important export destination. Grain imports from Russia and Ukraine are on the rise, with some fluctuations depending on the harvest conditions in Turkey. The USA's share in imports is declining due to increasing competition in cereals from Turkic Republics, Russia and Ukraine. Exports to South American Countries remain negligible. However, these countries are becoming major importers of oilseeds and oilseed products.

According to the EC's combined nomenclature (EC, 2012), nearly 75 percent of Turkish exports are consumer-oriented products. The opposite is observed on the import side. Almost half of imports are bulk commodities and more than one third intermediate inputs. Rapid decline in the share of bulk exports and stagnant share of bulk imports may be considered as a reflection of the high protection in agricultural commodities. The steady increase in imports of final products signals greater openness to trade, mostly through preferential trade agreements.

Turkey's agri-food exports are not highly diversified. Their concentration in a few sub-sectors is noteworthy. Edible fruits, nuts and vegetables make up around 40 percent of exports. Another 20 percent of exports are processed fruit and vegetable products. An upward trend can be observed in cereal preparations, especially wheat flour. Agri-food imports are dominated by various agricultural raw materials, notably raw hides and skins, leather, textile fibres and fibre scrap, which account for more than half of the

total. Cereals and cereal products, animal feed, tobacco and tobacco products, animal and vegetable oils, fats and waxes, oilseeds and pulses account for the rest of agricultural imports. The main imported products are oilseeds and vegetable oil. Despite generous domestic subsidies to the production of oilseeds, this sector's share in total imports remained at around 30 percent.

The dynamic nature of agri-food exports needs to be praised given the rather limited room for manoeuvre afforded to exporters. Turkey is basically a permanent importer of oilseeds and cotton and occasionally imports other agricultural commodities in the event of domestic supply shortages. Most of those imports originate from USA, EU and South America. The main destinations of exports of final products are EU, Near and Middle Eastern countries and Russia.

3 Dynamic CGE Model for Turkey: Data and Scenarios

Since 1996 Turkey's trade relationship with the EU has mainly been shaped by the CU Decision between the two parties. The benefits and costs of the agreement have been subsequently the topic of many studies in literature. Since 2000, significant efforts have also been made to determine the possible economic effects of trade liberalisation between the EU and Turkey, either in the form of full accession or as a result of extending the CU to agricultural products. Although no clear conclusions can be drawn from any of these studies, some general results can be highlighted.

The main question addressed in literature with respect to full trade liberalisation between the EU and Turkey concerns the sign and size of possible welfare effects. Most studies report a welfare gain of around 0.5% or an increase in GDP under agricultural trade liberalisation scenarios (Eruygur, 2006; Harrison, Rutherford, & Tarr, 1997; Lejour, Mooij, & Capel, 2004; Mercenier & Yeldan, 1997; Ozer & Ozcelik, 2009). On the other hand, it has been reported that deeper integration in the EU will sustain higher levels of gain for Turkey. It is also claimed that trade liberalisation through improved EU market access (Harrison *et al*., 1997), abolition of non-tariff barriers by Turkey (Mercenier & Yeldan, 1997; Zahariadis, 2002), including CAP payments for Turkey (Eruygur, 2006; Nowak-Lehmann, Herzer, Martinez-Zarzoso, & Vollmer, 2007), creating a sustainable competitive environment (Bayar, Diao, & Yeldan, 2000), sustaining a flexible labour market (De Santis, 2000), institutional improvement and free mobility of the labour force (Lejour *et al*., 2004), taking into account economies of scale (Sulamaa & Widgrén, 2006), timing of liberalisation (Acar, Afyonoglu, Kus, & Vural, 2007) and harmonisation with the EU's sanitary and safety standards (Oskam *et al*., 2004) will increase the gains from trade liberalisation for Turkey. However, few studies report either an insignificant overall effect (Augier & Gasiorek, 2003; Cagatay, Saunders, & Amor, 2001; Cakmak & Kasnakoğlu, 2003; Grethe, 2004) or even welfare losses (Bekmez, 2002) for Turkey. Hence, depending on the models and assumptions regarding the way trade liberalisation is implemented, it may be postulated that

extending the CU to agriculture would result in a welfare gain of between 0.5 and 1.5 percent annually.

Winners and losers from agricultural trade liberalisation is another aspect that has been studied in depth. The answer usually depends on the scale and type of analytical model used. Partial equilibrium models give a clear answer regarding the distribution of welfare gains from trade liberalisation across producers and consumers. Producers are generally reported to lose out, while consumers are expected to gain (Cakmak & Kasnakoğlu, 2003; Grethe, 2004; Oskam *et al*., 2004). The main reason for this is declining producer prices as a result of liberalisation. However, this effect is not uniform across all producers (Oskam *et al*., 2004). Crop producers are generally worse off (Fellmann, Leeuwen, & Salamon, 2011) while the effect on the welfare of livestock producers is ambiguous Çakmak & Kasnakoğlu (2003), Grethe (2004) and Eruygur (2006) report negative effects while Fellmann *et al*. (2011) and Leeuwen *et al*. (2011) report positive effects. The gain for consumers is not uniform either. De Santis (2000) reports that urban populations would be better off, while the rural population is likely to be worse off under agricultural trade liberalisation although the effect on income distribution across income groups would be negligible.

Studies employing global or multiregional CGE models have also been used to evaluate the impact of trade liberalisation in agriculture. The global effect of agricultural trade liberalisation between Turkey and EU is found to be negligible (Sulamaa & Widgrén, 2006). The change in EU welfare is insignificant whether it is positive (Alessandri, 2000; Augier & Gasiorek, 2003; Zahariadis, 2002) or negative (Acar *et al*., 2007; Adam & Moutos, 2008; Alessandri, 2000; Francois, McQueen, & Wignaraja, 2005). These effects are not uniform within the EU either: Southern European countries are more likely to lose and northern European countries to win since Turkey's main competitors are Southern European countries (Nowak-Lehmann *et al*., 2007; Sulamaa & Widgrén, 2006).

Trade effects are also ambiguous. There is no doubt that the overall effect on the volume of trade between Turkey and EU will increase (Bekmez, 2002; De Santis, 2000; Lejour *et al*., 2004), implying trade diversion toward the EU (De Santis, 2000). Some studies report that Turkey will become a net importer of crops (Cagatay *et al*., 2001) while others claim that crop exports will increase more than crop imports (Cakmak & Kasnakoğlu, 2003; Grethe, 2004; Ozer & Ozcelik, 2009). Other authors report that Turkey will become a net importer of livestock products (Grethe, 2004a). Almost all consider that fruits and vegetable exports will increase (Cakmak, 2007; Eruygur, 2006; Nowak-Lehmann *et al*., 2007).

To summarise, trade liberalisation is expected to increase welfare in Turkey, especially through its effects on consumers. However, the findings published in literature are quite diverse and sensitive to the data and method of analysis used. Most of the studies rely on relatively old databases such as GTAP with a base year of 1997, long before CU become fully effective. Almost all studies employ static models while ignoring the

dynamic aspect of the problem. Lastly, the CGE models used lack a detailed disaggregation of agriculture, while partial equilibrium models ignore feedback effects from other sectors.

3.1 Description of the model

The model used in this study is an extended version of the CGE model developed in Dudu & Cakmak (2012). It consists of production activities, households, firms, government and main trading partners of Turkey as the main economic agents and attempts to model the behaviour of these agents and their interactions with a well-established algebraic framework.

Each main sector in the economy is represented with one production activity using labour, capital, rainfed land, irrigated land and water, together with intermediate inputs supplied from other sectors. The production function has a nested structure. A Leontief-type production function between irrigated land and water is used in the first step of the nest to reflect the complementarity between these two factors. The produced water-irrigated land composite is used as an input in a CES production function together with the other factors of production. This factor composite is then used as an input in another CES production function with a composite intermediate input that is produced by a Leontief production function of the intermediate inputs used by the activity. A detailed description of the production structure can be found in Dudu & Cakmak (2012).

The output of the activity is supplied to the domestic markets for intermediate input use or for final consumption in the internal and international markets. Activities pay taxes to and receive subsidies from the government.

The value added created by capital is paid to firms as income. Firms also receive transfers from government and rest of the world. This income is used to pay capital income of households, institutional taxes to government and profit transfers to trading partners.

Households receive the value added created by labour, land and water as income directly, while capital income is received through firms. Households also receive transfers from government and rest of the world. Household income is used for consumption purposes, to pay income taxes and for savings. Consumption is modelled using a linear expenditure system where households receive utility from the part of consumption that is above the subsistence consumption level.

Leisure is included in the utility function. To overcome calibration difficulties, we used the number of people who are in the work force but who are not looking for jobs as an indicator of leisure. People who are not in the workforce (students, housewives, retired people, etc.) are taken as a proxy for the subsistence level of leisure. Although this approach can model the labour supply decision of households, the labour force participation decision remains exogenous in the model, since it is impossible to

endogenise the subsistence level of leisure in this framework. Hence, a "rule of motion" was defined for labour force participation. Labour force participation responds to changes in the real wage. A detailed account of the implemented utility maximisation framework can be found in Dudu & Cakmak (2012).

Household saving behaviour is not determined by utility maximisation but by the closure rule. Investment-driven saving behaviour at macro level is assumed while absorption adjustments are distributed to all components uniformly. Hence, the share of investment in absorption is fixed; the saving rates of the agents are uniformly scaled to finance investment (Löfgren, Harris, & Robinson, 2002).

There is no behavioural assumption regarding government. Government collects taxes and receives transfers from the rest of the world. Government income is used for government consumption, savings, transfers to domestic institutions and the rest of the world and their shares in total absorption are constant. It is assumed that government savings are flexible while tax rates are fixed.

The rest-of-the-world account consists of five trading partners who supply imports and demand exports, make and receive transfers and invest in Turkey. Imports follow the Armington specification while exports are modelled using a CET approach. Accordingly, imported commodities are not perfect substitutes for domestic alternatives, and the relationship between demand for domestic and imported commodities is managed by substitution elasticity. Similarly, the share of export supply in domestic production is also managed by a constant elasticity of the transformation function. Foreign savings are always equal to the difference between the value of imports and exports in order to balance the current account deficit. Transfers to and from domestic institutions are constant shares of their incomes. It is assumed that foreign exchange rates for all trading partners are fixed while foreign savings can be freely adjusted.

3.2 Description of data

The social accounting matrix (SAM) used in this study is based on the SAM described in Dudu & Cakmak (2012). Three major modifications were made in the SAM. Firstly, regional SAM in Dudu & Cakmak (2012) was aggregated to the national level. Secondly, aggregated agricultural activity in Dudu & Cakmak (2012) was disaggregated. The model consisted of 13 agricultural activities: wheat, maize, rice, other cereals, oilseeds, sugar beet, other field crops, fruits, vegetables, dairy, meat, other livestock and other agricultural production. Lastly, foreign trade was extended to five trading partners that supply imports and demand exports, make and receive transfers and invest in Turkey. The rest of the SAM contained 4 manufacturing activities (food, textiles, energy and other manufacturing production) and 2 services (private and public services).

Disaggregation of agricultural production was accomplished based on the production statistics for 2008 (TurkSTAT, 2012a). It was first assumed that input-output (I/O)

shares of all agricultural activities were similar to aggregate agriculture presented in the most recent I/O table (TurkStat, 2012b). Several adjustments were then made:

- Crop production activities do not use the commodities of other crops as intermediate inputs but only their own commodities as intermediate inputs.
- Milk and meat production activities use the commodity of other livestock production activities, which mainly cover animal husbandry.
- Other livestock activity uses the commodities of wheat, maize and sugar beet as inputs since these sectors are the main feed suppliers to the livestock sector.
- Agricultural activities do not use any textiles or public services commodities.
- The I/O table for the agricultural sector is balanced by increasing the intermediate input use of food production activity from agricultural activities. Hence, a significant part of the intermediate input supply of agricultural activities is used in food production.
- Textile production activity only uses inputs from other cereals and other field crop commodities.
- The energy sector receives input from sugar beet production, reflecting the small amount of ethanol production in Turkey.
- Minor adjustments are made to balance the other sectors in the I/O table.
- Value added of land is obtained from the rent data for irrigated and rainfed land. Rent data is not readily available; hence, rents are calculated from farm household survey data (G&G Consulting *et al*., 2005) and cultivated land area data (TurkSTAT, 2012a) for each of the 81 provinces and aggregated at national level. The share of irrigated land in total cultivated land is obtained from the agricultural master plans of 81 provinces (Ministry of Food Agriculture and Livestock, 2012). These shares are then used to determine total irrigated land at national level. It was assumed that the share of irrigated and rainfed land is the same across different crops, since there is no data at crop level on the use of irrigated land. However, a priori information on irrigated and rain-fed land use was used by taking into account the fact that sugar beet, rice and vegetables are never produced on rainfed land.
- Value added of water is calculated from the difference between the rent of rain-fed land and irrigated land for 12 NUTS-I regions from G&G Consulting *et al*. (2005).

Agricultural subsidies are introduced in the national SAM according to OECD data as negative activity taxes (Table 3.1). The capital value added account was adjusted accordingly.

Households do not directly consume commodities like wheat, maize, other cereals, oilseeds, sugar beet, other field crops, other livestock and other agricultural production activities. The outputs of these activities are used as intermediate inputs, mostly in food production. The outputs of rice, fruit, vegetable, milk and dairy production activities are

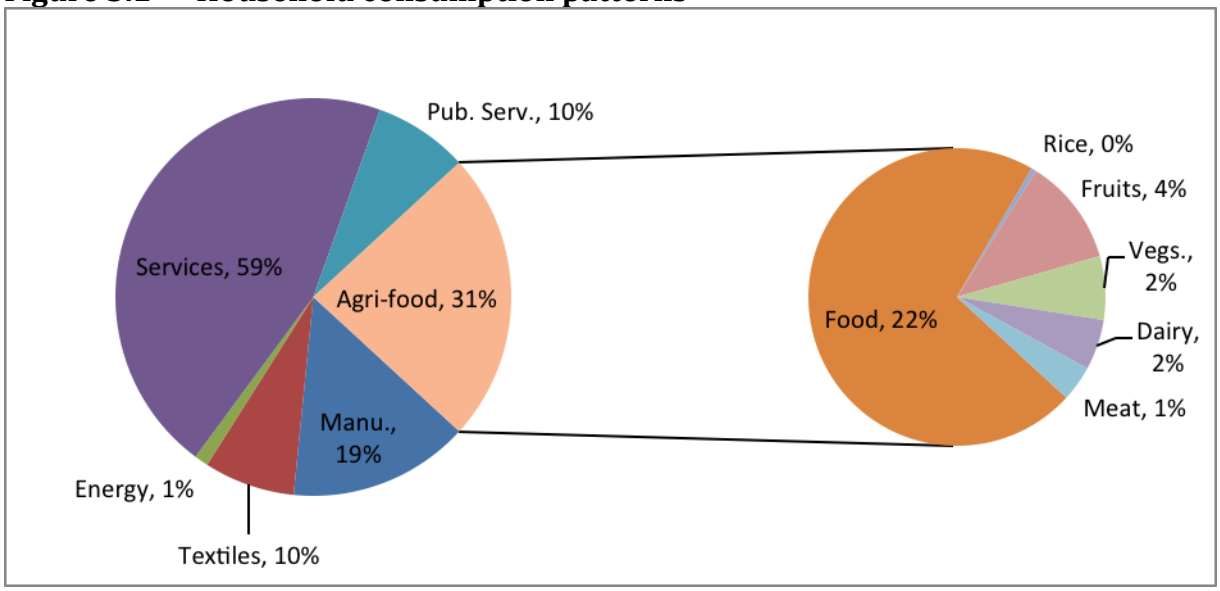
consumed by households. It was assumed that government does not consume any agricultural products. The resulting consumption pattern is shown in Figure 3.1.

Table 3.1 Subsidies for agricultural activities (USD million)

Activity	Subsidy (million USD)	Percent
Wheat	521.8	4.85
Maize	55.4	3.22
Rice	0.0	0.00
Other cereals	4.8	0.13
Oil seeds	88.8	6.23
Sugar beet	13.0	0.72
Other field crops	529.1	4.77
Fruits	2.9	0.01
Vegetables	0.0	0.00
Dairy products	240.5	2.08
Meat	0.9	0.01
Other livestock	661.5	4.27
Other agriculture	38.0	0.54

Source: authors' calculation from OECD data (2011)

Figure 3.1 Household consumption patterns



Source: author's own calculations

The ROW account was disaggregated into 5 trading partners: EU, MENA, North America, Other Europe and Rest of the World. The countries in these regions are the same as those published by TurkSTAT (2012c). Imports were distributed across trading partners based on foreign trade statistics (TurkSTAT, 2012c). Minor adjustments were made in the savings-investments account to balance the difference in trade accounts.

Tariffs were recalculated according to GTAP data. Since the reported amount of tariff revenue was lower than the revenue obtained when GTAP tariff rates were implemented, minor adjustments were made to the SAM. The increase in tariff revenue was added to the government account while the increase was discounted from commodity supply. The decline in supply was then balanced by reducing capital value added; hence, the capital income of firms was reduced. Transfers from government to

firms were then increased by the same amount to keep household income intact. Changes in capital and government transfers to firms were insignificant compared to the initial levels of these accounts. The implemented tariff rates in the model are given in Table 3.2. Closer inspection of Table 3.2 shows that Turkish protection against EU imports is already low compared to other regions. Protection is especially high in dairy products and meat, while fruit imports are also heavily taxed. High protection against other regions is likely to create a trade diversion towards EU products in the event of trade liberalisation. The main competitors of EU countries with respect to the Turkish import market are other European countries. According to baseline data, Turkey's cereal and fruit imports from other European countries are higher than the amount of imports of these commodities from EU countries.

Table 3.2 Tariff rates according to trading partners (percent)

	EU	MENA	North America	Other Europe	Rest of the World
Wheat	28.5			43.3	42.9
Maize			125.1		121.2
Rice	32.1	0	32.1	31.6	
Other cereals	92.3		125.1	97.9	121.2
Oil seeds	1.2		4.8	4.8	8.4
Sugar beet					
Other field crops	9.3	12.2			15.6
Fruits	39.1		24.5	35.4	59.5
Vegetables			24.5		59.5
Dairy products	101.8		116.4	122.8	118.5
Meat	83.6	22.1		7	102.6
Other livestock	2.0		4.9		5.3
Other agriculture	2.3	7.1		0.1	1.9
Other manufacturing	0		3.9	2.7	1.8
Food production	12.3		16.9	18.9	21.2
Textiles	0		6.5		5.1
Energy	0			0	0.3
Services	0				

Source: authors' calculation from (Narayanan & Walmsley, 2008). Empty cells indicate no trade.

Foreign savings and transfers from firms to trading partner accounts were distributed across trading partners according to foreign direct investment data (General Directorate of Foreign Capital, 2009). Transfers from trading partners to households (i.e. mainly workers' remittances) were distributed according to World Bank data (2012). Transfers from trading partners to firms were distributed according to direct foreign investment by Turkey in other countries (OECD, 2012). Thus, it was assumed that money transferred from abroad to firms are mainly profits obtained by firms abroad and are proportional to investment abroad. The results given in Table 3.3. The rest of the accounts in the SAM were obtained by aggregating the SAM developed in Dudu & Cakmak, (2012) over the regions. A detailed description of the compilation

method and assumptions for the other accounts can be found in Dudu & Cakmak (2012).

Table 3.3 Transfers from and to trading partners and foreign savings (USD million)

		EU	MENA	North America	Other Europe	Rest of the World
Transfers	from Firms	7,858	416	792	831	
	from Government	14,846	48,989			
	to Households	1,021	109	147	101	61
	from Firms	2,310	3,438	358	863	
	from Government			13,107	4,172	41,785
	Foreign savings	36,237	1,917	3,651	3,834	

Source: authors' calculation.

3.3 Description of scenarios

The scenarios developed in Kavallari, Rau & Rutten (2013) were followed to simulate the potential trade liberalisation and deep integration scenarios for Turkey. A summary of the scenarios is provided in Table 3.4.

Table 3.4 Overview of scenarios

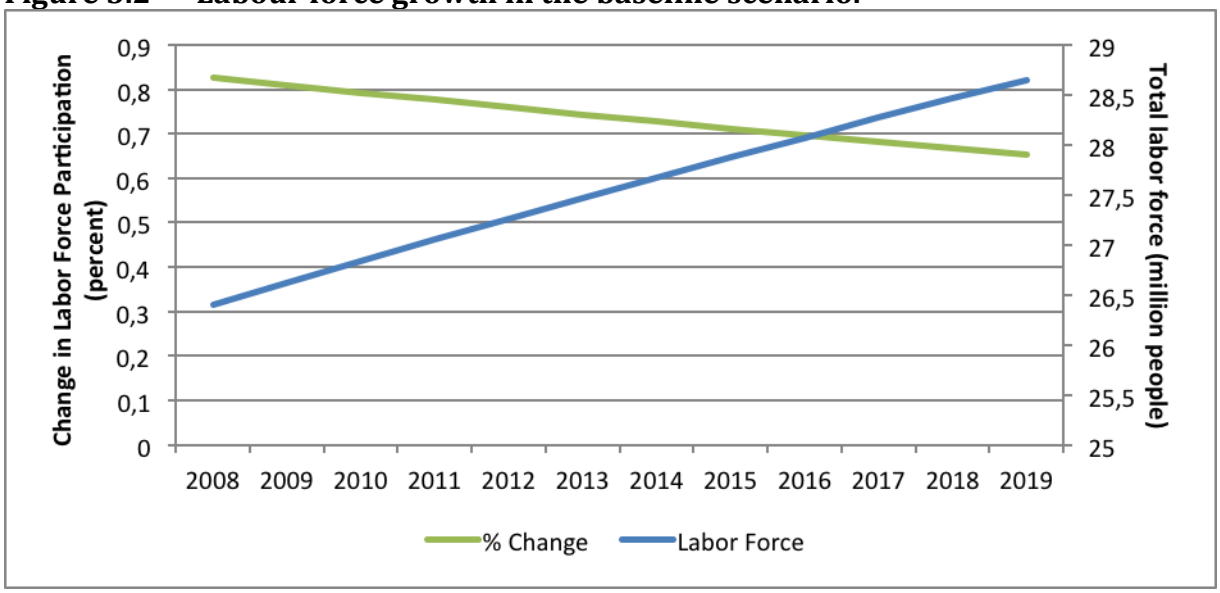
	Scenario	Assumptions
Baseline	BASE: Baseline scenario	0.9% population growth 0.8% TFP growth in Agricultural Activities 1.06% TFP growth in Manufacturing Activities 0.4% TFP growth in Services Natural resource growth equals 25% of growth of capital Capital output ratio is 4.2
Trade Liberalisation Shocks	TRF: Tariff Elimination	BASE + Elimination of tariffs for the commodities shown in Table 3.2 imported from the EU.
	NTM: Non-Tariff Measure Elimination	TRF + Increase in prices of Turkish exports to the EU
	ACC: EU Accession	NTM + Tripled agricultural subsidies + Transfers from the EU to Government
Wheat Price Shocks	WPI: Wheat Price Increase	World wheat price increases by 3.6% over 2008-2020
	DCP: Domestic Consumer Protection	WPI + Turkey reduces tariffs imposed on wheat imports by around 6 percent to keep domestic prices close to the Baseline
TFP Shocks	TFPG: Total Factor Productivity Increase	0.15 % extra TFP growth on top of Baseline
	DFW: Decreasing Food Waste	Productivity in agricultural and food processing industry increased according to FAO (2011)

Baseline scenario

The baseline scenario was the reference scenario for the other simulations in which we attempted to mimic the growth of the economy over the period 2008 and 2020.

In the baseline scenario, it was assumed that the population will grow by 0.9 per cent annually. The subsistence consumption levels were automatically updated to reflect the increase in population. Accordingly, the labour force adjusts endogenously to population growth by taking into account the change in real wages. The resulting change in labour supply is shown in Figure 3.2. Labour force growth is close to population growth at the beginning but the rate of increase declines over time.

Figure 3.2 Labour force growth in the baseline scenario.



Source: model results

We assume that total factor productivity (TFP) will increase annually by 0.8% in agricultural activities, 1.06% in industrial sectors and 0.4% in services. The yield projections for wheat presented in Bruinsma (2003) and reported in Kavallari, Rau, & Rutten (2013) were used. Accordingly, we assume that TFP growth in services will be half the increase in agricultural activities while industrial TFP growth will be 2.65 times TFP growth in services.

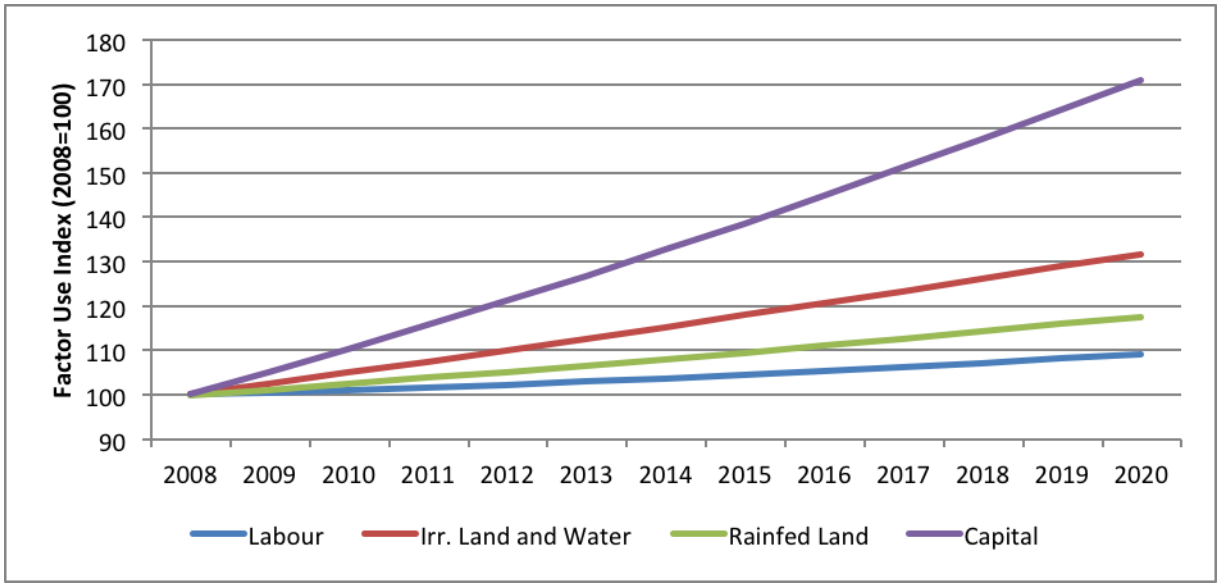
Capital growth is also endogenous in the model. The growth in capital stock was determined using the dynamic equations described in the Appendix. We predict a default capital/output ratio of 4.2 [2] and a depreciation rate of 3%.

The growth in rainfed land and industrial water is calculated at 25% of the growth in capital stock. The increase in irrigation water supply and irrigated land are endogenous

[2] We calculated 4.2 as the capital/output ratio from data published by the Ministry of Development (2012).

since they are assumed to be mobile and their supplies are elastic. The growth paths of factor supplies are given in Figure 3.3.

Figure 3.3 Growth paths of factor supplies in the baseline scenario (2008=100)



Source: model results

Trade liberalisation scenarios

Three different trade liberalisation scenarios between Turkey and EU were developed with the model. First, it was assumed that all tariffs applied by Turkey on EU imports would be unilaterally eliminated on top of the Baseline scenario. This scenario was called the Tariff Elimination scenario (TRF).

In the second simulation, we assumed a deeper integration between EU and Turkey. In order to simulate this scenario, we eliminated the tariffs imposed on Turkey by the EU. To simulate this effect, the price of Turkish exports to the EU was increased by the amount of tariffs imposed by the EU. The rate of increase is given in

Table 3.5. Protection against Turkish rice and dairy product exports is high while trade in the other commodities is not affected by high protection levels.

Lastly, we simulated the accession to the EU scenario where subsidies to agricultural activities doubled and the difference in subsidies is transferred from the EU to the Turkish Government. The total amount of transfers starts at USD 1.4 billion, increasing gradually to USD 1.8 billion. This figure is close to the estimated CAP transfers reported by Grethe (2004b).

Table 3.5 Tariffs imposed on Turkish exports by EU (percent)

	Tariff	Share of EU in exports of the commodity	Share of commodity in agricultural exports
Wheat	4.9	0.0	0.0
Rice	21.27	39.9	0.1

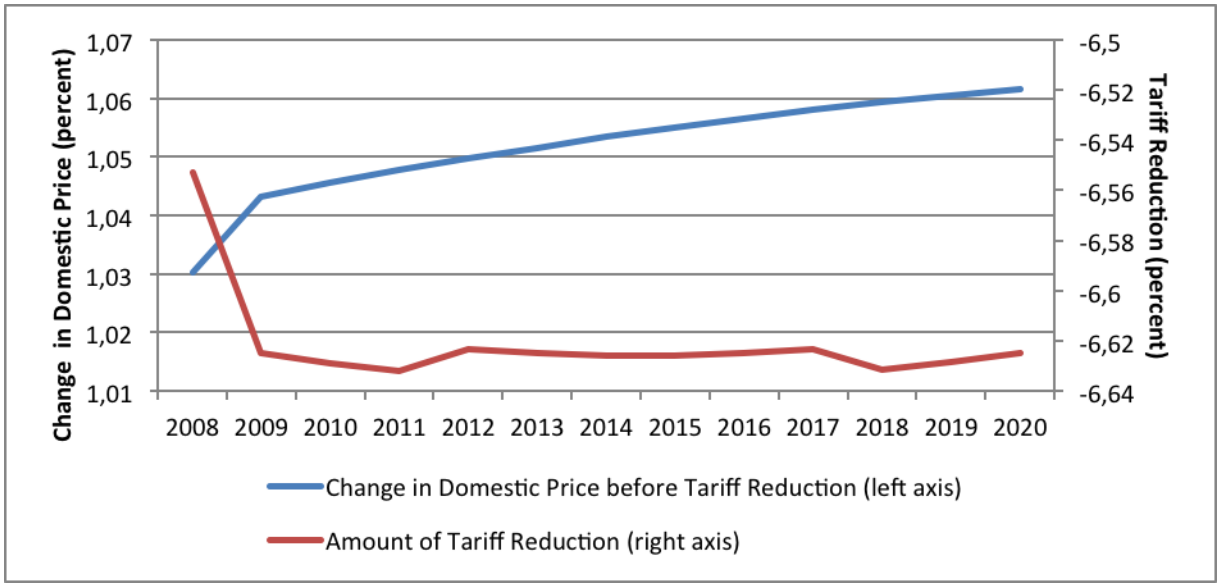
Maize	2.36	68.5	0.3
Other cereals	2.36	58.5	0.0
Oil seeds	0	48.1	1.2
Other field crops	0	11.2	1.6
Fruits	3.2	62.2	31.7
Vegetables	3.2	42.3	7.1
Dairy products	19.67	0.0	0.0
Meat	1.68	0.0	0.0
Other livestock	0.16	74.2	0.7
Other agriculture	0	67.9	5.2
Other manufacturing	0	48.2	
Food production	3.61	38.1	
Textiles	0	77.1	
Energy	0	32.3	
Services	0	48.2	

Source: authors' calculation from Narayanan & Walmsley (2008).

Wheat Price Increase and Policy Response

Two simulations were run in the food security scenario. In the first simulation, we simulated a world price increase for wheat and called this scenario the Wheat Price Increase (WPI) scenario. In the second simulation, we eliminated tariffs on wheat imports from all Turkey's trading partners as a policy reaction to protect consumers from rising world prices and called this simulation the Domestic Consumer Protection (DCP) scenario.

Figure 3.4 Tariff reduction to keep domestic prices stable under the food security scenario (percentage)



Source: model results

We assumed that the world price of wheat will increase by 3.6% over the period 2008-2020, as reported by Kavallari, Rau & Rutten (2013), who simulated the effects of a harvest failure in North America on world wheat prices. This would increase the

Turkish import price for wheat by 5 percent[3]. This translates to a 1 percent increase in the domestic price compared to baseline over the simulation period. Then, we assumed that Turkey will reduce tariffs on wheat in order to keep the change in the domestic price level close to the change in domestic prices under the Baseline Scenario. The tariff reduction required to keep domestic prices stable was found to be around 6.3 times the change in domestic prices. This represents a 6.5 percent reduction in tariffs, corresponding to approximately 30 percent of the implemented tariff rate for EU and 15 percent of the implemented tariff rate for the other regions.

TFP growth

In the TFP growth scenario (TFPG), we followed Kavallari, Rau & Rutten (2013) and assumed that total factor productivity in all sectors will grow 0.15% more than the baseline as a result of deeper integration between the EU and Turkey.

Decreasing Food Waste

Food waste is an important problem in Turkey with 1 to 5 per cent losses from the field to the processing stage (TurkSTAT, 2012a) and 5 to 9 per cent losses in processing and consumption (Pekcan *et al.*, 2006). We attempted to simulate a scenario in which food waste in production is reduced. The effect of decreasing food waste in production is equivalent to an increase in total factor productivity. The TFP shocks introduced in the model are shown in Table 3.6.

Table 3.6 Food waste in production (percent)

	Food waste (%)		Food waste (%)
Wheat	5.0	Fruits	5.0
Maize	3.5	Vegetables	5.0
Rice	2.0	Dairy products	2.0
Other cereals	1.6	Meat	1.0
Oilseeds	3.0	Other livestock	1.0
Sugar	3.0	Other agriculture	3.0
Other field crops	3.0	Food processing	7.0

Source: model results

4 Simulation Results

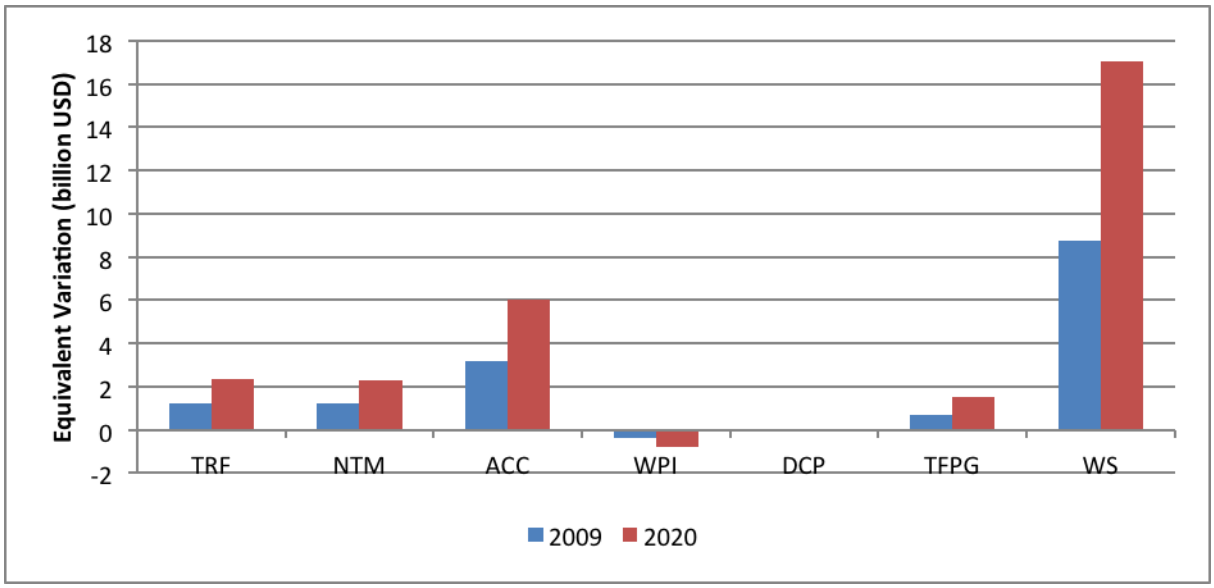
This section presents the main results of the simulations and explores the main drivers of change. Since the variation in the results is not significant over time, we generally report the changes in the final year simulations, namely 2020, as a difference or deviation from baseline. The following subsection offers a comparative overview of the macro results obtained from all the scenarios. The specific results of the scenarios are scrutinised in the subsequent sections.

[3] We simulated the same harvest failure as Kavallari, Rau, & Rutten (2012) and used the import price change for Turkey.

4.1 Overview of results

The results are largely consistent with what has been suggested in the literature and provide important insights about the main drivers. Figure 4.1 shows the equivalent variation (EV)[4], which is an indicator of welfare gains for households under all scenarios. EV is not significantly different under the TRF and NTM scenarios but is more than 2 times higher under the accession (ACC) scenario. The difference is close to the transfers made from the EU to Turkey and justifies the findings reported in literature regarding the importance of accession for trade liberalisation in agriculture. The effects of the increasing world price of wheat and the reduction in tariffs to stabilise domestic prices are not significant, but the difference between these two scenarios adds up to USD 390 million. The effect of the TFPG scenario on consumer welfare is also limited compared to the trade liberalisation and food waste scenarios, which yield the highest welfare gains.

Figure 4.1 Equivalent variation, 2009 & 2020 (USD million)

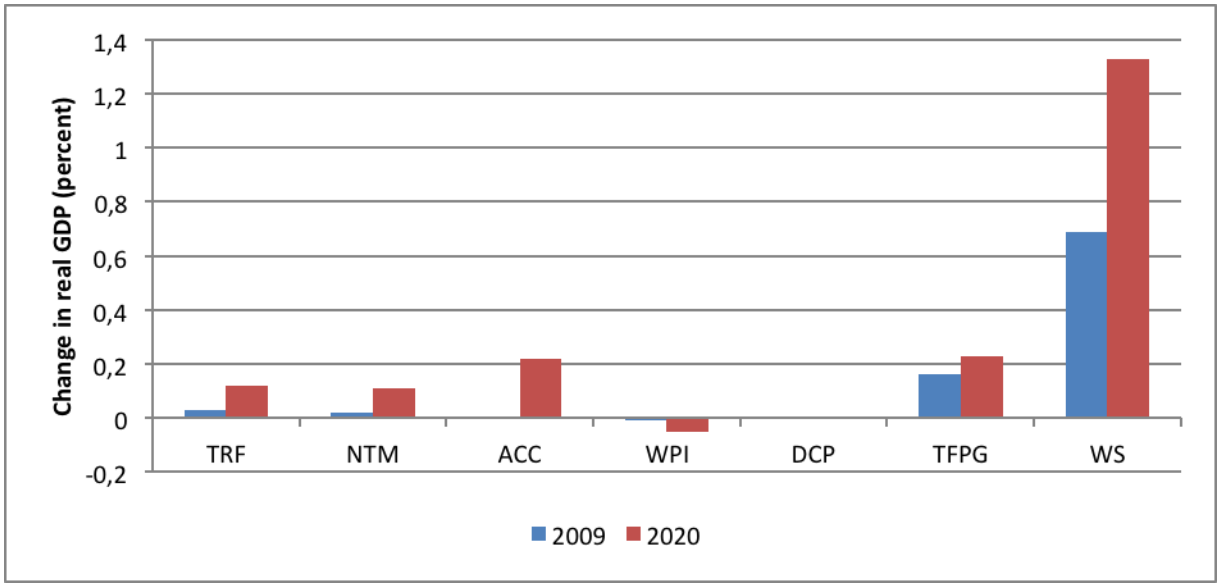


Source: model results

The reflection of welfare gains in GDP is generally limited (Figure 4.2). The change in GDP is only significant under the WS and TFPG scenarios. It is worth noting that trade liberalisation and domestic consumer protection scenarios are related to the consumer side of the economy. The link between these shocks and GDP is indirect. In contrast, the food waste and TFP scenarios are related to the production side and directly affect value added. Hence, the changes in tariffs are not fully transmitted to the production side of the economy. The impacts are generally absorbed by substitution mechanisms in trade, consumption and production.

[4] More formally, EV shows the minimum payment that consumers would require in order to forego welfare gains under the relevant scenario. Calculations were adapted from Sadoulet & Janvry (1995).

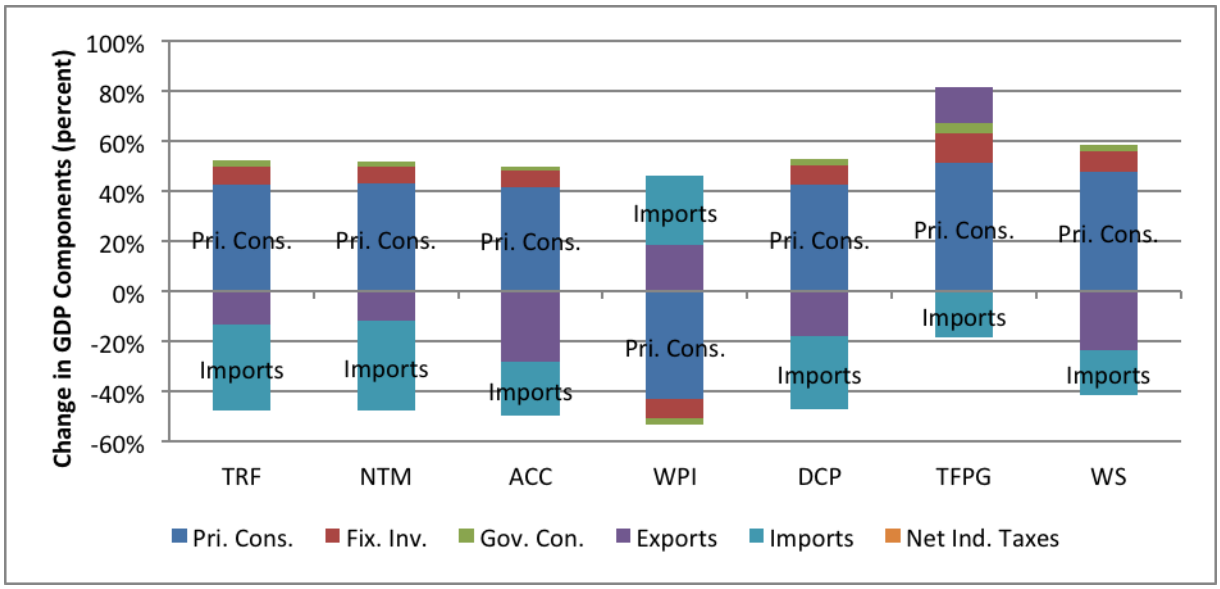
Figure 4.2 Changes in real GDP, 2009 & 2020 (difference from baseline)



Source: model results

Figure 4.3 shows the breakdown of the changes in GDP. The most important drivers of change in GDP are private consumption, imports and exports. The contributions of government consumption and fixed investments can largely be ignored.

Figure 4.3 Breakdown of the change in GDP, 2020 (percentage deviation from baseline)



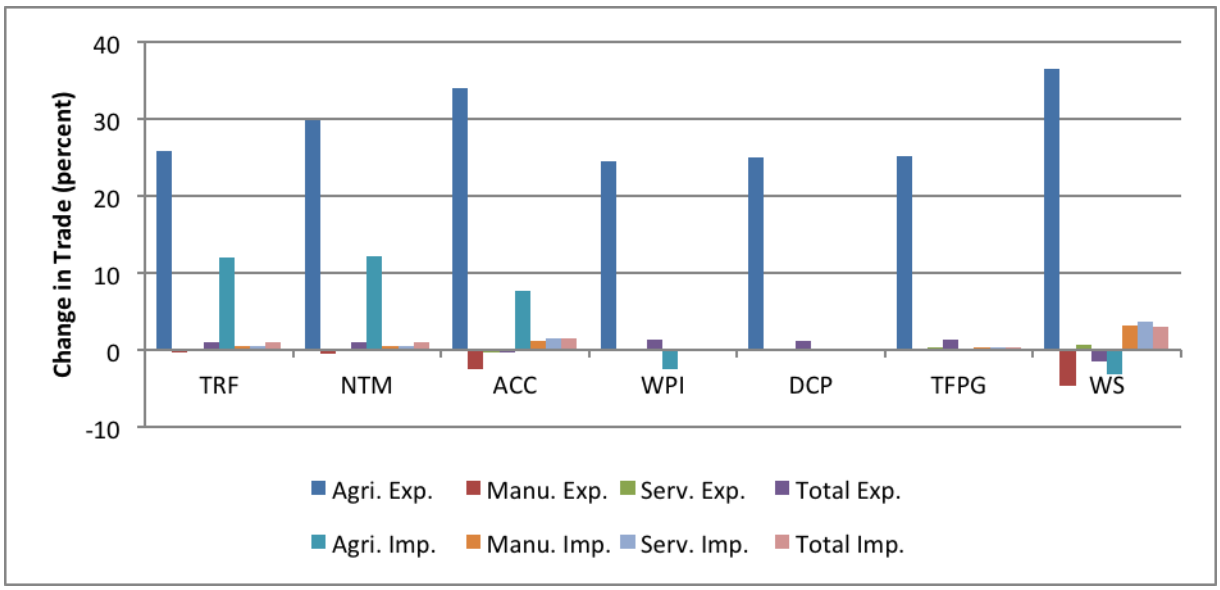
Source: model results

The contributions of private consumption and trade to changes in GDP evolve in opposite directions under all the scenarios, except the TFPG scenario where the contribution of exports evolves in the same direction as private consumption. Exports contribute negatively, implying a deteriorating value of exports under the NTM and ACC scenarios where the prices of exports to EU countries increase. This is mainly due to declining total exports (Figure 4.4), mainly as a result of the decrease in exports to

regions other than EU. The effects of private consumption and trade are reversed under world price increase scenarios. Imports and exports contribute positively, while private consumption affects GDP negatively. This result is expected with increasing domestic prices caused by an increase in the world price. The positive effect of imports in the WPI scenario is due to declining imports in the event of a world price increase. Note that the effects diminish under the DCP scenario when tariffs are reduced.

An overview of the simulation results suggests that trade liberalisation in agriculture is likely to have a limited overall effect given the current structure of the Turkish economy. Welfare gains are positive but not as high as expected for consumers. On the production side, total value added does not change much from the baseline, implying a limited feedback effect. The main drivers of changes in GDP are imports and domestic consumption. The positive contribution of domestic demand is largely offset by the negative effects of imports on GDP.

Figure 4.4 Trade effects of the scenarios (percentage difference from baseline)



Source: model results

4.2 Trade liberalisation between Turkey and the EU

Three trade liberalisation scenarios gradually enhance the extent of liberalisation: firstly, tariff elimination (TRF), then the elimination of non-tariff measures (NTM) and, lastly, full accession to the EU (ACC).

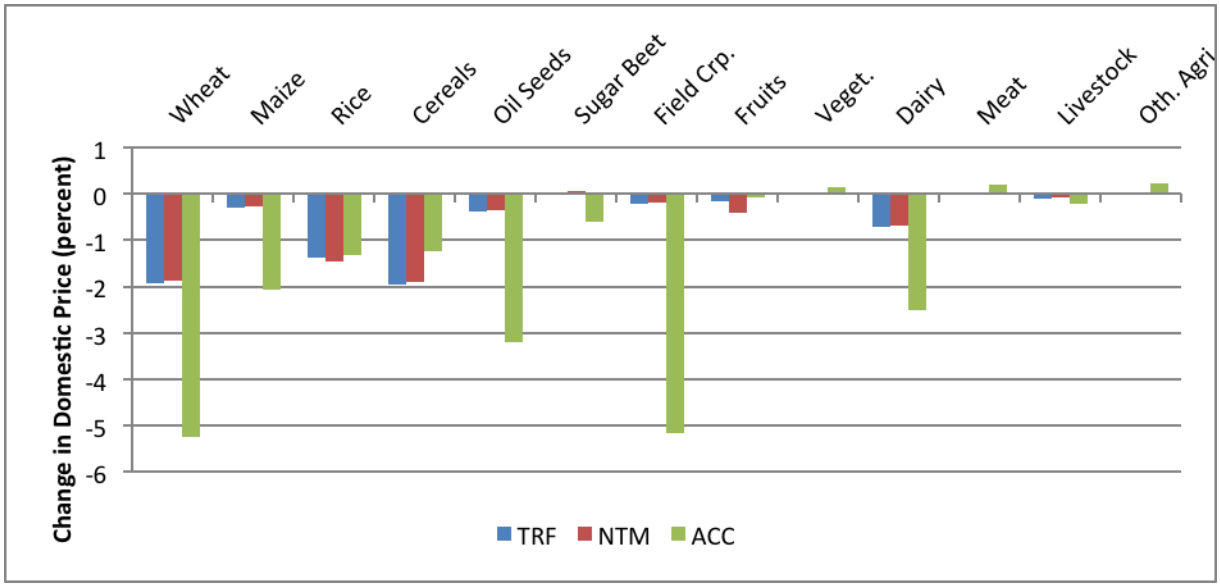
The most noteworthy effect of trade liberalisation can be observed in domestic prices. Prices decline for all agricultural commodities, except for sugar beet and vegetables. Trade in sugar is almost zero and protection on vegetables is low. The changes in prices are very similar in the TRF and NTM scenarios. The elimination of non-tariff barriers does not have a significant effect on domestic prices. However, under the ACC scenario, the effects turn out to be significant. Prices of wheat and other field crops decline by more than 5 percent, while oilseed prices falls by more than 3 percent. The size of the

changes in prices is directly related to the levels of protection. Higher protection leads to greater changes in prices.

Figure 4.6 shows the sectoral breakdown of the change in import quantity. Imports of almost all sectors under all scenarios increase. The increase in services imports is relatively small compared to manufacturing and agriculture imports. Manufacturing imports increase significantly under all scenarios. Almost half of the total increase in all cases is attributable to manufacturing. The increase in agricultural imports is higher than the increase in manufacturing imports under TRF and NTM scenarios, while under ACC the increase in manufacturing imports is higher. In other words, increasing subsidies in agriculture, which should eventually boost agricultural production under the ACC scenario, causes manufacturing production to decline and this decline is offset by imports.

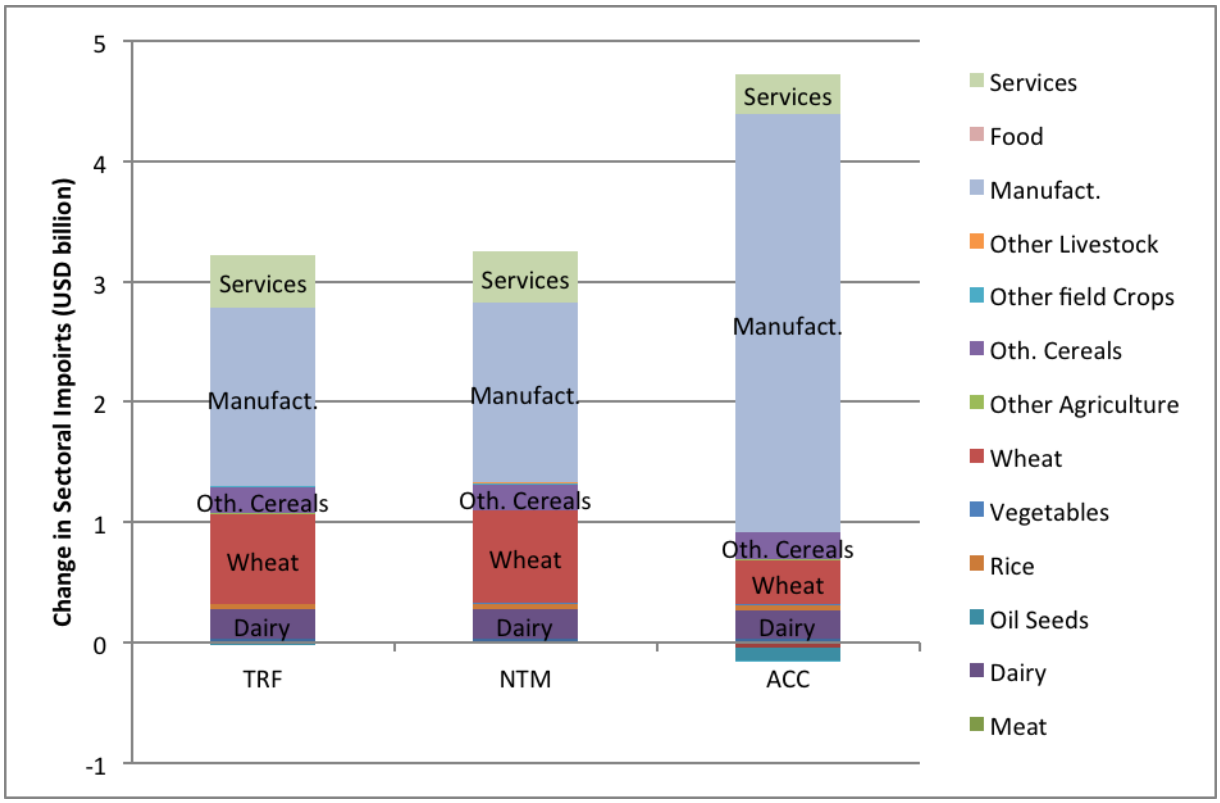
The agricultural commodities that increase most are wheat, dairy products and other cereals. Oilseed and maize imports decline slightly under the TRF and NTM scenarios, but the decline becomes relatively high under the ACC scenario. The underlying reason is that the level of protection on these commodities is already low at the baseline, and hence they become relatively more expensive under trade liberalisation compared to the other agricultural commodities.

Figure 4.5 Changes in domestic prices of agricultural commodities, 2020 (percentage deviation from baseline)



Source: model results

Figure 4.6 Sectoral changes in imports, 2020 (difference from baseline, USD billion USD)

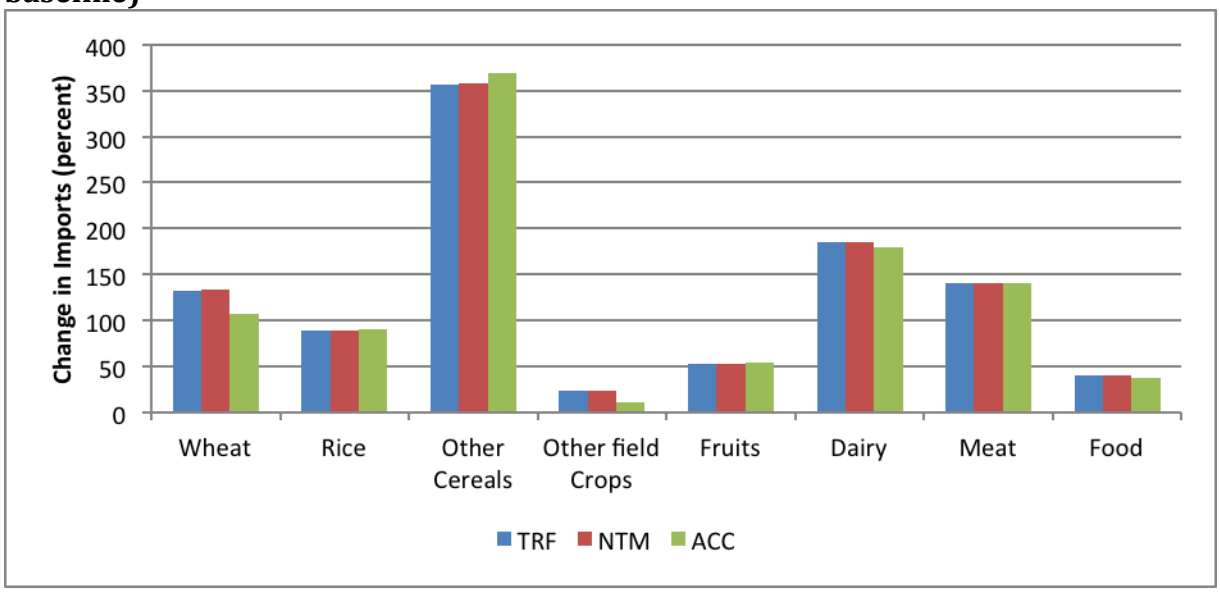


Source: model results

Figure 4.7 shows the change in imports of commodities from EU. The imports of other cereals, which are heavily protected in Turkey, increase more than three fold. Dairy and meat products follow, increasing by more than 140 percent. Wheat and rice imports increase by around 100 percent. Food and fruit imports rise by 50 percent. These rates are directly proportional to the amount of protection in the baseline scenario. The more a product is protected, the greater the increase in its imports after trade liberalisation.

The increase in imports of other cereals is mainly due to the low level of trade with EU in the base year, and this trend continues under the baseline scenario. Furthermore, the return on other cereals is lower compared to other agricultural products. Hence, once the import price of other cereals declines as a result of trade liberalisation, the substitution of their production with other commodities and their consumption with imports is inevitable. Factors of production are mostly diverted to oilseed and maize production from the production of other cereals. The increase in imports of dairy and meat products is consistent with literature. The insignificant effect on livestock imports is mostly due to the low substitutability of imported livestock with domestic production. As imports (and production, see next section) of imported inputs do not increase significantly, the increase in imports of final goods is expected. The changes in the imports of other commodities are shown in Figure A.1 in the Appendix.

Figure 4.7 Changes in imports from EU, 2020 (percentage deviation from baseline)



Source: model results

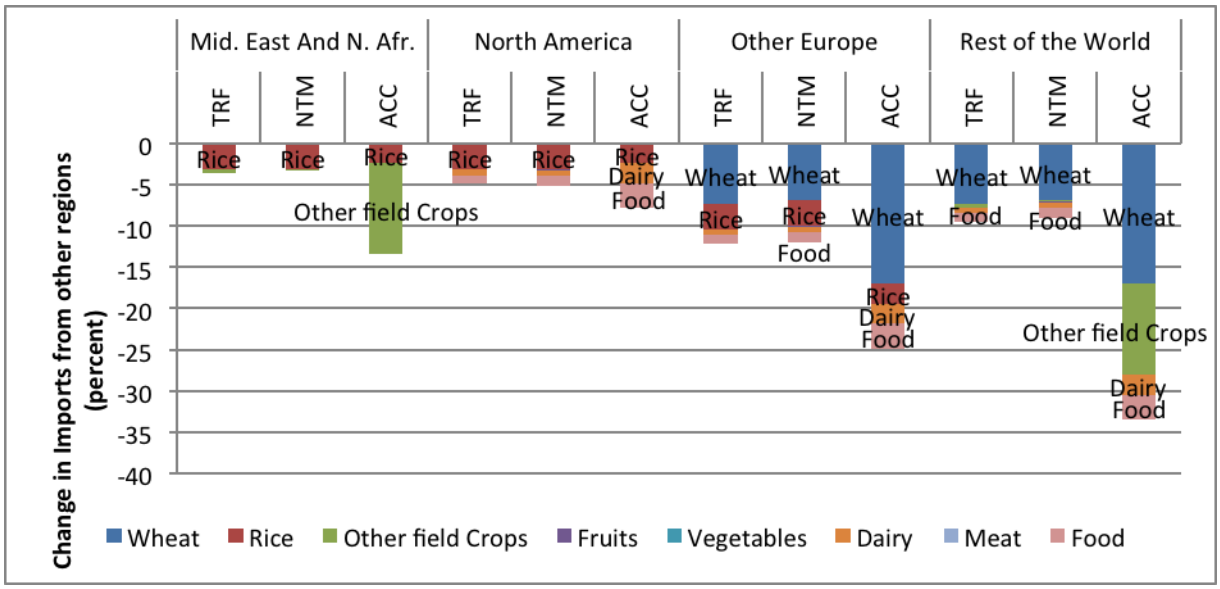
The significant increase in imports from EU causes imports from other trading regions to decline, signalling trade diversion (see Figure 4.8). This effect takes place in two steps. As the import price from EU falls as a result of trade liberalisation, imports from other regions become uncompetitive. Furthermore, declining import prices also pull down domestic prices, thus making domestic products more competitive than imports from other regions.

Cereal trade with other trading partners declines significantly. Under accession, the effects become stronger since the effects of trade diversion combine with the effects of increasing domestic production. Trade in wheat, rice, other field crops and food is affected most.

The change in exports differs considerably between different trade liberalisation scenarios. The effects are negligible under the TRF scenario[5]. Under the NTM scenario, exports of rice, food, maize and fruits increase significantly. Exports of other field crops also increase significantly under the ACC scenario. The difference between the ACC and NTM scenarios is mainly due to the dynamics of the domestic markets for agricultural commodities. Under NTM, the expansion in exports is limited to commodities for which the trade volume or protection is low in the base year, since these commodities cannot benefit from escalating export prices or are simply not demanded in EU. However, once subsidies are increased for all commodities, production surges and exports are boosted. This is especially true in the case of oilseeds and maize.

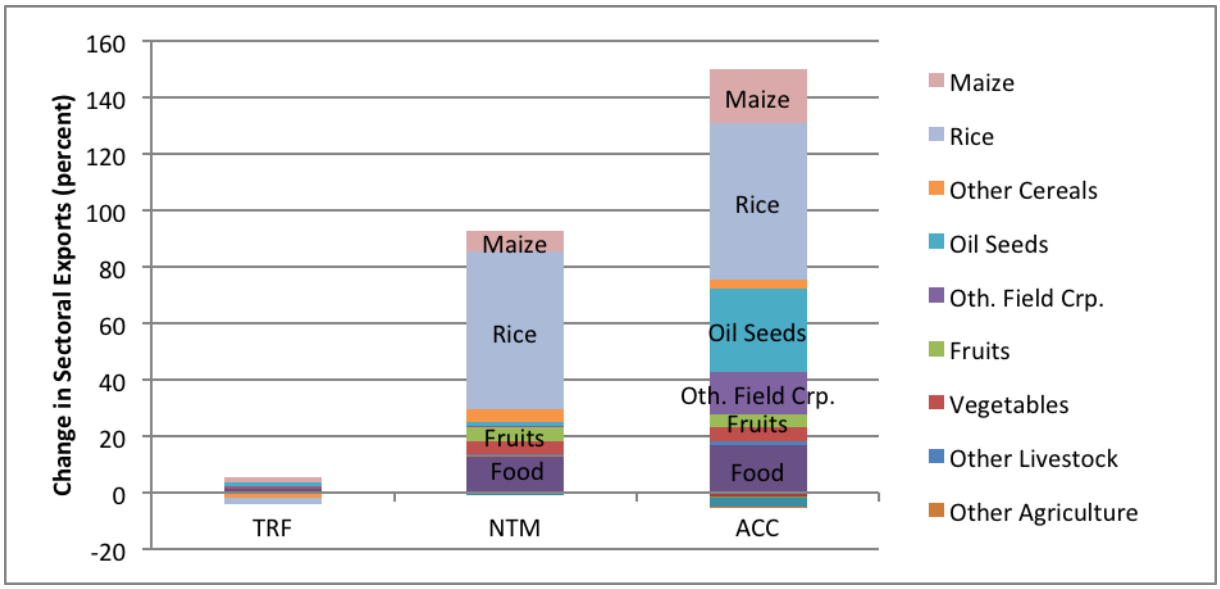
[5] The changes under the TRF scenario are the same for all trading partners due to constant CET elasticity; hence, product specific results are similar to those for EU given below.

Figure 4.8 Changes in imports from other regions, 2020 (percentage deviation from baseline)



Source: model results.

Figure 4.9 Changes in exports to EU, 2020 (percentage deviation from baseline)

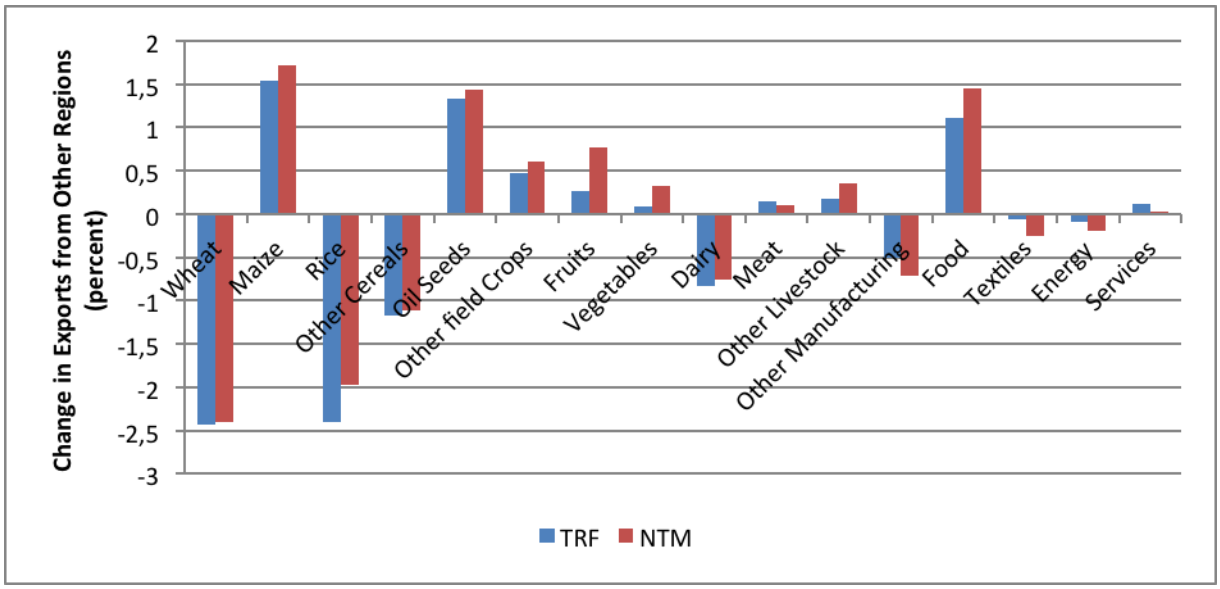


Source: model results.

Changes in exports to other trading partners are very similar under the TRF and NTM scenarios, while ACC results differ substantially for wheat, maize, oilseeds, other field crops and food. This implies that the real driver of the change in exports to the rest of the world is the increase in subsidies. Since the difference is quite substantial, the results are shown in separate figures (Figure 4.10 and Figure 4.11). Under TRF and NTM, exports of wheat, rice, other cereals and dairy products decline while those of maize, oilseeds, other field crops and food increase. Under the TRF scenario, the effects on exports are totally indirect and related to the changes in domestic prices. Exports will increase if commodity prices decline as a result of trade liberalisation. On the other

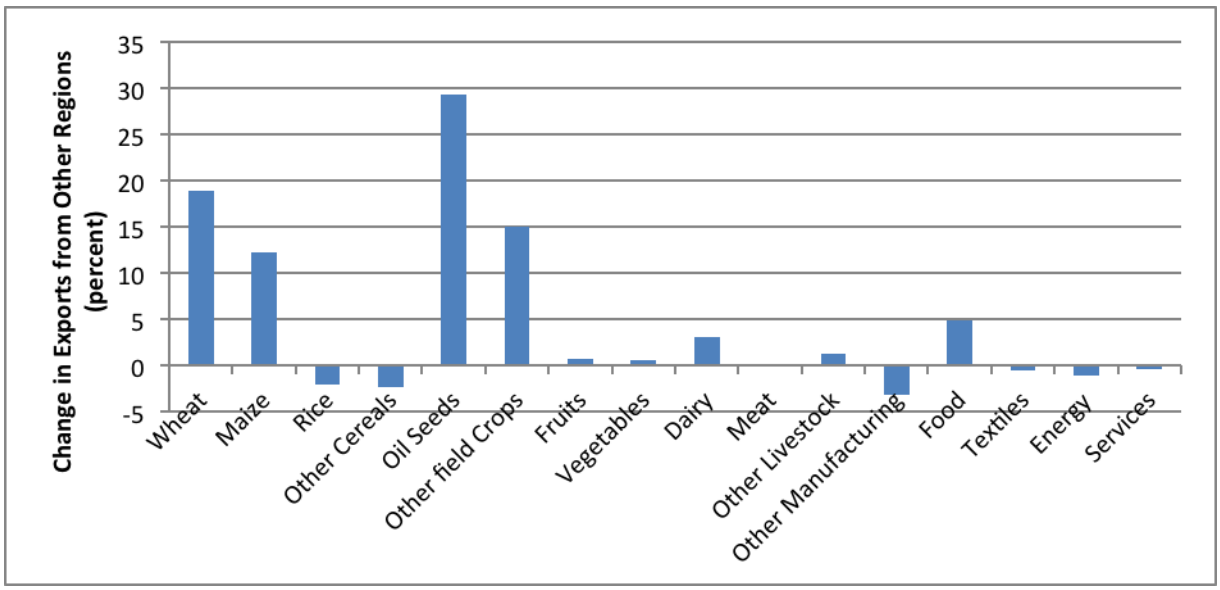
hand, rising export prices contribute to the increase in domestic prices, but this effect is not strong enough to create trade diversion, as it is in the case of imports. However, there are significant differences between ACC and other trade liberalisation scenarios.

Figure 4.10 Changes in exports to non-EU in the TRF and NTM scenarios, 2020 (percentage deviation from baseline)



Source: model results.

Figure 4.11 Changes in exports to non-EU in the ACC scenario, 2020 (percentage deviation from baseline)



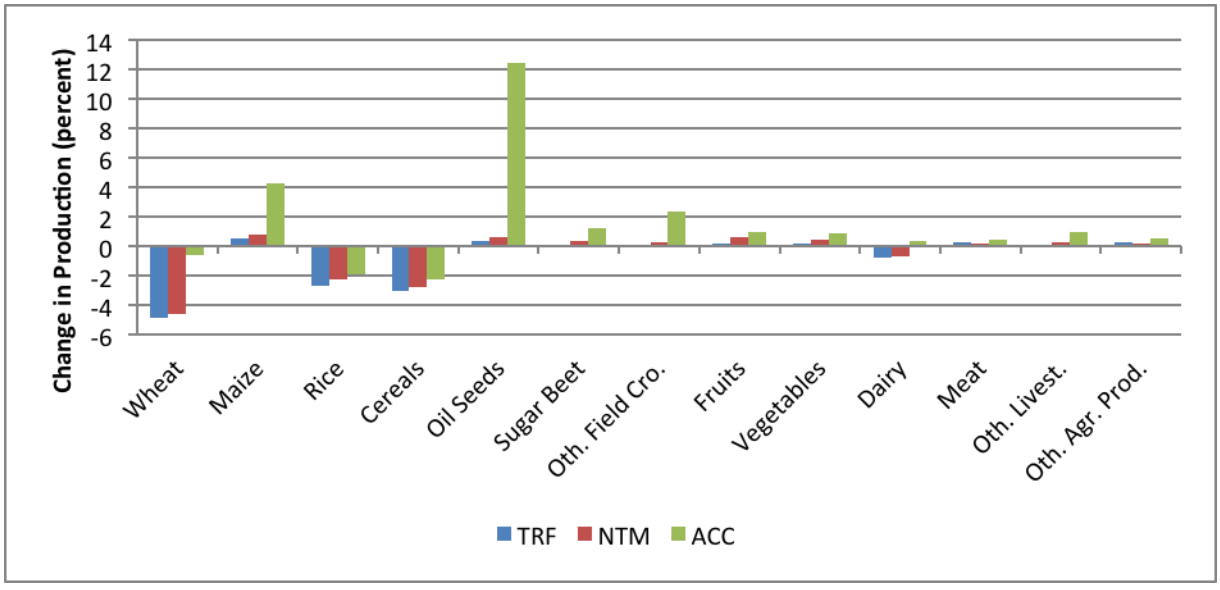
Source: model results.

Exports of wheat and dairy products increase. Changes in exports of maize, oil seeds and other field crops become noticeable with increases of 12 to 30 percent. When comparing the ACC and NTM scenarios, it seems that this is due to the increase in agricultural subsidies. Subsidised commodities become more competitive in international markets and hence exports are boosted significantly if the increase in

subsidies is very high. Consequently, CAP payments transferred to Turkish farmers are likely to boost exports not only to EU countries but also to other regions.

The effect of trade liberalisation on agricultural production is significant compared to the baseline scenario. Cereals are generally more affected than other activities, especially under the NTM and ACC scenarios. Production of wheat, rice and other cereals declines, while the production of maize and oil seeds increases. Production of highly protected cereals declines between 2 and 4.5 per cent. The decreases get smaller while the increases get higher as the degree of integration improves. The main driver of this change is the substitution of imports for domestic production as import prices decline. Although export demand may be expected to increase and pull up production, this effect is quite limited under the NTM scenario. Furthermore, doubling subsidies does not help to stop the decline under ACC although the decline becomes significantly less pronounced. The upsurge in maize and oilseed production is significant especially under the ACC scenario. Current protection in these commodities is not high, but increasing subsidies allows them to compete for factors of production. Moreover, since EU protection in these commodities is also low, the boost is not due to the increasing price of exports.

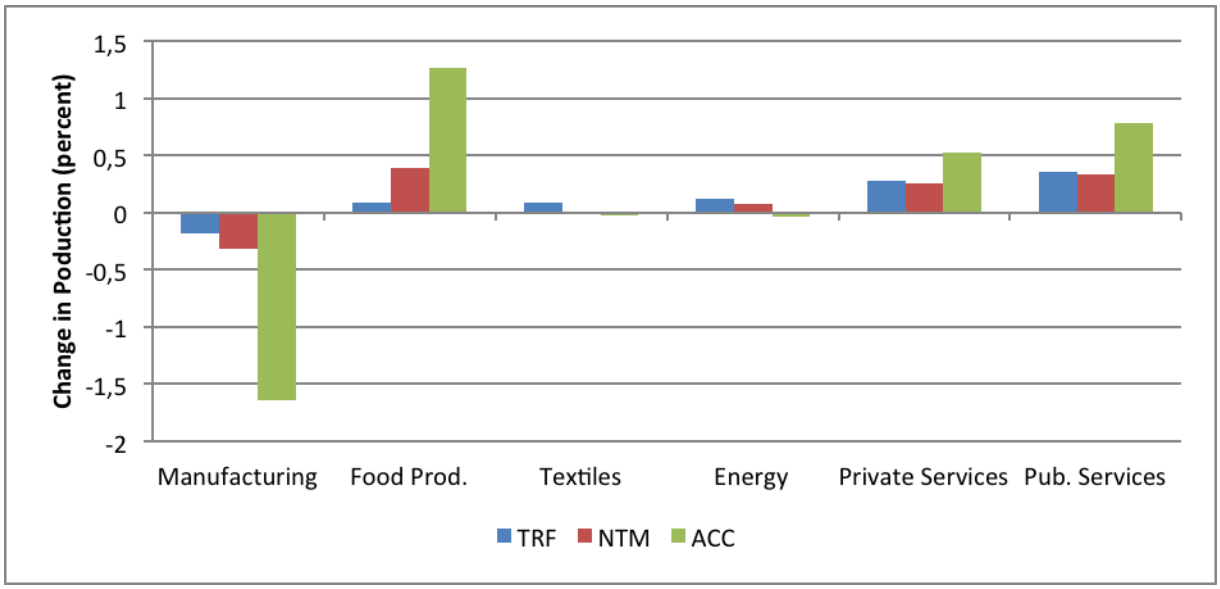
Figure 4.12 Changes in agricultural production, 2020 (percentage deviation from baseline)



Source: model results

The increase in fruit and vegetable production is relatively small. This contradicts the findings published in literature. Fruits and vegetables are expected to increase due to growing demand for exports from the EU, at least with the removal of non-tariff measures or in the case of accession. However, as mentioned previously, GTAP tariffs rates imposed on Turkish fruits and vegetables are not very high (3.2 percent). Thus, the increase in exports has a limited impact on production.

Figure 4.13 Changes in production of other sectors, 2020 (percentage deviation from baseline)

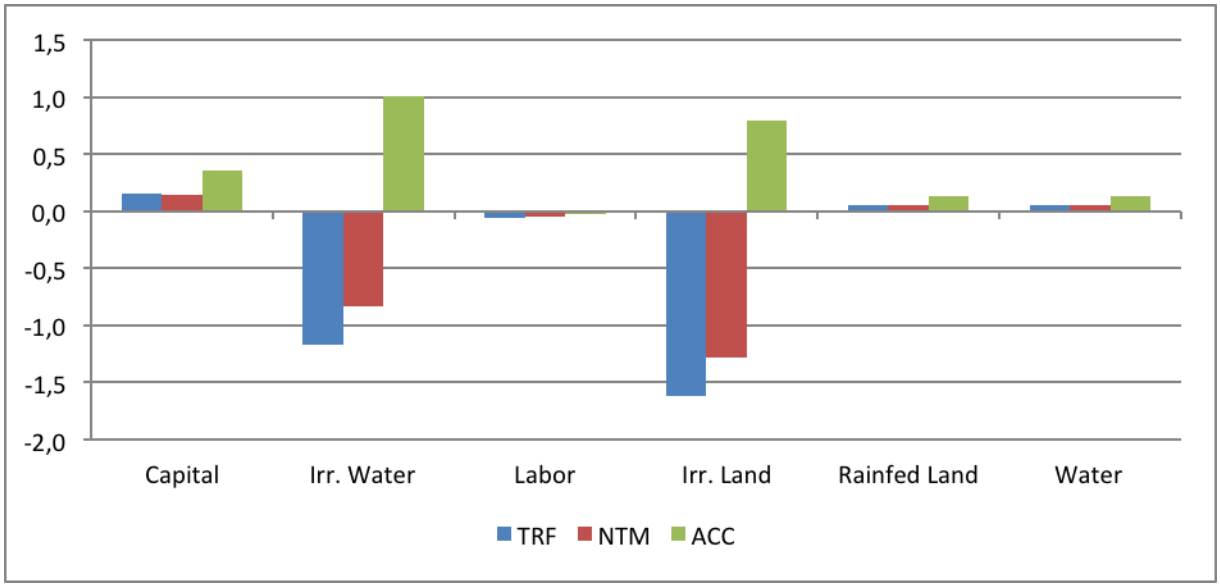


Source: model results

Production in other sectors is also affected by trade liberalisation. Manufacturing production declines, except for food production, which uses agricultural outputs as inputs. Services increase slightly. The effects are once again greater under the ACC scenario. The main drivers of change in manufacturing production are decreasing export demand due to the increasing relative price of manufacturing goods. Secondly, intermediate input demand also declines significantly due to the deterioration of agricultural production and manufacturing production itself. In contrast, food production rises under trade liberalisation, especially under the ACC scenario. This is expected with decreasing prices of agricultural commodities, which are the main inputs for food production. Hence, imported agricultural products are mainly used to produce food.

Total factor use under trade scenarios is given in Figure 4.14. The changes in labour, rainfed land and water employment are not significant. The use of capital increases under all scenarios. This is due to increasing investment. The effects on irrigated land and irrigation water use under the ACC scenario differ from those in the TRF and NTM scenarios. Increasing agricultural subsidies under the ACC scenario boosts the use of these factors while trade liberalisation without CAP payments causes a significant fall. The underlying reason is the increasing substitution of domestic production with cheaper imports, prompting an upsurge in the use of factors with flexible employment closure. The effect of changes in factor use on household income is rather small, at 0.1 percent under the TRF and NTM scenarios and 0.5 percent under the ACC scenario.

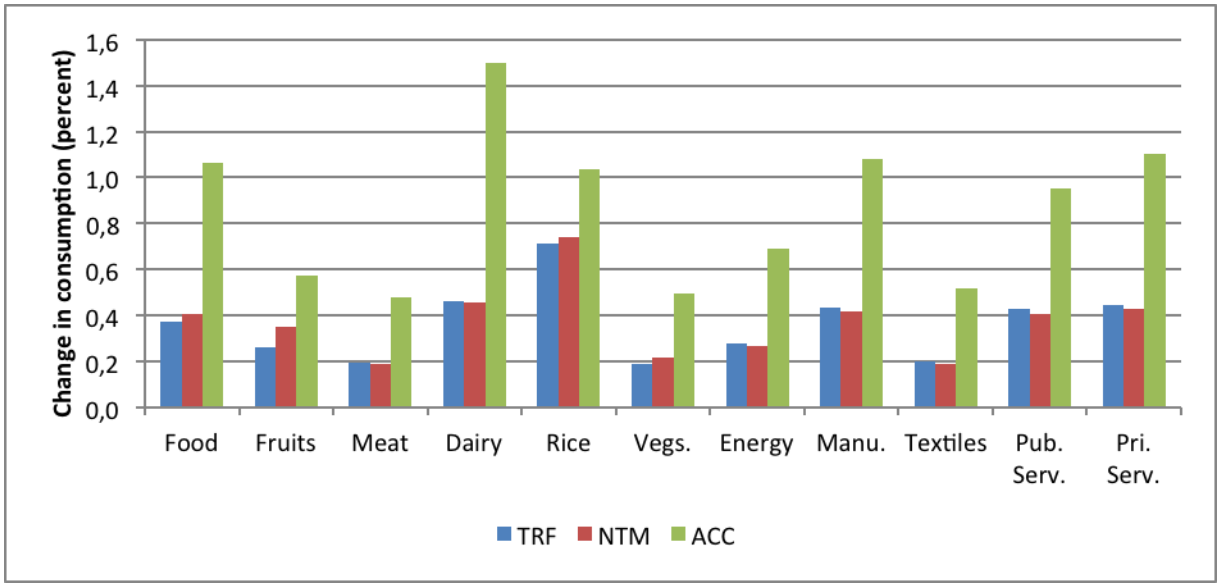
Figure 4.14 Changes in factor use, 2020 (percentage deviation from baseline)



Source: model results

Consumption increases under all three trade liberalisation scenarios as a result of declining agri-food prices and increasing – or at least non-decreasing – household incomes (Figure 4.15). However, the changes are negligible under the TRF and NTM scenarios but rather significant under ACC scenarios. The most noteworthy increases occur in the rice, milk, processed food, manufacturing and services sectors. Manufacturing and services constitute almost 60 percent of total consumption; hence, the increase in their consumption levels is normal despite the slight increase in their prices due to the income effect. Increases in the consumption of other commodities are attributable to declining domestic prices and mainly driven by substitution effects.

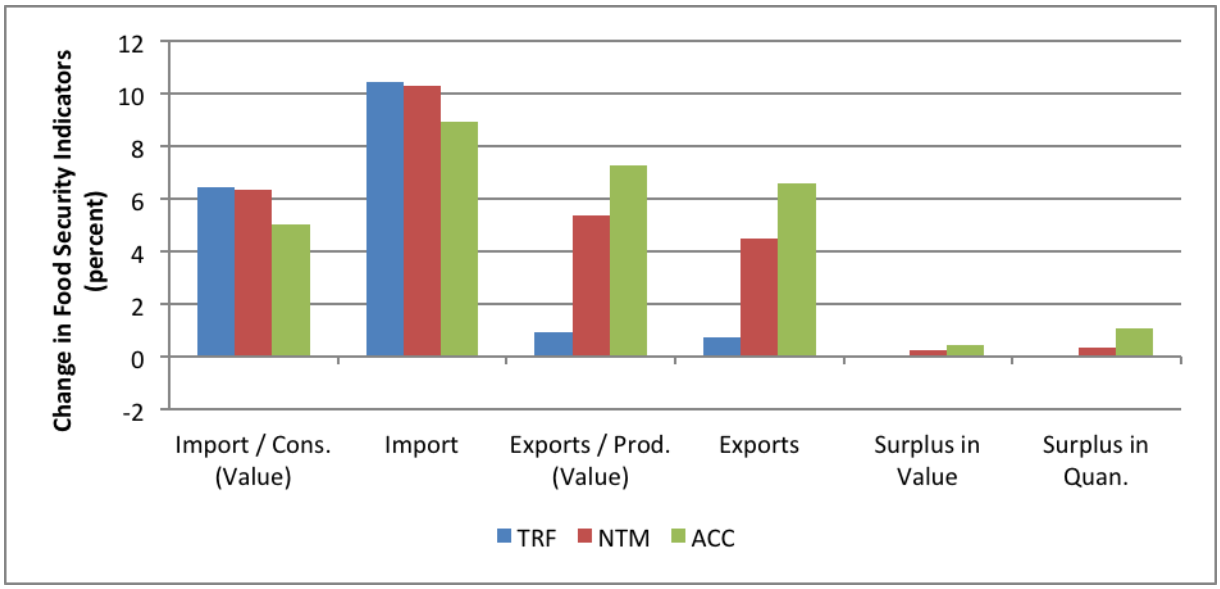
Figure 4.15 Changes in consumption, 2020 (percentage deviation from baseline)



Source: model results

Increasing food consumption can be considered as an indicator of increasing food security, as this would ensure the availability of more food for a growing population. On the other hand, while Turkey is a net exporter of food in the baseline scenario, the situation does not change substantially under trade liberalisation. The ratio of food exports to imports declines to 1.67 under TRF, 1.74 under NTM and 1.79 under ACC from 1.83 at baseline. As described above, this is due to the greater increase in food imports compared to food exports. Thus, the source of increase in food consumption is not production but imports. Import share in consumption increases while a larger part of production is exported under all scenarios. However, the difference between the value of imports and production and the values of exports and consumption also increases. This leaves more intermediate inputs for the food industry, thus improving food security.

Figure 4.16 Food security indicators, 2020 (percentage deviation from baseline)

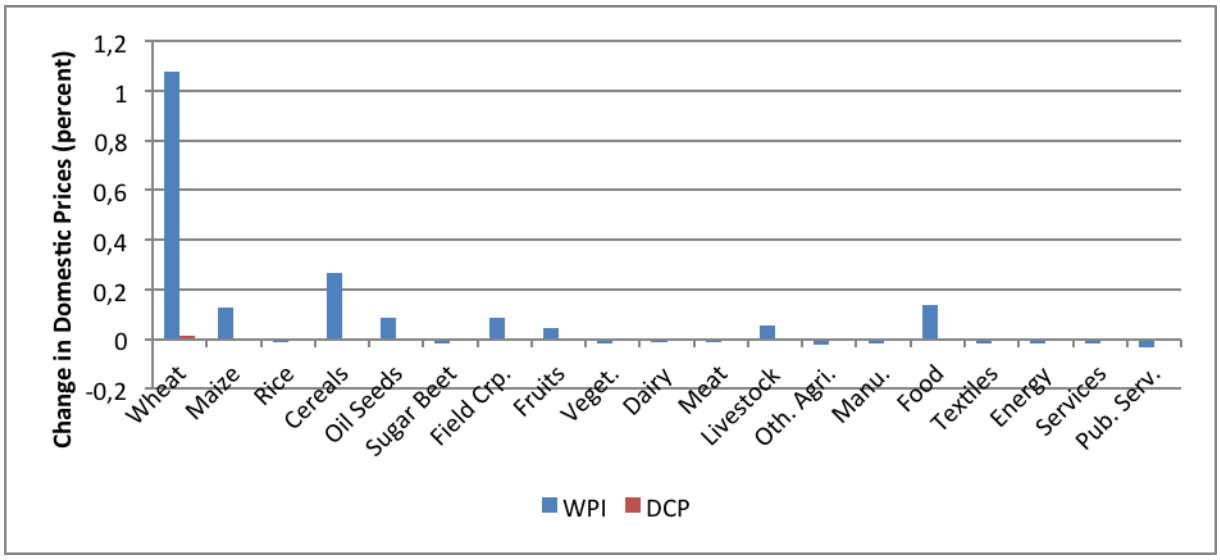


Source: model results

4.3 Increase in world price of wheat and policy response

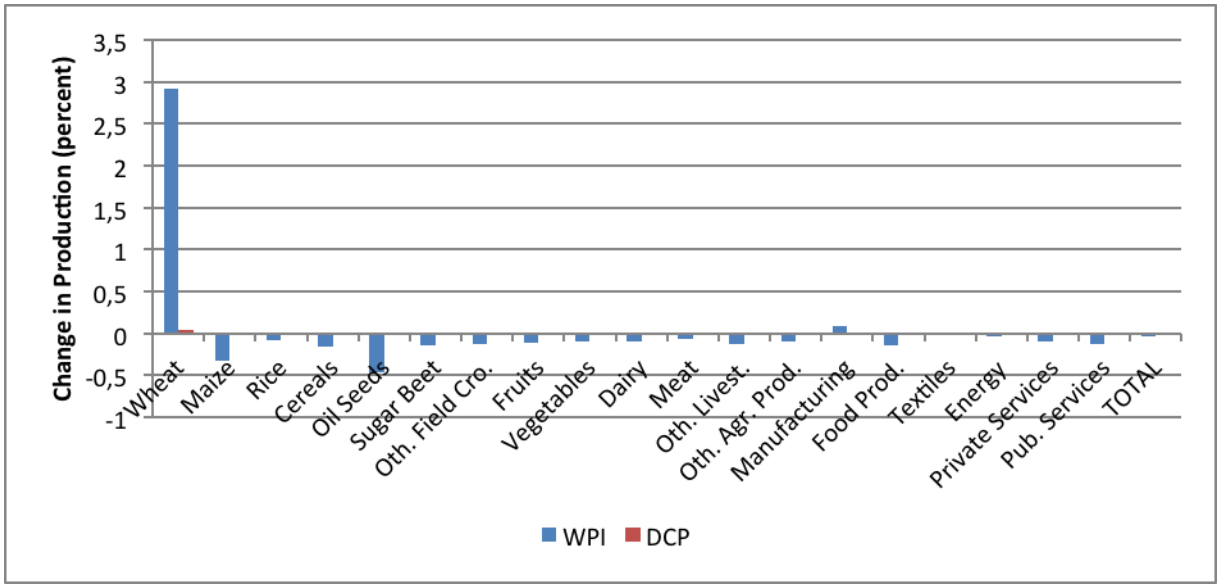
We simulated two scenarios in order to analyse the effects of an increase in the world price of wheat (WPI) and the policy response by Turkey to stabilise domestic prices in order to protect consumers (DCP). The immediate effect of an increasing world price is an increase in the level of wheat exports and a decrease in the level of wheat imports. The effect is directly proportional to the Armington and CET substitution elasticity. Increasing exports and declining imports mean a fall in supply to the domestic market. Hence, the domestic price increases to maintain the equilibrium in the wheat market. The change in domestic prices is shown in Figure 4.17. The increase in wheat prices due to a 5 percent increase in world prices is around 1.1 percent.

Figure 4.17 Changes in domestic prices, 2020 (percentage deviation from baseline)



Source: model results

Figure 4.18 Changes in production, 2020 (percentage deviation from baseline)



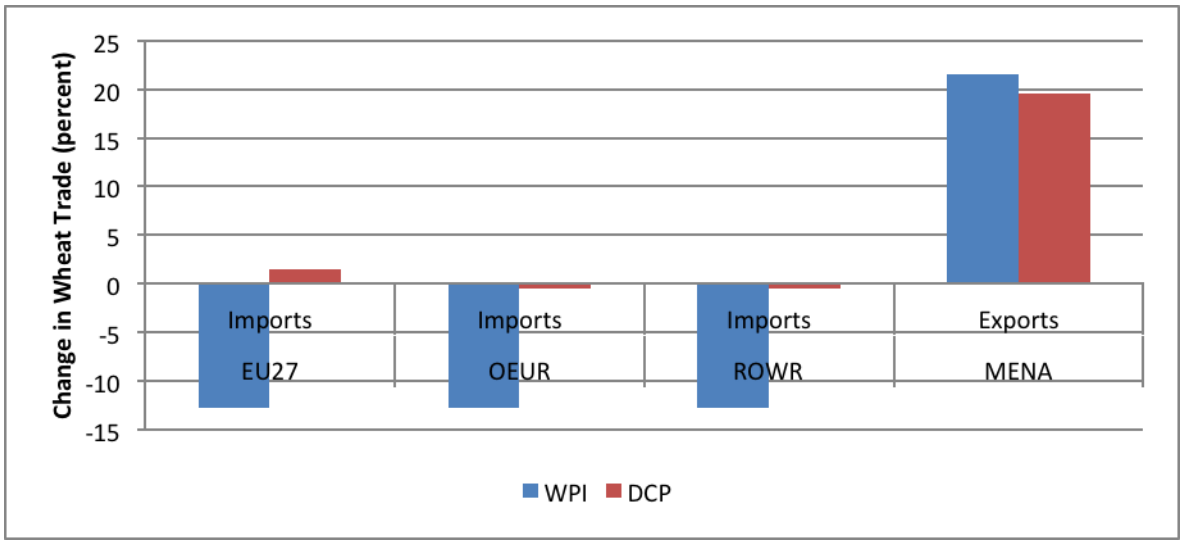
Source: model results

Cereals other than wheat, oilseeds and food products follow wheat in terms of the domestic price increase. The prices of other cereals and food increase for different reasons. The effect on other cereals is due to the increasing price of intermediate inputs and factors. Once the domestic price for wheat increases, wheat production also expands, causing demand for intermediate inputs and factors to rise. This prompts the production cost of other cereals to increase since their cost structure (i.e. input and factor mix) is similar to that of wheat production. The effect on food production is rather more direct. Wheat is not consumed directly by consumers and is mainly used as an intermediate input in food production. Hence, an increase in the price of wheat implies an increase in the cost of food production. The effect is driven by the share of

wheat in food production costs and the ability of food producers to substitute wheat with other inputs. Domestic production adjusts to the price changes. Wheat production increases by 2.9 percent while production of other commodities declines slightly.

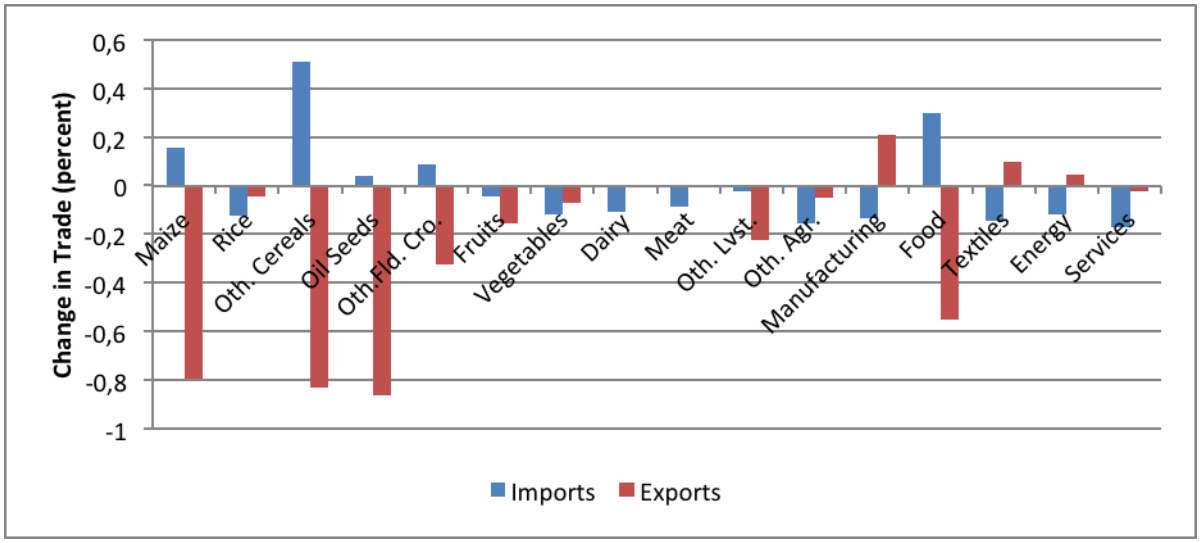
Reducing wheat tariffs by approximately 6 percent eliminates the effects of the increase in the world price on domestic prices and production.

Figure 4.19 Changes in wheat trade, 2020 (percentage deviation from baseline)



Source: model results

Figure 4.20 Changes in the trade of other products, 2020 (percentage deviation from baseline)



Source: model results

The effects of policy response occur mostly via wheat trade. Wheat imports from all regions decline by around 12 percent under the WPI scenario (Figure 4.19). The impact diminishes when the tariff is reduced. The shift in exports to the Middle East and North Africa remains significant. Changes in food security indicators (Figure A.2) are negligible when the world price of wheat increases.

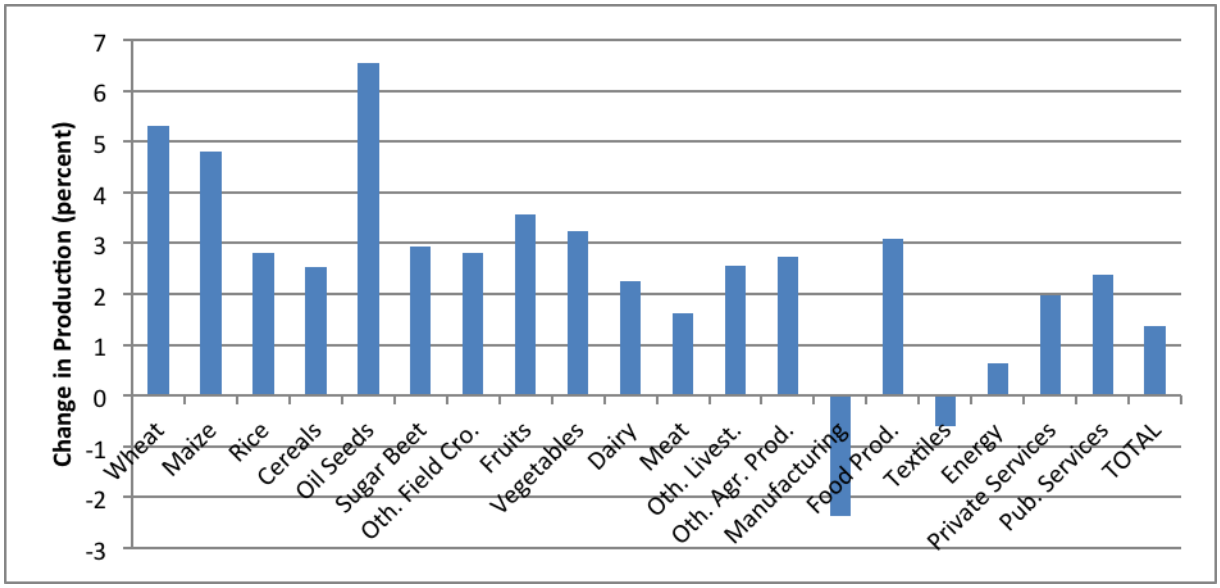
4.4 Total factor productivity growth and food waste

The impact of a 0.15% per annum increase in productivity in all sectors (TFPG scenario) is limited. Hence, the results for the WS scenario are reported in this section. The changes in the main indicators under the TFPG scenario are presented in the Appendix.

The immediate impact of increasing TFP under the WS scenario is increased production of agricultural commodities. The increase is between 2.5 and 6.3 percent for crops and varies between 1.8 and 2.4 percent for livestock-related activities (Figure 4.21). Oilseed, wheat and maize production increase most. The increase in TFP in these activities is relatively higher, at 5 percent for wheat and 3 percent for the other activities. However, the size of the shock cannot explain the relatively higher increase since TFP growth in these activities is similar to that in many others such as fruits, vegetables and other field crops. The underlying reason is the structure of production. Activities that can substitute factors with intermediate inputs can easily increase their production more, while others fail to do so; if an activity cannot substitute intermediate inputs with factors, the production increase is limited according to the availability of factors, especially rainfed land, the supply of which is fixed.

The output of service sectors increases although there is no TFP growth for these sectors. Service producers benefit from the increase in prices (Figure 4.24) fostered by growing demand. The rise in household income increases the demand for services since services account for a substantial portion of household demand. Service providers can afford to employ more labour and capital due to rising output prices even if the prices of these factors increase.

Figure 4.21 Changes in production, 2020 (percentage deviation from baseline)

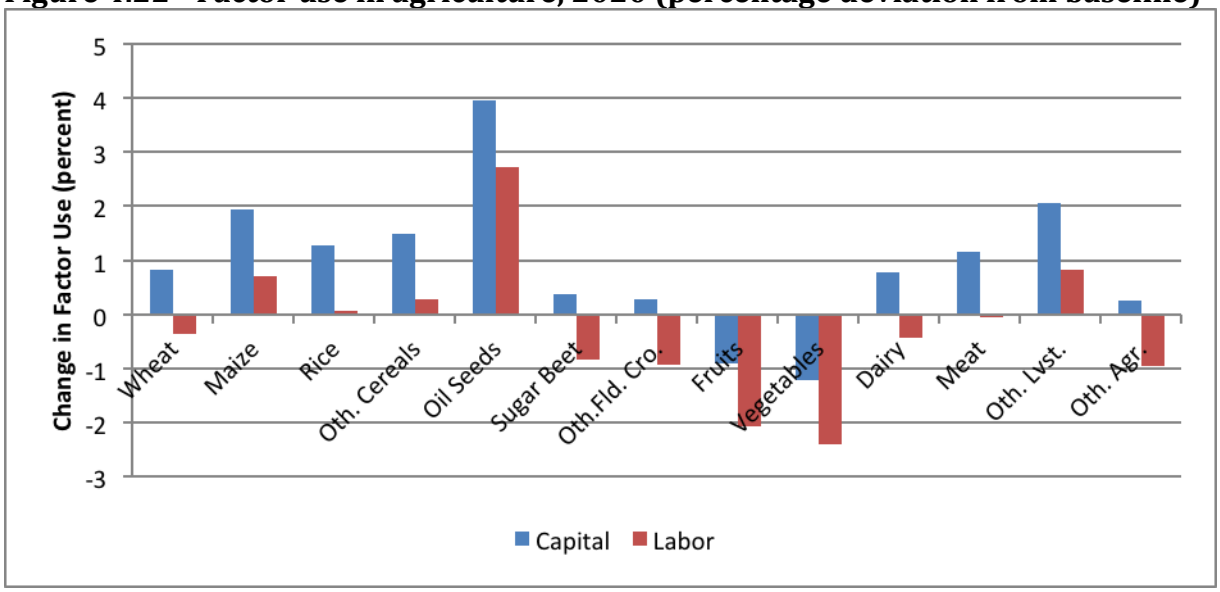


Source: model results

Expansion in agriculture and services production occurs at the expense of manufacturing production. This is due to the link between agricultural activities and manufacturing through the factor and intermediate input markets. Increasing

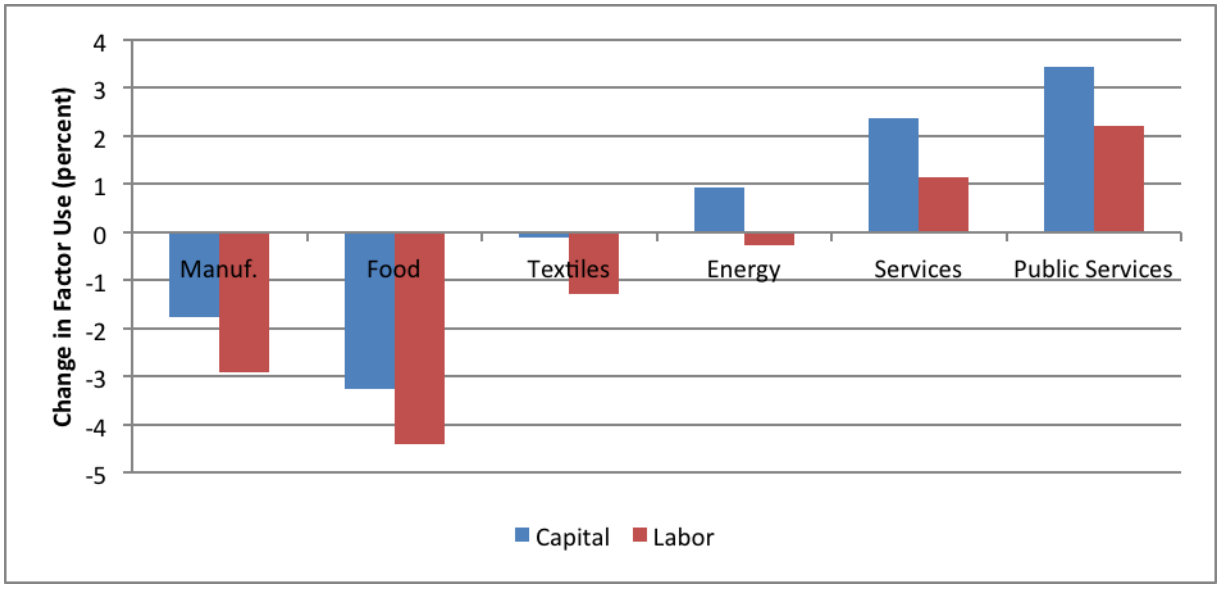
productivity in agricultural activities causes the value of the marginal product of factors to increase, in turn allowing agricultural producers to pay higher wages to factors. This means a shift in factor demand and consequently an increase in real wages. Thus, factors of production are mobilised towards agricultural sectors and factor costs for manufacturing increase. This is confirmed in factor employment under the WS scenario presented in Figure 4.22. This effect occurs in capital employment as a result of a dynamic adjustment process, which allocates a higher share of gross fixed capital formation to more profitable sectors. Since agricultural activities become more productive under the WS scenario, a greater portion of capital is devoted to agriculture.

Figure 4.22 Factor use in agriculture, 2020 (percentage deviation from baseline)



Source: model results

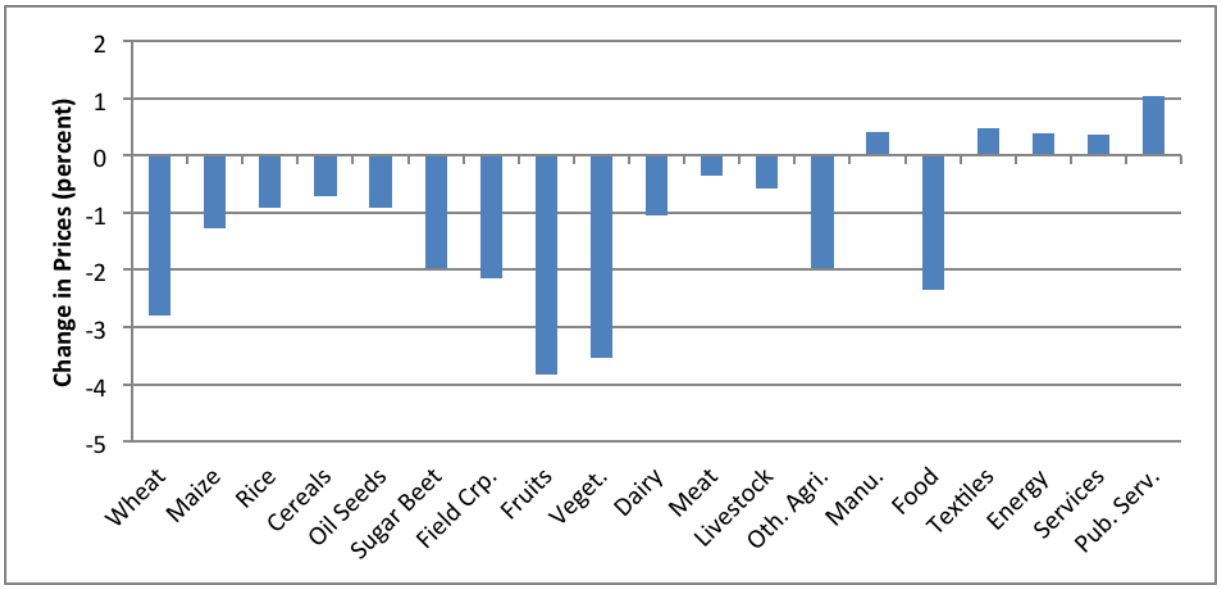
Figure 4.23 Factor use in non-agriculture sectors, 2020 (percentage deviation from baseline)



Source: model results

Prices of agricultural commodities decline in response to the upsurge in production (Figure 4.24). The most noteworthy decline is in fruits and vegetables. This may seem surprising since the production of these commodities is not as high as that of other agricultural commodities. Significantly, factor use in fruits and vegetables also declines and is accompanied by an increase in production. This means fruit and vegetable producers benefit most from increased productivity. They manage to avoid increasing factor prices by substituting intermediate inputs with factors of production and are thus able to supply more output with lower prices.

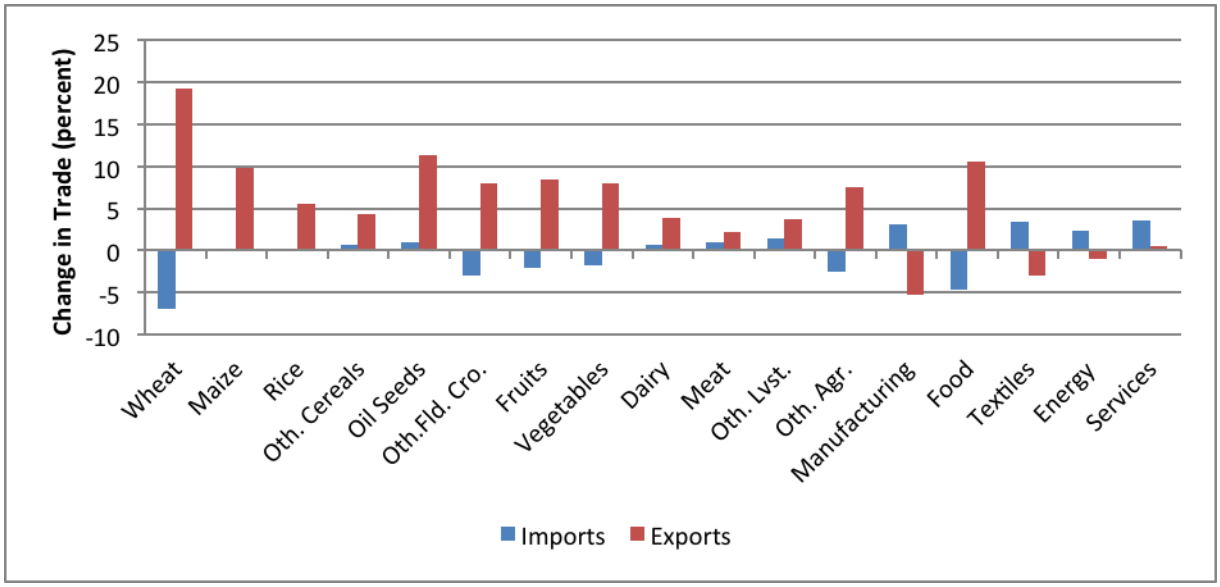
Figure 4.24 Changes in prices, 2020 (percentage deviation from baseline)



Source: model results

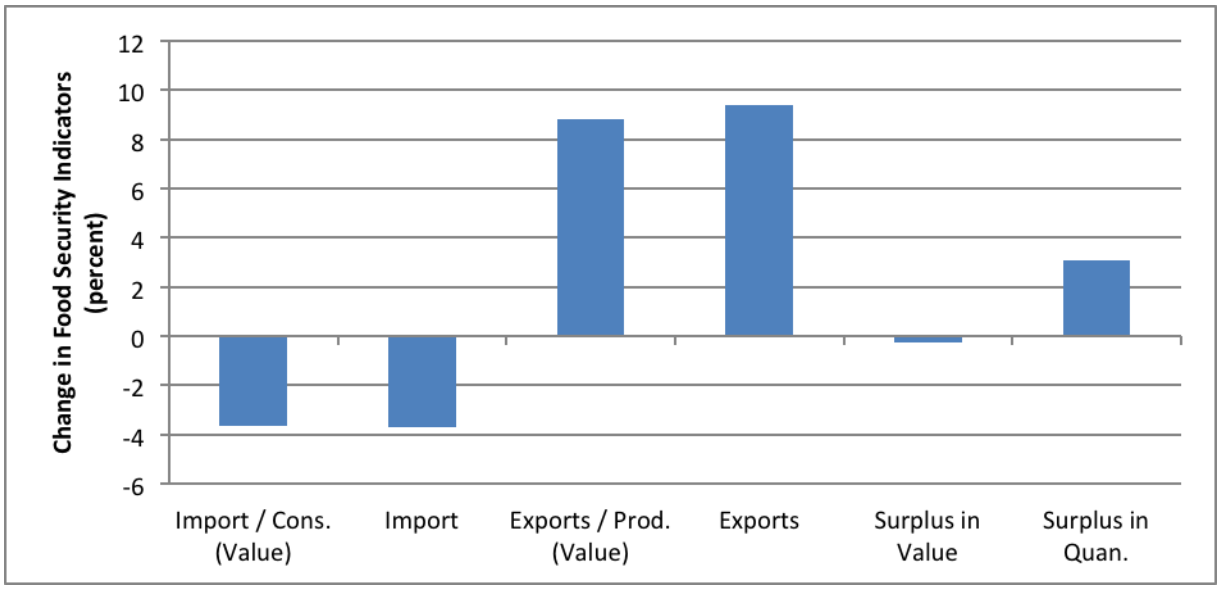
The changes are largely proportional to the changes in prices under the WS scenario. Exports of all agricultural commodities and food products increase significantly. Exports of wheat, oilseeds, maize and food products increase within the range of 10 to 18 percent. Agricultural commodities become more competitive in international markets as a result of the increase in productivity. The effect on imports is rather limited and generally occurs through the substitutability of domestic commodities with foreign equivalents. The most significant decreases in imports are in wheat, fruits and vegetables and food products since these commodities are the ones that benefit most from the TFP increase. In contrast, imports of oilseeds, dairy products and oilseeds increase slightly. Manufacturing and textile imports also increase significantly. This is due to the declining production of these activities.

Figure 4.25 Changes in trade, 2020 (percentage deviation from baseline)



Source: model results

Figure 4.26 Food security indicators, 2020 (percentage deviation from baseline)



Source: model results

Food security improves substantially under the WS scenario. Turkey becomes less dependent on imports of food products and contributes significantly to global food safety by exporting slightly more than 8 percent of its food production. The domestic food surplus increases due to growing production, which is in turn reflected in trade through increasing exports and decreasing imports.

5 Effects of Trade Liberalisation between the EU and NAF Countries on Turkey

NAF countries compete directly with Turkey in the EU market, especially in agri-food products. Trade liberalisation between the EU and NAF countries is expected to affect

EU-Turkey trade. In this section, we will evaluate the possible impacts of EU-NAF trade liberalisation on Turkey using the results of the MAGNET model reported in Kavallari, Rau & Rutten (2013). The analysis will focus on the potential changes in the pattern of trade.

Trade liberalisation between EU and NAF countries has a limited overall effect on Turkey's trade. The model results suggest that the aggregate trade diversion effect of liberalisation between the EU and NAF countries is significant for trade between Turkey and NAF countries, while it has limited effect on her trade with EU countries. The value of Turkish exports to EU countries increases slightly under both trade liberalisation scenarios (0.35 and 0.5 percent). Hence, trade liberalisation does not offer any significant advantage to NAF countries over Turkish exports in European markets. This is mostly due to the income effect of welfare gains in EU countries, prompting an increase in demand for Turkish exports. On the other hand, Turkish exports to NAF countries decline significantly. Turkey competes with EU countries for access to NAF markets. In the event of trade liberalisation between NAF and EU countries, European countries have a significant advantage over Turkish exporters due to declining export prices. Turkish exports are further hampered by declining domestic prices in NAF countries brought about by trade liberalisation. Overall, the increase in exports to EU far from compensates for the decline in exports to NAF countries. Turkey's total exports to these regions decline by around 0.4 percent under the tariff elimination scenario and by 0.9 percent under the deeper free trade area scenario.

The changes are generally driven by the changes in manufacturing exports. The contribution of food exports to the change is negligible under both scenarios. Sectoral effects show that Turkey benefits from the overriding income effect on her manufacturing and services exports to EU, while the substitution of Turkish exports with NAF exports is the main effect in the case of agri-food commodities. The decline in food exports to EU countries is significant especially under a scenario of greater trade liberalisation between EU and NAF countries. Interestingly, Turkish service exports to NAF countries also increase as a result of increasing welfare in these countries. However, despite the strong increase in service exports to NAF countries, the low level of trade at baseline means that the contribution of this increase hardly compensates for the negative effects of manufacturing and agri-food trade.

The change in imports is relatively smaller compared to the change in exports. Imports from EU countries decline slightly, again mostly driven by manufacturing imports. Imports from NAF countries behave differently under scenarios S1 and S2. Imports increase as domestic prices in NAF countries - except Tunisia - decline significantly under S1. However, the increase in imports from NAF countries far from compensates for the decline in imports from EU. Under scenario S2, imports from NAF countries also decline, mainly due to the inability of the increase in imports from Egypt and Morocco to compensate for imports from Tunisia. The final effect is a significant decline. Hence, it

may be concluded that the decrease in NTMs between EU and NAF countries is likely to hamper Turkey's imports from both regions, mainly due to the changes in the manufacturing trade. This signals a significant trade diversion effect. NAF imports are diverted towards the EU after trade liberalisation at the expense of NAF countries' access to the Turkish market.

To summarise, the trade effects of trade liberalisation between EU and NAF countries have significant implications for trade between Turkey and NAF countries, but the effect on EU-Turkey trade is negligible. Agricultural trade does not have a significant impact on the resulting changes, which are mainly driven by the manufacturing sector.

Table 5.1 Impact of EU-NAF trade liberalisation on Turkish trade

	Exports			Imports		
	Base (USD million)	S1[a] (% change)	S2[b]	Base (USD million)	S1[a] (% change)	S2[b]
EU	96,594	0.35	0.54	88,410	-0.44	-0.73
Agri-Food	5,209	-0.33	-2.88	2,293	-0.63	-0.73
Manufacturing	78,049	0.39	0.74	79,733	-0.44	-0.74
Services	13,336	0.35	0.71	6,385	-0.33	-0.58
NAF	4,363	-17.42	-31.90	1,744	2.83	-1.66
Agri-Food	151	-34.44	-47.02	170	0.31	-5.55
Manufacturing	4,007	-17.69	-33.27	1,420	3.38	-0.62
Services	205	0.49	5.85	154	0.58	-6.98
Egypt	1,630	-16.26	-29.94	1,010	2.86	1.56
Agri-Food	94	-34.04	-37.23	142	0.48	-5.63
Manufacturing	1,411	-16.51	-32.32	784	3.44	3.39
Services	125	0.00	2.40	84	1.43	-3.39
Morocco	1,572	-20.12	-27.61	341	10.35	4.19
Agri-Food	18	-20.11	-50.28	18	8.88	9.53
Manufacturing	1,508	-20.65	-28.29	283	11.30	4.69
Services	47	-2.80	3.23	39	4.20	-1.90
Tunisia	1,162	-15.55	-40.46	393	-3.74	-14.99
Agri-Food	39	-43.44	-69.15	10	-17.85	-31.99
Manufacturing	1,089	-15.19	-41.39	353	-3.11	-13.78
Services	34	5.06	22.92	30	-6.41	-23.45
Total	100,957	-0.42	-0.86	90,154	-0.37	-0.75
Agri-Food	5,360	-1.29	-4.12	2,463	-0.57	-1.06
Manufacturing	82,056	-0.49	-0.92	81,152	-0.37	-0.74
Services	13,541	0.35	0.79	6,539	-0.31	-0.73

Source: calculated by the authors from the Annexes of Kavallari, Rau & Rutten (2013).

Notes: [a] S1: tariff elimination between EU and NAF trade, and intra-NAF trade.

[b] S2: tariff elimination as in S1and reduction of NTMs.

The implication of these changes for the rest of the economy is generally limited. The change in production is smaller than 0.1 percent[6]. The response of Turkish domestic prices to trade liberalisation between EU and NAF countries is also insignificant. The changes are all negative, of a magnitude of less than 0.5 percent. Effects on consumption are also negligible. The impact of declining imports and exports on Turkish GDP is also small but positive.

[6] The only exception is processed rice, but it is well known that rice is always problematic in models based on GTAP data due to the thin global market for rice.

6 Concluding Remarks

We analysed the effects of trade liberalisation, the world price increase of basic staple commodities and productivity growth in agricultural activities on Turkey using a dynamic computable general equilibrium model calibrated to 2008 data. In trade liberalisation scenarios, we simulated unilateral trade liberalisation, elimination of NTMs and an accession scenario. The other scenarios analysed were those described by Kavallari, Rau, & Rutten (2013). All scenarios were benchmarked against a baseline scenario in which the growth of the economy was calibrated in order to reflect historical averages.

Equivalent Variation is not significantly different under the tariff elimination and non-tariff measure elimination scenarios but is more than 2 times higher under the accession scenario, thus reflecting the importance of accession for trade liberalisation in agriculture. The effect of the increasing world price of wheat and the reduction of tariffs to stabilise domestic prices is not significant but the difference between these two scenarios adds up to USD 390 million. The effect of the total factor productivity increase scenario on consumer welfare is also limited compared to the trade liberalisation and food waste scenarios, which yield the highest welfare gains. The reflection of the welfare gains in GDP is generally small. The impacts are generally absorbed by the substitution mechanisms in trade, consumption and production. The overview of the simulation results suggests that trade liberalisation in agriculture is likely to have a limited overall effect under the current structure of the Turkish economy. Welfare gains are positive but not as high as expected for consumers.

Domestic prices for all agricultural commodities decline proportionally with the size of protection under trade liberalisation, with the exception of sugar beet and vegetables. Imports in all sectors increase. Manufacturing imports increase significantly. In terms of agricultural activities, the highest increase is in wheat, dairy products and other cereals. The increase in imports from the EU causes imports from other trading regions to decline, revealing significant trade diversion. Under accession, the impacts become stronger since the effects of trade diversion combine with the effects of increasing domestic production. Changes in exports differ considerably under different trade liberalisation scenarios. The effects are negligible under the tariff elimination scenario. Under the non-tariff measure elimination scenario, exports of rice, food, maize and fruits increase significantly. Exports of other field crops also increase significantly under the accession scenario.

To summarise, under trade liberalisation imports from EU countries increase significantly, causing domestic prices to decline in the trade liberalisation scenarios. Consequently, production levels of agricultural commodities fall. Since the decline in domestic prices is lower than the tariffs imposed in the other trading regions, prices of agricultural imports from other regions increase. This causes aggregate imports to

decline. Hence, trade liberalisation with the EU has a trade diversion effect, causing imports from other trading regions to decline. Food consumption increases with trade liberalisation. As a result, trade liberalisation increases food security.

Under the world wheat price increase scenario, it was observed that decreasing tariffs imposed on wheat by around 6 percent eliminates the effects of a world price increase on domestic prices and production. The effects of policy response occur mainly via wheat trade. Wheat imports from all regions decline by around 12 percent under the world price increase scenario. After tariff reductions, the change becomes insignificant. The change in exports to the Middle East and North Africa remains significant. Consequently, trade policy can be used to avoid the adverse effects of increasing world basic staple commodity prices. Increasing exports and declining imports can jeopardise food security if world prices increase. This effect is not significant for Turkey. The economy can handle the adverse effects on food security through substitution mechanisms.

The immediate impact of increasing total factor productivity is a surge in the production of agricultural commodities. The increase is between 2.5 and 6.3 percent for crops but varies between 1.8 and 2.4 percent for livestock-related activities. Expansion in agriculture and services production occurs at the expense of manufacturing production. This is due to the link between agricultural activities and manufacturing through the factor and intermediate input markets. Trade effects are relatively significant under the total factor productivity scenario. Food security improves substantially under the WS scenario. Turkey becomes less dependent on food product imports and contributes significantly to global food safety by exporting more than 8 percent of its food production. Subsequently, the total factor productivity increase in agricultural production boosts the production of all agricultural commodities, causing their prices to fall and exports to increase. The final magnitude of change is driven by competition for factors and the ability of activities to substitute intermediate inputs with factors becomes crucial.

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Appendix

A.1 Dynamic process of the model

Following Thurlow (2004), the recursive dynamic process is introduced into the model by capital accumulation, productivity, population and labour force growth.

The amounts of aggregate and sectoral capital in the current period are given respectively by:

$$K_t = K_{t-1}\left(1+R_t\right) \tag{1}$$

$$k_{t,A} = k_{t-1,A}\left(1+r_{t,A}\right) \tag{2}$$

where $k_{t,A}$ is the amount of capital used in the activity A while K_t is the amount of aggregate capital stock[7]. r_A is annual growth rate of capital stock used in activity A while R is the annual growth rate of aggregate capital stock. Annual growth rates are calculated by

$$R_t = \frac{D_t}{K_t} - \Delta_t \tag{3}$$

$$r_{t,A} = \frac{d_{t,A}}{K_{t,A}} - \delta_{t,A} \tag{4}$$

where D_t is the change in real aggregate capital stock and $d_{t,A}$ is the change in real sectoral capital stock while Δ_t and δ_t are corresponding depreciation rates. Change in aggregate capital is calculated as

$$D_t = \theta_{F,t}\frac{GFCF_t}{P_t} \tag{5}$$

where $\theta_{F,t}$ is the investment share of capital type F in total investment. Since we have only one type of capital, θ_t is always 1. $GFCF_t$ is gross fixed capital formation and P_t is the price of aggregate capital. Gross fixed capital formation is simply the value of investment in the previous period.

$$GFCF_t = \sum\nolimits_C PQ_{t,C}QINV_{t,C} \tag{6}$$

where $PQ_{t,C}$ is the price of commodity C, $QINV_{t,C}$ is the amount of good C used for investment. The price of aggregate capital in Equation (5) is calculated as

$$P_t = \sum\nolimits_C PQ_{t,C}B_{t,C} \tag{7}$$

[7] t is the time index for all variables and parameters.

where $B_{t,c}$ are the shares of investment goods in aggregate capital and is calculated as

$$B_{t,C} = \frac{QINV_{t,C}}{\sum_C QINV_{t,C}} \tag{8}$$

Lastly the sectoral capital stock is calculated as

$$D_{t,A} = \gamma_{t,A} D_t \tag{9}$$

where $\gamma_{t,A}$ is the investment share of capital stock of activity A in aggregate capital stock. $\gamma_{t,A}$ is calculated as

$$\gamma_{t,A} = \frac{K_{t,A}}{\sum_A K_{t,A}} \left(1 + \beta_2 \left(\frac{W_{t,A}}{\bar{W}_t} - 1 \right) \right) \tag{10}$$

where β_2 is an exogenous constant that determines the mobility of capital across sectors, $W_{t,A}$ is the price of capital in sector A. $\bar{W}_t$ is the average price of capital and is calculated as

$$\bar{W}_t = \sum_A W_{t,A} \frac{K_{t,A}}{\sum_A K_{t,A}} \tag{11}$$

That is , γ_A shows the share of investment in sector A adjusted for the differences in the price of capital. When the price of capital increases in a given sector, a relatively higher portion of gross fixed capital formation takes place in that sector.

Productivity growth is introduced as an exogenous increase in the shift parameter of the top level CES production function, $\alpha_{t,A}$.

$$\alpha_{t,A} = \alpha_{t-1,A} \left(1 + \eta_{t,A} \right) \tag{12}$$

where $\eta_{t,A}$ is total factor productivity growth.

Population growth implies growth in two exogenous parameters in the model: increasing subsistence level consumption and labour force. Subsistence level consumption growth is introduced as an exogenous shock to the subsistence level consumption parameter, μ_t.

$$\mu_t = \mu_{t-1} \left(1 + \varepsilon_t \right) \tag{13}$$

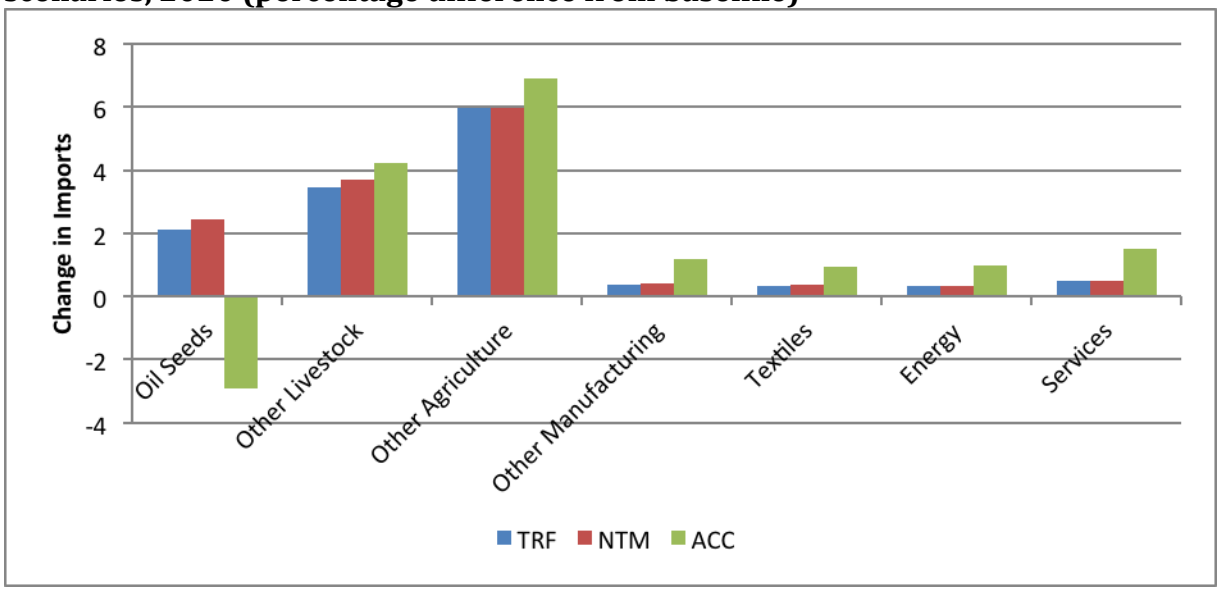
where ε_t is the population growth rate. Labour force growth is also introduced as an exogenous growth in the number of people participating in the labour force, L_t.

$$L_t = L_{t-1} \left(1 + \lambda_t \right) \tag{14}$$

where λ_t is the labour force growth. We differentiated between labour force growth and population growth since the former is generally lower than the latter. Lastly, an increase in the labour force does not necessarily imply increasing labour force participation since labour force participation is determined by real wage.

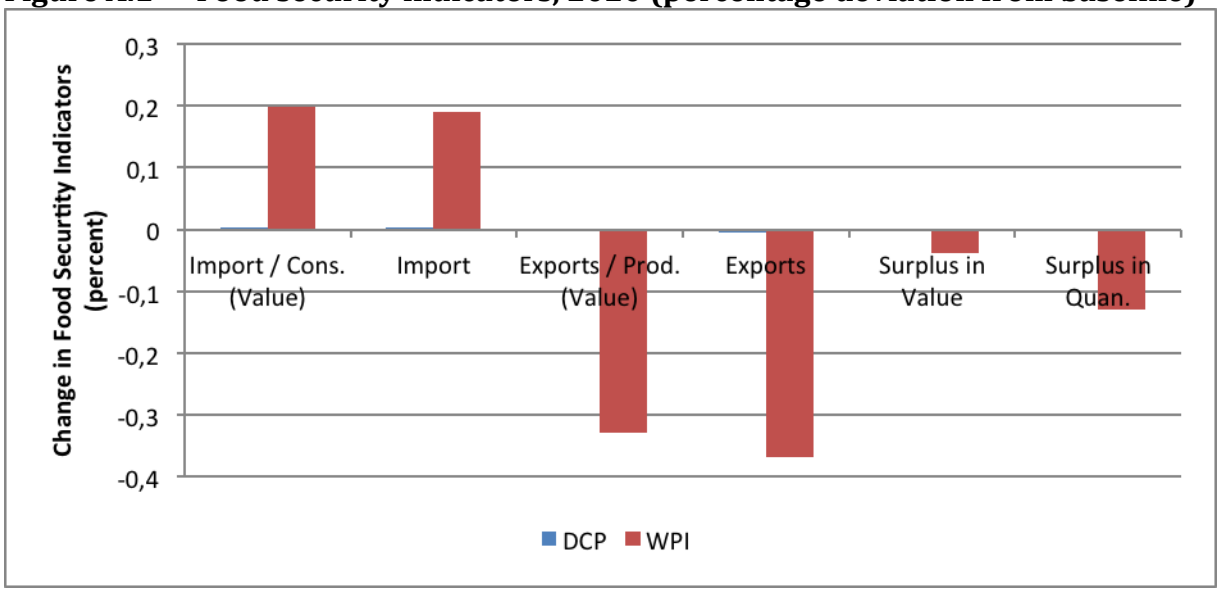
A.2 Tables and figures

Figure A.1 Changes in imports from EU countries under trade liberalisation scenarios, 2020 (percentage difference from baseline)



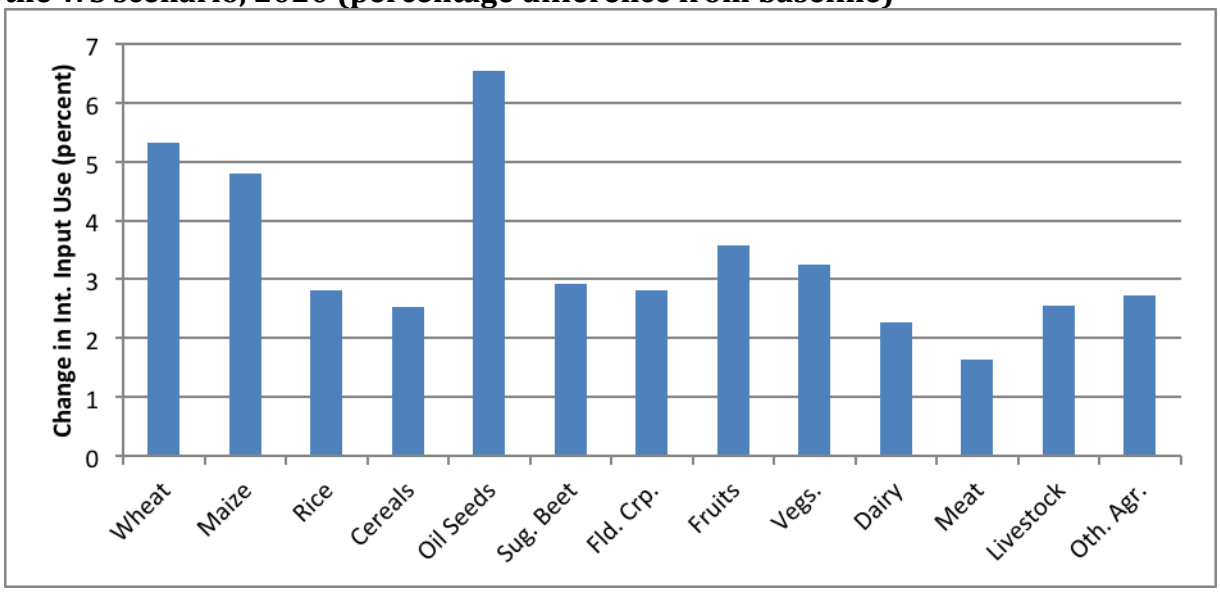
Source: model results

Figure A.1 Food security indicators, 2020 (percentage deviation from baseline)



Source: model results

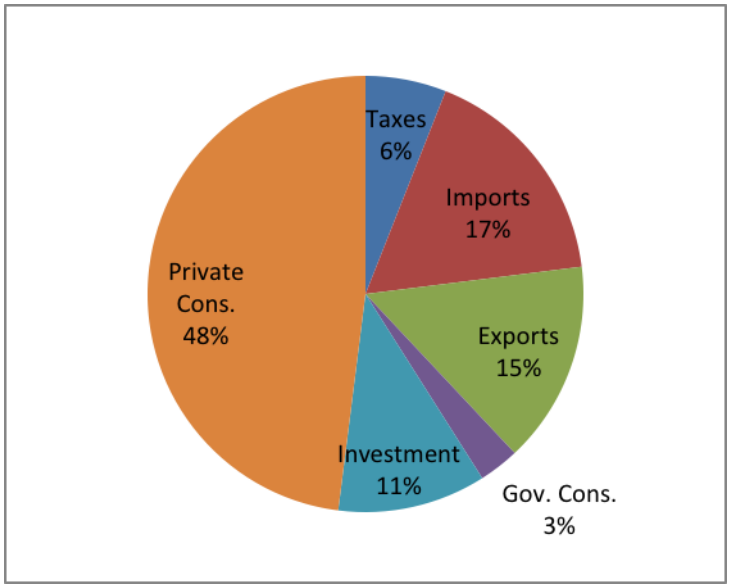
Figure A.2 Changes in intermediate input use in agricultural activities under the WS scenario, 2020 (percentage difference from baseline)



Source: model results

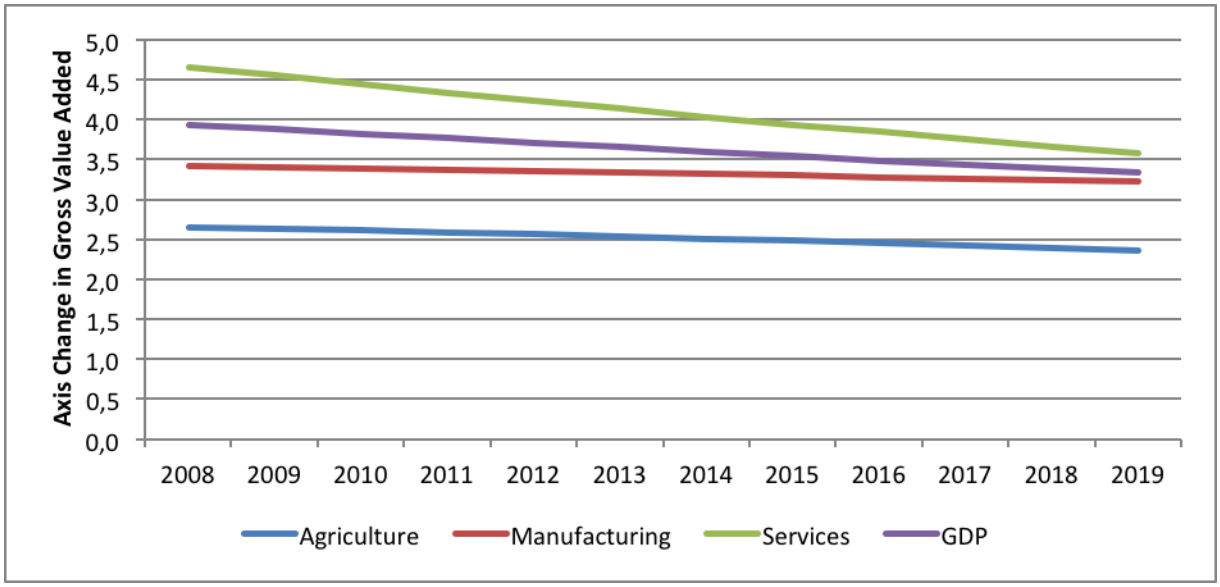
A.3 Results for the baseline Scenario

Figure A.3 Share of GDP components in the base year



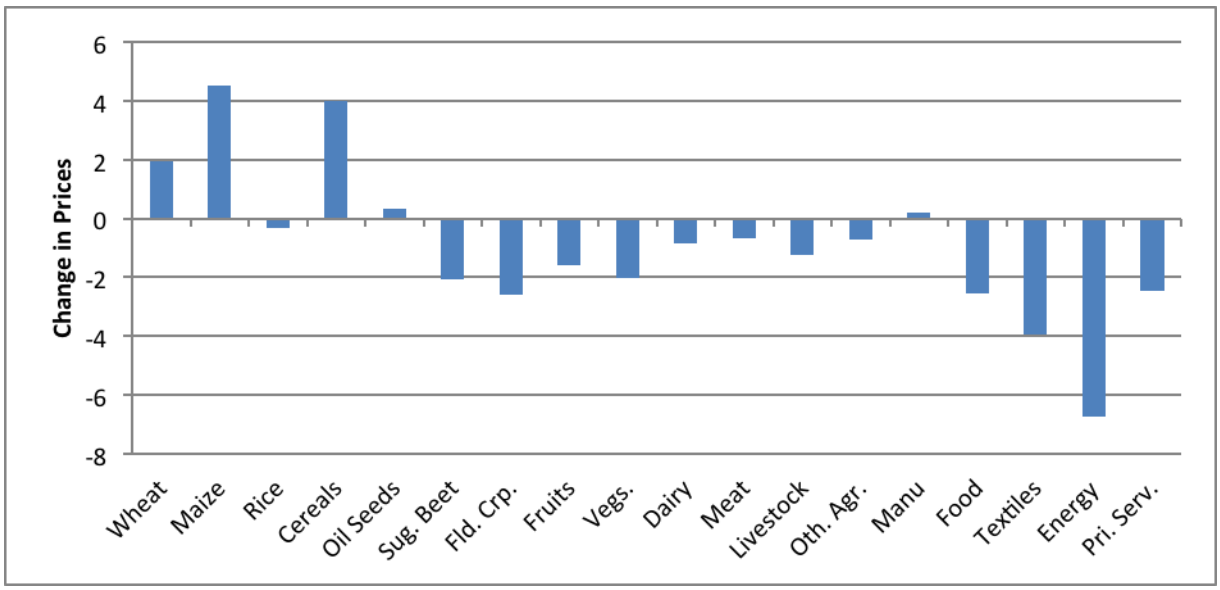
Source: model results

Figure A.4 GDP and value added growth in the Baseline Scenario (percentage change from the previous period)



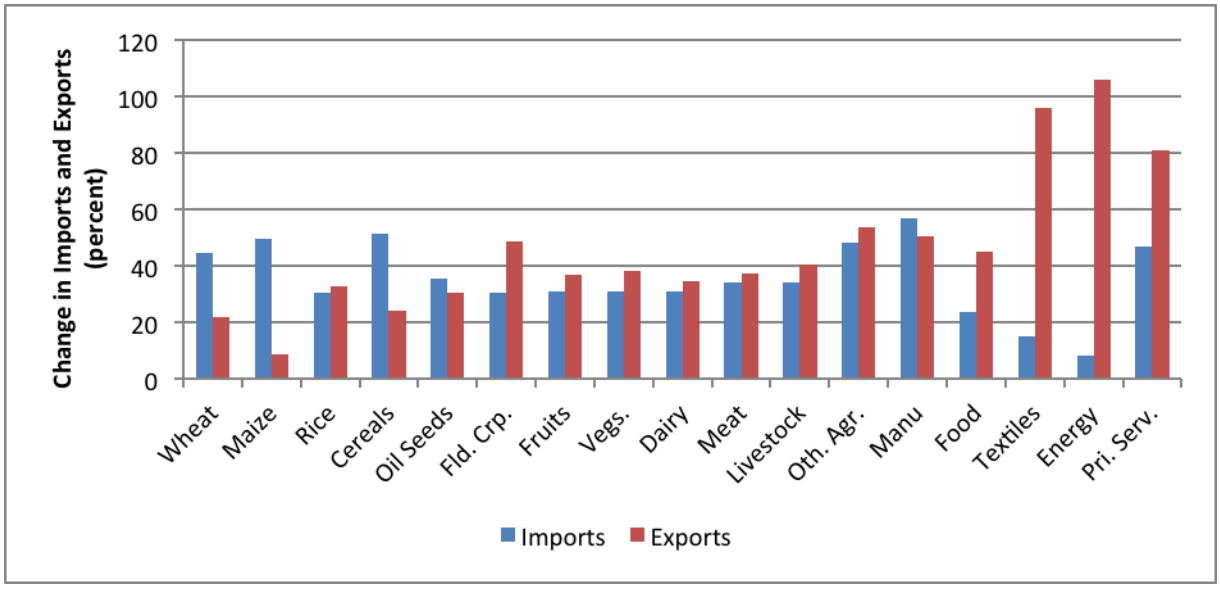
Source: model results

Figure A.5 Changes in prices in 2020 from base year under the Baseline Scenario (percentage deviation from the base year)



Source: model results

Figure A.6 Changes in imports and exports in 2020 under the Baseline Scenario (percentage deviation from the base year)



Source: model results

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Abstract

This study analyses the effects on Turkey of trade liberalisation, the increase in the world price of basic staple commodities and productivity growth in agricultural activities using a dynamic CGE model calibrated to 2008 data. The simulation results suggest that the Turkish economy is capable of accommodating the adverse effects of trade liberalisation. There are significant welfare gains if trade liberalisation is accompanied by CAP payments in the accession scenario. Trade policy turns out to be a strong instrument for stabilising domestic prices and avoiding the adverse effects of world price increases. An increase in productivity in agri-food production has a substantial impact on welfare and trade.

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