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TURKISH EU
MEMBERSHIP:
A SIMULATION
STUDY ON
ECONOMIC
EFFECTS

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Abstract: This paper evaluates the economic effects of Turkish EU membership. The evaluation is based on the widely utilized computable general equilibrium called model GTAP (Global Trade Analysis Project). Imperfect competition is modelled by existence of scale economies on non agricultural sectors. The latest GTAP database version (base year 2001) is aggregated into seven regions: Turkey, Germany-Austria, North EU, South EU, Balkan countries, NAFTA, ASIA and Rest of World. We analyse economic effects of abolishing trade barriers between the EU25 and Turkey and applying common external tax on Turkey. Turkish EU membership is clearly beneficial for Turkey and it does not seem to have significant negative impact for the rest of the world. If we take scale economies into account the aggregate effects are larger than in perfect competition case.

Key words: Turkey, EU, CGE, international trade

Tiivistelmä: Turkin EU jäsenyyden taloudellisia vaikutuksia analysoidaan numeerisella yleisen tasapainon mallilla (GTAP malli). Mallissa otetaan huomioon epätäydellinen kilpailu olettamalla nousevat skaalatuotot kaikilla toimialoilla paitsi maataloudessa. Turkin EU jäsenyys simuloitiin poistamalla kaikki jäljellä olevat tullit EU ja Turkin välillä sekä asettamalla Turkille sama keskimääräinen tullitaso kolmansiin maihin kuin EU:lla. Työvoiman siirtymistä Turkin ja EU:n välillä ei huomioitu. Simulaatiotulokset osoittavat, että Turkki hyötyy EU jäsenyydestä, joskin hyödyt ovat pieniä. EU:lle Turkin jäsenyydestä ei ole merkittäviä taloudellisia vaikutuksia. Epätäydellinen kilpailu oletus lisäsi Turkin saamia hyötyjä selvästi täydelliseen kilpailutasapainoon verrattuna.

Asiasanat: Turkki, EU, CGE-malli, skaalatuotot, kansainvälinen kauppa

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1. Introduction

1.1 Preliminaries: Turkey's integration with the EU

Turkey's integration with the European Community has a long history. It applied for associate membership already in 1959, just two years after the establishment of the European Economic Community (EEC). The application resulted in an association agreement (Ankara agreement) four years later in 1963. Already this agreement had an intermediate goal to gradually form a customs union with the EEC by 1995. Customs union was seen as a step to a full membership as the ultimate goal. No timetable was, however, set to full membership.

In practise, Turkey pursued very inward-oriented development strategies and trade policy during the 1960s and 1970s. Only in the 1980s the Turkish economy started to open up. The shift to more outward-oriented strategy led finally to an application for EU membership in 1989.

In 1996, Turkey and the EU agreed that Turkey will join the EU's customs union. The agreement covers industrial products and processed agricultural goods. Turkey adopted the EU's common external tariff (CET), resulting in lower duties for imports from third countries, including the United States. The union establishes zero duty rates and no quotas for non-agricultural items of EU and European Free Trade Association (EFTA) origin. The current import regime is organized in five chapters that list more than 20,000 items, identified with 12 digit harmonized tariff system numbers. Turkey also adopted most of the preferential trade agreements concluded by the EU, as well as other measures covered by the EU's external trade policy. Turkey did not, however, obtain any influence of EU's external trade policy – it only started to follow the EU's commercial policy. Moreover, agriculture was excluded and it is still heavily protected by both the EU and Turkey.

Turkey started its membership negotiations with the EU in October 2005 after a 16 years delay after its application. On Turkish side the public opinion on membership is positive. According to the most recent Eurobarometer survey 54 per cent of Turks are in favour of membership and only 20 per cent against. The share of Turks who do not favour nor oppose Turkish membership has increased during the negotiations. In general, the survey results demonstrate that economic prosperity, social protection and freedom to travel, study and work in other EU countries are seen as the main benefits whereas less use of own language, loss of national identity and organised crime are placed as the main fears. All in all the results suggest that Turks think that they will benefit from membership, in particular, economically.

On the EU side the opinion is not at all as positive. Only 39 per cent of EU citizens are in favour of Turkish membership. Moreover, among the potential new member states Turkey is seen as least popular. The public opinion towards Turkish membership is most critical in Austria, Germany and Luxembourg. This suggests that membership negotiations will last long and, indeed, they have made only little progress so far.

Thus a number of Europeans seem reluctant to accept Turkey as a member of the EU. One reason may be that culture of the Turkish society is seen 'non-European' reflecting the fact that Islam is the main religion and that Turkey is largely an Asian rather than a European country. Another reason why EU members may be reluctant about the Turkish accession may originate from its size. Population forecasts indicate that the Turkish population will exceed that of Germany by 2020, which would mean that Turkey would be the biggest country in the EU and hence it would obtain substantial power in EU decision making.

1.2 Earlier studies on Turkey's EU membership

Despite the sluggish progress in membership negotiations it is important to evaluate the effects of Turkish membership from several perspectives. In this paper, we concentrate on the economic effects of Turkish EU membership using a computable general equilibrium model. There are several earlier studies on Turkish EU integration using similar methodology. Harrison, Rutherford and Tarr (1997) estimated that gain from adopting the EU's common external tariff (CET) amount 1.1 percent of Turkish GDP. As an implication Francois (2005) argues that the trade effects of EU membership will be very small due to the existing CU between the EU and Turkey. The same reason leads him to conclude that in terms of regulatory stance Turkey has developed towards the EU regime. Agriculture is not, however, a part of the CU and therefore the most substantial trade effects of Turkey's membership are expected concern agriculture.

Lejour and de Mooij (2005) focus on three following main changes associated with Turkish membership: accession to the internal European Market, institutional reforms in Turkey triggered by EU-membership and migration in response to the free movement of workers.

The authors utilise gravity estimation to derive the trade potential between the EU and Turkey. By comparing this potential trade with actual trade, they estimate the tariff equivalent of the remaining trade barriers between Turkey and the EU. These barriers were then removed to simulate the accession of Turkey to the EU internal market, thereby using a computable general equilibrium (CGE) model for the world economy that is calibrated on data for 2001. The *acquis communautaire* could act as a catalyst for improving institutions in Turkey. Many institutional indicators show that these institutions are less market oriented

in Turkey than in the EU member states or the other accession countries. The authors investigate to what extent a reform of these institutions could benefit the Turkish economy by improving its competitive position. This was done by deriving the trade potential between Turkey and other countries if the institutions would be improved. They then simulated the macroeconomic effects of this trade increase with CGE model. Thirdly, the authors elaborated on the potential migration flows following the accession of Turkey to the EU. They explored the implications for labour markets with their CGE model.

The main findings of Lejour and de Mooij study are three-fold. First, the economic effects are asymmetric. The accession to the internal market yields positive effects for Turkey: private income (a measure for welfare) increases by 4.4 billion US\$ (approximately € 3.5 billion, assuming 1€ = 1.25US\$), while GDP expands by about 0.8% in the long term. Incumbent EU countries benefit from the accession of Turkey to the EU, albeit only marginally. This is a typical finding in studies concerning EU enlargements where a relatively small country or groups of countries is assumed to join. The result is simply due to the fact that the EU is in relative terms much more important trading partner to Turkey than Turkey is to the EU. Second, membership in the Internal Market is likely to improve national institutions in Turkey and this would bring large effects relative to the direct impact of the accession to the Internal Market. Turkish GDP would increase according to Lejour and Mooij estimate by 5.6% due more working institutions. Third, migration involves a potentially important effect in light of the accession of Turkey to the EU. An expected inflow of 2.7 million Turks to the current EU, mainly to Germany, would reduce GDP in Turkey by between 1.8% and 2.2%, and increase it in the EU-15 by between 0.5% and 0.7%, depending on the skill composition of the migrants. Flam (2005) estimates that the number of Turks in Germany will reach 3.5 million from the current 2.2 million. Drawing on earlier empirical and theoretical literature, he argues that wages of skilled workers might increase in the current EU countries if the immigrants are complements to local skilled labour. Wages of unskilled labour, in turn, are likely to decrease.

Francois (2005) explores both quantitative and qualitative implications of Turkish accession to the EU for the transport sector. The paper executed an application of numerical estimates of the economy-wide and sector impact of accession (given the pre-existence of a customs union) on the sector. Also a factor analysis of regulatory regimes was performed.

The customs union, as currently constructed, yielded a boost in Turkish welfare (measured as a % of base national income) of over 1.3 % relative to baseline with MFN industrial tariffs. Based on 1997 values, this was comparable to a boost in real GDP of \$2.2 billion. The static effect is slight, adding less than 0.1 % to welfare through induced capital accumulation. Both skilled and unskilled workers gained from the agreement, with a 2.2 % and 1.7 % boost to real

incomes (net of changes in the CPI) over the long-run. Such wage changes were considerable, given that they were realised in the context of a trade agreement.

In their recent study, Togan and Hoekman (2005) argue that the main economic dimensions of Turkish membership are the availability of the EU model, free labour mobility, assistance from the EU budget and EU institutions. Contrasting to other studies they argue that the first effect seems gradually been achieved through the CU with the EU. Agriculture, which has an important role in the Turkish economy, is however excluded from the CU. De-regulation is another additional issue that is not directly implied by the CU but is an essential part of the Internal Market. Togan (2005) estimates that the economic gain from EU membership for Turkey will be 3.6 per cent of Turkish real household income and 2.6 percent increase in GDP. The major impact on welfare comes from deregulation of banking, transportation, telecommunications and electricity sector. The total income effect is slightly smaller than in Lejour and Mooij (2005) but the output effect is slightly bigger. In this paper, we also deal indirectly with regulation by using a simulation model that assumes imperfect competition. We also put emphasis on sectoral and geographical results.

2. The Turkish economy

The per capita GDP for the year 2003 (PPP) is almost 6,400 dollars, significantly lower than the average of the EU. The main contribution to the Turkish GDP comes from the services sector (60%). Other sources are industry (28%) and agriculture (12%). Tourism is the leading branch in the services sector. In 2000, the number of tourists reached 10.2 million while the forecast is that by the year 2020 the number of tourists visiting Turkey each year will reach some 40 million. Approximately 33% of the Turkish work force is employed in agriculture.

The Turkish economy possesses a number of advantages, including a very young population, very low labour costs (some 25% of the labour costs that are the norm in Germany), a proficient labour force and a central and convenient location between Western Europe, Asia and the countries of the Middle East.

In 2003, exports from Turkey amounted to some 47 billion dollars. In the same year, imports into Turkey amounted to some 68 billion dollars. The main export components are the textile industry, followed by the automobile industry and food. The main import components are machinery and equipment and the import of types of fuel. Turkey's main trading partners are the countries of the EU. In 2003, main exports were to Germany (16%), the U.S. (8%) and the U.K. (8%).

In 2003, most imports were from the EU countries, with Germany (13.7%) and Italy (7.9%) being the main import sources. The Turkish economy benefits from a Customs Union agreement that was signed in 1996 with the EU. The agreement increases profitability of trade with the EU countries. The main natural resources in Turkey are the Chromites copper mines, sulfur and coal. Turkey is also very rich in water resources that it is attempting to export to other countries. The Turkish economy benefits from membership of a number of international organizations, including, among others - NATO, OECD and IMF.

Analysis of the main indices in Turkey shows a high rate of inflation in Turkey compared to the EU. Despite the recent decrease in inflation, the 2003 annual rate of inflation is still around 25% per annum. The forecast for 2004 is around 11%. The GDP in 2002-2003 shows a recovery. The unemployment rate in 2003 is around 10%.

The Government of Turkey estimates that as a result of its accession to the European Customs Union, the average duty rate for imports from the European Union and EFTA countries has dropped from approximately ten percent to zero. For products imported from third countries, including the United States, the average duty rate has dropped from ten percent to approximately five percent. Turkey has reserved some exempted categories for sensitive products with tariffs

on these items generally much higher than the CCT. Some agricultural goods will remain protected by steep tariffs until the next WTO round is concluded. When the European Union applies further Uruguay Round reductions, Turkey's average rates for third countries (including the U.S.) will be lowered to 3.5 percent.

Turkey is a member of GATT/WTO and regulates its customs practices in line with GATT requirements. In 1989, Turkey, along with the United States, converted to the new GATT Harmonized System. While generally in compliance with the WTO agreement, Turkey has exceeded its annual export subsidy limits for sugar and wheat in the past. In the current year, Turkey has exceeded its limits for barley. Turkey regularly fails to notify the WTO of changes to import requirements. Application of non-tariff barriers also poses problems for agricultural products such as wheat and bananas. Maintenance of high import duties on agricultural products, while consistent with WTO obligations, is not consistent with the spirit of the WTO agreement. Turkey's failure to establish protocols for the importation of all meat products (except for breeding cattle-beef and dairy), effectively banning all imports is in violation of WTO obligations.

Import duties are calculated on the CIF value. Turkey is a signatory to Article VII of the General Agreements on Tariffs and Trade (GATT). The agreement stipulates that the customs valuation is the transaction value (the price that is actually paid or payable plus costs and expenses). Turkey is also obliged to comply with other Article VII provisions including the rapidity of clearance of goods, currency convertibility, and appeal privileges and rights. Turkish regulations do not allow for advance rulings on customs HS classification or on the applicable import duties on particular products.

3. GTAP model

The Global Trade Analysis Project¹ (GTAP) is a multi-region, computable general equilibrium (CGE) model. The inter-regional linkages originate from bilateral trade flows, while intra-industry linkages are captured by the regional input-output structure. The associated GTAP database covers bilateral trade data, structure of production, consumption and intermediate use of commodities and services. The latest version of the database, GTAP 6 Beta, includes 78 different regions² and 57 different sectors of production.

Macroeconomic data (GDP, private consumption, government consumption, and investment) are used in updating the input-output tables to a common reference year – 2001. The primary source of 2001 macroeconomic data used in the GTAP 6 Data Base is the World Bank.

Reconciled bilateral 2001 merchandise trade data is based on COMTRADE data. Services trade data was updated to 2001 using the IMF Balance of Payments Statistics.

GTAP model computes money metric equivalent of aggregate per capita utility for a region (using the regional household's utility function). The regional household's Equivalent Variation (EV) is the difference between the expenditure required to obtain the new, post-simulation level of utility at initial prices.

The standard GTAP-model is a multi-region, applied general equilibrium model, with perfect competition and constant returns to scale. Imports are differentiated by their source from domestic goods, that is, the Armington assumption is made on bilateral trade. The standard model has some salient features that distinguish it from other CGE models: a presentation of private household preferences with a non-homothetic constant-difference-of-elasticity (CDE) functional form, an explicit treatment of international trade and transport margins, and a global banking sector which intermediates between global savings and consumption.

Each industry is represented by a single homogeneous commodity. The basic model includes three factors of production: labour, capital, and land. Labour and capital are mobile across domestic sectors, while land is assumed to be used only in agricultural sectors. Capital is traded internationally like intermediate inputs, while labour and land are not mobile across borders.

The model gives users a wide range of closure options (choosing which variables are exogenous), including a selection of partial equilibrium closures which

¹ See (<http://www.gtap.agecon.purdue.edu>)

² Of which 56 are primary regions and 10 composite regions.

facilitate comparison of results to studies based on partial equilibrium assumptions.

Production is presented by a multi-level production function. The upper nest is a Leontief production function involving value added and intermediate inputs. Value added is produced through a Constant Elasticity of Substitution (CES) function of the three primary factors of production. Each intermediate input is in turn produced using domestic and imported components (the Armington assumption) with the technical process described by a CES function. Finally, imported components are a mix of imports from the other regions in the global model with the technical process again described by a CES function.

3.1 Imperfect competition in GTAP

The standard GTAP model assumes perfectly competitive markets and hence marginal cost pricing rule. Francois (1998) formulated an imperfect competition module that can be added to the standard GTAP model. The imperfect competition module³ includes several types of oligopoly models: increasing returns to scale, monopolistic competition, and free entry and exit assumptions. The models are documented in Francois (1998).

For this study we considered the effect of scale economies. For these we needed information on cost disadvantage ratios defined as $CDR = (AC-MC)/AC$.

Martins et. al (1996) estimate sector specific P/MC margins for OECD countries. The link between cost disadvantage ratio and price cost margins comes from

$$CDR = (AC-MC)/AC = (P-MC)/P = 1-(MC/P) \text{ under } P = AC \text{ pricing.}$$

In the model, falling average costs are captured via variable ao , which is output augmenting technical change. For imperfectly competitive sectors this is determined endogenously via following equation.

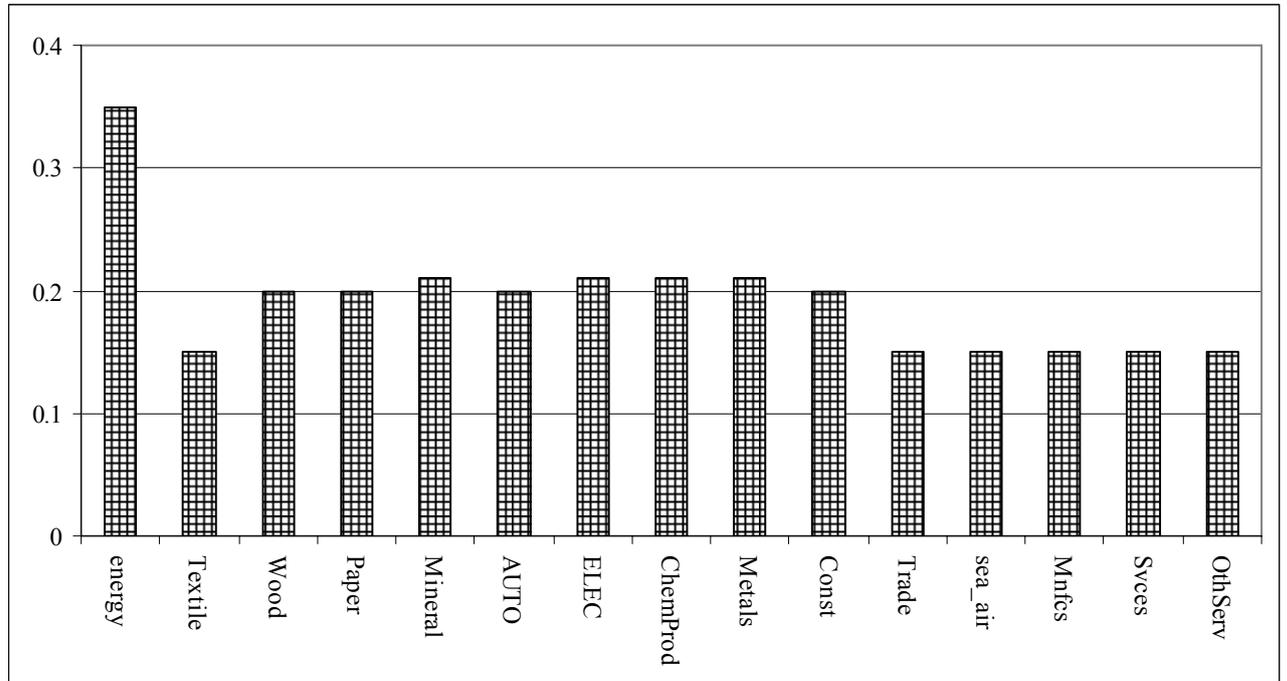
$$\frac{1}{CDR} = (qva - FIRMS) = ao$$

where CDR denotes the scale-economies parameter defined above, qva is percentage change in real value-added demanded by the sector. $FIRMS$ is a variable denoting entry to the market (assumed here exogenous). According to the above equation, ao rises, or equivalently average costs fall as the quantity of value-added per firm rises. The rate at which this fall in average costs takes place when output increases depend inversely on the CDR parameter value. Figure1

³ see also <http://130.94.208.165/francois/data.htm>

shows calculated scale parameter values, which were derived from mark-up estimates.

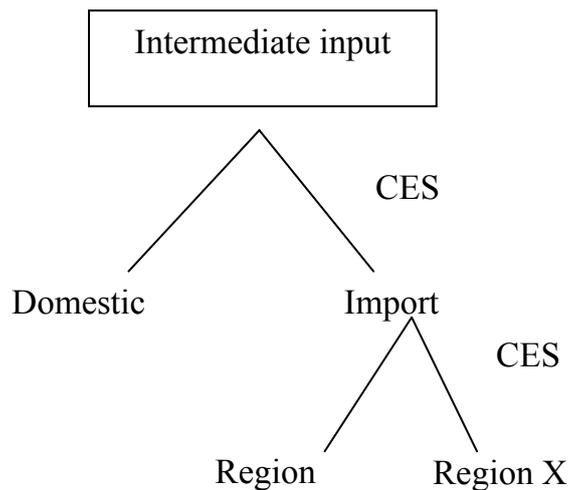
Figure 1 Scale parameter values



Note: Using the fact that $CDR = (AC - MC) / AC = (P - MC) / P = 1 - (MC / P)$ under $P = AC$ pricing, the above estimates for the scale economies parameter were used.

Togan (2005) considers only some industries with a different methodology. He ends up with 26 per cent price decline in banking, 33 per cent in telecommunications, 9 per cent in transport and 21 per cent in electricity. Using these we end up with almost exactly the same scale parameters as shown in figure 1.

In models where so called Armington assumption is made, goods are differentiated by country of origin. In multi-country models like GTAP, similarity of goods from different regions is measured by the elasticity of substitution. Within a particular region, it is assumed that demand goods from different regions are aggregated into a composite good according to the CES function.



The imperfect competition module assumes a non-nested Armington structure, that is, the Armington CES elasticity for domestic/imported allocation equals, the Armington CES elasticity for regional allocation of imports.

4. Simulations

Original GTAP data is aggregated into 8 new regions (original 78 regions) and into 15 new sectors of production (57 original industries). The 8 regions in the simulations are Turkey, EU north (EUN) comprising Nordic countries, Baltic countries, Benelux countries, Poland, the UK and Ireland; EU south (EUS) comprising the rest of the EU except Germany and Austria that are assumed to form one unit; Balkan countries, NAFTA, Asia and the rest of the world (ROW). The industry aggregation can be seen in figure 1 and the detail in appendix 2.

4.1 Scenarios and shocks

In order to assess economic effects of Turkish EU membership we run the following simulations.

1. EU membership under competitive market structure– this corresponds to standard GTAP model with import sourcing.
2. EU membership with imperfect competition with no entry – assuming existence of scale economies
3. EU membership with imperfect competition with entry – as above, but with zero profit assumption

The shocks implies fairly small within EU changes in import tariffs. Table 1a reports import tariff change from turkey to EU. Only Agricultural and metal products face noticeable percentage changes in tariff rates. The changes are calculated from the base year 2001 GTAP data base.

Table 1a . Import tax change due EU-membership on good i imported from Turkey to region s

	GermanyAustria	EU North	EU South
Agriculture	-4.19	-2.43	-9.50
energy	0.00	0.00	0.00
Textile	0.00	-0.03	-0.31
Wood	0.00	-0.01	-0.11
Paper	0.00	-0.01	-0.58
Mineral	0.00	-0.03	-0.14
AUTO	0.00	-0.01	-0.09
Electrical appliances	0.00	0.00	-1.05
ChemProd	0.00	-0.01	-0.45
Metals	-1.21	-4.16	-5.58
Const	0.00	0.00	0.00
Trade	0.00	0.00	0.00
sea_air	0.00	0.00	0.00
other manufactures	0.00	-0.01	-0.37
Services	0.00	0.00	0.00
Other services	0.00	0.00	0.00

Table 1b reports import tariff rate changes from the Turkey's point of view. Import tariffs on imported agricultural products from Germany-Austria region falls by 12.29 percent due to the trade union. As can be seen all but agricultural products face little or no import tariff changes when the import origin is EU. The Common external tariff that is applied on Turkey due it's EU membership implies, however, changes in import tariff rates on imports from non-EU countries. In general, the common external EU import tariff implies that Turkey has to lower its import tariffs visa-a-vis non EU countries.

Table 1b. Import tax change due EU membership on good i imported from region r to Turkey

	GermanyAustria	EU North	EU South	Balkan	NAFTA	ASIA	ROW
Agriculture	-12.29	-7.94	-12.19	-14.60	-15.80	-25.59	-14.46
energy	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Textile	0.00	-0.07	-0.05	0.72	-1.03	-7.82	-1.78
Wood	0.00	-0.03	-0.15	0.62	-7.70	-3.88	-0.36
Paper	0.00	0.00	-0.10	0.94	-0.67	-2.00	-0.55
Mineral	0.00	0.00	-0.07	0.57	-1.29	-3.46	-0.44
AUTO	0.00	0.00	-0.14	-2.47	-5.30	-7.88	-4.40
Electrical appliances	0.00	0.00	-0.96	0.70	0.01	-2.30	0.53
ChemProd	-0.01	-0.03	-0.08	0.78	-3.14	-3.08	-0.88
Metals	0.00	0.00	-0.04	-6.66	-2.39	-4.47	-3.42
Const	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Trade	0.00	0.00	0.00	1.00	1.00	1.00	1.00
sea_air	0.00	0.00	0.00	1.00	1.00	1.00	1.00
other manufactures	0.00	0.00	-0.06	0.86	-0.41	-1.06	0.42
Services	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Other services	0.00	0.00	0.00	1.00	1.00	1.00	1.00

4.2 Results

Our simulation results confirm earlier findings that suggest clear benefits for Turkey and not significant impact on the other parts of the world. Figures 2 and 3 show the welfare effect measured by equivalent variation in million of USD and the output effect as a percentage of GDP. As an aggregate the rest of the world seems to gain welfare slightly especially in scale with entry scenario. This does not hold in standard benchmark scenario with perfect competition in which the EU incumbent countries lose. Moreover, EU south loses under both imperfect competition scenarios. The output effect for the rest of the world can hardly be seen.

Compared to earlier quantitative estimates our positive effect for Turkey is smaller in terms of output and welfare than most of the earlier studies. Our results are, however, very similar to those obtained in Francois (2005). He also considers dynamic effects, which is not done here. Their impact on welfare is

roughly additional 50 per cent and they have various output effects, biggest being in agriculture.

Figure 2. Economic welfare effects of Turkish EU accession, EV in mill. USD

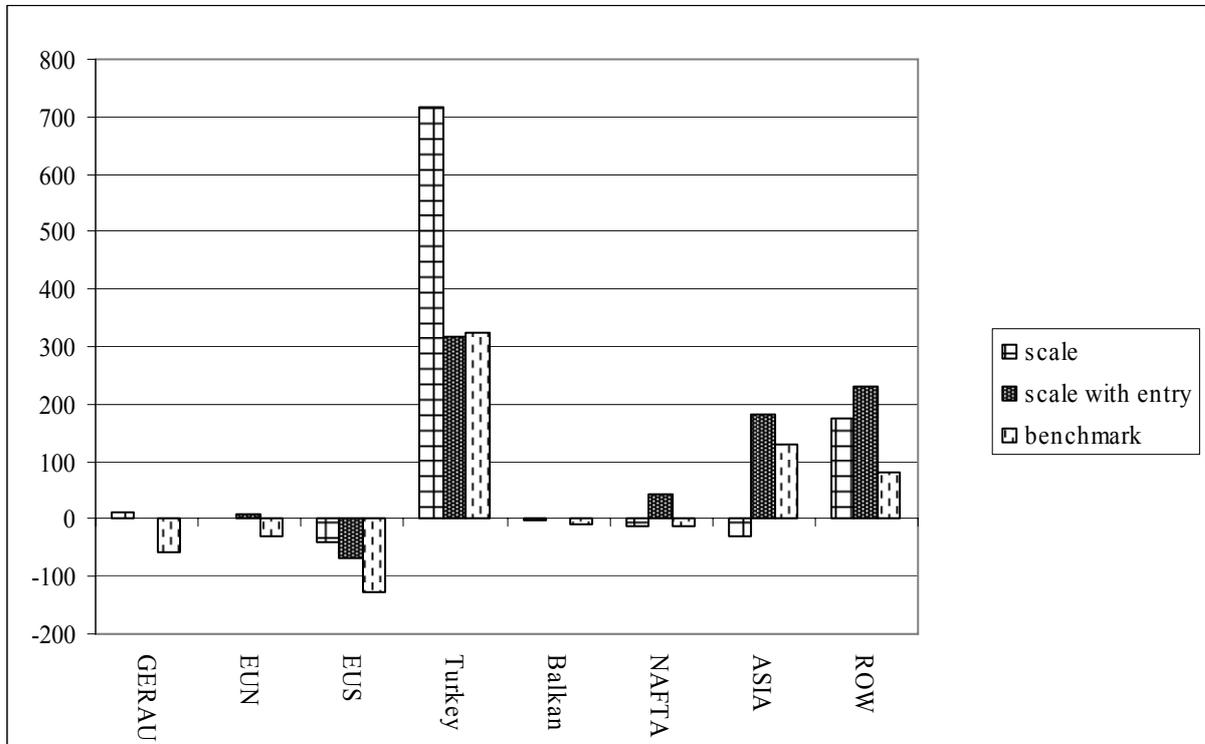
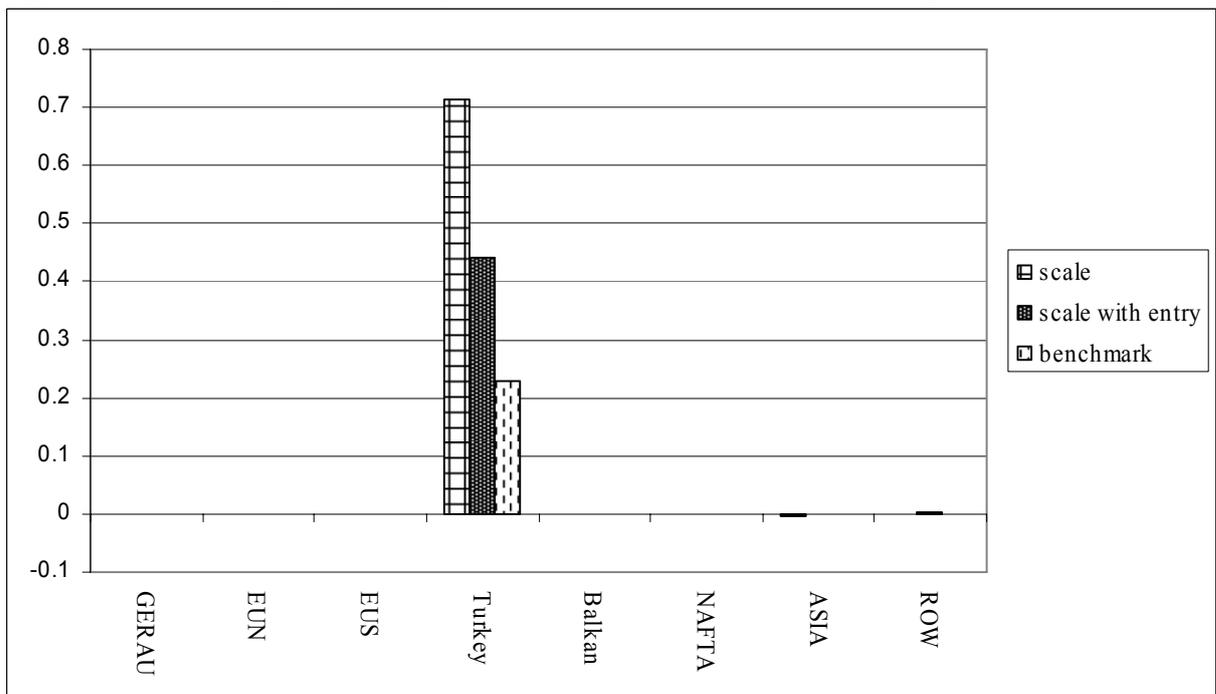


Figure 3 The output effects of Turkish accession to the EU, % of GDP



Let us next have a look on sectoral output effects shown in Table 2. These results assume scale economies and no entry. Again there are no significant effects on other regions and countries than Turkey. The sectors that gain output in Turkey are wood, electronics, manufactures and to some extent car and textile industries. The only sector that is shrinking is agriculture as would be expected. Compared to Francois (2005) results ours are somewhat different as we obtain a positive output effect for car and metals industries. Moreover, in textiles the output effect in table 2 is much smaller than in Francois (2005). One obvious reason for this is the small scale parameter value in textiles.

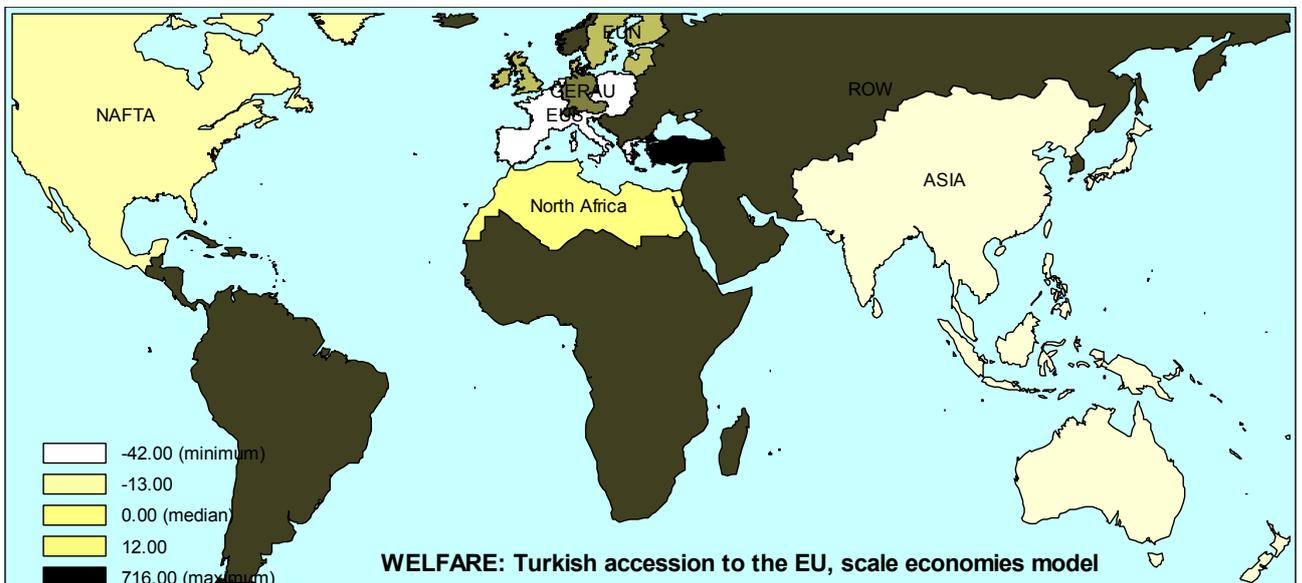
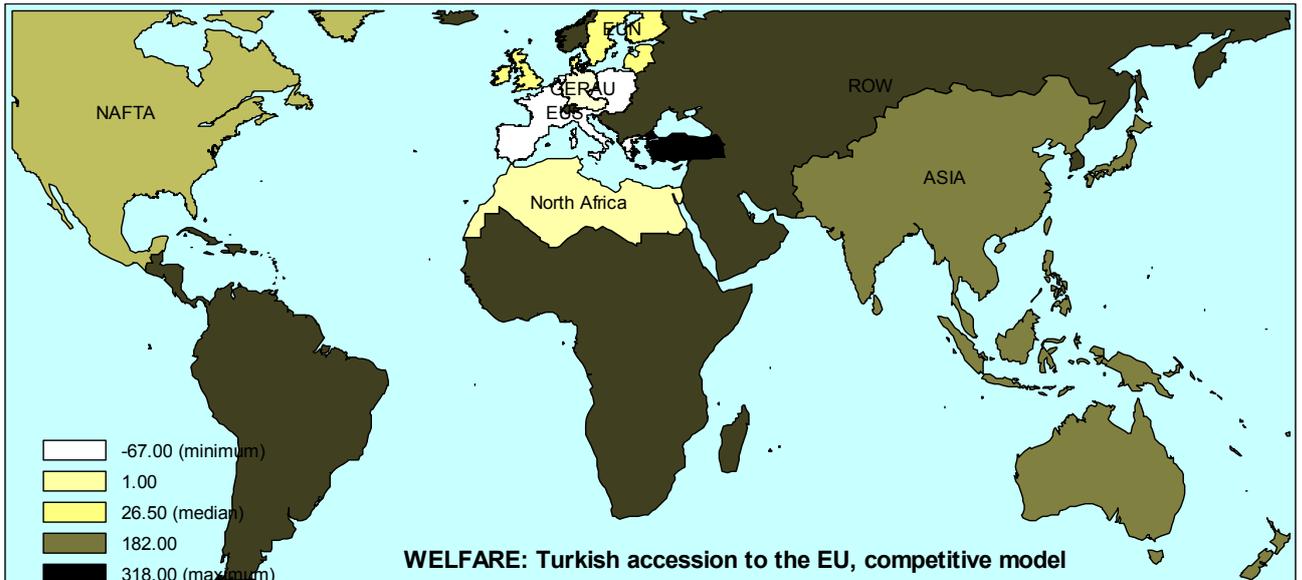
Table 2. The effects of Turkish accession to the EU on output in different regions and sectors assuming scale economies

	GERAU	EUN	EUS	Turkey	BALK	NAFTA	ASIA	ROW
AGRI	-0.071	-0.016	-0.064	-4.575	0.031	0.042	0.056	0.024
energy	0.017	0.012	0.019	0.776	0.014	0.003	-0.003	0.001
Textile	-0.236	-0.160	-0.112	1.754	-0.246	-0.015	0.044	-0.088
Wood	-0.022	-0.003	0.013	6.758	-0.037	0.000	-0.037	-0.063
Paper	0.013	0.001	0.014	0.481	-0.014	0.002	-0.008	-0.019
Mineral	-0.002	-0.008	-0.002	1.064	-0.001	-0.003	-0.009	0.001
AUTO	0.006	-0.009	0.009	1.747	-0.014	-0.004	-0.018	-0.017
ELEC	0.049	0.015	0.096	3.594	-0.007	0.000	-0.042	-0.050
ChemProd	0.011	0.001	0.004	0.238	-0.035	0.003	-0.001	-0.004
Metals	0.073	-0.092	-0.133	4.640	0.122	-0.010	-0.012	0.089
Const	-0.010	-0.003	0.000	1.490	-0.003	-0.003	-0.005	0.005
Trade	0.002	0.001	0.000	0.585	0.002	0.000	-0.006	0.000
sea_air	0.042	0.030	0.047	0.556	0.030	0.001	0.004	0.008
Mnfcs	0.045	0.023	0.073	3.976	-0.027	-0.015	-0.048	-0.073
Svces	-0.003	-0.003	-0.007	0.940	0.006	0.000	-0.002	0.000
OthServ	0.005	0.003	0.005	0.475	0.004	-0.002	-0.006	-0.002

Overall, Turkish EU membership is clearly beneficial for Turkey and it does not seem to have significant negative impact for the rest of the world. If we take scale economies into account the aggregate effects are larger than in perfect competition case. This is illustrated in figure 4 with two maps which illustrate distribution of welfare. In the maps, the darker the area the larger the calculated equivalent variation value with Turkey appearing as black. It seems that under competitive model the close-by regions (GERAU and North Africa) gain less than under imperfect competition. This applies to Turkey as well. Turkey obtained total welfare of about 300 million USD under competitive model, while the figure was over 700 million USD under imperfect competition.

Also, the industries having the highest scale parameters naturally gain more than those with lower scale parameters, which makes some difference to the results that assume perfect competition. Still, lighter industries like electronics and light manufacturing, where Turkey has comparative advantage, are the winners in the deeper EU integration.

Figure 4. Regional welfare distribution maps - competitive and scale economies models



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Appendix 1. Aggregation of the data – Sectors of production

Model	Original GTAP data	Model	Original GTAP data
AGRI	Paddy rice	Metals	Ferrous metals
AGRI	Wheat	Metals	Metals nec
AGRI	Cereal grains nec	Metals	Metal products
AGRI	Vegetables, fruit, nuts	Mineral	Minerals nec
AGRI	Oil seeds	Mineral	Mineral products nec
AGRI	Sugar cane, sugar beet	Mnfcs	Transport equipment nec
AGRI	Crops nec	Mnfcs	Machinery and equipment nec
AGRI	Cattle,sheep,goats,horses	Mnfcs	Manufactures nec
AGRI	Animal products nec	OthServ	Communication
AGRI	Raw milk	OthServ	Financial services nec
AGRI	Forestry	OthServ	Insurance
AGRI	Fishing	OthServ	Business services nec
AGRI	Meat: cattle,sheep,goats,horse	OthServ	Recreation and other services
AGRI	Meat products nec	OthServ	PubAdmin/Defence/Health/Educat
AGRI	Vegetable oils and fats	OthServ	Dwellings
AGRI	Dairy products	Paper	Paper products, publishing
AGRI	Processed rice	sea_air	Transport nec
AGRI	Sugar	sea_air	Sea transport
AGRI	Food products nec	sea_air	Air transport
AGRI	Beverages and tobacco products	Svces	Electricity
AUTO	Motor vehicles and parts	Svces	Gas manufacture, distribution
ChemProd	Petroleum, coal products	Svces	Water
ChemProd	Chemical,rubber,plastic prods	Textile	Plant-based fibers
Const	Construction	Textile	Wool, silk-worm cocoons
ELEC	Electronic equipment	Textile	Textiles
energy	Coal	Textile	Wearing apparel
energy	Oil	Textile	Leather products
energy	Gas	Trade	Trade
		Wood	Wood products

Appendix 1. Aggregation of the data – regions

Model	Original GTAP data	Model	Original GTAP data
ASIA	Australia	Nafr	Morocco
ASIA	New Zealand	Nafr	Tunisia
ASIA	Rest of Oceania	Nafr	Rest of North Africa
ASIA	China	NAFTA	Canada
ASIA	Hong Kong	NAFTA	United States
ASIA	Japan	NAFTA	Mexico
ASIA	Taiwan	NAFTA	Rest of North America
ASIA	Rest of East Asia	ROW	Korea
ASIA	Indonesia	ROW	Colombia
ASIA	Malaysia	ROW	Peru
ASIA	Philippines	ROW	Venezuela
ASIA	Singapore	ROW	Rest of Andean Pact
ASIA	Thailand	ROW	Argentina
ASIA	Vietnam	ROW	Brazil
ASIA	Rest of Southeast Asia	ROW	Chile
ASIA	Bangladesh	ROW	Uruguay
ASIA	India	ROW	Rest of South America
ASIA	Sri Lanka	ROW	Central America
ASIA	Rest of South Asia	ROW	Rest of FTAA
EUN	Denmark	ROW	Rest of the Caribbean
EUN	Finland	ROW	Switzerland
EUN	United Kingdom	ROW	Rest of EFTA
EUN	Ireland	ROW	Rest of Europe
EUN	Sweden	ROW	Albania
EUN	Estonia	ROW	Bulgaria
EUN	Latvia	ROW	Croatia
EUN	Lithuania	ROW	Cyprus
EUS	Belgium	ROW	Malta
EUS	France	ROW	Romania
EUS	Greece	ROW	Russian Federation
EUS	Italy	ROW	Rest of Former Soviet Union
EUS	Luxembourg	ROW	Rest of Middle East
EUS	Netherlands	ROW	Botswana
EUS	Portugal	ROW	South Africa
EUS	Spain	ROW	Rest of South African CU
EUS	Czech Republic	ROW	Malawi
EUS	Hungary	ROW	Mozambique
EUS	Poland	ROW	Tanzania
EUS	Slovakia	ROW	Zambia
EUS	Slovenia	ROW	Zimbabwe
GERAU	Austria	ROW	Rest of SADC
GERAU	Germany	ROW	Madagascar
turk	Turkey	ROW	Uganda
		ROW	Rest of Sub-Saharan Africa

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