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# Moving towards EU or MENA? Comparing Alternative Turkish Foreign Policies Utilizing the GTAP Framework

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## 1 Introduction

It has always been a crucial question whether to refer to Turkey as a European, a Middle Eastern or even an Asian country. However, within the last years this ongoing debate attracted even more attention due to uncertainty about the European Union (EU) membership negotiations and the so called “axis shift” of Turkey towards the Middle East and North Africa (MENA). There seems to be a general tendency that Turkey is loosening the knots with the West and tightening them up with the East.

On the one hand, the first step to European integration of Turkey was taken in 1963 with the Ankara Association Agreement and continued with establishing a Customs Union in 1995. Thereafter, Turkey became a candidate country in 1999. This is followed by accession negotiations which started in 2005. By that time, the EU has continued to expand and reached 27 member countries after the latest enlargements of Romania and Bulgaria in 2007. On the other hand, since 2002 the Turkish Government has changed its direction in foreign strategy and started being politically closer to the Arab World. Consequently, this political change affects trade strategy directly. Even though this “axis shift” is trying to be based on different grounds, it is arguable whether the origin to this shift is the ideology of ruled party of Turkey. Thus, critics are all about pursuing “Islamic Foreign Policy” being “Neo-Islamist” or “Neo-Ottoman” (compare Migdalovitz 2008; Alessandri 2010; Kadioglu et al. 2011). Moreover, following this “axis shift”, free trade agreements (FTAs) that Turkey has signed in the last 10 years are mainly focused on the Arab world. Currently, Turkey has 8 FTAs with MENA countries among 19 in total. However, for a long period of time until today, the EU has been the biggest trade partner of Turkey. In 2010, 47% of Turkey’s total exports were traded to the EU, while the share of the MENA accounted for 24%.

In this paper we are looking at the question from different perspectives by employing a global computable general equilibrium (CGE) model. Our aim is to contribute to the debate whether Turkey’s political fondness of the Middle East is a better incentive than the EU membership. Accordingly, utilizing the Global Trade Analysis Project (GTAP) framework (Version 8) we compare Turkey’s possible accession to the EU with a possible membership to the Greater Arab Free Trade Area (GAFTA).

There are a significant number of papers assessing the impacts of the EU enlargement of Turkey on the basis of CGE analyses (e.g., Acar et al. 2007; Eruygur and Cakmak 2008; Philippidis and Karaca 2009 ) whereas only a few examples can be found on Turkey and its FTAs as well as its integration with MENA (e.g., Sonmez et al. 2007; Onthman et al. 2010; Acar and Aydin 2011). Although it is common in the literature to hold a two-stage analysis by considering the reduction of non-tariff barriers (NTBs) and implementing them in the CGE model (e.g. Philippidis and Sanjuan 2006, 2007; Fugazza and Maur 2008; Winchester 2009, Chang and Hayakawa 2010), in the context of Turkey-EU integration, to the best of our knowledge, the only paper following this approach belong to Lejour and Mooij (2004). Zahariadis (2005) also considers the technical barriers, however does not employ a gravity model. Moreover, none of the studies reflect the impacts of Turkey’s integration with MENA. Therefore, this paper adds to the existing studies assessing the impacts of Turkey’s integration with the east and the west by analyzing the reduction of tariff and non-tariff trade barriers in the food and agriculture sector simultaneously. The analysis is divided into two parts. First, we adopt the theory-based gravity border effect approach to estimate the effects of NTBs in the agro-food trade flows between Turkey and the EU and between Turkey and GAFTA, and convert the resulting effects into ad-valorem tariff equivalents (AVEs). Second, we incorporate AVEs into the GTAP model and derive economy-wide results of the enlargement of the EU and GAFTA to include Turkey. Accordingly, this paper con-

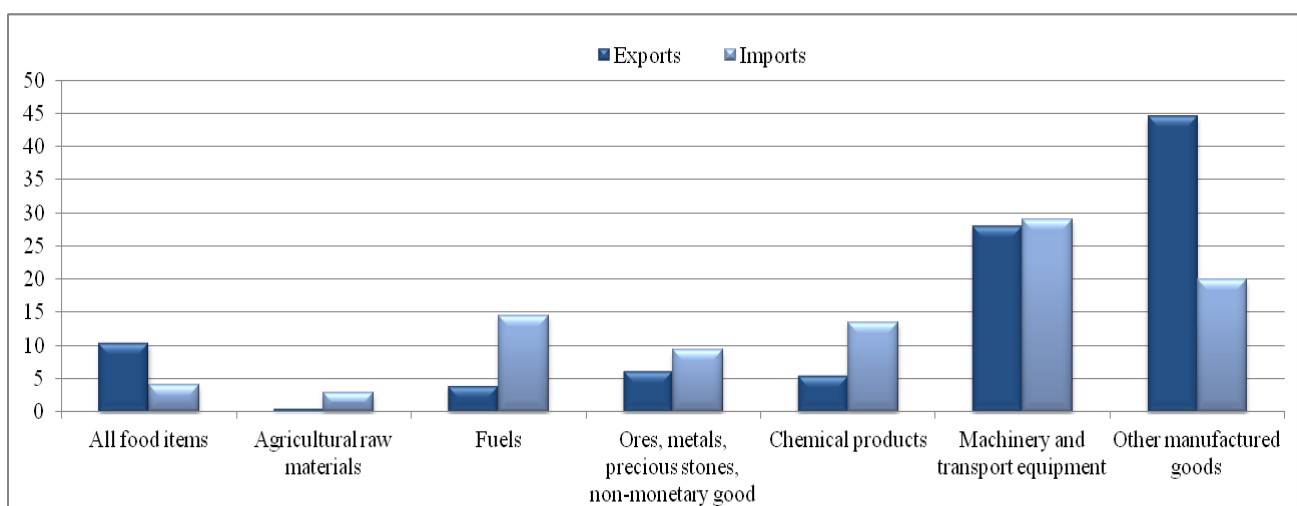
sists of three main chapters. We start the first chapter with a brief overview of the Turkish trade structure focusing on the flows with EU and MENA as well as FTAs of Turkey. We provide the theoretical and empirical framework for the estimation of NTBs in the third chapter. Before conclusion, we explain how we implement our results to our CGE model in the third chapter. Then we demonstrate our final results.

## 2 Overview: Trade Structure and Protection

### 2.1 Turkish Trade Structure

Turkey with a population of 72 million, GDP of 735 264 million US\$ and with -48 445 million US\$ account deficit for 2010 has the 33rd rank in world merchandise exports and 28th in the imports (WTO, 2012). Breakdown in economy's total exports and imports shows that manufacture has the highest share in both. By main Standard International Trade Classification (SITC) Revision 3 product group (percentage), Turkey has the highest share of imports in machinery and transport equipment whereas almost half of Turkish exports consist of other manufactured good for the 2010 data. Food items only make around 10% of exports.

**Figure 1:** Trade structure of Turkey (2010, %)



**Source:** UNCTAD, 2011.

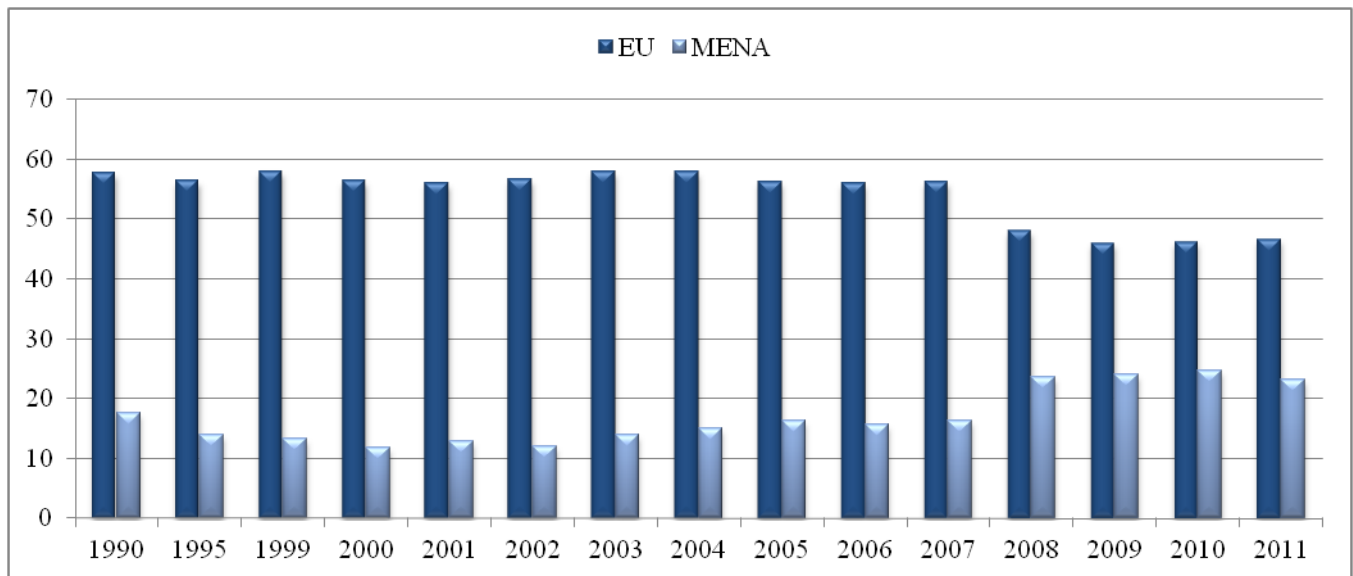
The EU has been the biggest trade partner of Turkey for a long time, whereas MENA<sup>1</sup>'s share has always been lower. Figure 2 illustrates that since 1990 EU's share in Turkish exports has never fallen below 45% although there has been a decrease in recent years. The share of exports to MENA has mostly been around 10% until 2007. However, there is a slight increase in the last 4 years.

As seen in Figure 2, Turkey's total exports in 2010 are consisted of 47% to the EU and 24% to the MENA countries. Additionally, exports to the FTA partners make 11% of the total exports. In terms of imports, the

1 Although there is no official definition for the MENA countries, in most of the sources 19 countries are included in this grouping as Algeria, Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates (UAE), Occupied Palestinian Territory and Yemen. In broader definitions, most frequently Turkey and Sudan are also included. In this study we focus on the 19 countries. Also for the EU region, we consider the latest enlargements in 2007 and cover all 27 members.

EU still has the highest share with 38%. However, imports from MENA make only 10% of imports. Only 8% of imports are from the FTA partner countries. Here, by a share of 23%, BRIC group (Brazil, Russia, India and China) have an importance (Turkstat, 2012).

**Figure 2:** Turkey's exports to the EU and MENA as share of Turkish exports (%)



**Source:** Turkstat, 2012.

Manufacture has the highest share in Turkish trade flow with the EU and the Middle East. However, differences are seen in the trade structure when sectors are considered at a more disaggregated level. In case of exports to MENA, main metal industry with a value of 7 billion US\$, make almost the half of high manufacture exports. As expected, petroleum goods, fuels and chemical goods have the highest shares in Turkish imports from MENA. In contrast, half of high manufacture trade with to the EU consists of motor vehicles and tugboats. Additionally, chemical goods, machinery, textiles and wearing apparel have very high shares in exports to the EU. After manufacture exports, agriculture has the highest share to both regions while import of services has the third rank from both regions (Turkstat, 2012).

## 2.2 Free Trade Agreements of Turkey

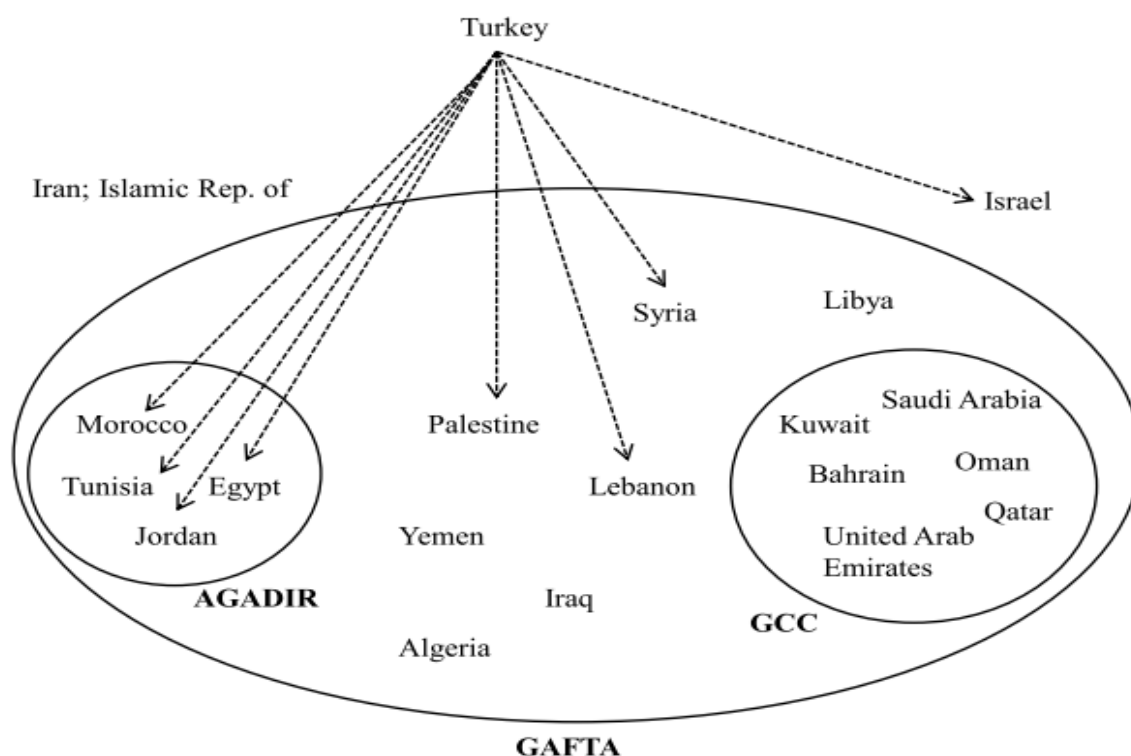
Turkey has signed its first FTA<sup>2</sup> with the European Free Trade Area (EFTA) member countries in 1991. This is followed by the Customs Union Agreement in 1996 between the EU and Turkey. Thereafter, several FTAs with Hungary, Romania, Lithuania, Estonia, Czech Republic, Bulgaria, Poland, has been signed. However, after their accession to the EU, those FTAs were modified according to the Turkey's Customs Union Agreement. The concluded FTAs of Turkey shows the growing tendency towards MENA within the last years.

2 In most of the FTAs Turkey immediately abolishes the tariffs on industrial products imposed to partner countries, whereas the import taxes that are levied on Turkey are decreased gradually in 3 to 15 years. In terms of food and agricultural products, there is no specific regulation. When the tariffs on some products are eliminated immediately, in some cases there are no reductions e.g., the FTA between Turkey and Chile assumes that there will be full elimination of tariffs on Turkish grain imports to Chile. However, Albania does not reduce its tariff rates at all on Turkish grain imports

Currently, Turkey has 8 FTAs with MENA countries out of 19 MENA countries in total. Excluding the one with Israel, all of these FTAs were signed after 2002. More details are given in Table A1 in the appendix.

Among MENA countries there are also FTAs and custom unions. Figure 4 demonstrates the FTAs of Turkey (arrows) and the trade blocs as well as trade agreements (circles). The attempts of economic integration in the Arab world has started with the Arab League in 1945 and continued since then with several FTAs and trade blocs in the region e.g., the Gulf Cooperation Council (GCC) signed in 1981 which includes a customs union agreement (GCC, 2012) and AGADIR which is a free trade zone between the Arabic Mediterranean nations which came to force in 2007 (Agadir Agreement, 2012). However, as also pointed out by Abedini and Peridy (2008) the most important and most achieving trade block in the region is GAFTA due to several reasons such as relying on political institutions, having wide scope of countries in the region as well as covering the reduction of all means of trade barriers. GAFTA currently comprises 17 countries including Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen. Established in 1957 and signed in 1997, the main purpose of the GAFTA is to establish an economic unity. The agreement was extended to the implementation of full trade liberalization of goods among member countries in 2005. Due to reasons given above, this study focuses on GAFTA and evaluates Turkey's integration with MENA by a possible membership to GAFTA.

**Figure 4:** Regional and Free Trade Agreements of Selected Regions<sup>1)</sup>



1) Arrows symbolize FTAs, whereas circles represent trade blocs.

**Source:** Modified from World Bank, 2008.

## 2.3 Protection Rates of Turkey

Table 1 shows the tariff rates that are imposed by and to Turkey. From a first glance, it is apparent that Turkish food and agricultural sector is highly protected. However, when we decompose the tariffs to a more disaggregated level, we see that protection level changes. For example, tariffs imposed by Turkey on grain imports from GAFTA are much lower than what is imposed for the EU. On the contrary, for the crops and processed food sectors, tariff rates on the imports from GAFTA are the higher in comparison to EU and the rest of the world (ROW). However, for the meat and livestock sectors, Turkey is imposing relatively lower taxes on EU and GAFTA imports than from the ROW. For the non-agricultural sectors there are no tariffs charged for the EU and very low for the manufacture sector in the GAFTA. Column 4 and 5 shows that the protection levels of EU and GAFTA for the food and agricultural sector are much lower than Turkey's protection rates. There are no taxes at Turkish imports in the non-food and agricultural sector by the EU, but GAFTA imposes relatively higher tariffs than the ones that Turkey levies towards them.

**Table 1:** Tariffs Levied by Turkey, the EU and the GAFTA

| Turkey's tariffs on imports from |       |       |       | EU's tariffs on imports from | GAFTA's tariffs on imports from |
|----------------------------------|-------|-------|-------|------------------------------|---------------------------------|
| Sector                           | EU    | GAFTA | ROW   | Turkey                       | Turkey                          |
| Grains                           | 61.70 | 12.46 | 63.03 | 4.04                         | 0.10                            |
| Crops                            | 9.63  | 30.11 | 11.66 | 2.62                         | 9.06                            |
| Processed Food                   | 15.05 | 36.46 | 23.38 | 3.91                         | 9.39                            |
| Meat & Livestock                 | 6.24  | 2.34  | 20.00 | 0.30                         | 0.41                            |
| Extraction                       | 0.29  | 0.01  | 0.07  | 0.00                         | 8.26                            |
| Light Manufacture                | 0.00  | 1.78  | 4.92  | 0.00                         | 11.25                           |
| Heavy Manufacture                | 0.00  | 1.12  | 1.73  | 0.00                         | 5.85                            |
| Services                         | 0.00  | 0.00  | 0.00  | 0.00                         | 0.00                            |

**Source:** GTAP 8 data base.

## 3 The Gravity Approach

### 3.1 Theoretical and Empirical Framework

The estimation of AVEs of NTBs is based on the gravity model. The gravity model is the workhouse for empirical studies to measure expected bilateral trade by using economic size and a further set of control variables. Its empirical success lies in the theoretical justification and the simple and flexible application. For our analysis we use the border effect approach to identify NTBs in the trade between Turkey and the EU and between Turkey and GAFTA countries in 2007. Originated by McCallum (1995) and advanced by Anderson and van Wincoop (2003) the border effect compares the intra-national with international trade. It reveals how much international trade falls below the trade within countries due to barriers resulting from the international border, i.e., tariffs, non-tariffs measures and all other factors that might hinder trade. The advantage of this approach is that the border effect summarizes all impediments including those that are unobservable or difficult to measure directly. Particularly in agriculture there is a lack of reliable and updated statistics on tech-

nical regulations and phytosanitary standards which significantly influence agro-food trade. To our knowledge there are only a few papers applying this theory-based border effect approach on agricultural trade, namely Olper and Raimondi (2008a), Olper and Raimondi (2008b), Winchester (2009) and Chang and Hayakawa (2010).

In order to follow the latest developments regarding the specification of gravity models we adopt the gravity-like equation developed by Anderson and van Wincoop (2003, 2004) in that relative prices play a decisive role. Their model takes the following form

$$x_{ij} = \frac{y_i y_j}{y_w} \left( \frac{t_{ij}}{P_i P_j} \right)^{1-\sigma} \quad (1)$$

where  $x_{ij}$  is the export value from  $i$  to  $j$ ,  $y_i$  ( $y_j$ ) is the exporter (importer) production (consumption),  $y_w$  is the global output,  $t_{ij}$  is the bilateral trade resistance,  $\sigma$  is the elasticity of substitution between all goods;  $P_i$  ( $P_j$ ) are CES consumer price indices for  $i$  and  $j$ , respectively. They are defined as follows:

$$P_i = \left( \sum_{j=1}^J \left( \frac{t_{ij}}{P_j} \right)^{1-\sigma} \theta_j \right)^{1/(1-\sigma)} \quad P_j = \left( \sum_{i=1}^I \left( \frac{t_{ij}}{P_i} \right)^{1-\sigma} \theta_i \right)^{1/(1-\sigma)} \quad (2)$$

Here,  $\theta_{ij}$  indicates the income shares of country  $i$  and  $j$ . These price indices represent the multilateral resistance terms (MRTs) which cannot be observed (Anderson and van Wincoop, 2003). They capture costs of bilateral trade between two regions which are affected by the average trade cost of each region with the rest of its trading partners. These MRTs form the substitutability between country's different trading partners and allow accounting for unobserved heterogeneity in econometric sense. Since each trading country has different prices for each commodity we control for them by specifying importer and exporter fixed effects (e.g., Feenstra, 2002; Chen, 2004; Olper and Raimondi, 2008a; Winchester, 2009). Thus we include dummies that are attached to each exporter and importer trade unit. In that way country dummies not only control for multilateral resistance but also for country-specific unobservables. The component  $t_{ij}$  is a function of observable trade costs comprising transport costs  $d_{ij}$  and a border variable  $b_{ij}$

$$t_{ij} = d_{ij}^\rho b_{ij}^{\delta_{ij}} \quad (3)$$

where  $d_{ij}$  is the distance between  $i$  and  $j$  and  $\rho$  the corresponding coefficient.  $(b_{ij} - 1)$  is the tariff equivalent of all trade barriers resulting from an international border. The factor  $\delta_{ij}$  takes the value of one if  $i$  and  $j$  are different countries and zero if  $i$  and  $j$  are the same country which represents international and intra-national trade, respectively (Anderson and van Wincoop, 2003). Typically, a further set of continuous variables and dummy variables are components of the trade cost function. Replacing the cost function in equation (1) and taking the logarithms we derive an empirical log-linear specification. We include country and sectoral dummies and an error term to obtain the following estimable equation:

$$\begin{aligned}
\ln x_{ij} = & \beta_1 + \beta_2 \ln \text{Prod}_i + \beta_3 \ln \text{Consum}_j + \beta_4 \ln \text{Dist}_{ij} + \beta_5 \text{Contig}_{ij} + \beta_6 \text{Lang}_{ij} \\
& + \beta_7 \text{Landlocked} + \beta_8 \text{RTA} + \beta_{11} \ln(1 + \text{AVE}_{\text{tariff}}) + \beta_{12} \ln(1 + \text{AVE}_{\text{esub}}) \\
& + \beta_9 b_{\text{EU}} + \beta_{10} b_{\text{EU/TUR}} + \beta_{11} b_{\text{TUR/EU}} + \beta_{12} b_{\text{GAFTA}} + \beta_{13} b_{\text{GAFTA/TUR}} + \beta_{14} b_{\text{TUR/GAFTA}} + \beta_{15} b_{\text{OTHER}} \\
& + \alpha_i + \alpha_j + \lambda_k + \varepsilon_{ij}
\end{aligned} \tag{4}$$

|                              |                                                                                         |
|------------------------------|-----------------------------------------------------------------------------------------|
| $x_{ij}$                     | Export value from $i$ to $j$                                                            |
| $\text{Prod}_i$              | Production value of $i$                                                                 |
| $\text{Consum}_j$            | Consumption value of $j$                                                                |
| $\text{Dist}_{ij}$           | Distance between $i$ and $j$                                                            |
| $\text{Contig}_{ij}$         | Dummy variable taking the value one for contiguity of the two countries                 |
| $\text{Lang}_{ij}$           | Equal to one if a language is spoken by at least 9% of the population in both countries |
| $\text{Landlocked}_{ij}$     | Number of landlocked countries (0,1,2)                                                  |
| $\text{AVE}_{\text{tariff}}$ | Ad-valorem tariff imposed by region $j$ on exports from $i$                             |
| $\text{AVE}_{\text{esub}}$   | Ad-valorem export subsidy imposed by region $i$ on exports to $j$                       |
| RTA                          | Equal to 1 if $i$ and $j$ are members in same RTA                                       |
| $b_{\text{EU}}$              | Equal to 1 if the dependent variable measures the exports between EU members            |
| $b_{\text{EU/TUR}}$          | Equal to 1 if the dependent variable measures the exports from EU to Turkey             |
| $b_{\text{TUR/EU}}$          | Equal to 1 if the dependent variable measures the exports from Turkey to the EU         |
| $b_{\text{GAFTA}}$           | Equal to 1 if the dependent variable measures the exports between GAFTA members         |
| $b_{\text{GAFTA/TUR}}$       | Equal to 1 if the dependent variable measures the exports from GAFTA to Turkey          |
| $b_{\text{TUR/GAFTA}}$       | Equal to 1 if the dependent variable measures the exports from Turkey to GAFTA          |
| $b_{\text{OTHER}}$           | Equal to 1 if the dependent variable measures cross-border trade not mentioned before   |
| $\alpha_i, \alpha_j$         | Exporter and importer dummies                                                           |
| $\lambda_k$                  | Sector dummies ( $k = 1, \dots, 57$ )                                                   |
| $\varepsilon_{ij}$           | Error term                                                                              |

We apply the above equation for four aggregated sectors (heavy and light manufacturing, services, and extraction) and for seventeen agricultural disaggregated sectors (see Table A2 in the Appendix). Although the theory based equation (4) implies size-adjusted trade ( $\beta_2 = \beta_3 = 1$ ), we do not impose this constraint. The most interesting parameters to estimate are coefficients of the border effects which are equal to  $\beta_{bij} = (1 - \sigma) \ln b_{ij}$ . Taking the antilog of the estimated border coefficient we obtain the border effect quantifying how much international trade falls below intra-country trade. By controlling for differences in tariffs, distance and other unspecified trade costs in the gravity equation we assume that the border effect is mainly determined by the effects of NTBs.

### 3.2 Data and Estimation Technique

We source data on bilateral exports, production values, consumption values, bilateral tariffs and export subsidies from version 8 (base year 2007) of the GTAP data base. In order to apply the border effect approach we also need intra-national trade. Following Wei (1996), Chen (2004) and other authors thereafter, we calculate a country's exports to itself by subtracting each country's aggregate exports (to all international destina-

tions) from its domestic production in each sector. This is equal to the variable VDM from the GTAP data base. The GTAP data base offers 129 regions and 57 sectors. We reduce the number of regions to 79 by omitting composite regions and countries whose trade share with Turkey is less than 0.001 of total Turkish trade. Our regression analysis includes 355737 observations. Of those 351234 ( $=79*78*57$ ) are bilateral cross-border trade observations and 4503 ( $=79*57$ ) are intra-country trade observations. Information on distance, number of landlocked countries, contiguity, common language and colonial relationships are from the Centre D'Etudes Prospectives et D'Informations Internationales (CEPII). For our analysis we use bilateral distances between two countries as population-weighted average distances between major cities in countries of interest. This enables us to also use intra-national distances. One serious problem in estimating a gravity model in the typical log-linear specification is the presence of zero trade flows (11% of the export flows in our case). Because logarithm of zero is not defined, a truncation or rescaling of the dependent variable is needed. Furthermore, Santo Silva and Tenreyro (2006) show that using OLS to estimate the log-linear model results in biased and inconsistent estimates in the presence of heteroskedasticity. Instead the authors employ the more advantageous Poisson pseudo-maximum likelihood (PPML) estimator because it produces estimates that are robust to heteroskedasticity. In addition the Poisson regression permits to account for zero trade flows due to the inclusion of trade values in levels. However, the assumption of equidispersion for the PPML estimator involves the conditional variance of the dependent variable to be equal to its conditional mean. This assumption is unlikely to hold so that statistical inferences should be based on the robust covariance matrix estimator. Burger et al. (2009) suggest other Poisson family estimators. The negative binomial specification accounts properly for overdispersion stemming from omitted variable bias. However, if the violation of equidispersion can be found in excess zeros than the Zip-Inflated Poisson (ZIP) model is the proper specification. It deals with censored variables by specifying two equations. The first part is a logit regression estimating the probability of zero trade values. The second part is a Poisson regression. Thus, we will proceed in two steps. Firstly, we will compare different estimation techniques to get the most suitable one. Secondly, we will take the preferred specification as a benchmark for further estimations of border effects. Applying the Poisson estimation we rearrange the gravity equation given in equation (4) according to an exponential function.

### 3.3 Estimation Results

Table 2 compares estimation outcomes from equation (4) resulting from different estimation techniques in order to decide on a benchmark specification. The first column presents OLS estimates using the logarithm of exports as a dependent variable and skipping observations with zero trade flows. Results are comparable to other studies using OLS on truncated data with relatively high border effects. Column 2 shows the OLS results using a rescaled dependent variable to overcome the problem of zeros. Estimates do not differ a lot to the first OLS regression and indicate even higher border effects. The third and fourth columns contain PPML results. The first PPML estimation comprises the whole sample, whereas in the second estimation only non-zero observations are considered. The rationale behind this is to check whether the changes in the estimates are driven by the estimation technique or by the inclusion of nil trade values. Comparing the OLS estimates, Poisson estimation reduces nearly all coefficients. The highest differences are observable in the border effect coefficients. Surprisingly, the effect of being members in the same RTA is not significant anymore and the sign of the export subsidies changed. The last two columns show the outcomes resulting from ZIP regression. The results of the Poisson regression are the same. The difference occurs in the logit regression. In the first ZIP estimation the model is inflated with distance, contiguity and geographical size of the countries. The results show that the probability of zero trade increases with distance and decreases with the size of the coun-

tries and by sharing a common border. In the second ZIP estimation we also included common language, also showing the correct sign. The coefficients of the logit regression are significantly different from zero and concur in sign and value with the theory so that we prefer the ZIP estimation over the PPML estimation thought the results are very similar. Furthermore, the significantly positive Vuong test statistic for comparing the ZIP and the PPML estimations indicates the preference of the ZIP estimation.

**Table 2:** Different estimation outcomes for the gravity model

|                                  | OLS             | OLS               | PPML       | PPML                | ZIPPML_1                 | ZIPPML_2                 |
|----------------------------------|-----------------|-------------------|------------|---------------------|--------------------------|--------------------------|
|                                  | log( $X_{ij}$ ) | log( $1+X_{ij}$ ) | $X_{ij}$   | $X_{ij}$ (> 0 only) | $X_{ij}$                 | $X_{ij}$                 |
| Constant                         | 1.9952          | 6.3129***         | 0.55029    | 0.69116             | 0.69116                  | 0.69116                  |
| ln(Production)                   | 1.0556***       | .82337***         | .86418***  | .86794***           | .86794***                | .86794***                |
| ln(Consumption)                  | .14932***       | .10199***         | .20281***  | .19226***           | .19226***                | .19226***                |
| ln(Distance)                     | -.82484***      | -.80521***        | -.53083*** | -.53121***          | -.53121***               | -.53121***               |
| Contiguity                       | 1.2668***       | 1.2831***         | .50528***  | .50319***           | .50319***                | .50319***                |
| Language                         | .31761***       | .29045***         | .53481***  | .54273***           | .54273***                | .54273***                |
| Landlocked                       | -.70031***      | -.56863***        | -.3448**   | -.34644***          | -.34644***               | -.34644***               |
| RTA                              | .35665***       | .34271***         | 0.12552    | 0.1251              | 0.1251                   | 0.1251                   |
| ln(1+AVEtariff)                  | 3.3388***       | 4.2341***         | 1.083***   | 1.0319***           | 1.0319***                | 1.0319***                |
| ln(1+AVEsub)                     | 3.741***        | 4.1727***         | -1.4622*   | -1.5438*            | -1.5438*                 | -1.5438*                 |
| bEU                              | -4.7563***      | -5.4323***        | -2.9161*** | -2.8968***          | -2.8968***               | -2.8968***               |
| bEUTUR                           | -5.6749***      | -6.3382***        | -3.6931*** | -3.6689***          | -3.6689***               | -3.6689***               |
| bTUREU                           | -5.4997***      | -6.1468***        | -3.4537*** | -3.4254***          | -3.4254***               | -3.4254***               |
| bGAFTA                           | -4.6774***      | -5.3312***        | -3.9707*** | -3.8497***          | -3.8497***               | -3.8497***               |
| bGAFTATUR                        | -5.3696***      | -5.9413***        | -4.2465*** | -4.2189***          | -4.2189***               | -4.2189***               |
| bTURGAFTA                        | -5.1049***      | -5.7928***        | -3.3041*** | -3.2756***          | -3.2756***               | -3.2756***               |
| bOTHER                           | -5.2031***      | -5.8399***        | -3.2467*** | -3.2113***          | -3.2113**                | -3.2113***               |
|                                  |                 |                   |            |                     | $X_{ij} = 0$ (Logit)     | $X_{ij} = 0$ (Logit)     |
| Constant                         |                 |                   |            |                     | -1.0618 ***              | -1.0239***               |
| ln(Distance)                     |                 |                   |            |                     | 0.1341***                | 0.1332***                |
| Contiguity                       |                 |                   |            |                     | -0.6535***               | -0.5806***               |
| Ln(Area_i)                       |                 |                   |            |                     | -0.1188***               | -0.1197***               |
| ln(Area_j)                       |                 |                   |            |                     | -0.0576***               | -0.0580***               |
| Language                         |                 |                   |            |                     |                          | -0.1821***               |
| Country and sector fixed effects | yes             | yes               | yes        | yes                 | yes for $X_{ij} > 0$     | yes for $X_{ij} > 0$     |
| <i>N</i>                         | 315599          | 355737            | 35573      | 315599              | 355737                   | 355737                   |
| <i>Nonzero N</i>                 | 315599          | 355737            | 315599     | 315599              | 315599                   | 315599                   |
| <i>Zero N</i>                    | -               | -                 | 40138      | -                   | 40138                    | 40138                    |
| $R^2$                            | 0.7674          | 0.79008           |            |                     |                          |                          |
| Pseudo $R^2$                     |                 |                   | 0.96876    | 0.96867             |                          |                          |
| log pseudo likelihood            |                 |                   | -1.90E+13  | -1.90E+13           | -1.87E+13                | -1.90E+13                |
| AIC                              |                 |                   | 3.80E+13   | 3.70E+13            | 3.74E+13                 | 3.70E+13                 |
| BIC                              |                 |                   | 3.80E+13   | 3.70E+13            | 3.74E+13                 | 3.70E+13                 |
| Vuong                            |                 |                   |            |                     | 80.43***<br>(ZIP better) | 80.43***<br>(ZIP better) |

**Source:** Authors' own calculation.

Table 3 represents the regression results of the ZIPPML pooled on food and agriculture sector. Most coefficients have the expected sign and are statistically significant. Consumption and production induce the expected positive effect on food and agriculture trade and highly significant. The existence of a common border and a common language between two nations also positively influences agro-food trade. The elasticity of trade with respect to distance is expectantly negative and less than one. Thus, exports decrease by 0.7638%, if the distance between two countries increases by 1%. Contradictory, the effect of tariffs is not significant. However, this is not uncommon in the literature and also found by Philippidis and Sanjuán (2007a, 2007b) and Winchester (2009). FTA membership increases the trade significantly.

**Table 3:** Regression Results for the Food and Agriculture Sector<sup>1)</sup>

|                  | PPML              | ZIPPML     |                   |
|------------------|-------------------|------------|-------------------|
|                  |                   | Logit      | Poisson           |
| ln(Production)   | 0.7290***         |            | 0.7320***         |
| ln(Consumption)  | 0.3336***         |            | 0.3303***         |
| ln(Distance)     | -0.7638***        | 0.0529***  | -0.7603***        |
| Contiguity       | 0.5228***         | -1.1463*** | 0.5270***         |
| Language         | 0.6688***         | -0.0875*** | 0.6661***         |
| Landlocked       | -0.7164***        |            | -0.7130***        |
| RTA              | 0.5234***         |            | 0.5178***         |
| ln(1+AVEtariff)  | -0.1841           |            | -0.2183           |
| ln(1+AVEesub)    | 0.8609**          |            | 0.8368*           |
| <b>bEU</b>       | <b>-2.2350***</b> |            | <b>-2.2390***</b> |
| <b>bEUTUR</b>    | <b>-4.2725***</b> |            | <b>-4.2693***</b> |
| <b>bTUREU</b>    | <b>-3.5070***</b> |            | <b>-3.5030***</b> |
| <b>bGAFTA</b>    | <b>-2.5650***</b> |            | <b>-2.5630***</b> |
| <b>bGAFTATUR</b> | <b>-4.2447***</b> |            | <b>-4.2435***</b> |
| <b>bTURGAFTA</b> | <b>-3.9794***</b> |            | <b>-3.9748***</b> |
| bOTHER           | -3.0237***        |            | -3.0210***        |
| Constant         | 1.8131***         | -2.2723*** | 1.8004***         |
| <i>Vuong (z)</i> |                   | 63.77***   |                   |

1)\* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001

**Source:** Authors' own calculation.

The coefficients of the border dummies are negative and significant. Accordingly, there is a negative influence of international borders. After controlling for distance and other trade cost factors the ratio of *i*'s exports to *j* to *i*'s exports to itself is given by the exponential of the coefficient on the *i-j* border dummy,  $b_{ij}$ . The border coefficient for the EU of -2.2390 means that intra-country agricultural trade is, on average 9.38 ( $=\exp(2.2390)$ ) times larger than the cross-border trade within EU. In case of GAFTA, intra-country agricultural trade is on average 12.97 times larger than cross-border trade among GAFTA member countries. These numbers shows that the incidence of NTBs among EU members is lower than NTBs among GAFTA members. Regarding trade with Turkey, in the agro-food regression EU's exports to itself are 71.47 times larger

than EU's exports to Turkey. GAFTA's exports to itself are 69.65 times larger than GAFTA's exports to Turkey. Turkey's exports of agro-food products to itself are 33.51 times larger than Turkey's exports to EU and 53.23 times larger than Turkey's exports to GAFTA. Thus, Turkey's exports to GAFTA face higher NTBs than Turkey's exports to EU member countries. Although not shown in Table 4, the greatest border effects are in services trade, whereas the lowest in the manufacture sector. The effects are strikingly high in service sector but in line with Winchester (2009).

### 3.4 Calculation of Tariff Equivalents

The theoretical foundation of the gravity model enables us to transform the effects of border barriers into border trade costs using the elasticity of substitution. By controlling for transport costs and other trade costs in the gravity equation it is assumed that border trade costs reflect the effects of NTBs (Winchester, 2009). To calculate AVEs of non-tariff trade barriers we use the formula  $AVE_{bij} = \exp[\beta_{ij}/1-\sigma] - 1$ , where  $AVE_{bij}$  is the AVE of border barriers, e.g.,  $AVE_{EU/TUR}$  indicates the complexities faced by the EU when exporting its products to Turkey concerning the implied effect on price. It covers the average level of importing country protection and further factors not captured by the proxies in the gravity equation.  $\beta_{ij}$  is the coefficient applying to the border dummy  $b_{ij}$  and  $\sigma$  is the elasticity of substitution between goods. We employ the elasticity of substitution (ESUBM) between goods from the GTAP data base according to our sector aggregation.

Following the approach of Winchester (2009) we use the existing border barriers between EU member countries as benchmark in case of an EU enlargement. Thereby we assume that the effects of NTBs between EU member countries are low and that a successful conclusion of the EU enlargement would involve a similar low level of NTBs between EU and Turkey. Equivalently we use the existing border barriers among GAFTA members as benchmark in case of a GAFTA enlargement assuming that the effects of NTBs among GAFTA member countries is low and that a conclusion of a GAFTA enlargement would involve similar low level of NTBs in the trade between GAFTA and Turkey. We calculate AVEs of NTBs facing EU's exports to Turkey by subtracting  $AVE_{EU}$  from  $AVE_{EU/TUR}$ , if  $AVE_{EU}$  is lower than  $AVE_{EU/TUR}$ . In the same way we calculate AVEs of NTBs facing Turkey's exports to the EU by subtracting  $AVE_{EU}$  from  $AVE_{TUR/EU}$ , if  $AVE_{EU}$  is lower than  $AVE_{TUR/EU}$ . In cases when  $AVE_{EU}$  is greater than  $AVE_{EU/TUR}$  and  $AVE_{TUR/EU}$  in absolute terms, we assume that the EU enlargement would not change the level of NTBs between EU countries and Turkey. Equivalently we calculate AVEs of NTBs facing the GAFTA's exports to Turkey and Turkey's exports to the GAFTA. In cases when  $AVE_{GAFTA}$  is greater than  $AVE_{GAFTA/TUR}$  and  $AVE_{TUR/GAFTA}$  in absolute terms, we assume that a GAFTA enlargement would not change the level of NTBs between the GAFTA countries and Turkey.

Table 3a reports the AVEs between EU member countries, total AVEs and the EU-normalized AVEs of NTBs in the trade between EU and Turkey.

**Table 3a:** Ad-valorem Equivalents of NTBs (%)

|                                        | Among EU<br>member countries | On EU's exports to Turkey |             | On Turkey's exports to EU |             |
|----------------------------------------|------------------------------|---------------------------|-------------|---------------------------|-------------|
|                                        |                              | total                     | benchmarked | total                     | benchmarked |
| Wheat                                  | 25.9                         | 60.9                      | 35.0        | 68.7                      | 42.8        |
| Cereal grains nec                      | 57.0                         | 106.3                     | 49.3        | 243.8                     | 186.8       |
| Vegetable oils and fats                | 26.2                         | 119.1                     | 92.9        | 137.0                     | 110.8       |
| Oil seeds                              | 89.2                         | 81.4                      | 0.0         | 76.9                      | 0.0         |
| Plant-based fibers                     | 131.0                        | 254.6                     | 123.6       | 59.7                      | 0.0         |
| Crops nec                              | 81.8                         | 81.8                      | 0.0         | 114.9                     | 33.1        |
| Bovine cattle, sheep and goats, horses | 100.4                        | 495.1                     | 394.7       | 425.8                     | 325.4       |
| Animal products nec                    | 106.0                        | 128.1                     | 22.1        | 189.6                     | 83.6        |
| Wool, silk-worm cocoons                | 38.1                         | 0.0                       | 0.0         | 85.8                      | 47.6        |
| Bovine meat products                   | 29.1                         | 194.8                     | 165.7       | 194.5                     | 165.5       |
| Meat products nec                      | 21.0                         | 123.9                     | 103.0       | 125.4                     | 104.4       |
| Vegetables, fruit, nuts                | 23.0                         | 243.2                     | 220.2       | 152.3                     | 129.3       |
| Dairy products                         | 42.0                         | 175.8                     | 133.8       | 120.4                     | 78.5        |
| Processed rice                         | 58.8                         | 62.0                      | 3.2         | 501.5                     | 442.7       |
| Sugar                                  | 40.1                         | 260.8                     | 220.8       | 227.2                     | 187.2       |
| Food products nec                      | 103.4                        | 265.5                     | 162.2       | 194.5                     | 91.1        |
| Beverages and tobacco products         | 94.0                         | 232.7                     | 138.7       | 199.3                     | 105.3       |
| Light Manufacture                      | 32.8                         | 42.8                      | 10.0        | 33.3                      | 0.5         |
| Heavy Manufacture                      | 25.4                         | 40.5                      | 15.2        | 42.7                      | 17.4        |
| Services                               | 413.2                        | 833.9                     | 420.7       | 632.1                     | 218.9       |
| Extraction                             | 20.3                         | 37.6                      | 17.3        | 35.3                      | 15.0        |

**Source:** Authors' own calculation.

Table 3b reports the AVEs among GAFTA member countries, total AVEs and GAFTA-normalized AVEs of NTBs in the trade between GAFTA and Turkey.

**Table 3b:** Ad-valorem Equivalents of NTBs (%)

|                                        | Among GAFTA<br>member countries | On GAFTA's exports to Turkey |             | On Turkey's exports to<br>GAFTA |             |
|----------------------------------------|---------------------------------|------------------------------|-------------|---------------------------------|-------------|
|                                        |                                 | total                        | benchmarked | total                           | benchmarked |
| Wheat                                  | 103.0                           | 96.3                         | 0.0         | 171.2                           | 68.2        |
| Cereal grains nec                      | 123.0                           | 169.1                        | 46.1        | 127.6                           | 4.6         |
| Vegetable oils and fats                | 0.0                             | 248.7                        | 248.7       | 119.0                           | 119.0       |
| Oil seeds                              | 0.0                             | 137.0                        | 137.0       | 347.0                           | 347.0       |
| Plant-based fibers                     | 215.6                           | 336.6                        | 121.0       | 89.9                            | 0.0         |
| Crops nec                              | 37.4                            | 58.0                         | 20.5        | 190.5                           | 153.1       |
| Bovine cattle, sheep and goats, horses | 134.9                           | 590.3                        | 455.4       | 1025.4                          | 890.5       |
| Animal products nec                    | 820.0                           | 195.0                        | 0.0         | 286.0                           | 0.0         |
| Wool, silk-worm cocoons                | 80.9                            | 45.9                         | 0.0         | 215.9                           | 135.0       |
| Bovine meat products                   | 82.4                            | 161.4                        | 78.9        | 201.2                           | 118.8       |
| Meat products nec                      | 36.4                            | 121.9                        | 85.6        | 126.3                           | 89.9        |
| Vegetables, fruit, nuts                | 139.4                           | 266.6                        | 127.2       | 135.0                           | 0.0         |
| Dairy products                         | 19.5                            | 181.6                        | 162.1       | 82.8                            | 63.3        |
| Processed rice                         | 154.6                           | 0.0                          | 0.0         | 928.4                           | 773.8       |
| Sugar                                  | 0.0                             | 0.0                          | 0.0         | 312.1                           | 312.1       |
| Food products nec                      | 109.4                           | 442.8                        | 333.4       | 196.0                           | 86.6        |
| Beverages and tobacco products         | 155.0                           | 566.2                        | 411.2       | 235.4                           | 80.4        |
| Light Manufacture                      | 50.2                            | 83.5                         | 33.3        | 55.9                            | 5.7         |
| Heavy Manufacture                      | 42.4                            | 58.7                         | 16.3        | 27.2                            | 0.0         |
| Services                               | 1226.1                          | 904.0                        | 0.0         | 780.0                           | 0.0         |
| Extraction                             | 33.9                            | 31.2                         | 0.0         | 37.0                            | 3.1         |

**Source:** Authors' own calculation.

## 4 Simulations with Global Trade Analysis Project (GTAP) Framework

### 4.1 GTAP Model and Data

The CGE simulations in this paper utilize the comparative static multi regional general equilibrium GTAP model. This model provides a detailed representation of the economy including the linkages between farming, agribusiness, industrial and service sectors of the economy. The use of the non-homothetic constant difference of elasticity (CDE) functional form to handle private household preferences, the explicit treatment of international trade and transport margins and a global banking sector which links global savings and consumption are innovative in GTAP. Trade is represented by bilateral matrices based on the Armington assumption. Further features of the standard model are perfect competition in all markets as well as a profit and utility maximizing behavior of producers and consumers. All policy interventions are represented by price wedges. The framework of the standard GTAP model is well documented in Hertel (1997) and available on the internet.<sup>3</sup>

Francois (1999, 2001) developed an approach where NTBs are modeled as iceberg or dead-weight trade to study the Doha Round of the WTO negotiation. This approach has been extended by Hertel et al. (2001a, 2001b) who also aimed at the connection between NTBs and CGE modeling treating NTBs as unobserved

<sup>3</sup> See [www.gtap.org](http://www.gtap.org).

trade costs which are not explicitly in the GTAP data base. The authors introduce an additional “effective” import price that is a function of the observed import price and an exogenous unobserved technical coefficient (Hertel et al., 2001, p. 13):

$$pms_{irs}^* = pms_{irs} - ams_{irs} \quad (5)$$

where:  $pms_{irs}^*$  percentage change of effective import price of  $i$  supplied from region  $r$  to region  $s$   
 $pms_{irs}$  percentage change of domestic price for  $i$  supplied from  $r$  to region  $s$   
 $ams_{irs}$  import  $i$  from region  $r$  augmenting tech change in region  $s$

Removal of trade costs from a particular exporter are reflected in an increase of  $ams_{irs}$  under the assumption that  $ams_{irs}$  is equal to one in the initial equilibrium. The effective domestic price of good  $i$  exported from region  $r$  to  $s$  falls and thereby mirrors a reduction of real resource costs. This approach of modeling a removal of NTBs as a reduction in trade costs draws on the iceberg transport costs theory as it is originally introduced by Samuelson (1954). Other authors (e.g., Fugazza and Maur, 2008) also name this the “sand in the wheel” approach.

An increase of  $ams_{irs}$  and the corresponding efficiency enhancement furthermore implies that the effective imported quantity of good  $i$  from region  $r$  to region  $s$  is increased ( $qxs_{irs}^* = qxs_{irs} + ams_{irs}$ ) which leads to the following import demand and composite import price equation (Hertel et al., 2001, p. 13):

$$qxs_{irs} = -ams_{irs} + qim_{is} - \sigma^i \cdot (pms_{irs} - ams_{irs} - pim_{irs}) \quad (6)$$

$$pim_{is} = \sum_k \theta_{iks} \cdot (pms_{iks} - ams_{iks}) \quad (7)$$

where:  $qxs_{irs}$  percentage change in bilateral exports of  $i$  supplied from  $r$  to region  $s$   
 $qim_{is}$  percentage change in average imports of  $i$  supplied from region  $r$  to region  $s$   
 $pim_{is}$  percentage change in average import price of  $i$  supplied from region  $r$  to region  $s$   
 $\sigma^i$  elasticity of substitution among imports of  $i$   
 $\theta_{irs}$  share of imports from  $r$  in imports of  $s$  at market prices

According to equations (6) and (7) an increase of  $ams_{irs}$  implies that imports of  $i$  from region  $r$  to  $s$  are more competitive and substitute imports from other regions.

Additionally to this cost raising effects, NTBs also generate a protection effect which might be captured via import tariffs. Andriamananjara et al. (2003, 2004) as well as Fugazza and Maur (2008) offer a thoroughly study of NTBs impacts in regional and global CGE models, respectively. The authors emphasize that the use of the import tariffs approach to model NTBs and the corresponding rent creating mechanism needs very careful interpretation of the resulting welfare effects. This is of diminishing importance, but also given in the GTAP model where all additional tariff revenues are collected by the regional house and are being kept inside the tariff revenue collecting country.

Andriamananjara et al. (2003, 2004) comprehensively compare these two approaches of CGE modeling of NTBs. Fugazza and Maur (2008) offer the first analysis that does this on a global basis by utilizing the AVEs of NTBs estimates, which are provided by Kee et al. (2006) for a 26-country 27-sector version of the GTAP data base version 6. The result of both papers shows that there are surprising large differences in the results of the experiments when NTBs are modeled with the help of import tariffs and technological change variables, respectively, although both approaches tend to affect the terms of trade in a similar manner. In particu-

lar the authors conclude that the efficiency type modeling of NTBs tends to weigh heavily in the overall large positive welfare gain results. This is also found by Philippidis and Carrington (2005), Philippidis and Sanjuán (2006, 2007), Winchester (2009) as well as Chang and Hayakawa (2010) who used estimated AVEs of NTBs and implement them in a CGE model via the “iceberg cost approach”.

In the following quantitative GTAP analysis we employ the newly available version 8 GTAP data base. We combine the original 129 countries and regions and 57 sectors into a 24 sector, 14 region aggregated version. In so doing, we single out potential FTAs and other significant trading partners of Turkey, the EU and GAFTA. With the sector aggregation, we match the sectors predefined in the gravity model approach. Hence, we use all the available food and agriculture sectors and group the non-food and agriculture sectors into 4. Countries, regions and sectors are highlighted in more detail in Table A2 and A3 in the Appendix.

## 4.2 Experiment Design

In this section the results of the membership experiments to include Turkey into the EU and the GAFTA are discussed. Here, we focus of the welfare effects on the EU, GAFTA and Turkey. The results are discussed on the basis of the equivalent variation (EV) in different experiments. Results are presented in millions of US\$ for the year 2007 of the GTAP data base. The calculations are based on GEMPACK (Version 11.0) and RunGTAP (Harrison and Pearson, 1996). A fixed trade balance is adopted as macroeconomic closure in all FTA experiments.<sup>4</sup>

The base year of the newest GTAP version 8 data base is 2007. Advantageously, this very recent base year 2007 of a global data base implicates that the political environment is fairly up to date. Thus, the MFA quota is already phased out (2005), the EU enlargement of 2004 and 2007 is taken care of and China is by 2007 a member of the WTO fulfilling its scheduled obligations.<sup>5</sup> However, to analyze the possible Turkey-GAFTA enlargement, we still need to implement the changes after 2007 such as Algeria’s membership to GAFTA. Algeria is grouped under the “Rest of North Africa” region with Libya and Western Sahara in the GTAP 8 data base. Since Libya is also a member of the GAFTA, we implement the whole region to GAFTA membership.

Besides changes in the political environment of an economy, macroeconomic developments such as technical progress are of great importance for the growth of an economy. In order to take these changes into account, corresponding trends are incorporated in the analysis. We include exogenous projections of the global and regional GDP and factor endowment into the extended GTAP model. In the simulations, technical progress is generated endogenously by the model, enabling the projected growth pattern. Data for the corresponding shocks are taken from the CEPII, the United Nation and the World Bank.

Implementing the latest changes and updating the macroeconomic environment we move the GTAP framework to the year 2020. Within this timeframe we assume that Turkey’s accession to the EU or GAFTA will

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4 We also assumed the top level nest Armington elasticities between domestic goods, and the import composite to be equal to lower-level nest Armington elasticities between imports from different countries.

5 While the implementation period extends to 2010, almost all of the reduction will have been completed by 2005 (Martin et al., 2003).

be concluded. We also take into account the current FTAs of Turkey which came in force after 2007 or which will be in force until 2020<sup>6</sup>.

### 4.3 Simulation Results

Table 4 displays the welfare results of the experiments in millions of US\$ utilizing the EV. The upper part of the table exhibits the results of a possible EU enlargement of Turkey whereas the lower part is considering Turkey's membership to GAFTA. However, in both cases the first columns display the total EV, while subsequent ones decomposed this result according to the initiating shock. Thus, columns 2 to 7 show the effects of bilateral tariff reduction in the food and agricultural sector as well as the manufacturing sector of the EU, Turkey or for GAFTA. The second part of Table 4 (Columns 8 to 15) represents the effects that stem from the removal of NTBs in the food and agriculture sectors either of the EU, Turkey or GAFTA.

From the first upper column in Table 4 it is apparent that Turkey is unambiguously gaining from the EU enlargement. Total welfare gain of Turkey amounts to 18.9 billion US\$ whereas the EU's welfare gain is less than Turkey, but still very significant with 12.7 billion US\$. That Turkey experiences higher welfare gains than the EU is also in accordance with Lejour and Mooij (2004), Zahariadis (2005) as well as Acar et al. (2007). In our analysis, these results can be traced back to the NTBs' removal in agro-food sectors in both regions. The overall gain from the bilateral tariff reduction (3 billion US\$ for Turkey and 0.5 billion US\$ for the EU) is much lower than the gain due to NTBs' removal (14.3 billion US\$ for Turkey and 12.3 billion US\$ for the EU). This is parallel with Lejour and Mooij (2001) where they also showed the effects of NTBs are larger than the effects of the customs union in terms of an EU enlargement to include Central and Eastern European countries.

When Turkey eliminates the NTBs in the food and agriculture sector, both regions face significant welfare gains (9 billion US\$ for Turkey and 5.3 billion US\$ for the EU). The removal of NTBs in the European agro-food sector leads to a gain of 10 billion US\$ for the EU itself, whereas the gains for Turkey amount to 2.3 billion US\$. Due to Customs Union Agreement between the EU and Turkey, there are only import tariffs in the food and agriculture sector. Accordingly, as can be seen from Table 4, the gains from the bilateral tariff reduction are seen in this sector. Given the initial high protection rates of Turkey in the agro-food sector, EU's gain almost reaches up to 1 billion US\$ when there is reduction in the import tariffs by Turkey. As expected, Turkey's gain amounts to 1.6 billion US\$ when the EU eliminates the taxes. In case of Turkey's accession to the EU, Turkey has an additional gain due to application of common external tariff. Turkey gains 1.5 billion US\$ (not shown in Table 4) resulting from the lower tariff rates adopted especially in the agro-food sector.

The second part of Table 4 exhibits the results of our second experiment which Turkey is regarded as a GAFTA member. From a first glance it can be seen that the overall effect of this experiment are more limited than the experiment of an EU enlargement. Turkey's total welfare gain amounts to 13.6 billion US\$, whereas it is 3.5 billion US\$ for the GAFTA member countries. Similar with our first experiment, gains coming from

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6 In the experiment that we assume Turkey as a GAFTA member, we consider the FTAs with Albania, Georgia, Montenegro, Serbia and Chile. However, we exclude the one with Jordan since it is already a GAFTA member. While Albania, Georgia and Chile are single regions in the GTAP 8 data base, Georgia and Montenegro are aggregated with other European countries. Therefore, FTAs with Albania, Georgia and Chile are easily conducted; whereas it was not possible for Montenegro and Serbia. Thereby, due to common external tariff that Turkey needs to adapt after a possible EU membership, those FTAs are not implemented in the Turkey-EU experiment.

the NTBs' reduction (9.9 billion US\$ for Turkey and 2.9 billion US\$ for GAFTA) are higher than the ones coming from the elimination of tariffs (3.7 billion US\$ for Turkey and 0.5 billion US\$ for GAFTA). In case of a removal of NTBs in the Turkish food and agricultural sector, Turkey attains a welfare gain of 8.8 billion US\$, while this gain amounts to 1.8 billion US\$ for GAFTA. Conversely, when GAFTA eliminates the NTBs in the same sector, welfare gain amounts to 1.8 billion US\$ for GAFTA and 1.1 billion US\$ for Turkey. Decomposing the welfare results to the sectoral level, we can see that duty free access in the food and agricultural sector comprise the highest share in terms of bilateral tariff reduction for Turkey. For the GAFTA, it is for the manufacture sector where GAFTA's gain is the highest (0.7 billion US\$) when Turkey removes its import tariffs in this sector. Acar and Aydin (2010) analyzed Turkey's integration with MENA and Former Soviet Union countries. Their results showed that Turkey is facing welfare gains while other regions are losing. Also Othman et al. (2010) analyzed the impact of possible trade liberalization among the Developing-8 countries. Their results are evident for both gains and losses, whereas Turkey is one of the countries that gain. Sonmez et al. (2007) also evaluated the FTAs of Turkey where they showed an increase of 1.96% in Turkish welfare level. However, in these studies only bilateral reductions of tariffs are considered, not NTBs.

**Table 4:** Welfare Results in Experiments (million US\$ relative to the baseline)

|                                                       | Total EV | Bilateral Tariff Reduction |      |       |           |      |       | Removal of NTBs |        |        |
|-------------------------------------------------------|----------|----------------------------|------|-------|-----------|------|-------|-----------------|--------|--------|
|                                                       |          | EU                         |      |       | Turkey    |      |       | EU              | Turkey |        |
|                                                       |          | Food & Ag                  | Mnfc | Total | Food & Ag | Mnfc | Total | Food & Ag       | Total  |        |
| Experiment 1: Enlargement of the EU to include Turkey |          |                            |      |       |           |      |       |                 |        |        |
| Turkey                                                | 18,977   | 1,607                      | 10   | 1,617 | 1,461     | 1    | 1,462 | 5,344           | 9,052  | 14,396 |
| EU                                                    | 12,732   | -509                       | 24   | -485  | 954       | -1   | 953   | 10,039          | 2,323  | 12,362 |
| GAFTA                                                 | -36      | -94                        | -5   | -98   | 38        | 0    | 38    | -247            | 114    | -133   |
| ROW                                                   | -495     | -437                       | -49  | -486  | 61        | 0    | 60    | -1,328          | 324    | -1,003 |
| Experiment 2: Enlargement of GAFTA to include Turkey  |          |                            |      |       |           |      |       |                 |        |        |
|                                                       |          | GAFTA                      |      |       | Turkey    |      |       | GAFTA           | Turkey |        |
| Turkey                                                | 13,674   | 321                        | 737  | 1,058 | 2,717     | -41  | 2,676 | 1,139           | 8,813  | 9,952  |
| EU                                                    | 407      | 2                          | -32  | -30   | 144       | -11  | 132   | 182             | 181    | 363    |
| GAFTA                                                 | 3,516    | -126                       | -191 | -317  | 739       | 66   | 805   | 1,856           | 1,110  | 2,966  |
| ROW                                                   | 694      | -165                       | -356 | -521  | 828       | -12  | 817   | -722            | 1,154  | 433    |

**Source:** Authors' own calculation.

Lejour and Mooij (2001 and 2004) explains the gains through the removal of NTBs by the elimination of administrative barriers leading to reduced costs, reduction on technical barriers to trade and by the reduced risk and uncertainty. The authors also add that by the removal of NTBs, the corresponding sectors face fiercer competition at the domestic market by reduced import prices, but also capture better position in the foreign market. Most importantly the gains due to removal of NTBs are attributed to the increased production efficiency (Philipidis and Sanjuan 2006, 2007; Lejour and Mooij 2001, 2004). Philipidis and Sanjuan 2006 and 2007 explains this as greater trade possibilities from improved input efficiency by the elimination of trade barriers. By removing the iceberg costs, effective prices are lowered causing efficiency gains. Moreover, trade-induced productivity gains occur through increased technology transfer. Accordingly, in our first experiment where we simulated Turkey's accession to the EU, the triggering factor behind Turkey's and the

EU's welfare gain is the allocative efficiency gain, whereas in the second experiment GAFTA's gain mainly stem from the terms of trade effect. The increased efficiency in the allocation of resources mainly explains the gains through reduction of NTBs.

#### **4.4 Qualification of Results**

The analysis needs several qualifications. In terms of the gravity approach, it has to be noted that NTBs are not directly estimated and that the estimated AVEs do not only include NTBs, but also border barriers unrelated to policy measures such as transaction costs and consumer preferences towards domestic products. These are non-rent border costs whose elimination leads to greater welfare impacts than the elimination of border barriers related to policy measures (Olper and Raimondi, 2008a). Thus, implementing our estimated AVEs into the GTAP model simulations might lead to overestimated results. Second, we also need to emphasize that the EU benchmark and the GAFTA benchmark settings are very ambitious ones. Trade relations between EU member countries and between GAFTA members have developed over a long period of time. Our estimates therefore constitute long term welfare effects of Turkey's integration to the EU or to GAFTA. Finally, welfare effects would be lower, if we were able to take the WTO negotiation or tax replacement scenarios into account. However, as Winchester (2009) pointed out, the welfare effects do not cover several welfare improving aspects, like realization of economies of scale, dynamic gains due to additions to capital stock and productivity improvement due to transfer of technology. All of this leaves room for improvement and further research.

Furthermore, as mentioned in the previous chapters, the EU with 27 member countries is the biggest player in the world economy and a significant trade partner of Turkey. However, even though Turkey attempts to firm the relations with the Arab world, Turkey's gain from this relation could only be limited due to several reasons. Our experiment results are also evident for narrow gains in case of Turkey's membership to GAFTA especially in comparison to possible gains of EU enlargement to include Turkey. Hence, closer relations with the Middle East can lead to question marks in many ways. First, the current political and armed conflicts are causing chaos, mistrust and wars in the region. The Arab-Israeli conflict is the main one in the region. For the time being and the near future, the internal corruptions in Egypt, Syria and Libya are threatening factors hindering economic activities. As stated in Said (2011) banking and tourism sectors have been damaged especially in the tourism dependant economies as Tunisia and Egypt. Tourism industry in Egypt is said to lose 1 billion US\$ a month. Likewise, stock markets have lost 140 billion US\$ within five weeks in the Arab region. Moreover, leaving the political unrest behind, the Arab world has very solid problems with the structure of their economies. Due to closed trade regimes, MENA trades less than its potential. Low FDI level, high NTBs, lacking of skilled labor and infrastructure, the high share of oil-exports but very low shares of non-oil exports are the main problems of the region (Iqbal and Nabli, 2004; Bhattacharya and Wolde, 2009). As Böhmer (2010) points it out, MENA has the second place after OECD countries in the country risk classification for 2010.

#### **5 Conclusion**

This paper analyzes the potential effects of membership of Turkey to the EU and to GAFTA by considering tariffs and NTBs in food and agriculture sector. We use the GTAP data base and the theory-based gravity

approach to estimate AVEs of border effects reflecting the impacts of NTBs in 20 agro-food and 4 non-agro-food sectors.

In a second step we employ the GTAP model in order to implement the AVEs in the general equilibrium model. In our analysis we utilize the newest version 8 of GTAP data base. Before the implementation of AVEs, we move the GTAP framework to 2020 by updating the political and economic environment. Thereafter, we run two experiments and compare the possible effects of Turkey's integration either with the EU or GAFTA. In doing so, we also consider the reduction of tariffs in agro-food sector. In case of Turkey's membership to the EU, we remove the bilateral import tariffs between the EU and Turkey, but also adopted the common external tariffs to the third countries for Turkey. However, in our second experiment we only remove the tariffs between the GAFTA member countries and Turkey. Our results are evident for higher overall welfare gains for Turkey in case of a possible membership to the EU than the membership to GAFTA. However, in accordance with other authors, in both cases the new memberships are delivering higher gains for Turkey than the gains for the partner economies. The overall welfare gain coming from tariff reduction is much lower compared to the one coming from NTBs' removal in both experiments. However, the effects of NTBs' elimination are more pronounced in the experiment that we enlarge the EU to include Turkey.

Given the results above and as discussed in the previous section, Turkey gains ambiguously from the EU membership, while gains from the GAFTA membership are more restricted. The results are anticipated when the trade structure as well as political and economic environment of the regions of interest is considered.

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## 7 Appendix

**Table A1:** Turkey and its Free Trade Agreements

| Country                | Date of Signature | Date in Force | Elimination of duties in industrial products |
|------------------------|-------------------|---------------|----------------------------------------------|
| EFTA                   | 10.12.1991        | 01.04.1992    | 01.01.1996                                   |
| Israel                 | 14.03.1996        | 01.05.1997    | 01.01.2000                                   |
| Macedonia              | 07.09.1999        | 01.09.2000    | 01.01.2008                                   |
| Croatia                | 13.03.2002        | 01.07.2003    | 01.01.2007                                   |
| Bosnia and Herzegovina | 03.07.2002        | 01.07.2003    | 01.01.2007                                   |
| Palestine              | 20.07.2004        | 01.06.2005    | 01.06.2005                                   |
| Tunisia                | 25.11.2004        | 01.07.2005    | 01.07.2014                                   |
| Morocco                | 07.04.2004        | 01.01.2006    | 01.01.2015                                   |
| Syria                  | 22.12.2004        | 01.01.2007    | 01.01.2019                                   |
| Egypt                  | 27.12.2005        | 01.03.2007    | 01.01.2020                                   |
| Albania                | 22.12.2006        | 01.05.2008    | 01.01.2013                                   |
| Georgia                | 21.11.2007        | 01.11.2008    | 01.11.2008                                   |
| Montenegro             | 26.11.2008        | 01.03.2010    | 01.01.2015                                   |
| Serbia                 | 01.06.2009        | 01.09.2010    | 01.01.2015                                   |
| Chile                  | 14.07.2009        | 01.03.2011    | 01.01.2015                                   |
| Jordan                 | 01.12.2009        | 01.03.2011    | 01.01.2018                                   |
| Lebanon                | 24.10.2010        | in progress   | in progress                                  |
| Mauritius              | 09.09.2011        | in progress   | 01.01.2022                                   |

Source: Turkish Undersecretariat of Foreign Trade, 2012.

**Table A2:** Regional Aggregation of version 8 of the GTAP data base

| <b>Regions</b>                                                                                                                                                                                                                                                                                                                          | <b>Abbreviation</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>1. Turkey</b>                                                                                                                                                                                                                                                                                                                        | <b>TUR</b>          |
| <b>2. European Union</b><br>Austria, Belgium, Denmark, Finland, France, Germany, Ireland, United Kingdom, Greece, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, Czech Republic, Hungary, Malta, Poland, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Cyprus, Romania, Bulgaria                                            | <b>EU</b>           |
| <b>3. Greater Arab Free Trade Area</b><br>Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Egypt, Morocco, Tunisia, Rest of North Africa, Rest of Western Asia                                                                                                                                                         | <b>GAFTA</b>        |
| <b>4. Islamic Republic of Iran and Israel</b>                                                                                                                                                                                                                                                                                           | <b>IR-IS</b>        |
| <b>5. Former Soviet Union</b><br>Belarus, Romania, Russian Federation, Ukraine, Kazakhstan, Kyrgyzstan, Armenia, Azerbaijan, Rest of Former Soviet Union                                                                                                                                                                                | <b>XSU</b>          |
| <b>6. Asia</b><br>China, Hong Kong, Japan, Korea, Mongolia, Taiwan, Cambodia, Indonesia, People's Democratic Republic of Lao, Malaysia, Philippines, Singapore, Thailand, Viet Nam, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Rest of South Asia, Rest of Southeast Asia                                                           | <b>ASIA</b>         |
| <b>7. North America</b><br>Canada, United States of America, Mexico, Rest of North America                                                                                                                                                                                                                                              | <b>NORTH AM</b>     |
| <b>8. Latin America</b><br>Argentina, Bolivia, Brazil, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador, Caribbean, Rest of Central America, Rest of South America                                                                                                | <b>LATIN AM</b>     |
| <b>9. Oceania</b><br>Australia, New Zealand, Rest of Oceania                                                                                                                                                                                                                                                                            | <b>OCEANIA</b>      |
| <b>10. Sub-Saharan Africa</b><br>Cameroon, Cote d'Ivoire, Ghana, Nigeria, Senegal, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Tanzania, Uganda, Zambia, Zimbabwe, Botswana, Namibia, South Africa, Rest of African Customs Union, South Central Africa, Rest of Eastern Africa, Rest of Western Africa, Central Africa | <b>SSA</b>          |
| <b>11. Rest of the World</b><br>Switzerland, Norway, Croatia, Rest of EFTA, Rest of Eastern Europe, Rest of Europe, Rest of the World                                                                                                                                                                                                   | <b>ROW</b>          |
| <b>12. Albania</b>                                                                                                                                                                                                                                                                                                                      | <b>ALBANIA</b>      |
| <b>13. Georgia</b>                                                                                                                                                                                                                                                                                                                      | <b>GEORGIA</b>      |
| <b>14. Chile</b>                                                                                                                                                                                                                                                                                                                        | <b>CHILE</b>        |

**Table A3:** Sectoral Aggregation of the GTAP data base

| Sectors                                                                                                                                                                                                                                                                |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1. Paddy rice                                                                                                                                                                                                                                                          | PDR |
| 2. Wheat                                                                                                                                                                                                                                                               | WHT |
| 3. Cereal grains nec                                                                                                                                                                                                                                                   | GRO |
| 4. Vegetables, fruits, nuts                                                                                                                                                                                                                                            | V_F |
| 5. Oil seeds                                                                                                                                                                                                                                                           | OSD |
| 6. Sugar cane, sugar beet                                                                                                                                                                                                                                              | C_B |
| 7. Plant-based fibres                                                                                                                                                                                                                                                  | PFB |
| 8. Crops nec                                                                                                                                                                                                                                                           | OCR |
| 9. Cattle, sheep, goats, horses                                                                                                                                                                                                                                        | CTL |
| 10. Animal products nec                                                                                                                                                                                                                                                | OAP |
| 11. Raw milk                                                                                                                                                                                                                                                           | RMK |
| 12. Sugar                                                                                                                                                                                                                                                              | SGR |
| 13. Processed rice                                                                                                                                                                                                                                                     | PCR |
| 14. Dairy products                                                                                                                                                                                                                                                     | MIL |
| 15. Meat: cattle, sheep, goats, horses                                                                                                                                                                                                                                 | CMT |
| 16. Meat products nec                                                                                                                                                                                                                                                  | OMT |
| 17. Vegetable oils and fats                                                                                                                                                                                                                                            | VOL |
| 18. Food Products nec                                                                                                                                                                                                                                                  | OFD |
| 19. Beverages and tobacco products                                                                                                                                                                                                                                     | B_T |
| 20. Extraction                                                                                                                                                                                                                                                         |     |
| Wool, forestry, fishing, coal, oil, gas, minerals nec                                                                                                                                                                                                                  |     |
| 21. Light Manufacture                                                                                                                                                                                                                                                  |     |
| Textiles, wearing apparel, leather products, wood products, paper products, publishing, metal products, motor vehicles and parts, transport equipment nec                                                                                                              |     |
| 22. Heavy Manufacture                                                                                                                                                                                                                                                  |     |
| Petroleum, coal products, chemical, rubber, plastic products, mineral products nec, ferrous metals, metals nec., electronic equipment, machinery and equipment nec                                                                                                     |     |
| 23. Services                                                                                                                                                                                                                                                           |     |
| Electricity, gas manufacture, distribution, water, construction, trade, transport nec, sea transport, air transport, communication, financial services nec, insurance, business services nec, recreation and other services, PubAdmin/Defence/Health/Educat, dwellings |     |

