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Deep Integration with the EU and its Likely Impact on Selected ENP Countries and Russia

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Abstract

The aim of this study is to estimate the impact of the removal of NTBs in trade between the EU and its selected CIS partners: Russia, Ukraine, Georgia, Armenia and Azerbaijan (CIS5). The report includes a discussion of methodologies of measurement of non-tariff barriers and the impact of their removal, including a review of previous studies focusing on CEE and CIS regions. Further, we employ a computable general equilibrium model encompassing the following three pillars of trade facilitation: legislative and regulatory approximation, reform of customs rules and procedures and liberalization of the access of foreign providers of services. We conclude that a reduction of NTBs and improved access to the EU market would bring significant benefits to the CIS5 countries in terms of welfare gains, GDP growth, increases in real wages and expansion of international trade. The possible welfare implications of deep integration with the EU range from 5.8% of GDP in Ukraine to sizeable expected gains in Armenia (3.1%), Russia (2.8%), Azerbaijan (1.8%) and Georgia (1.7%).

1. Introduction

The European Neighbourhood Policy (ENP) was created with the aim of extending the area of prosperity, stability and security to the new EU neighbours following the EU Enlargement in 2004. The ENP offers deeper political and economic integration to countries bordering the EU. The ENP applies to the immediate neighbours by land or sea: Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Israel, Jordan, Lebanon, Libya, Moldova, Morocco, Occupied Palestinian Territory, Syria, Tunisia and Ukraine. The EU has developed a Strategic Partnership with Russia covering four "common spaces". The central elements of the ENP are the bilateral Action Plans that set out an agenda for political and economic reforms with various short to medium-term priorities. The Action Plans contain provisions on gradual harmonization of the national legislation with the acquis in selected areas. The Action Plans set a clear agenda for harmonization of product standards and provide detailed provisions on customs, state aid and competition policy. The implementation of the ENP Action Plans is to lay grounds for the conclusion of deep and comprehensive Free Trade Agreements (FTAs) with the ENP partners, covering substantially all trade in goods and services and including legally-binding provisions on trade and economic regulatory issues[1].

The aim of this paper is to estimate the likely impact of the institutional harmonization through the removal of non-tariff barriers (NTBs) in trade with the EU in selected countries. We focus on Russia along with four ENP countries: Armenia, Georgia, Azerbaijan and Ukraine. We refer to them as the CIS5. The country coverage was dictated by broader research agenda of the ENEPO[2] project and by data availability. We begin with a review of studies on deep integration and on the measurement of NTBs in Central and Eastern Europe and in CIS countries in the Chapter 2. Then we proceed with an overview of the progress in harmonization of product standards and reform of the conformity assessment infrastructure, customs and barriers to foreign provision of services in the CIS5 (Chapter 3). Finally, we provide our estimates of the likely impact of FTAs between the EU and the CIS5, looking at a Simple FTA (tariff reductions) and a Deep FTA (significant reduction of NTBs and improvements in the business environment).

[1] For a review of the institutional harmonization in the context of the ENP, please see Kolesnichenko (2009).
[2] http://enepo.case.com.pl/dyn/?ID=enepo&nlang=710.

2. Measuring the Magnitude of Non-Tariff Barriers[3]

Further integration of the ENP countries with the EU can affect the economies of both the ENP countries and the EU in several ways: via trade, FDI, domestic investment etc. These effects work through at least three major channels: first is elimination (or at least reduction) of administrative barriers, such as reduced costs of passing customs at the frontier; second is mitigation of risks and uncertainties, which form substantial impediments to trade, for example, instability of business environment; third is the reduction in technical barriers to trade (TBTs). The single market reduces TBTs by means of mutual recognition of different technical regulations, minimum safety requirements and harmonization of rules and regulations.

Earlier studies (e.g. Baldwin et al., 1997; Keuschnigg and Kohler, 2002) admit that quantifying the accession to the internal market is not an easy task. The complexity of the Single Market access makes it impossible to model it explicitly in a general equilibrium model. The standard solution used by these authors is to model Single Market access crudely as a reduction in the real cost of trade. So, the authors did not attempt to actually measure NTBs and thus quantify their impact, but simply made assumptions on trade cost reductions. Thus, Baldwin et al. (1997) assume this to be equivalent to a 10% reduction in real cost of all CEEC-EU trade, whereas Keuschnigg and Kohler (2002) argue that a trade cost reduction of 5% is appropriate. As Nahuis (2004) notices, these approaches have some obvious limitations. First, any such assumption is arbitrary. Second, the assumed number is identical for all countries. Third, it is identical for all industries. Again, Nahuis (2004) in his work shows that the impact of the internal market accession is markedly different across industries and countries.

Taking into account the above mentioned limitations, three alternative methods of measuring NTBs have been developed. First, *frequency-type measures* can be constructed using, for example, UNCTAD database (which is commodity/sector and country specific) or using special surveys on how trading firms perceive or experience NTBs. Based on such data, frequency or import coverage ratios are

[3] This section is taken entirely from Chapter 3 "Measuring non-tariff barriers and their impact on the economy" of the intermediate report delivered under this project (CASE, 2007).

developed.[4] These ratios are subsequently used to calculate tariff equivalents. Second, *price-comparison measures*, where estimates of NTBs are derived based on differences between domestic and foreign prices.[5] Since the price impact is a general property of NTBs, such a price comparison can pick up the net effects of all NTBs that are present in a market. Percentage differences between the prices are calculated, comparable to tariffs, which are commonly referred to as tariff equivalents. However, the drawback of such a method is the impossibility to identify NTBs nature since it is not clear which concrete NTBs cause those price differences. Quantity measure would be preferable to price measure. Thus, we move to the third method - *quantity-impact measures.* The objective here is to estimate the potential trade in the absence of NTBs and to compare it to the actual trade. This method involves estimation of econometric models of trade determination based on theoretical models of Heckscher-Ohlin (trade based on comparative advantage), Helpman-Krugman (trade based on product differentiation) or gravity models. Under all these approaches NTBs are measured either by using residuals of the estimated regressions as representing NTBs or various dummy variables. Besides the above three general methods there are also *special purpose methods*[6], extensively described in the study of Deardorff and Stern (1998). Below we discuss the results of the three types of studies on NTBs in CEE and CIS countries.

2.1. Studies based on frequency-type method

Several studies look at the issue of border effects[7] in the enlarged EU economic space in the context of technical barriers to trade (e.g. Brenton and Vancauteren, 2001; Chen, 2004). However, evidence on CEECs countries is still quite scarce.

[4] The frequencies are calculated for commodity categories that were subject to some identifiable NTB in a specific year. The number of product categories subject to NTBs is then expressed as a percentage of the total number of product categories in each commodity group. This is referred to as the frequency ratio. The import coverage ratios are calculated by determining the value of imports of each product subject to NTBs, aggregating by applicable commodity group, and expressing the value of imports covered as a percentage of total imports in the corresponding commodity group.

[5] Provided the data on prices is available.

[6] Special purpose methods include: (1) elasticity estimation; (2) determinants of variations in elasticity estimates; (3) variations in effects of NTBs over time; (4) binding of NTBs; (5) risk characteristics of NTBs.

[7] Exchanges between economic actors are normally found to cost more if they cross any kind of administrative borders. The difference in the costs involved in moving products within a country or between countries is underlying the nature of border effect.

Manchin and Pinna (2003) study differences in the importance of border effects in trade in products with different magnitude of technical barriers. They examine bilateral trade flows in the CEECs using data for the period 1992–1998 between a sample of accession countries (Cyprus, Bulgaria, Hungary, Latvia and Poland) and the EU. Manchin and Pinna (2003) use the same Commission's review of the impact of the Single Market in the EU as Vancauteren and Weiserbs (2003). They group products using the approach adopted by the EU to remove technical barriers: old approach, other approach (including mutual recognition, new approach), and mixed approach (includes products where old approach and other approach are applicable). They find that the border effects are the largest for old approach products, where they expect to have the most important technical barrier to trade due to complicated harmonization procedures. In the absence of border costs their countries of interest would trade between themselves 114 times more in old approach products, while only 25 times more in other approach products. However, the authors notice that the estimated border effects seem to be too large to be consistent only with the presence of trade barriers.

Another study of Chevassus-Lozza et al. (2005) aims to assess the role of NTBs in eight EU new member states[8] exports but only in agri-food sector. The authors divide NTBs into three categories - sanitary and phytosanitary (SPS) measures, quality measures, and import certificates - and include them as dummy variables into their gravity model. They compare the role of various trade barriers in a cross-section design (for 1999 and 2003) and thus answer the question about the changing role of NTBs over time. The data on NTBs is taken from the French Customs source[9] that hosts the electronic version of EU border regulations. They find that in 1999 these three NTBs indeed represented serious obstacles to trade. In 2003 their role has diminished, most notably for SPS and quality measures. The change of size of their coefficients[10] between 1999 and 2003 can be interpreted as an indication of the progress made by these countries in implementing the *acquis communautaire* in the pre-accession period.

In case of CIS countries, the availability of NTBs datasets and empirical evidence on their impact on trade flows between them and the EU is very limited. In most cases the existing international datasets contain rather outdated, or incomplete (in terms of country coverage) or highly aggregated data on NTBs. For example, CIS countries are included into the UNCTAD's Trade Analysis and Information System (TRAINS) but the latest NTB data are from 1997 for most of them.

[8] Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia.
[9] www.douane.gouv.fr.
[10] The coefficient for SPS has changed from -0.63 to -0.25; quality: from -0.31 to -0.07.

In spite of these shortcomings, the UNCTAD TRAINS data have been frequently used in studies on the role of NTBs in the world trade, including CIS countries. The most recent among them is the World Bank study by Kee, Nicita and Olerreaga (2006) that provides estimates for three measures of trade protection in the form of tariff equivalents – trade restrictiveness indices. These measures include: (i) trade restrictiveness index (TRI), which is an indicator of country's trade protection that measures trade distortions (or domestic inefficiencies) of country's trade policies imposed on itself (ii) overall trade restrictiveness index (OTRI), which reflects restrictiveness of country's trade policy imposed on its importers (import losses), and (iii) market access overall trade restrictiveness index (MA-OTRI) which captures trade barriers of other countries imposed on exports of each separate country.

Ad-valorem equivalents were estimated for certain NTBs[11] and agricultural domestic support for each 6-digit HS category and for 104 countries. Data on core NTBs was obtained from UNCTAD's TRAINS database, whereas on agricultural support – from WTO members' notifications (previously constructed by Hoekman, Ng and Olearreaga, 2004). Final estimates of this several-stage study, in particular (i) import demand elasticities; (ii) ad-valorem equivalents of core NTBs and agricultural domestic support (in percentage form), and (iii) trade restrictiveness indices[12] (computed for broad aggregates: overall trade, agriculture and manufacturing) can be freely accessed through the World Bank trade website.

Obtained results allowed authors to make the following conclusions on trade barriers across countries: (i) NTBs have a significant contribution to global trade protectionism – on average the additional 70% of the level of trade restrictiveness imposed by tariffs (the importance of NTBs is stronger in developed countries); (ii) poor countries tend to have more restrictive trade regimes and, at the same time, higher trade barriers on their exports; (iii) trade restrictiveness is generally higher in agriculture (in import markets), and agricultural exporters usually face higher trade barriers on export markets.

These general findings have relevance to CIS countries covered by the study (Belarus, Kazakhstan, Moldova, Russia and Ukraine) as well. For instance, market access overall trade restrictiveness index (MA-OTRI) for Ukrainian exporters in the world markets equals on average 15.2%, while this index goes up to 49.2% for Ukrainian agricultural producers and goes down to 11.4% for its manufacturing producers. For comparison, the respective estimates for the Russian exporters are

[11] The following NTB measures were included: price and quantity control measures, technical regulations, and monopolistic measures.

[12] As well as additional indicators: dead weight losses due to the existing trade restrictiveness (TRI), import losses due to overall trade restrictiveness (OTRI).

as follows: 12.2%, 46.7% and 9.7%, while exporters from the EU encounter on average trade restrictiveness of similar magnitude 15.1%, 34.3% and 12.2% (see Table 1). In regard to trade barriers imposed by CIS countries on their imports, the authors found that Moldova maintained one of the most liberal trade regimes. Still, Ukraine's protection of its agricultural market is the highest among the considered countries.

Table 1. Trade Restrictiveness Indices of CIS countries

	Ukraine	**Russia**	**Moldova**	**Belarus**	**Kazakhstan**
Market Access Overall Trade Restrictiveness Index (MA-OTRI), %					
Overall	15.2	12.2	25.9	15.4	15.3
Agriculture	49.2	46.7	43.3	33.8	62.4
Manufacturing	11.4	9.7	18.0	14.7	11.2
Overall Trade Restrictiveness Index (OTRI), %					
Overall	21.6	22.6	7.4	15.9	14.0
Agriculture	46.4	33.4	16.8	31.2	32.9
Manufacturing	18.4	20.4	5.7	13.7	11.7

Source: Kee, Nicita and Olerreaga, 2006.

To the best of our knowledge, the most complete NTB database in terms of different types of NTBs and time coverage, developed for Ukraine, is the one constructed by Movchan and Eremenko (2003), following the UNCTAD's TRAINS methodology. In particular, this dataset reports the presence or absence of a non-tariff barrier in each HS 6-digit tariff line over the period starting from 1993. A broad range of import-related NTBs applied in Ukraine has been used for construction of this database, including core NTBs but not only them (see the full list of NTBs in the Annex1 Table A1). Such a complete NTBs database makes it possible to compute various types of NTB intensity indices - in the form of simple frequency or import-weighted (import coverage) ratios.

The same authors (Movchan and Eremenko, 2003) computed an augmented weighted index of NTBs which allows differentiating intensity of various types of the NTBs and aggregating them into one measure[13]. Having considered NTBs applied in Ukraine between 1994 and 2001 the author concluded: (i) in the studied period aggregate intensity of non-tariff protection increased by almost 97% with a

[13] According to Movchan and Eremenko (2003), augmented weighted index of NTBs is a "compound additive index that incorporates a spectrum of non-tariff barriers applied in the country weighted on the value of imports. It applies the changeable indicator of the non-tariff protection for each type of the NTB what allows preserving positive characteristics of frequency measures like transparency and universality, at the same time adding flexibility and better representation of reality".

peak in 1999–2000 and gradual reduction afterwards, (ii) evolution of different types of non-tariff protection revealed that core NTBs, with most harmful influence on trade, had been gradually reduced starting 1998 for most commodities, on the contrary the role of technical barriers[14] had been steadily increasing; (iii) food products were the most heavily affected by NTBs (Movchan, 2003).

Later, these findings were developed further. For example, the augmented weighted index of core NTBs (quotas, licenses, excise charges, anti-dumping measures, and minimum custom value) applied to imports in Ukraine during the 1999–2004, was computed and used in Pindyuk (2006). NTB index calculations used in this study suggest that agriculture, food and agricultural processing, fishing, extraction of coal have been the most protected sectors in Ukraine in terms of NTBs (see Table 2). The NTB indices for these sectors even increased by the end of the respective period while protection of most of the other sectors has been gradually declining.

In the World Bank's "Ukraine Trade Policy Study" (World Bank, 2004) frequency indices were calculated for longer period of 1993–2004 which illustrated longer-term dynamics of NTBs in this country. During the analyzed period the simple frequency index calculated for 17 non-tariff measures including core and technical regulations measures[15] increased by more than twice from 7.2 to 17.5% whereas import coverage index rose ten times from 1993 to 2004. There was a considerable escalation of the number of applied safety control measures and compulsory standards certification during this period, which have become the major component of the NTB index of Ukraine. In 2001–2002 the NTB frequency index was slightly reduced due to elimination of minimum custom value regulations and easing state procurement rules, but in 2002–2004 it grew again stipulated by extension of the list of compulsory certification and introduction of new risk-control measures by the Custom Service of Ukraine[16]. The authors conclude that Ukraine seems to be rather liberal in terms of applied official *core* NTBs frequencies, if compared with OECD countries, and then mentions that informal NTBs can also play a substantial role. Therefore, business surveys investigating effective trade barriers and business climate in the country are of great importance for getting a full picture of NTBs.

[14] They include safety standards and ecological control, compulsory standards certification, permits for medicine imports.
[15] See Appendix for their list.
[16] World Bank (2004), pp. 48-49.

2.2. Special surveys

Another kind of frequency-type measures is based on special surveys. One of the recent surveys was conducted for five Western Balkan countries (Frohlich, 2005), for which the prospect of the EU membership was confirmed during the Thessaloniki summit in June 2003 (Albania; Bosnia and Herzegovina; Croatia; Macedonia; Serbia and Montenegro). Overall, 2,166 companies from five countries took part in the survey. As to the NTBs, companies were asked to rank various barriers in accordance with their importance. The highest score was received by technical standards and certification, followed by quality control and consumer protection. Customs procedures are on the third place, followed by access to final end-users. Company registration procedures seem to be relatively less important, taking the last – fifth place. However, it should be noted that the difference in average grades given to various NTBs is not large: on the four-point scale the highest rank (technical standards, certification) on average stands at 3.8, while the lowest (company registration) – at 2.9.

Another survey, which served as a basis for the above mentioned Western Balkan survey, was conducted in 4,400 enterpirses in 10 then EU candidate countries of Central and Eastern Europe (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia) plus Croatia (Frohlich, 2003). The total of 2,725 companies (62% of the target) were interviewed. The survey included an assessment of company compliance with the *acquis* – in general and by areas; problem areas in the *acquis* implementation; and cost of compliance with the *acquis* for the Single Market. Four-point scale was used, with the score of 4 corresponding to full compliance, and 1 – very low compliance. According to the survey results, companies assessed their general level of compliance at 2.2 on average. Compliance with the following areas: consumer protection and producer liability; product certification, technical regulations, standards; and work safety were ranked the highest (2.7). Food quality and safety on average was rated at the level 2.6. The lowest scores were attributed to environmental protection; labels, trademarks, patents; and rules of competition (2.5). The same questions of compliance were addressed from a different angle: assessing the expected difficulties accompanying implementation of the *acquis*. Here the area of product certification, technical regulations, standards was ranked the highest – 2.8; and food quality and safety – the lowest (1.9).

Jakubiak et al. (2006) study investigated NTBs based on the surveyed sample of 510 exporters, most of which were rather small companies (less than 50 workers) owned by Ukrainian private capital. Most of them were involved in trade relations, exporting about half of their production, mostly to the EU. The survey fo-

cused on questions relevant mostly to manufacturing producers and covered such areas as certification of origin, customs procedures and technical standards. The EU custom procedures were assessed as relatively easy and not so costly by Ukrainian exporters (over 72% of firms did not see any problems with them). According to the survey, respondents on average spent 6% of export value on custom clearance and waited on average one day on the border with the EU. Most of the large companies claimed that costs of compliance with the EU's technical regulations were about identical as with domestic technical regulations. On the contrary, small private firms, especially those exporting agricultural products, consider that the cost of meeting EU technical standards is higher comparing to domestic ones. However, there is no big difference between large and small companies in perception of product quality requirements as the most restrictive technical standard.

When asked about the ratio of costs incurred to meet EU's technical requirements to total production costs, respondents provided rough estimates rather than calculated numbers. According to them, average level of costs across the sample equalled to 13.9% of production, while this number for large foreign-owned firms was greater than the average and constituted 16.1%. Breakdown by the sectors shows that companies selling products of metallurgy and chemistry industries spent the least on upgrading the commodities up to EU requirements, while textile and apparel industry spent the most (see Table 2 for more detailed information). As to the cost of passing the testing and certification procedures as a share of total production costs, it was estimated as 4.2% on average with greater burden for small firms than for large. Most companies reported that there was high degree of duplication of their efforts due to necessity to test production for both Ukrainian and EU requirements.

Trade barriers (tariff and non-tariff) encountered by Moldovan exporters to the EU market were studied in Diomin et al. (2005). The study presents results of the survey conducted among 95 Moldovan commodity exporters. They were asked to prioritize main obstacles to trade with the EU. Most Moldovan exporters perceived high tariffs as the main obstacle in exporting to the EU (about 20% of surveyed exporters indicated it as the strongest obstacle). Competitive pressure from the EU producers (about 15%) and limited possibilities of getting visas (14%) were perceived as the next most important impediments to trade with the EU. On the contrary, Moldovan businesses in general considered conformity with EU standards and obtaining the certificate of origin as not very important obstacles to their trade with the EU (5% and 6% respectively).

Rutherford et al. (2005) estimated the ad valorem equivalents of barriers to foreign direct investment in service sectors in their assessment of the impact of Russia's WTO accession on poverty. These sectors included: telecommunications; science and science servicing; financial services; railway transportation; truck

transportation; pipelines transportation; maritime transportation; air transportation; and other transportation. The authors first commissioned surveys in telecommunications; banking and securities; and maritime and air transportation services by Russian research institutes. Then they used these surveys, the supplementary data and research results of Kimura et al. (2004a, 2004b, 2004c) to estimate reduction in barriers to FDI based on assessing the regulatory environment. The estimated ad valorem tariff equivalents to FDI range from 33% (in telecommunications, science, railway, truck and pipelines transportation) to 90–95% (air transportation and maritime transportation) (see Table 2).

The same methodology of measuring barriers to trade/foreign direct investments in services, as in Rutherford et al. (2005), was employed in Copenhagen Economics, IER, and OEI (2005) for Ukraine and then updated in IER (2007). This work modelled different scenarios of Ukraine's WTO accession and estimated respective economic impact of their implementation. The authors estimated ad valorem tariff equivalents of barriers to FDI in three Ukrainian services sectors: telecommunications (fixed, Internet, mobile), railway transport (freight and passenger) and finance (banking, insurance, securities) (see Table 2). Their estimates revealed that financial services were the most protected among service sectors (about 30% ad valorem tariff equivalent), followed by railways (16.7%) and telecommunications (4.9%). Hence the estimated barriers to foreign provision of services were significantly lower than in the case of Russia.

2.3. Gravity model approach

The literature quantifying NTB effects in the context of EU enlargement with the help of gravity models is quite scarce. To the best of our knowledge, there are three studies examining regional trade and welfare implications of NTBs in the context of EU enlargement. These are Lejour et al (2001); Nahuis (2004) and Philippidis and Carrington (2005); yet, the latter basically replicates the Lejour et al (2001), using spatial econometric procedures.

Lejour et al. (2001) used WorldScan CGE model for the world economy. The accession countries were divided into three regions: Poland, Hungary, and CEEC5 (Czech Republic, Slovakia, Slovenia, Bulgaria, Romania); Baltic countries were not included. The authors distinguished sixteen sectors: agriculture, raw materials, ten manufacturing sectors and four service sectors. They derived NTB equivalents based on gravity model approach. The estimated ad-valorem NTB equivalents ranged from 0% to 17.7% among sectors, in particular for agriculture – 17.7%,

trade services – 17.2%, textile and leather – 14.5%, non-metallic minerals – 13.1%, food processing – 11.7%. Noteworthy, according to study's estimation, trade in services (financial services, transport and communication) was well liberalized (with 0% tariff equivalents).

The same approach was used by Nahuis (2004) – incorporating EU-membership dummy into his gravity equation. In particular, the author assumed that dummy indicating whether both countries are EU members provides insight into the impact of the internal market access. The estimations exploited the fact that the 'old' EU members belonged to a single market since 1992. Therefore, the trade levels between two EU members when compared to trade between two similar non-EU members gave indicstion on the NTBs which the single market succeeded to remove.

Similarly to Lejour et al. (2001), Nahuis (2004) did estimation for sixteen industries; the CEECs were divided into three regions: Poland, Hungary, and Rest CEEC. Main findings of Nahuis (2004) lay in line with the previous study; still after transforming coefficients of EU membership dummies into tariff equivalents the NTB estimate appeared to be higher (up to 30% for some industries: agriculture – 30%, textiles and leather – 19%, trade services – 17%, etc.).

However, the gravity specification employed in Lejour et al. (2001) was recently criticized and revisited by Philippidis and Carrington (2005). The authors claim that the impact of Single Market access is misrepresented due to the absence of spatial effects in their gravity specification.

Philippidis and Carrington (2005) employed spatial econometrics procedures in gravity modelling and applied the same CGE dataset and aggregation as Lejour et al. (2001) to ascertain the degree of bias on gravity estimates of predicted trade. Authors explain that in the presence of spatial effects (namely spatial dependence, caused by various degrees of spatial aggregation, spatial externalities and spillover effects, and spatial structure of heteroskedasticity) traditional econometric techniques produce inefficient and, given the implicit misspecification, biased estimates. Their results suggest that there was a systematic overestimation of NTBs for eleven sectors when traditional econometric techniques were used. In particular NTB tariff equivalent for agriculture amounted to 7.5%, food processing – 9.4%, textiles and leather - 11%, non-metallic minerals – 11%, etc.

As for the CIS, we are only aware of a study on Ukraine. The gravity approach for obtaining NTB estimates was applied in the recent study on feasibility of free trade between the EU and Ukraine undertaken by CEPS 'The Prospects of Deep Free Trade between the European Union and Ukraine (CEPS, 2006). Removing non-tariff barriers was included as an important characteristic of deep institutional and regulatory convergence in the framework of a deep integration scenario. The

authors used the gravity model technique to estimate the implicit NTBs at the sectoral level among the regions of their CGE model. In particular, they introduced dummy variables for different country groupings - EU members, accession countries (CEEC and SEEC) or other countries - expecting that trade usually would be greater if the two countries belonged to the same trade block. The estimated coefficients of these dummies were later transferred into ad-valorem tariff equivalents of trade barriers between countries[17]. The resulting estimates of NTBs for non-EU countries including Ukraine appeared to be rather large, ranging from 20% for textiles to 40% for food products.

Table 2. Estimated non-tariff barriers for Ukraine and Russia

Sectors	**Applied to Ukrainian exporters to the EU**	**Applied to exporters to Ukraine**	**Applied to exporters to Ukraine**	**Applied to all exporters to Russia**
	*Jakubiak et al. (2006)**	*Pindyuk (2006)***	*Copenhagen Economics, IER, and OEI (2005), IER (2007)****	*Rutherford et al., (2005)*****
Agriculture	11	27.8		
Forestry		22.4		
Food processing	11	31.9		
Fishing		33.5		
Extraction of energy materials		17.1		
Extraction of coal		19.1		
Extraction of non-energy materials		14.3		
Textile and apparel		13.9		
Textiles and leather	19			
Leather and footwear		17.2		
Wood		14.2		
Paper		9.7		
Coke and oil refining		18.9		
Rubber and plastic goods		12.5		
Other non-metal mineral products		10.0		
Metals	5			
Iron and steel		8.1		
Chemistry and petrochemical	5	16.7		
Machinery and equipment	12	11.2		
Electrical and electronic equipment		14.2		
Transport equipment		11.4		
Other production		12.4		

[17] There is neither description of the methodology for doing this transformation nor the resulting estimates of ad-valorem tariff equivalents of trade barriers presented in this study.

Sectors	Applied to Ukrainian exporters to the EU	Applied to exporters to Ukraine	Applied to exporters to Ukraine	Applied to all exporters to Russia
Electricity, gas and water supply		5.9		
Telecommunications				33
- fixed			5.2	
- Internet			3.4	
- mobile			6.1	
Financial services:				36
- banking			21.9	
- insurance			36.0	
- securities			28.7	
Railway transportation			16.7	33
Science & science servicing				33
Truck transportation				33
Pipelines transportation				33
Maritime transportation				95
Air transportation				90
Other transportation				33

Notes:
* Percentage of total year production costs spent in order to ensure products compliance with the EU norms, Ukraine, 2006.
** Augmented weighted index for NTBs (quotas, licenses, excise charges, anti-dumping measures, and minimum custom value), Ukraine, 2004.
*** Ad valorem tariff equivalents of barriers to FDI applied against foreign providers of services, Ukraine, 2005.
**** Ad valorem tariff equivalents of barriers to FDI in service sectors applied against foreign providers of services, Russia, 2005.

2.4. Summary

- With a reduction in tariffs in the framework of the WTO liberalization, non-tariff barriers have become leading component of trade protection measures applied by countries throughout the world. Therefore, closer market integration that envisages reduction of non-tariff barriers to trade in goods, as well as lessening barriers to FDI, usually brings more economic gains for trading partners than the mere tariff reduction.
- Indirect estimates of NTBs obtained through a gravity model approach are usually higher than estimates of other approaches (e.g. frequency indices), which use direct evidence on the prevalence of NTBs. The former usually take into account the broader range of non-tariff barriers since

they capture all existing non-tariff barriers to trade (including informal measures) thus providing the upper bound of estimated NTBs. Gravity estimations can be used to measure how NTBs prevent trade between countries from its potential, whereas frequency indices per se do not measure the influence of NTBs on trade. Business surveys reflecting entrepreneurs' perceptions are good as well at complementing the picture on NTBs significance to economic agents involved in foreign trade but their quantitative estimations are susceptible to respondent bias.

- Different approaches for estimating NTBs (frequency indices, gravity modelling or enterprises' perception surveys, etc.) usually provide higher NTBs estimates for agricultural products compared to industrial products. NTBs estimates of non-tariff barriers to FDI and trade in services in general appear to be also high, especially in developing and transition countries.
- In the structure of NTBs the role of core non-tariff barriers diminishes while the importance of regulatory differences and technical barriers to trade and market access gradually increases thus stipulating the need for taking the latter into account while investigating the impact of NTBs on trade and economic performance.
- CIS (Ukraine and Russia): NTBs magnitude and their role in trade between EU and CIS countries as well as between CIS countries themselves proved to be highly significant. Business surveys conducted for Ukraine show that the costs of meeting EU technical standards are considered rather high and burdensome by Ukrainian producers (Jakubiak et al., 2006) (see Table 2). These costs are perceived the highest (reaching more than 30% of yearly production costs) by Ukrainian enterprises producing wearing apparel and dressing, agricultural and food processed products, wood products, non-metallic mineral products.

Estimates of barriers to FDI in services sectors derived for Ukraine and Russia prove existence of significant restrictions to trade and foreign investment in these sectors. Upper bounds of existing NTBs to EU-Ukraine trade estimated through gravity model approach are even greater ranging from 20 to 40% depending on industry (CEPS, 2006). The NTB system developed by Ukraine followed general trends in international trade: agriculture, food and agricultural processing, fishing, etc. have been the most NTB protected sectors in Ukraine; the significance of technical barriers have been increasing in the structure of applied NTBs (World Bank, 2004).

3. Measuring the Benefits of Improved Market Access

3.1. Introduction

Market access for goods is usually defined as the conditions, including tariff and non-tariff measures, for the entry of specific goods into the country's market. In regard to trade in services, market access is ensured via the four ways (or modes) of supply: cross-border supply, consumption abroad, commercial presence (most services are traded in this way), and presence of natural persons (or movement of people). Improvement of market access for goods implies reducing tariffs and/or non-tariff barriers (NTBs), while for services it means a removal of different restrictions applied to services provision within the four modes[18].

Trade-affecting NTBs work through a shift of an exporter's cost curve hurting trade flows between countries, but they may also have broader market implications by changing the structure of domestic supply or demand (Popper et al. (2004), p.93). In addition, NTBs may trigger efficiency losses due to an alteration of production technologies to meet a new technical requirement, restrain competition and lead to market segmentation[19]. In general, protective NTBs result in gains to the domestic industry at the expense of domestic consumers and foreign suppliers (the magnitude of losses of foreign suppliers depends on the availability of alternative outlets for their products).

The literature describes several types of empirical methodologies to assess the economic effects of NTBs; some of them address trade effects only, others consider economic welfare effects as well. The detailed description of approaches to modelling and measuring the economic effects of non-tariff barriers, including technical measures, are provided in Maskus et al. (2001) and Beghin and Bureau

[18] Restrictions on trade in services may include special licenses, requirements for additional diplomas, local residence of management, local professional insurance, restrictions on right of establishment and movement of business personnel, etc.

[19] According to Maskus et al. (2001), some NTBs, for example technical regulations, may also have positive effects on economic well being of market participants by remedying safety hazard or other market failures. The same is true for custom procedures, which are needed for smooth trading. These NTBs are considered trade restrictive if they are more stringent than necessary or inefficient.

(2001). Maskus et al. (2001) differentiate approaches by methodology or model type alone, in particular surveys, macro-level econometric analysis, partial equilibrium models, computable general equilibrium (CGE) models. Beghin and Bureau (2001) distinguish between trade-oriented and welfare-oriented approaches. *Surveys* are usually designed to identify existing barriers to trade, measure the cost of compliance with these trade barriers and the extent to which they impede trade. Most surveys are trade-oriented and their results are usually used as inputs to a broader welfare-oriented analysis. Surveys can draw attention to those regulations that firms really care about, but firms' quantitative estimations of the amount of NTBs and their economic effects may be biased (Popper et al, 2004). Macro-level econometric models explain trade flows in terms of a set of exogenous variables, which explicitly or implicitly include trade-restrictive regulatory policies and practices. *Gravity-based models* are an example. They provide insight to broad relationship between NTBs and trade (trade-oriented) but usually rely on the use of simple "count data" (e.g., the number of standards) being a poor proxy for the trade restrictiveness of the regulatory regime and do not allow distinguishing between important and unimportant NTBs and their effects (Popper et al, 2004).

Partial equilibrium models investigate the effects of a particular NTB on trade or welfare more generally than gravity-type models. They rely on microeconomic theory of supply and demand in a particular industry and are used to assess in detail the various effects of a particular NTB (on prices, quantity and welfare) (Beghin and Bureau, 2001). These models include studies using price-wedge and risk-based methods, sectoral models, other micro-economic approaches. These models do not capture spill-over effects between sectors. Data availability and interpretation (especially for price-wedge method) impose practical difficulties with partial equilibrium models (Popper et al, 2004).

Whilst *computable general equilibrium (CGE) models* do capture interactions across all sectors of an economy and provide insight to aggregate-level economy-wide trade and welfare effects. However, they typically lack the capacity to accommodate the necessary details for industry-based, case study analyses. CGE models are usually based on the inputs on NTBs measures generated by surveys, price-wedge and other micro-based approaches.

Below we will focus on the existing studies using CGE models to investigate economic impacts of reduction of NTBs in CEECs and CIS countries as we are going to employ such a model further in this chapter.

3.2. Measuring economic impacts of a reduction of NTBs in CEECs and CIS countries

Below we discuss three CGE studies focusing on the removal of NTBs in the 2004 Enlargement: Lejour et. al. (2001), Philippidis and Carrington (2005) and Maliszewska (2004).

Lejour et al (2001) employ the CPB's[20] CGE model for the world economy – WorldScan for measuring the economic implications of the EU-enlargement shocks. The authors consider three such shocks: (i) a gradual removal of the remaining formal trade barriers in agriculture and food processing and the adoption of the common external tariff; (ii) accession to the internal market; and (iii) free movement of labor. For all three experiments, they explore the macroeconomic implications, namely the effects on real GDP, the volume of private consumption, and the terms of trade.

The first experiment, which is a move towards a customs union, shows that CEECs experience an increase in GDP and consumption of 2.5% and 2.3% respectively, while consumption and GDP in the EU hardly change. It also reveals that CEECs (except for Hungary) experience a terms-of-trade loss. In the second experiment, the authors explore the implications of accession to the internal market by simulating a gradual abolishment of the NTBs. The macroeconomic implications of accession to the internal market turn out to be substantial for the CEECs, namely GDP and consumption increase by 5.3% and 9.3%, respectively. For all countries, consumption growth is higher than the growth in GDP because of the terms-of-trade gain. Overall, the economic implications for the accession counties in this study are significant. If we add the impact of the three shocks of enlargement for the CEECs, GDP per capita increases by more than 8%. The effects for the EU countries are generally positive, but modest. Also, as the study suggests, compared to the customs union and free movement of labour, accession to the internal market yields the largest economic effects.

Philippidis and Carrington (2005) simply revisit the gravity specification employed in Lejour et al (2001). Thus, employing spatial econometric procedures, they apply the same CGE dataset and aggregations as Lejour et al (2001) and reassess the importance of NTBs on trade flows, real growth, and real income changes. The authors run three model scenarios, examining the trade and welfare impacts of accession to the Single Market. In their baseline scenario, they simulate the removal of all formal trade barriers and extending the common external tariff to CEECs. The second and third scenarios employ the same shocks as the baseline

[20] CPB Netherlands Bureau for Economic Policy Analysis.

scenario, but including import augmenting technical change shocks to capture the trade costs associated with the removal of NTBs by sector associated with non-spatial effects and spatial effects gravity estimates respectively. The authors find that trade diversion, resource reallocation and welfare effects from European Integration are biased upwards when not accounting for spatial effects. Thus, comparing between spatial effects and non-spatial effects simulations, real growth for the CEECs falls by 0.25% under conditions with spatial effects. The authors report 4.68% GDP growth in non-spatial effects scenario and 4.43% – in spatial effects scenario.

There is one more paper evaluating the implications of the EU enlargement with the use of a computable general equilibrium model – Maliszewska (2004). The focus of this paper is on the accession to the Single Market. Among the CEECs considered in the analysis separately are modelled only Poland and Hungary, the CEEC-5 aggregate contains Czech Republic, Slovakia, Slovenia, Romania and Bulgaria. The model employed in Maliszewska (2004) is a standard static CGE model based on Harrison, Ruterford and Tarr (1994), which model NTBs explicitly including border costs and standard costs as discussed further in section 5.1. Maliszewska's (2004) analysis is based on lower protection levels in trade between Poland, Hungary and the EU (as there are considerable differences between tariffs reported by GTAP and applied tariffs in 1997), while Lejour et al (2001) use the original GTAP v.5 protection data. Therefore, Maliszewska (2004) welfare changes are smaller than those of Lejour et al (2001). Maliszewska (2004) results indicate that a steady state welfare implications of full abolition of standards and border costs amount to 7% for Hungary and 3.4% for Poland, while Lejour et al (2001) welfare implications of the Single Market amount to 9% of GDP for Hungary and 5.8% for Poland. However, the author mentions that her simulations not reported in the study show that results become very close to Lejour (2001) when she uses original GTAP protection data.

The recent studies investigating economic impacts of trade liberalization including NTBs reduction for CIS countries, in particular Ukraine and Russia, include Jensen, Rutherford and Tarr (2004), Rutherford, Tarr and Shepotylo (2004), Rutherford, Tarr and Shepotylo (2005), Jensen and Tarr (2007), Copenhagen Economics, IER, and OEI (2005), and CEPS (2006).

Potential impacts of trade liberalization within Russia's WTO accession process were studied in Jensen, Rutherford and Tarr (2004). The authors started the analysis with an observation that Russia had achieved a relatively good progress in lowering its tariffs on goods, while its barriers to foreign direct investment (namely, restrictions on right of establishment and movement of business personnel, lack of intellectual property rights protection and contract enforcement, etc.) in key business services sectors remained quite substantial therefore necessitating

a thorough investigation of the impact of their liberalization. In this paper, the authors employed a 35-sector small open economy comparative static computable general equilibrium model of the Russian economy that allowed for Dixit-Stiglitz endogenous variety-productivity effects from investment and trade liberalization in business services, such as telecommunications, financial services, most business services and transportation services, and imperfectly competitive goods sectors[21]. It was assumed that a substantial portion of business services requires FDI provided by multinationals (domestic presence) to compete well with Russian business service providers, but cross-border service provision was also available[22]. Four principal effects of Russia' WTO accession were considered: 1) improved access to the markets of non-CIS countries in selected products; 2) tariff reduction on goods; 3) reduction of barriers against multinational service providers; and 4) improvement of the investment climate. The ad valorem equivalents of barriers to FDI in the Russian service sectors were estimated in accordance with the methodology described in Findlay and Warren (2000) (see Section 3.2.5 for more details). The resulting estimates suggested that Russia would gain about 3.3% of GDP or 7.3% of Russian consumption in the medium term due to the WTO accession; in the long term this number would reach 11% of GDP or 23.6% of Russian consumption[23]. Moreover, execution of different scenarios showed that about 70% of the total gains from Russian WTO accession were ensured by FDI liberalization in services (5.2% of the welfare gains vs. 1.3% due to tariff reform only (50% reduction)). Thus, the major conclusion of the study is that the most important source of WTO accession gains for Russia comes from the liberalization of barriers against foreign direct investment in business services. As to the sector results, it was found that non-ferrous metals, ferrous metals and chemicals would expand their output the most as a result of Russia's WTO accession (due to high export intensity and exogenous increase in export prices), while machinery and equipment, food and light industry and construction materials would contract the most (most protected sectors with a relatively small share of exports).

[21] The adopted Dixit-Stiglitz-Ethier structure for business services and goods produced under increasing returns to scale and imperfect competition implies endogenous productivity gains from the net introduction of new varieties that appear due to reduction of investment and trade barriers.

[22] Other important assumptions about business services included: multinational service providers import some of their technology or management expertise as part of their decision to establish a domestic presence; and business services supplied with a domestic presence are supplied by imperfectly competitive firms, which produce a unique variety of the service (Jensen et al. (2004), page 3).

[23] This result was received by using the comparative steady state model.

In Jensen and Tarr (2007) a computable general equilibrium model of the Kazakhstan economy was employed to assess the impact of accession to the WTO which encompasses (1) improved market access; (2) Kazakhstan tariff reduction; (3) reduction of barriers to FDI for multinational service providers; and (4) reform of local content and VAT policies against multinational firms in the oil sector. The authors assumed that FDI in business services was necessary for multinationals to compete well with Kazakhstan business services providers, but cross-border service provision was also present. The ad valorem equivalents of barriers to FDI were estimated based on detailed questionnaires completed by specialized research institutes in Kazakhstan. It was found that Kazakhstan would gain about 6.7% of the value of Kazakhstan consumption (or 3.7% of GDP) in the medium run from WTO accession and up to 17.5% in the long run (9.7% of GDP). The largest gains to Kazakhstan would derive from liberalization of barriers against multinational service providers, but the other three elements of WTO accession also contributed positively to the estimated gains.

Impact of the WTO accession for Ukraine was studied in Copenhagen Economics, IER, and OEI (2005). This study employed a comparative static computable general equilibrium model of Ukrainian economy allowing for: production in perfectly and imperfectly competitive sectors (implying the appropriate standard assumptions discussed in Jensen, Rutherford and Tarr (2004)), three types of service providers (domestic providers, domestic multinational providers and international providers), four types of households (urban non-poor, urban poor, rural non-poor, and rural poor) with the poor endowed with unskilled labour and non-poor households endowed with skilled labour and capital, full employment and full mobility of factors (with exemptions for mining and pipelines). To capture different sources of economic impacts of Ukraine's WTO accession four scenarios were executed: 1) reform of FDI barriers against foreign service providers in key services sectors, in particular telecommunication and financial services (their ad valorem equivalents using the same approach as in Jensen et al. (2004)) tariff reform in accordance with the WTO commitments; 3) improved market access for Ukrainian exports; and 4) full WTO accession. Dynamic impacts of WTO accession with long-term capital stock adjustments were also estimated in a steady state model. All results presented changes of the respective variables relative to the benchmark year of 2002. The principal findings of the study included: full WTO accession would lead to gains in GDP (+2.3%) and welfare (+4.7%) in the medium term and +2.8% and +5.9% respectively in the long term; major welfare gains would come from the reform of FDI barriers to multinationals in services sectors (2.3% vs. 1.9% due to tariffs reform and 0.5% due to improved market access), while the respective numbers for the GDP growth were 1.1%, 1.1% and 0.1%; Ukraine's membership in the WTO would be the most beneficial for sectors

with high shares of skilled labour in value added and exports in total output such as metallurgy, chemical industry, production of non-energy materials, coke production, etc.), on the contrary, sectors with high level of initial tariff protection would contract (food processing, agriculture); FDI liberalization in services sectors would stimulate largest increases in aggregate output in telecommunication (+3.7%) and financial intermediation (+2.7%), machinery and equipment (+4.6%), would impose low adjustment costs for households, both skilled and unskilled; welfare gains would be generated by lowering tariffs for poor households and by decreasing FDI barriers in services for non-poor households.

In 2006–2007, the above study was updated in IER (2007). In particular, the authors changed base year for 2004, as well as elaborated new market access and tariff reform scenarios. As to the tariff reform, two different options of tariff reform for agricultural products resulting in higher and lower tariffs rates upon the WTO accession were considered. Moreover, each of the earlier applied scenarios of Ukraine's WTO accession was executed by using three tariff datasets (base year 2002/base tariffs 2002; base year 2004/base tariffs 2004; base year 2004/base tariffs 2005[24]). The obtained estimates of this study followed the major results of the previous version confirming the importance of service sectors reform for improving Ukraine's welfare and GDP (Ukraine's WTO accession would improve its welfare by 10.1–10.2% of which 4.8% would by derived from FDI liberalization in services sectors - for base tariffs of 2004; and 7.8–7.9% and 4.8% respectively for base tariffs of 2005).

The expected economic impact of a free trade agreement between the EU and Ukraine was investigated in CEPS (2006). In particular, the authors analyzed two possible levels of economic integration between countries: simple integration implying a mere removal of import tariffs (simple FTA scenario) vs. deep integration entailing the approximation of many of Ukraine's external trade and internal regulatory policies, such as customs services, industrial product standards, SPS requirements, competition policy, government procurement, etc., to the EU standards (FTA+ scenario). The latter would lead to a considerable reduction of existing NBTs. The authors used a multi-country general equilibrium model that was an adaptation of that used in Brenton and Whalley (1999). The updated version of the model took into account changes in economic structure and trade patterns between countries, as well as European integration possesses of Ukraine's neighbours; apart from that the analysis was extended to include deeper integration scenario along with simple integration scenario. The model incorporated six re-

[24] This was done to model a considerable tariff reduction undertook by the Ukrainian Government in line with Ukraine's WTO commitments in 2005.

gions[25] breakdown of the world and eight economic sectors[26] breakdown of the economy. The authors used the 2001 GTAP database (whereas data on Ukraine's imports and exports were updated to 2003 levels). Estimates of NTBs to be used in the FTA+ scenario were obtained by using the same gravity approach as in Lejour et al. (2001) (see Section 3.2.6 for more details). Three scenarios of gradual stages of market integration were executed: 1) CEESs' accession to the EU along with the SEECs (South-Eastern European countries) and Turkey joining the EU customs union and the Single Market; 2) following the changes in round 1, formation of the EU-Ukraine simple FTA (implying elimination of tariffs and steel quota); 3) following the first two rounds, Ukraine's entering into deeper FTA+ with the EU. In addition, there were considered short term and long term variants of the model (allowing for much more flexibility for both production and consumer behaviour to change in response to price changes).

These simulations resulted in the following major findings: accession of the CEECs and SEECs to the EU is expected to be beneficial to Ukraine resulting in 1.91% welfare gain in the short term and 3.05% in the long term; further formation of FTA with the EU would lead to significant increases in trade and output, particularly in metals, food processing and light manufacturing, with no gains in overall welfare if compared with CEEC/SEEC accession (+1.91% in the short rum and +2.99% in the long run if compare with the base year); establishing FTA+ integrating NTBs reform may significantly increase Ukrainian welfare (by +4.5% in the short run and +6.67% in the long run if compare with a simple FTA stage and by +6.5% in the short run and +9.86% in the long run if compare with the base year) with metals, food processing, textiles, light manufacturing expanding the most. The study confirms the earlier conclusions of other studies that simple free trade agreement would have a minor impact on economic performance of both FTA participants – Ukraine and even less the EU. At the same time, deeper forms of market integration can have a substantial impact on Ukraine's economy in terms of its trade improvement and welfare gains.

Further, Ecorys and CASE-Ukraine study (2007) analyses the implications of an FTA between the EU and Ukraine, while Maliszewska (2008a, 2008b) analyse the implications of EU-Georgia and EU-Armenia FTAs. The CGE models applied in those studies are a modification of Harrison-Rutherford-Tarr (1996) as in Maliszewska (2004) (see section 5.1 for details). The assumptions on NTBs in the EU-Ukraine trade are based on Jakubiak et. al. (2006). The studies on Georgia and

[25] Ukraine, EU-15, 2004 Eastern European accession states (CEECs), South-Eastern European countries + Turkey (SEECs), Russia, and the Rest of the World.

[26] Food crops and animal production, minerals, food products, light manufacturing, heavy manufacturing, textiles, metals, services.

Armenia are based on surveys on NTBs that were conducted in those countries in 2007. The questionnaires were specifically designed for the purpose of their further use in the modelling assumptions as discussed in the above studies.

The Ecorys and CASE-Ukraine (2007) study analyses a few scenarios from limited to extended FTA with the EU following the WTO Accession of Ukraine. The extended liberalization scenario including full liberalization of tariffs on manufacturing products and a substantial reduction of agro-food tariffs, reduction of technical barriers to trade, barriers to trade in services and costs related to customs formalities. The welfare impact of the extended FTA is expected to reach around 5.3% of GDP, while the impact of the WTO Accession amounts to 0.6% of GDP and the impact of limited FTA amounts to 3.3% of GDP. Real wages of skilled and unskilled workers are expected to increase along with the income, sectors expected to expand include textiles and wearing apparel, leather products, wood products, chemicals, metal products, electronic equipment and machinery. Despite significant differences in methodology these results are similar to CEPS(2006) in terms of welfare implications and expected sectoral output changes.

In Maliszewska (2008a) a range of scenarios has been simulated, starting with the effects of liberalisation measures adopted by respectively Georgia (unilateral significant tariff liberalisation of trade in goods along with the recognition of foreign product standards) and the EU (granting Georgia GSP+ under its new GSP scheme) in 2006 (baseline scenario), which could boost the GDP growth in Georgia by 1%. The simple elimination of tariffs in Georgian trade with the EU would not add much, since essentially only the remaining agro-food tariffs would be reduced or dismantled. Finally, the simulations incorporate possible confidence and synergy effects that could come from the binding in of the multiple liberalization and reform measures that Georgia has made in the recent past. These confidence effects can be modeled as reductions in the perceived risk premium attached to investment in Georgia, which could lead to additional welfare gains of 2.4% of GDP. Further gains of 1.7% of GDP could be reaped from a deep integration scenario that would lock in further domestic policy changes such as conformity with EU regulatory standards, improvement in customs procedures and further facilitation of FDI in service sectors. If as a result of a Deep FTA and further flanking measures such as on competition and corruption Georgia achieved a notable reduction in the perceived risk premium on investment, reflecting a sustained rebranding of Georgia as a favorable and safe place to invest, the total gains on the top of the ones achieved out of the 2006 liberalisation might reach around 6.5% of GDP.

Maliszewska (2008b) is based on a similar methodology. A set of scenarios ranges from the liberalization in the EU-Armenia bilateral trade that took place in

2006 (baseline scenario) to a deep integration scanario. The analysis using a CGE model indicates that the welfare gains for Armenia from tariff liberalisation on its and the EU side respectively that took place in 2006 (in particular Armenia's unilateral lowering of import tariffs and EU's granting Armenia tariff preferences under the general arrangement of its new GSP) are likely to be small (less than 0.4% of GDP). Also the additional impact of possible future EU-Armenia simple FTA involving further tariff reductions is likely to be negligible. Further, a deep integration scenario has been analyzed. It involves a more complete elimination of barriers to trade and investment implying reductions in, or elimination of regulatory and behind-the-border impediments to trade, which may relate to customs procedures, product standards and certifications procedures and market access for foreign providers of services. The potential additional welfare gains are estimated to amount to about 3.38% of GDP. If comprehensive reforms brought about by deeper integration along with additional flanking measures related to competition policy and corruption led to a re-branding of Armenia as a favourable investment location, a reduction of the risk premium on investment could work as an additional mechanism for boosting both investment and GDP growth. If this was to occur, from our model simulations, we envisage the possibility of additional economic gains from a Deep FTA+ reaching as much as 8% of GDP.

3.3. Conclusions

The overview of various studies on identification and estimation of NTBs and their economic impact allows drawing the following general conclusions:

- Studies estimating the impact of Eastern EU enlargement and accession of the CEES countries to the Single European Market report that internal market access and lessening of NTBs may lead to considerable aggregate trade increase for CEES countries well exceeding trade increase for the 'old' EU members. The estimated non-tariff barriers to trade differ substantially between sectors: agriculture and food products, trade services, textiles and leather, non-metallic minerals and electronic equipment were the most protected. As a result, these particular sectors may benefit the most from getting access to the EU internal market and lessening non-tariff protection. The reviewed studies revealed rather low barriers to FDI and trade in services between CEES countries and the 'old' EU members indicating to high level of liberalization in this important area of international economic relations.

- Previous studies analyzing the impact of a FTA between the EU and selected CIS countries conclude that simple elimination of tariffs in trade is not going to have a big economic impact as several CIS countries have already preferential access to the EU market. However, the deep integration tackling non-tariff barriers to trade and leading to a significant improvement of the business environment can have potentially very significant impact on the CIS countries' GDP, employment and international trade. In the long run the estimated gains from deep integration can reach up to 8–10% of GDP.

4. Assessment of NTBs in Selected CIS Countries

In this section we analyse the level of non-tariff barriers in the studied countries to derive their numerical tariff equivalents that can be used in the modelling of improved market access. The types of NBTs considered in this review include: standard costs, border costs and barriers to trade in services. Standard costs are expenses born by exporting companies in order to satisfy the EU product requirements, such as labelling, product redesign etc. Border costs emerge due to the existence of borders and customs formalities, which involve delays and various kinds of administrative costs. Finally, barriers to trade in services refer to discriminatory measures faced by foreign service providers in respect to their statutory funds, supply of particular services, establishing branches etc. We review the level of legal harmonization of technical regulations and product standards with the EU ones, the availability of conformity assessment centres, the costs of exports/imports and the business environment in our 5 selected countries: Russia, Ukraine, Azerbaijan, Armenia and Georgia. Then we make assumptions on the reduction of NTBs following the FTAs with the EU in order to assess their economic implications using a CGE model.

4.1. Standard costs

Standards and technical regulations such as product certification requirements, performance mandates, testing procedures, conformity assessments, labelling standards, exist to protect consumer safety or to achieve other goals. Product standards overcome existing market failures and have a positive effect on domestic welfare. On the other hand, standards can raise substantially both start-up (fixed costs) and production costs (variable costs) by requiring additional inputs of labour and capital; they constitute *additional production costs firms have to incur in order to export to a specific market*. Complying with different standards can add costs and limit export competitiveness of domestic producers. International harmonization of product standards may diminish these costs since the compliance

with a single standard eliminates the multiple costs that are otherwise incurred by exporters in non-harmonizing countries (Maskus et al., 2005).

CIS countries often lack adequate financial and human resources for the reforming and upgrading of their conformity assessment infrastructure and for the harmonisation of national standards with the international including the EU ones. Due to differing regulations national exporters incur high standards cost (i.e. costs relating to observance of the international and EU technical norms) which constitute a significant barrier to trade with the EU and the world.

In our modelling exercise the standards costs are determined as an increase of the cost of production incurred by domestic producers of CIS countries exporting their products to the EU. They are modelled as additional value added in each sector where trade takes place. This approach does not take into account the fixed cost elements of implementation of new standards. It is expected that the alignment of the standards and technical regulation systems of the considered CIS countries with the EU norms and requirements will lead to a considerable reduction of existing standards costs associated with exports to the EU. We first develop assumptions on the current (2006) level of these costs across countries and then assess the possible magnitude of their reductions as a result of regulatory convergence with the EU.

In the absence of business surveys or empirical studies providing quantitative estimates of standards costs in the Caucasus region and Russia, we will base our assumptions regarding the current level of standards costs on the survey of Ukrainian exporters to the EU conducted by CASE and CASE Ukraine in 2006 (Jakubiak et al 2006). In this survey, over 500 Ukrainian companies from different economic sectors were asked to assess costs associated with meeting EU technical standards and the duplication of efforts related to compliance with both national and the EU standards. According to this survey, Ukrainian companies exporting to the EU claim that they had to increase their production costs by 13.9% on average in 2005–2006 in order to ensure compatibility of their products with the EU technical requirements (see Table 2). By commodity breakdown, companies selling products of metallurgy and chemical industry spent the least on upgrading the commodities up to the EU requirement, while appropriate expenses of companies producing agricultural and food products, machinery, apparels, etc. are comparatively higher (Jakubiak et al 2006).

All CIS countries have inherited the same standardisation and certification system from the Soviet Union based on the mandatory GOST standards. Presently, conformity with obsolete GOST standards is still technically required in almost all CIS countries (with a notable exception of Georgia as discussed below). Standardisation systems in the CIS countries remain excessively bureaucratic and cen-

tralised, poorly integrated into the international system. As a result, exporters from CIS countries encounter the similar problems with complying with the EU and international standards, incur high costs that arise from the duplication of efforts related to compliance with both national and international standards. At the same time, CIS countries gradually undertake the replacement of old GOST standards with international and the EU standards and technical regulations, and reform their standardisation and certification systems in line with the implementation of their commitments under the WTO and the Partnership and Cooperation Agreements with the EU. The progress of undertaking such reforms differs across countries. Therefore, we assume that the estimates of the Ukrainian survey can be applicable to other CIS countries, including Russia, Armenia, Georgia, and Azerbaijan, but with the adjustments for regional and country's status quo regarding the reforming and upgrading of standardisation and quality assurance systems.

To develop assumptions on the current level of standards costs in the countries of our interest we suggest taking the Ukrainian estimations as a benchmark and adjusting them in line with the following considerations:

- The level of harmonization of national legislation, technical regulations and standards with the EU and international norms and standards: the higher level of harmonization of technical regulations and standards of a particular sector/economy, the lower costs of compliance are for exporters to the EU markets.
- The status of the WTO membership: stage of accession/membership. The longer membership in the WTO the higher level of compliance of national standards and procedures with international standards is, thus the lower costs of compliance costs for exporters of all sectors. The level of implementation of the WTO commitments by the country is also important and should be taken into account during the analysis.
- The availability and development of the quality assurance infrastructure and capacities in the country (accreditation bodies, metrology institutes, accredited conformity assessment and certification bodies and their recognition by the EU, etc.). The more developed the countries quality infrastructure system and capacities the lower standards costs for all sectors are.
- The formal EU policy and existing requirements towards the particular products originating from CIS countries: recognition of conformity certificates issued by CIS countries, availability of mutual recognition agreements, other bilateral agreements, collaboration and membership in the European and international accreditation organizations, etc. Recognition of conformity certificates of the CIS countries by the EU for particu-

lar products may significantly reduce the costs of compliance with the EU standards for appropriate exporters.

4.1.1. Ukraine: a benchmark

In February 2008, the WTO General Council has approved Ukraine's WTO accession protocol[27] where the country has committed itself to ensure full compliance of its legislation with the WTO TBT Agreement and to abide by the provisions of the Code of Good Practice for the Preparation, Adoption and Application of Standards from the date of its accession to the WTO without any transition periods. Also, according to Ukraine's commitments, all national and regional standards will be voluntary, except those referred to in technical regulations intended to protect national security interests, prevent deceptive practices, protect the life and health of people, animals or plants, as well as protect the environment. Ukraine will continue giving priority consideration to international standards, guidelines and recommendations, as a basis for Ukraine's own standards, technical regulations and associated conformity assessment procedures. By 30 December 2011, all of Ukraine's technical regulations will be based on the relevant international standards. Ukraine will also continue to reduce the number of categories of products subject to mandatory certification, and broaden acceptance of supplier's declaration of conform in relation to the relevant technical regulation, prior to the end of year 2011 (see Ukraine WP Report 2008).

In 2000, Ukraine launched a program to align its standardisation and quality assurance system with the EU and international requirements. During 2001–2006 period, new laws on standardisation, on metrology, on conformity assessment, on accreditation of conformity assessment bodies and on consumer protection were adopted. In 2006, the government approved the State Program on Standardisation for the 2006–2010 envisaging harmonization of about 8,500 of Ukrainian standards with international and EU standards and norms during this period.

According to the State Committee of Ukraine for Technical Regulation and Consumer Policy (the DSSU)[28], until 2007 17 EU Directives have been approximated in Ukrainian national legislation as technical regulations[29], and other 22

[27] Ukraine has been in the process of the WTO accession during 1993-2008.

[28] The DSSU is the central body of executive power in the area of standardization and technical regulation, as well as a specially authorized central body of executive power in the area of conformity assessment.

[29] Covering the safety of low-voltage equipment; electric household refrigerating devices; electromagnetic compatibility; non-automatic weighing devices; and the safety of gas

technical regulations are under development. However, at the end of 2007, only 19.2% of standards were harmonised with the international and the EU ones. From its independence in 1991, Ukraine has adopted over 7000 national standards, 51% of which are the harmonized standards, while 879 old standards have been eliminated.

Table 3. Standards, in effect in Ukraine (as of 01.10.2007)

	Total	Inter-state GOST	Ukrainian national standards	Standards of the USSR
Total	25606	18110	7031	465
Harmonized	5137	1552	3585	0
Level of harmonization, %	19.2	8.6	51.0	0

Source: The DSSU.

According to the DSSU, the level of the adoption of the international and the EU standards in Ukraine varies from 6% to 46% across various sectors. The lowest level is observed in the sectors characterised by a large amount of international standards such as electrical engineering (8%), telecommunications (7%), information technologies (6%). Whilst agriculture and food industry have the highest ratios of adoption of international and EU standards (46% and 34% respectively) due to the lower amount of international and EU standards for these sectors. Also, the speed of the standards reform is correlated with funding: agriculture and food industry receive greater funding for standards reform than manufacturing. In addition, the level of sector's integration with the CIS countries influence the level of adoption of international and EU standards (e.g. for railroad equipment it is only 8% since railroad transportation services are mostly integrated with the CIS countries (see the DSSU, Draft Red Paper, 2007).

In the area of metrology, Ukraine has a large set of national measurement standards (46 standards of the first level, 54 standards of the second level, 56 etalons) available for industrial and legal metrology. According to domestic companies, they do not generally need to send any equipment for calibration abroad even when if it is destined to the EU or the US (BIZPRO, 2005).

As of 31 December 2006, 170 Ukrainian conformity assessment bodies including 124 testing laboratories and 22 product certification bodies have been accredited by the National Accreditation Agency of Ukraine - the NAAU (NAAU, 2006). Overall, in Ukraine there are about 1,000 testing laboratories, of which 600

appliances; boilers; simple pressurized vessels; equipment operating under pressure; lifts; toys, etc.

are state-owned, and about 120 certification bodies, state and private (30 of them are linked to the DSSU) (BIZPRO, 2005). Also, there are a few international certification bodies providing services recognized in the EU and other countries. The NAAU conducts an active cooperation with the EU and other international and CIS accreditation institutions. In December 2004 upon the thorough audit of the national accreditation system of Ukraine by the European experts, the National Accreditation Agency of Ukraine and the European Accreditation Association (EA) concluded an Agreement on Cooperation. Paragraph 10.1 of this Agreement provides for the recognition of services and works on conformity assessment. Following the conclusion of this Agreement, in 2005, 28 Ukrainian conformity assessment bodies accredited by the NAAU informed the NAAU that their testing protocols and certificates of compliance were recognized during the exportation of foodstuffs, construction materials, metallurgical products, agricultural products, and chemicals, etc. to the EU and other countries (NAAU, 2006). For Ukrainian exporters to the EU testing their goods in the accredited conformity assessment bodies, it implies the reduction of their costs due to the lowering or elimination of the necessity to pay for repeating costly conformity assessment procedures performed by EU companies. At the same time, it should be noted that the recognition of test results and conformity certificates is sometimes selective and depends on the type of products exported to the EU. According to Jakubiak et al (2006), as of 2006 metallurgy companies, for example, usually managed to receive Ukrainian certificates that were accepted in the EU, while exporters of chemicals, agricultural and food products, machinery noted that they face problems with Ukrainian certificates in the EU which led to duplication of testing and certification efforts.

Ukraine has committed to negotiate with the EU an Agreement of Conformity Assessment and Acceptance of Industrial Products (ACAA) and has already selected the priority sectors to be included. The "ACAA Action Plan" agreed in 2005 targets the ACAA to be in force in EU-Ukraine trade relations since 2011. This plan envisages the approximation and implementation of the EU legislation in the field of technical regulations, standardization, and conformity assessment and the EU sectoral legislation in regard to products covered by the Agreement. These products will be able to enter internal market freely, without additional testing and certification. For Ukraine this means improved access to the internal market and enhanced competitiveness of domestic products in the EU market. Ukraine is also an affiliate member of the ILAC (International Laboratory Accreditation Cooperation)[30].

[30] Once Ukraine obtains a full-fledged ILAC membership, it will have to abide its rules and fulfil the obligations of member bodies (i.e., to accept test results of laboratories accredited with, and notified by, ILAC member bodies).

Notwithstanding the above progress, Ukraine's major problems in the area of reforming its technical regulation sphere include inadequate state funding of these reforms; weak material base and underdeveloped conformity assessment and metrology infrastructure; insufficient number of laboratories technically competent to perform internationally recognized tests; resistance to change inside responsible government bodies (the DSSU), duplication of supervisory and controlling functions in central agencies of executive power, monopolised state certification bodies, etc. As a result, even in the areas where EU standards have been adopted, conformity assessment and certification is not always possible, leading to a rather limited mutual recognition of certificates of compliance by countries. This significantly restricts the EU-Ukraine trade and raises the costs of Ukrainian producers willing to export to the EU.

4.1.2. Georgia

Georgia has been the WTO member since June 2000. According to the Working Party Report, Georgia confirmed that from the date of accession all Soviet-era "GOST" and other regional standards would be voluntary with respect to products imported from WTO members. With respect to the items for which certification remained mandatory in Georgia imported products meeting either international, European, or GOST standards would be accepted, as well as conformance assessment certificates issued by internationally recognized authorities of the exporting countries, or approvals provided by recognized independent conformity assessment bodies. Georgia took the obligation that the existing GOST standards would be replaced by voluntary standards or technical regulations based on international standards in accordance with a transition plan, with full replacement by May 2002 (see Georgia WTO Working Party Report). Still, Georgia has been facing difficulties in the implementation of these obligations mainly due to the shortage of financial and human resources[31]. The Law on Standardization was adopted in 1999 and it introduced a concept of voluntary standards. Then in 2005 Georgia adopted new legislation on standardization, metrology and conformity assessment.

Though domestic producers are now free to use voluntary standards including international standards, GOST standards and their own standards, the GOST standards are still most frequently applied by them. The National Agency for Standards, Technical Regulations and Metrology (central executive body) conducts registration of international standards as national standards. Up to now, it has already registered 20,000 GOST standards, 400 ISO standards and ASTM (for pe-

[31] http://www.mfa.gov.ge/files/55_61_133510_CurrentTradeRegime.pdf.

troleum products) standards (see Maliszewska et al., 2008a). Adoption of new national standards based on EU standards is proceeding very slowly.

The national legislation stipulates the priority of EU Directives as a base for national technical regulations and standards. Still, the process of adoption of national technical regulations is slow as well. Georgia has already adopted only a few EU based technical regulations in the field of transport safety, pesticides and agrochemicals, and metrology.

In early 2006, Georgia recognized mandatory standards and technical regulations being applied worldwide and, in particular, in EU, OECD and CIS countries. First of all, this is a significant trade liberalization measure on the import side since the importer can choose to conform his products to Georgian standards or the standards of any EU or OECD member country. If foreign standards are chosen, they must be registered by the importer in the National Agency for Standardization, Technical Regulations and Metrology. At the same time, domestic producers are now entitled to produce according to EU and OECD member states' technical regulations (once registered by the Agency), as well as according to the CIS GOSTs. This potentially creates a scope for the cost reduction for domestic firms exporting to the EU, as now they do not need to modify their production to satisfy differing domestic and EU technical regulations. Still, so far very few international technical regulations has been registered at the Agency suggesting the difficulties faced by domestic producers in application of international technical regulations (see Maliszewska et al., 2008a).

Georgia's metrology infrastructure and measurement standards are rather underdeveloped. As a result, Georgian producers have to use metrological services of neighbouring countries, including Ukraine.

There are about 100 testing laboratories in Georgia that have been accredited in such fields as electrical and radio engineering products, food and mineral water, oil products, chemicals and pharmaceuticals, etc.[32] However, certificates of compliance issued by Georgian conformity assessment bodies are not recognized by the EU since the competent authorities have no means to certify that exports would fulfil the importing country requirement. As a result, domestic producers willing to export to the EU need to pay for the services of conformity assessment bodies based in the EU or other countries, increasing significantly their costs.

There is also a practice in Georgia that in the majority of cases the importing EU companies are responsible for undertaking all necessary tests and implementa-

[32] U.S. & Foreign Commercial Service And U.S. Department Of State, 2007. Doing Business in Georgia: A Country Commercial Guide for U.S. Companies, available at: http://georgia.usembassy.gov/downloads/2007CCGuide.pdf.

tion of technical requirements. This also may serve as an illustration that the standards costs are rather high and burdensome for Georgian producers.

Taking Ukraine as a benchmark, we can conclude that, on the one hand, Georgia being a WTO member since 2000 has proceeded more than Ukraine in reforming and liberalizing its standardization and technical regulation system (since Georgian producers are currently entitled to apply the EU standards and technical regulations without duplication of efforts related to compliance with both national and the EU standards). On the other hand, Ukraine has achieved more in harmonizing and adopting international and the EU technical regulations and standards, collaboration with international and the EU accreditation organizations, as well as Ukrainian producers has better access to comparatively more developed conformity assessment and metrology infrastructure and as a result they can avoid or reduce additional costs on passing costly calibration, testing, and conformity assessment procedures in other countries. This leads us to assume that the standards costs for Georgian exporters to the EU are higher by 30% as compared with Ukraine.

4.1.3. Armenia

Armenia has been the WTO member since 2003. Armenia's WTO commitments in this area include the obligation to apply the WTO Agreement on Technical Barriers to Trade from the date of accession without recourse to any transition period, and would sign and follow the Code of Good Practice for the preparation, adoption and application of standards from the date of Armenia's accession to the WTO. Armenia also committed that from the date of accession, it would accept conformity assessment certificates issued by internationally recognized authorities of exporting countries with which Armenia had signed mutual recognition agreements, or approvals provided by recognized independent conformity assessment bodies (see Armenia WTO Working Party Report). Still so far, Armenia has agreements on mutual recognition of certificates only with the CIS countries and Iran. Also, it has not yet granted unilateral recognition and acceptance of certificates or approvals.

In 2004, Armenia adopted a package of laws in the standardization and certification sphere, including on standardization, conformity assessment, metrology and market surveillance. The Department for Standardization, Metrology and Conformity Assessment (SARM) of the Ministry of Trade and Economic Development, responsible for the policy making and legislative functions in this area, has developed and adopted 320 national standards since 1993, but only 20% of them are harmonized with international and EU standards. Still, the majority of the standards

applied in Armenia are regional standards. More than 18,000 interstate standards of CIS countries (GOST) are included in the national fund of standards. In practice, most Armenian producers continue applying obsolete Soviet standards, though being voluntary now.

In accordance with its WTO commitments, after 31 December 2004 all mandatory GOST standards in Armenia expired and the system of voluntary standards and compulsory technical regulations based on international standards was introduced. For this purpose, Armenia has been actively developing technical regulations to replace existing mandatory standards and to fill in the regulatory gap which appeared after mandatory standards have been abolished. As of 2008 Armenia adopted 93 technical regulations (50 before the 31 December 2004 and 43 after). These technical regulations cover the strategic sectors for the Armenian economy such as food industry, tobacco products, electrical equipment, chemical products, machinery, etc[33].

There are no internationally recognized conformity assessment bodies in Armenia; as a result, the EU and other developed countries do not recognise compliance certificates of Armenia, and mutual recognition of certificates between countries is not likely to happen in the foreseeable future. Testing laboratories usually lack modern conformity assessment equipment and competent personnel. The accreditation process of conformity assessment bodies does not always imply adequate examination and proper implementation. Armenia applies a modular approach to conformity assessment in accordance with the New and Global Approach, still a full compliance with the EU regulations in this regard has not been achieved yet. Armenian exporters have to use European testing and certifying bodies located in the EU and other countries, which adds considerable expenses for them.

We conclude that Armenia's quality control infrastructure system, though undergoing comprehensive reforms, is still underdeveloped and weak thus creating a significant barrier for EU-Armenia trade and raising the costs for Armenian producers willing to export to the EU. Being a WTO member from 2003, Armenia has been ahead of Ukraine in reforming its standards and technical regulation system and implementing WTO commitments (e.g., in terms of the introduction of the system of voluntary standards, adoption of technical regulations, based on international standards, etc.). At the same time, underdeveloped conformity assessment infrastructure and the lack of international recognition of conformity assessment and accreditation procedures implemented in Armenia makes exports to the EU more costly than in case of Ukraine. We may also assume that stan-

[33] See http://www.sarm.am/?go=commodities.

dards' costs were slightly higher in Armenia as compared to Georgia in 2006 due to the recognition by Georgia of mandatory standards and technical regulations being applied worldwide and, in particular, in the EU, while Armenian producers were likely to incur some additional costs as a result of the regulatory gap between adopted domestic mandatory technical regulations and the EU norms. Based on the above analysis, we estimate these costs to be higher by 40% for Armenian exporters as compared to Ukraine.

4.1.4. Azerbaijan

Azerbaijan's Working Party was established on 16 July 1997. The first round of talks with the WTO took place in June 2002, five years after Azerbaijan was granted observer status. Initially, the Azerbaijani leadership opted for a cautious and gradual approach: reaffirming in August 2005 the country's commitment to achieving WTO membership, President Ilham Aliyev warned that there should be no haste.

In May 2006, government officials declared that out of the 22 new laws that needed to be enacted and the 10 that required amendments, only the law on standardization has been drafted. In August 2006, President Aliyev endorsed a program that envisaged completing the process by the end of 2007 with the aim of joining the WTO by 2010.

In 2001, in accordance with Presidential Degree No.623 of 27 December 2001, the standardization and certification system became a subject of reform and restructuring. The State Agency of Azerbaijan on Standardization, Metrology and Patents (AZSTAND) registers national standards, which bear the abbreviation "AZS". However, the regional standards (GOST) adopted by the Interstate Council for Standardization and Certification of the Commonwealth of Independent States (CIS) are also used.

In August 2006, within the fulfilment plan of Azerbaijan's WTO commitments[34], AZSTAND drafted a law on technical regulation which implies a comprehensive change of existing standardization system of product and production process, particularly the replacement of compulsory standardization system by a voluntary one.

67 testing laboratories (centres) for products subject to mandatory certification have been established in food industry, 23 in petrochemistry, 33 in mechanical engineering, 13 in building materials, etc., and have been accredited for technical

[34] www.demaz.org.

competence and/or independence under the procedure established by the National Certification System AZS.

Taking into account that Georgia and Armenia have been WTO members since 2000 and 2003 respectively, and our benchmark – Ukraine – since 2008, and as a result these countries have proceeded more in reforming their standardization and certification systems, Azerbaijani exporters are most likely facing higher costs of compliance for all sectors compared to the other two Caucasian countries, and Ukraine. As a result, we assume 50% higher standards costs for Azerbaijani exporters as compared to Ukraine.

4.1.5. Russia

Russia has applied for the WTO membership in 1993. During the WTO accession period, Russia has been constantly working to bring its technical regulations legislation and policy into conformity with international standards and the WTO requirements. In recent year, Russia has moved forward in implementing the standards reform. The law "On Technical Regulations", adopted in 2003, opened reforms of the existing cumbersome standardization and certification systems in Russia and harmonizing them with international standards. The Government set up a 7 year transition period for technical regulations reform, during which all mandatory requirements must by changed by technical regulations, while standards will become voluntary. The Concept of the Development of National Standardization System was adopted in 2006 envisaging a gradual movement towards the system of voluntary standards based on international and EU standards (still allowing for certain exceptions).

Russian system continues to be based on mandatory rather than voluntary standards. There are 25,654 Russian national standards including 2,616 for military products. According to the estimates by the U.S. & Foreign Commercial Service and U.S. Department of State (2005), approximately 35% of Russian national standards conform to international standards and norms (as of 2005). The process of the development and adoption of technical regulations is very slow (so far, none of the developed regulations has been adopted yet).

Russia still relies on product testing as a key element of the product approval process. Many products imported into Russia are required to have a certificate of conformity issued by the Federal Agency for Technical Regulation and Metrology. Russia does not recognise internationally accepted certified products and undertakes their testing and mandatory certification in accordance with Russian national standards.

One of the biggest problems today is the lack of capacity of conformity assessment and accreditation bodies needed to serve the growing demand for their services from Russian exporters. Accreditation is implemented by Russian-owned and foreign accreditation companies. Still, the accreditation process suffers from the application of different procedures and criteria, overlapping fields of activity, combination in one body functions of establishment accreditation rules, conducting of accreditation and certification. As of 1.01.2007, the Federal Agency Register of accredited conformity assessment bodies listed 2,581 testing laboratories (including 53 foreign laboratories) and 1,124 certification bodies (including 15 foreign bodies), and 4221 analytical laboratories (FATRM, 2006). Russia is not a member of international accreditation organizations such as the EA, IAF, ILAC; and there is a lack of international recognition of Russian accreditation system.

Summing up, the comparison of Russian progress in reforming its standards and technical regulations system with Ukraine shows that Ukraine has proceeded a bit forward in this regard (in terms of harmonization of national legislation to the international and EU standards, adoption of technical regulations, cooperation and membership in international accreditation organizations and development and recognition of domestic accreditation system, etc.). At the same time, standards costs are likely to be lower in Russia than in Armenia, Georgia or Azerbaijan since Russian exporters have a better access to more developed standardization, conformity assessment and metrology infrastructure. As a result, we suggest increasing the Ukraine benchmark standards costs by 20% to get appropriate assumptions for Russian exporters (see Table 4).

Our assumptions on standards costs faced by domestic producers from the selected CIS countries exporting their products to the EU in 2006 are summarised in Table 4. Sectors are grouped in accordance with the NACE industrial classification. It should be noted that in many of those sectors the analyzed countries do not have any exports to the EU (specifically, exports of Georgia, Azerbaijan and Armenia are highly concentrated in some commodity groups such as oil products, non-energy mineral products, base and precious metals, chemicals, etc.). This can be explained by the fact that these countries do not produce particular commodities at all or that the barriers to exports to the EU (such as technical barriers, SPS measures, transport costs, etc.) are too high, or that these products are uncompetitive on the EU market. However, in all those cases the assumptions on NTBs need to be provided, so we rely on the Ukrainian data. Since our CGE modelling exercise requires also the same standards costs assumptions for 2004, we assume that standards costs faced by exporters to the EU in 2004 were 10% higher than those in 2006 (the main argument here is that all CIS countries have been gradually reforming and liberalising their standards and technical regulations systems as part of their WTO and PCA commitments).

Legal, regulatory and institutional harmonization in the area of standards and technical regulation system between CIS countries and the EU (including the implementation of the EU acquis, conclusion of the Agreement of Conformity Assessment and Acceptance of Industrial Products (ACAA), the conclusion of membership and cooperation agreements with the European and international bodies, etc.) are expected to ensure better access to cheaper conformity assessment procedures as well as introduction of mutual recognition agreements between CIS countries and the EU in key sectors, thus considerably reducing existing standardisation costs and improving CIS countries access to the EU internal market. We assume that in the medium-term perspective such harmonization may bring all selected CIS countries up to a 50% reduction of their standards costs in trade with the EU (provided the same speed of reforms by each country, but with preserving their relative positions). Full harmonisation of domestic legislation and institutions and development of fully operational and the EU compatible quality assurance infrastructure is considered to be attainable in the long-term perspective only.

In regard to trade between CIS countries, we assume zero standards costs for exporters supplying their products to CIS markets since the majority of standards and mandatory technical regulations applied in CIS countries are still based on interstate (GOST) standards. CIS countries are signatories of the Agreement on Mutual Policies in the Area of Standards, Metrology and Certification (signed in 1992 and amended in 2000) that provided for the establishment of the Interstate Council on Standards, Metrology and Certifications and for mutual recognition of conformity certificates between CIS countries. At the same time, it should be noted that in practice these costs are not always zero, since mutual recognition is applied only to interstate standards, whilst each country may develop and adopt its own national standards thus creating risks for exporters. Moreover, certificates issued by the partner country can be questioned by some other countries, they may require certificates to be issued by their own bodies (including conducting the testing procedures). (BIZPRO, 2005). Still, these practices are not so widespread, hence the zero standards costs assumptions between CIS countries seems sensible. The Interstate Council, which is to develop the system of harmonised standards between CIS countries, also conducts the harmonisation of interstate standards with ISO standards, European and international standards, which then are adopted by CIS countries, though this harmonisation proceeds rather slow (only 20% of interstate standards are harmonised with international standards). Provided the Interstate Council continues and intensifies these efforts, we can assume that the process of standards and technical regulations harmonisation with European and international ones undertaken by individual countries on the national level will not eventually lead to creation of barriers in trade between CIS countries (hence, zero standards costs between CIS countries upon harmonization).

Table 4. Percentage of yearly production costs spent by exporters to the EU in 2006 in order to ensure products compliance with the EU norms

NACE	Industry	Survey of Ukrainian firms	Russia	Georgia	Armenia	Azerbaijan
		-	20%	30%	40%	50%
01	Agriculture, hunting and related service activities	14.0	16.8	18.2	19.6	21.0
02	Forestry, logging and related service activities	7.0	8.4	9.1	9.8	10.5
14	Other mining and quarrying	n/a	n/a	n/a	n/a	n/a
15	Manufacture of food products and beverages	10.4	12.5	13.5	14.6	15.6
16	Manufacture of tobacco products	n/a	n/a	n/a	n/a	n/a
17	Manufacture of textiles	2.3	2.8	3.0	3.2	3.5
18	Manufacture of wearing apparel; dressing and dyeing of fur	34.4	41.3	44.7	48.2	51.6
19	Tanning and dressing of leather; manufacture of luggage, and footwear	5.3	6.4	6.9	7.4	8.0
20	Manufacture of wood and of products of wood and cork	20.9	25.1	27.2	29.3	31.4
21	Manufacture of pulp, paper and paper products	15.0	18.0	19.5	21.0	22.5
22	Publishing, printing and reproduction of recorded media	0.0	0.0	0.0	0.0	0.0
23	Manufacture of coke, refined petroleum products and nuclear fuel	10.0	12.0	13..0	14.0	15.0
24	Manufacture of chemicals and chemical products	5.5	6.6	7.2	7.7	8.3
25	Manufacture of rubber and plastic products	5.6	6.7	7.3	7.8	8.4
26	Manufacture of other non-metallic mineral products	29.3	35.2	38.1	41.0	44.0
27	Manufacture of basic metals	5.0	6.0	6.5	7.0	7.5
28	Manufacture of fabricated metal products, except machinery and equipment	6.4	7.7	8.3	9.0	9.6
29	Manufacture of machinery and equipment n.e.c.	4.4	5.3	5.7	6.2	6.6
30	Manufacture of office machinery and computers	n/a	n/a	n/a	n/a	n/a
31	Manufacture of electrical machinery and apparatus n.e.c.	11.0	13.2	14.3	15.4	16.5

NACE	Industry	Survey of Ukrainian firms	Russia	Georgia	Armenia	Azerbaijan
32	Manufacture of radio, television and communication equipment and apparatus	10.0	12.0	13.0	14.0	15.0
33	Manufacture of medical, precision and optical instruments, watches and clocks	20.0	24.0	26.0	28.0	30.0
34	Manufacture of motor vehicles, trailers and semi-trailers	12.3	14.8	16.0	17.2	18.5
35	Manufacture of other transport equipment	4.0	4.8	5.2	5.6	6.0
36	Manufacture of furniture; manufacturing n.e.c.	15.3	18.4	19.9	21.4	23.0
37	Recycling	5.5	6.6	7.2	7.7	8.3
	Total/average	**13.9**	**16.7**	**18.1**	**19.5**	**20.9**

Source: own assumptions based on the survey described in Jakubiak et al (2006).

4.2. Border costs

Customs and administrative procedures have substantial impacts on trade flows. Evidence and research studies show that countries that have efficient customs, good transport networks and fewer document requirements, all ensuring faster and cheaper compliance with export and import procedures, are more competitive globally (WB, Doing Business in 2006). That leads to more exports and thus to greater economic growth. Conversely, too complicated and burdensome customs and administrative procedures are usually associated with more corruption in customs. Long delays, expensive procedures and frequent demands for bribes significantly restrict trade. Also, traders may try to avoid customs procedures and smuggle goods across the border, as a result, the very purpose in having border control of trade – to levy taxes and ensure high quality of goods – is defeated (WB, Doing Business in 2006).

In the CGE exercise border costs are modelled as additional purchases of a domestic transportation good, which includes shipping, handling and warehousing for customs purchases. Border costs for the selected CIS countries are also based on the Jakubiak et al (2006) study which provides the costs of customs clearance faced by the Ukrainian exporters to the EU in 2006. According to the claims of Ukrainian exporters to the EU, their border costs amounted on average to 7% of the value of production in 2006. In order to develop assumptions on border costs

for other selected CIS countries in 2006 and 2004 we refer to the "Cost of Doing Business", the World Bank reports, which allow for the comparison of those costs across time and across countries and record every official procedure – and the associated documents, time and cost – for importing and exporting the goods, starting with the contractual agreement between the two parties and ending with delivery of the goods. According to these data, in 2004 the cost of export and import was about 30% higher in Georgia than in Ukraine, and by 2.6 times higher in Azerbaijan than in Ukraine (see Table 5). WB data also show an important improvement in the import and export procedures in Georgia and Armenia over 2004–2006 period, while Ukraine, Russia and Azerbaijan have shown no improvements over the past few years. Our assumptions on border costs in Ukraine and other CIS countries in 2004 and 2006 are presented in Table 6.

We assume that border costs faced by exporters from CIS countries will be reduced by 50% in the case of legal approximation and regulatory convergence with the EU standards. We assume that the reduction of border costs due to reform of customs procedures is equal in case of trade with other CIS countries and the ROW (Rest of the World).

Table 5. Border costs in Ukraine and other CIS countries in 2004 and 2006

	Ukraine		Georgia		Armenia		Russia		Azerbaijan	
	2004	**2006**	**2004**	**2006**	**2004**	**2006**	**2004**	**2006**	**2004**	**2006**
Documents for export (number)	6	6	9* (1.50)	8 (1.33)	7 (1.17)	7 (1.17)	8 (1.33)	8 (1.33)	9 (1.50)	9 (1.50)
Time for export (days)	31	31	54 (1.74)	12 (0.39)	34 (1.10)	30 (0.97)	36 (1.16)	36 (1.16)	56 (1.81)	56 (1.81)
Cost to export (US$ per container)**	1045	1045	1370 (1.31)	1105 (1.06)	1600 (1.53)	1165 (1.11)	2050 (1.96)	2050 (1.96)	2715 (2.60)	2715 (2.60)
Documents for import (number)	10	10	15 (1.50)	7 (0.70)	6 (0.60)	8 (0.80)	13 (1.30)	13 (1.30)	14 (1.40)	14 (1.40)
Time for import (days)	39	39	52 (1.33)	14 (0.36)	37 (0.95)	24 (0.62)	36 (0.92)	36 (0.92)	56 (1.44)	56 (1.44)
Cost to import (US$ per container)**	1065	1065	1370 (1.29)	1105 (1.04)	1750 (1.64)	1335 (1.25)	2050 (1.92)	2050 (1.92)	2945 (2.77)	2945 (2.77)

Note. The reports for 2006 and 2008 cover data for Jan 2005 and Jan 2007 used to represent here the status quo in 2004 and 2006.
*Numbers in parenthesises are countries' to Ukraine ratios for a specific year.
** Cost measures the fees levied on a 20-foot container in U.S. dollars. All the fees associated with completing the procedures to export or import the goods are included, such as costs for documents, administrative fees for customs clearance and technical control, terminal handling charges and inland transport. The cost measure does not include tariffs or trade taxes.
Source: WB Costs of Doing Business reports 2006 and 2008.

Table 6. Assumptions on border costs in Ukraine and other CIS countries in 2004 and 2006 (in% of export value)

	Ukraine		Georgia		Armenia		Russia		Azerbaijan	
	2004	2006	2004	2006	2004	2006	2004	2006	2004	2006
Adjustments of Ukraine's benchmark	Survey results	Survey results	+30	+10	+50	+25	+90	+90	by 2.6 times	by 2.6 times
Share of border costs in export value	7	7	9.1	7.7	10.5	8.8	13.3	13.3	18.2	18.2

Note: Estimates for Ukraine are from Jakubiak et al (2006), adjustments are based on Doing Business 2006 and 2008.
Source: own estimations based on Doing Business 2006 and 2008, and Jakubiak et al (2006).

4.3. Services

Availability of a diverse set of business services is important for economic growth since it allows domestic firms to purchase a quality adjusted unit of business services at lower cost (Rutherford and Tarr, 2006). Reduction or elimination of the barriers to foreign direct investment in services sectors will improve access of domestic firms to high-quality services in areas like telecommunication, banking, insurance, transportation and other business services that typically lead to the reduction of cost of doing business, increase productivity, and improve the competitiveness of inidividual economies (Rutherford and Tarr, 2006).

In line with the WTO negotiations and international commitments, CIS countries liberalize market access for foreign service providers and encourage them to increase foreign direct investment. WTO-related reforms in services sectors imply the elimination or substantial reduction of *discriminatory* measures and barriers faced by foreign service providers (such as statutory fund restrictions for foreign investors, restrictions or prohibitions to supply particular services and to establish of branches of foreign companies, restrictions on movement of foreign employees, etc.). Regulatory convergence with the EU aquis and closer integration between countries will likely further reduce barriers to trade in services between CIS countries and the EU, including the cross border supply, commercial presence (through FDI), movement of natural persons.

Existing barriers to trade in business services in Ukraine and Russia were most recently estimated by Copenhagen Economics, IER and OEI (2005) and Kimura et al (2004a, 2004b, 2004c). The authors used the same methodology implying the assessments of the regulatory environment in Ukraine and Russia through the implementation of business surveys and other information sources and converting these into an index of restrictiveness in telecommunication, financial sector and transport sectors[35], and, after that, estimation of the ad valorem equivalents of the existing restrictions. It should be noted that distinctions were made between barriers faced specifically by foreign investors vs. restrictions incurred by both foreign providers and domestic firms, through the separate calculations of foreign discriminatory restrictiveness index (applicable only to foreign suppliers) and overall foreign restrictiveness index (applicable to both foreign and domestic producers). The authors assumed that discriminatory barriers faced by foreign suppliers will be substantially reduced or eliminated upon accession to the WTO and full implementation of WTO requirements by CIS countries.

One should also note that the described tariff equivalents assess restrictiveness of regulatory environment affecting trade in services and FDI in services sectors across countries rather than overall investment environment which also includes political risks, infrastructural development, institutional capacities, corruption, etc.

To develop assumptions on barriers to FDI in services for Georgia, Armenia and Azerbaijan we use Ukraine's estimates from Copenhagen Economics, IER and OEI (2005). Ukraine's assumptions are then adjusted for each country taken into account i) the status of the WTO accession/membership of those CIS countries since WTO accession implies substantial reduction of discriminatory regulatory measures against barriers to trade in services. The longer accession/membership in the WTO, the lower level of discriminatory barriers to FDI in services is. ii) the values of Heritage Foundation economic freedom indices (Global economic freedom index which covers 10 freedoms in 161 countries[36] including Investment freedom index and Financial freedom index), compatible across countries and measures (see Table 7).

[35] For Ukraine – railway transportation services, for Russia – air and maritime transportation services.

[36] Each one of the 10 freedoms (business freedom, trade freedom, fiscal freedom, government size, monetary freedom, investment freedom, financial freedom, property rights, freedom from corruption, and labor freedom) is graded using a scale from 0 to 100, where 100 represents the maximum freedom. A score of 100 signifies an economic environment or set of policies that is most conducive to economic freedom, an absolute right of property ownership, fully realized freedoms of movement for labor, capital, goods and services.

Table 7. Index of economic freedom, 2008

	Rank	Global economic freedom	Investment freedom	Financial freedom	WTO accession status
Ukraine	133	51.1%	30%	50%	Member since 2008
Armenia	28	70.3%	70%	70%	Member since 2003
Georgia	32	69.2%	70%	60%	Member since 2000
Russia	134	49.9%	30%	40%	In accession process since 1993, final stage of accession
Azerbaijan	107	55.3%	30%	30%	In accession process since 1997

Note. Distribution of Global Economic Freedom: 80–100 – free; 70–79.9 – mostly free; 60–69.9 – moderately free; 50–59.9 – mostly unfree; 0–49.9 – repressed.
Source: The Heritage Foundation, http://www.heritage.org/research/features/index/countries.cfm.

Table 8. Assumptions on barriers to trade in services (ad-valorem tariff equivalents of barriers to trade in services), 2006

	Suggested adjustments	Railway transportation*	Telecommunication	Financial services
Ukraine		16.0%	6.0%	24.0%
Russia		24.0%*	10.0%	41.0%
Georgia	-35% off Ukraine's estimates	10.4%	3.9%	15.6%
Armenia	-25% to Ukraine's estimates	12.0%	4.5%	18.0%
Azerbaijan	+30% to Ukraine's estimates	20.8%	7.8%	31.2%

Note. * - own assumption (calculated as Ukraine's appropriate estimate increased by 50%).
Sources: Kimura et al (2004a, 2004b, 2004c) – for Russia (except railway transportation); Copenhagen Economics, Institute for Economic Research and Policy Consulting, Institute for East European Studies Munich, (2005) for Ukraine; own assumptions – for other countries.

In particular, Heritage Foundation indices indicate a high degree of economic freedom (including investment and financial freedom) in Georgia and Armenia, while a repressed investment environment is reported in Ukraine, Russia and Azerbaijan[37]. Also Georgia and Armenia have been members of the WTO since 2000 and 2003 respectively, followed by Ukraine, while Russian Federation and Azerbaijan are still at the accession stage (see Table 7). Taking these considera-

[37] It should be noted that the Heritage Foundation investment and financial freedom indices capture not only formal regulatory restrictions affecting FDI in CIS countries but also corruption issues, contract enforcement, implementation of laws, etc.

tions into account, we can roughly assume the following ranking of the countries in regard to the level of barriers to FDI in services (from lowest to highest): Georgia, Armenia, Ukraine, Russia, and Azerbaijan. Our final assumptions on barriers to trade in services across five CIS countries under consideration in 2006 are represented in Table 8.

The harmonization of national legislation and policies with the EU acquis will lead to a further reduction of barriers to FDI for both foreign and domestic service suppliers. We assume a 50% reduction down from the 2006 level of barriers to FDI in each country as a result of harmonization with the EU acquis.

5. CGE Estimates of the Impact of Improved Market Access for Selected European Neighbourhood Policy Countries

The aim of this section is to look at the impact of institutional harmonization of the European Neighbourhood Policy countries with the EU, using a CGE model. We focus on three pillars of trade facilitation i.e. legislative and regulatory approximation, reform of customs rules and liberalization of the access of foreign providers of services. The modelling exercise covers five selected ENP countries (CIS5) i.e. Armenia, Azerbaijan, Georgia, Ukraine and Russia. The choice of countries was mainly determined by the data availability.

5.1. The CGE model

We employ a standard static computable general equilibrium model. It includes several price-wedge distortions such as factor taxes in production, taxes on intermediate inputs, subsidies in production, value-added taxes, import tariffs and export subsidies. Production involves combination of intermediate inputs and primary factors (capital, skilled and unskilled labour, energy products). We assume a Constant Elasticity of Substitution (CES) function over primary factors and a Leontief production function combining intermediate inputs with factors of production composite. Primary factors are mobile across sectors within a region, but immobile internationally. Each region has a government and a single representative consumer.

Demand for final goods arises from a Cobb-Douglas utility function. Within each region, final and intermediate demands are composed of the same Armington aggregate of domestic and imported varieties. The composite supply is a nested CES function, where consumers first allocate their expenditures among domestic and imported varieties and then choose among imported varieties. In the imperfect competition case firm varieties enter at the bottom of the CES function. This ap-

proach allows for the differentiation in preferences for home and imported goods. The special form of this demand structure is firm level product differentiation. It requires the assumption that all elasticities of substitution between firms and products are equal. Demand is then represented by a single level CES function with all domestic and imported varieties competing directly.

There is strong empirical evidence for modelling selected sectors as imperfectly competitive (e.g. Pratten, 1988). Increasing returns to scale (IRS) in production will therefore be incorporated in selected manufacturing industries. Goods subject to constant returns to scale (CRS) such as agriculture, forestry or public services are differentiated by the country of origin. Products can either be sold at the domestic market or exported depending on relative prices and constant elasticity of transformation production function. In sectors subject to IRS, goods are differentiated at the level of firms. Firms set prices at the level where marginal cost is equal to marginal revenue. There is free entry, which drives profits to zero. We will make an assumption of large group monopolistic competition with constant mark-up over marginal costs.

A detailed description of the model equations, calibration and parameters employed is provided in the Annex 2. It is built on the basis of the MRT – Multiregional Trade Model – by Harrison, Rutherford and Tarr (1996) implemented in their evaluation of the impact of the completion of the Single Market, but has been modified in several ways to fit this analysis. Similar analysis has been recently applied in the feasibility studies for Georgia and Armenia (Maliszewska et al.., 2008a, 2008b) and Russia (Dabrowski, Emerson, Maliszewska Eds., 2007) and Ukraine by Ecorys and CASE-Ukraine (2007) and earlier in the analysis of the Eastern EU Enlargement (Maliszewska, 2004) and Albanian Integration with the EU (Maliszewska and Kolesnichenko, 2004).

5.2. Data

A social accounting matrix (SAM) for Georgia for 2004 was based on Jasper Jensen's and David Tarr's submission to the GTAP (Global Trade Analysis Project) data base[38]. The SAM for Ukraine was submitted to GTAP by CASE-Ukraine. The data for all other regions is based on GTAP7 pre-release 3 data base.

[38] The submission of the SAMs for Georgia, Armenia and Azerbaijan by Jaspers Jensen and David Tarr was part of the ENEPO project coordinated by CASE and financed by the European Commission (FP6 STREP).

The GTAP database includes the national and regional input-output structures, bilateral trade flows, final demand pattern and government intervention benchmarked to 2004. The Georgian SAM has been imposed on the GTAP data using a code developed by Thomas Rutherford (www.mpsge.com/gtap6)[39]. The benchmark data includes Georgia, Armenia, Azerbaijan, Russia, Ukraine, and remaining CIS countries, EU27, Turkey and the Rest of the World (ROW). It includes 33 sectors out of which 11 are subject to increasing returns to scale (IRTS) in the imperfect competition scenarios[40].

We apply the CGE model to create a benchmark and then to study the implications of the trade liberalisation that took place between 2004 and 2006, a Simple FTA and a Deep FTA. The Deep FTA will be within a framework of a trade agreement that is bound to include across the board lowering or elimination of tariffs. Before studying the implications of various versions of an FTA we need to study the effects of trade liberalisation that took place over 2004–2006 period. The changes due to tariff and other trade related policies are already taking place and will require between 5–10 years to take their full impact on the economies. Without modelling of these policy changes we would be wrongly attributing their impact to the implications of FTAs. The **Simple FTA** scenario involves scrapping the tariffs in the EU27-ENP countries trade with the exception of agricultural and food products where tariffs are only halved. A Deep FTA adds the liberalization of non-tariff barriers to the Simple FTA. The three types of NTBs taken into account in this study are border costs, standards costs and barriers to foreign provision of services. The review of NTBs in the five selected ENP countries and the exact assumptions used in all scenarios are discussed in the Section 3.3.

5.3. Tariffs

The data on tariffs in the baseline 2004 and 2006 or 2007 originates from the WITS (World Integrated Trade Solution) database. It includes applied trade

[39] The original SAM for Georgia was not introduced correctly into the pre-release GTAP data, which is still in the testing stage. The Armenian and Azeri data submitted along with the Georgian data used in the present study was introduced properly. Other adjustments have been made to the GTAP data to update tariff data to 2004 levels.

[40] These are food, beverages and tobacco; textiles and wearing apparel; leather; paper products, publishing; petroleum and coal products; chemical products, rubber, plastic; mineral products, metal and metal products; transport equipment; machinery and equipment; other manufacturing products.

weighted averages of tariff rates with respect to all regions. In most instances, the GTAP tariff data for 2004 was replaced with the WITS tariffs for 2004 which were much lower. The data on tariffs for the set of simulations representing the initial trade policy changes for Georgia, Armenia and Ukraine is from 2006; data for Russia and Azerbaijan is from 2007.

Table 9. Tariffs on imports from the EU27 and the rest of the world (ROW) in 2006 and 2007 according to the sectors of the CGE model

	Armenia 2006		**Azerbaijan 2007**		**Georgia 2006**		**Russia 2007**		**Ukraine 2006**	
	World	**EU**	**World**	**EU**	**World**	**EU**	**World**	**EU**	**World**	**EU**
Grains, fruits, vegetables, crops nec	3.0	3.1	6.5	10.2	6.3	3.7	3.2	5.5	3.8	5.2
Livestock	2.5	0.2	5.5	11.1	4.4	11.6	4.1	6.3	0.6	0.6
Forestry	0.3	2.9	6.7	12.7	0.0	0.0	10.5	12.5	1.1	5.6
Fishing	1.1	0.3	1.3	0.5	0.0	0.0	8.5	9.7	1.0	0.7
Coal	0.0	0.0	0.3		0.0	0.0	4.0	5.0	0.0	0.0
Oil							3.8	5.0	0.0	2.0
Gas		0.0	8.0	15.0	0.0	0.0	5.0		0.0	
Mining and quarrying	0.0	0.0	1.4	2.6	9.3	3.4	4.1	5.0	1.0	1.0
Food products, beverages and tobacco	6.5	7.6	9.8	10.8	6.2	5.4	7.2	10.9	6.1	8.2
Textiles and textile goods	5.2	7.1	12.5	14.5	0.0	0.0	9.2	12.3	7.4	7.1
Leather products	5.6	9.7	10.9	14.7	0.0	0.0	6.8	8.0	9.0	7.0
Wood products	2.7	4.3	8.4	12.6	0.0	0.0	12.3	14.0	5.4	6.0
Paper products, publishing	2.8	1.5	8.7	7.6	0.0	0.0	10.6	11.4	2.5	2.9
Petroleum, coal products	0.0	0.0	13.2	14.4	0.0	0.0	4.5	5.0	0.0	0.0
Chemical, rubber, plastic products	0.2	0.3	5.5	6.2	0.0	0.0	7.8	8.1	2.0	2.3
Mineral products nec	5.7	6.9	10.2	13.2	4.1	3.1	12.8	13.9	6.9	8.3

	Armenia 2006		Azerbaijan 2007		Georgia 2006		Russia 2007		Ukraine 2006	
	World	EU	World	EU	World	EU	World	EU	World	EU
Metals and metal products	0.1	0.0	6.4	8.7	0.0	0.0	9.2	9.9	2.1	1.9
Transport equipment	5.1	6.6	1.5	1.4	0.0	0.0	8.0	9.1	8.3	10.0
Machinery, electronic equipment	1.8	0.8	5.3	5.8	0.0	0.0	5.8	6.1	2.8	2.6
Manufactures nec	6.3	2.7	12.9	13.9	0.0	0.0	14.1	15.0	5.3	5.5

Source: WITS and own calculations.

Georgia has the most liberal trade regime with most goods from the EU entering the Georgian market duty free. This is followed by Armenia and Ukraine. The highest protection is recorded in Russia and Azerbaijan. The expectation therefore is that the Simple FTA will be most beneficial to these two countries as most benefits often stem from own trade liberalization. The other major factor is the amount of trade with the EU. Further lowering of tariffs with respect to the rest of the world is expected with the WTO accession of Ukraine (which became a WTO member in 2008) and in the future in the case of Russia and Azerbaijan, which are negotiating their memberships in the WTO.

In terms of their access to the EU market most goods exported from the CIS5[41] qualify for the EU Generalised System of Preferences (GSP). In addition, in 2006 Georgia has qualified for the special arrangement for sustainable development and good governance (GSP+) offering it a particularly advantageous access to the EU market facing zero duties on all its exports to the EU. Also access of Armenian goods to the EU market is almost duty free with the exception of low tariffs on Food products and Textiles. As of January 2009 Armenia and Azerbaijan have also been granted the GSP+ status.

Table 10. Tariffs on exports to the EU27 in 2004 according to the sectors of the CGE model

	Armenia	Azerbaijan	Georgia	Russia	Ukraine
Grains, fruits, vegetables, crops nec	1.4	0.5	0.1	5.9	11.6
Livestock	0.3	NA	0.0	0.9	0.0
Forestry	9.3	0.0	0.0	0.4	0.0
Fishing	10.4	NA	5.4	6.0	0.0

[41] I.e. Armenia, Azerbaijan, Georgia, Russia and Ukraine.

	Armenia	Azerbaijan	Georgia	Russia	Ukraine
Coal	NA	NA	4.7	0.0	0.0
Oil	NA	NA	0.4	0.0	0.0
Gas	NA	NA	NA	0.0	3.4
Mining and quarrying	0.2	0.0	0.4	0.0	5.4
Food products, beverages and tobacco	9.0	11.0	9.5	8.0	0.0
Textiles and textile goods	6.1	5.8	8.9	6.8	0.0
Leather products	0.9	2.9	4.7	3.5	0.0
Wood products	0.1	0.0	0.0	0.9	0.0
Paper products, publishing	0.2	0.0	0.1	0.1	0.0
Petroleum, coal products	4.5	0.0	3.5	0.0	0.0
Chemical, rubber, plastic products	2.5	0.5	2.4	0.7	3.1
Mineral products nec	1.6	2.7	1.1	1.0	0.0
Metals and metal products	0.8	0.9	2.1	0.8	0.0
Transport equipment	1.2	0.0	1.7	0.9	0.0
Machinery and electronic equipment	0.5	0.1	0.1	0.2	0.0
Manufactures nec	0.0	0.5	4.2	0.3	0.0

Source: WITS and own calculations.

5.4. Non-tariff barriers

One of the studies ordered by the European Commission before completion of the Single Market looked at the perception of EC producers as to the importance of barriers to be removed by the formation of the Single Market. It showed that the elimination of physical frontiers, costs and delays, harmonisation of national standards and regulations, and government procurement were the most important barriers to trade before 1992. Similar conclusions were reached after a survey of barriers to exports to the EU faced by the Ukrainian exporters (see Jakubiak et. al. 2006). Elimination or lessening of these impediments to trade will also likely bring major benefits to the ENP countries especially if they gain improved access to the Single Market thanks to the creation of a deep FTA covering NTBs. In modelling of a deep FTA we focus on a reduction in border costs and delays, as well as a reduction in costs of compliance with varying national standards and technical regulations. In addition we also study the impact of a reduction of barriers to foreign provision of selected services.

5.4.1. Border costs

One of the most observable barriers to trade is due to the existence of borders and customs formalities, which involve delays and various kinds of administrative costs. At the moment all goods from the ENP countries exported to the EU and vice versa are stopped at the EU border for customs clearance. In the CGE exercise border costs are modelled as additional purchases of a domestic transportation good, which includes shipping, handling and warehousing for customs purchases.

For the purpose of the CGE modelling, it is assumed that benchmark border costs in Georgia are roughly 30% higher than those for Ukraine, in Armenia – 50% higher, in Russia – 90% higher and in Azerbaijan – 260% higher. This is based on the discussion in Section 3.3 and comparison of border costs per shipment from Table 3. Ukrainian border costs are approximated by the costs of customs clearance faced by the Ukrainian exporters to the EU in 2006 (Jakubiak et al 2006). These costs amounted on average to 7% of the value of exports, hence e.g. the 2004 benchmark border costs in Georgia are assumed to be equal to 9.1% of the value of exports. In 2006 these costs go down by 20% in Georgia and by 25% in Armenia again based on the comparison of the cost of shipment in Table 5. The 2006 border costs in the remaining countries remain unchanged again in agreement with the "Cost of Doing Business" estimates. The Simple FTA is assumed to leave those costs unchanged. The argument behind this is that already the majority of industrial tariffs in trade with the EU have been eliminated; hence the additional elimination of red tape or corruption as a result of complete elimination of tariffs on industrial products is likely to be quite small. In a Deep FTA these costs are assumed to be reduced by 50%, which is assumed to reflect a long-term improvement in customs and transit procedures.

5.4.2. Standards costs

The EC has been concerned with the elimination of the technical barriers to trade since its creation. However, the major effort of elimination of barriers to trade imposed by differing national regulations and standards was undertaken with the creation of the Single Market. The Single Market measures consist of 2,556 different mandated standards. This number rises to more than 20,000 when voluntary standards are considered.

The differences in technical regulations and standards, which vary between domestic and the EU markets, require producers to manufacture or package goods in forms, which are different than for their domestic markets. Standards costs therefore increase the cost of production for exports and they are modelled as addi-

tional value added in each sector where trade takes place. This approach ignores the fixed cost elements of implementation of new standards. However, these are mostly one-off investments and their magnitude is very difficult to estimate as these investments are often undertaken as part of the greater modernization effort.

In the survey mentioned above, CASE and CASE-UA investigated NTBs faced by Ukrainian exporters to the EU (Jakubiak et al 2006). Among others, respondents (over 500 companies) were asked to assess costs associated with meeting EU technical regulations and the duplication of efforts related to compliance with both national and EU standards (existing for the majority of surveyed firms). Given that we were not able to obtain data on standards costs for all selected ENP countries we are relying on the Ukrainian estimates as discussed in Section 4.1.

The reasons why we expect the costs of compliance with technical regulations to decrease following a deep FTA are greater availability of conformity assessment centres in the ENP countries, which would result in lower costs of testing and compliance, better availability of information and greater cooperation between the EU and ENP countries firms that comes with increased integration. Hence we make a rough assumption that the standards costs decrease by 50% in a Deep FTA. The experience of the new EU members and EU firms following the formation of the Single Market indicates that these costs have indeed gone down.

Our assumptions so far applied to CIS5 exports to the EU. We do not know of similar estimates for other export destinations for the CIS5 products and in any case the impact of a Deep FTA on the costs of complying with regulations of other importing partners is not clear. Hence in the simulations we assume that these costs apply only to exports to the EU. Any harmonization of legislation with the EU, wider availability of conformity assessment centres and with that lower costs of certification that would follow a Deep FTA would lead to a reduction of these costs for the CIS5 exporters to the EU. On the other hand, for CIS5 firms which have been producing only for domestic market, the introduction of EU regulations as compulsory on the domestic market may impose additional investment/ costs. A certain part of this investment will be undertaken in the normal course of replacing existing equipment over the coming years. However, in some cases the costs of compliance may be significant. Nevertheless even those firms are likely to benefit from the ability to export to the enlarged EU and wider availability of the assessment centres. Overall, it seems likely that all firms will experience some reduction in standards costs.

5.4.3. Barriers to trade in services

We were not able to find surveys on the barriers to trade in services for three out the CIS5. To the best of our knowledge, such estimates exist only for Russia and Ukraine. Hence again we rely on data for Ukraine. We base our estimates on the barriers to foreign direct investment in services estimated by Pavel et. al. (2006). The authors estimate tariff equivalents of barriers that discriminate against foreign providers of telecommunication, transport and financial services. We model those barriers as additional purchases of value added in the amount equal to tariff equivalents by exporters or providers of those services from all regions. Hence for instance in the case of Georgia we assume that in order to provide financial services (banking, insurance) foreign companies face costs higher by 28.8% compared to local provides. The additional costs in transport sector amount to 11.7% and in communications to 3.2%. The assumptions for all countries have been discussed in detail in Section 4.3.

We assume that in a Deep FTA those barriers would be halved. To some extent the barriers to foreign provision of services in the case of non-WTO members will be reduced with the WTO accession. The estimates for Russia and Ukraine suggest that these reductions might be quite significant. However, it is very difficult to estimate to what extent the institutional harmonization with the EU and to what extent the changes in legal and business environment brought about by the WTO accession will affect those barriers. Hence we opt for an arbitrary assumption of a 50% reduction in case of a Deep FTA as an illustrative example of the likely implications of a significant improvement in legal and business environment. The above discussion of modelling assumptions has been summarized in the Table 11 below.

Table 11. Summary of modelling assumptions

	Benchmark 2004	Initial liberalization 2006	Simple FTA	Deep FTA
Tariffs	Initial levels as described above	2006 tariffs	Zero tariffs in trade in industrial products, 50% off tariffs on agricultural and food products	Zero tariffs in trade in industrial products, 50% off tariffs on agricultural and food products
Border costs		2004 level (except for Georgia and Armenia)	2004 level (except for Georgia and Armenia)	50% off 2004 level
Standards costs		2004 level	2004 level	50% off 2004 level
Barriers to trade in services		2004 level	2004 level	50% off 2004 level

5.5. CGE Simulations

5.5.1. Benchmark Scenario and Simple FTAs

The macroeconomic implications of the benchmark scenario – 2006 are displayed in Table A3 in the Annex 3. In each simulation we calculate the impact of a given trade policy change assuming increasing returns to scale in selected sectors and allowing for the adjustment of capital stock in response to a change in return to capital – the long run scenarios. The calculation of steady state growth effects follows Harrison, Rutherford and Tarr (1996). In the short run scenarios the price of capital would be allowed to vary within each country, while capital stock would be held constant. In the steady state scenario capital stock is allowed to adjust, while the price of capital is held constant at its benchmark level. This approach assumes that there exists an invariant capital stock equilibrium. It is defined as a set of prices, production and investment levels for which the economy is able to grow at a steady rate with constant relative prices.

This approach provides an upper bound of the potential welfare gains as it ignores the adjustment costs and foregone consumption necessary to increase investment. For sufficiently high discount rates the costs of forgone consumption could overturn the benefits of capital accumulation. Although we measure welfare as equivalent variation as a share of GDP, it has to be born in mind that incorporation of the cost of the investment required to build up the capital stock may substantially reduce the estimates of welfare gains cited below. On the other hand, our approach does not incorporate the potential gains due to productivity improvements or endogenous growth theory "learning by doing" effects.

Table A3 displays major results of the 2006 scenario. Apart from welfare changes (equivalent variation as a share of GDP), we also present changes in wages of skilled and unskilled workers and GDP growth. We do not discuss this scenario in detail as this is only a benchmark for further analysis, but it is worthwhile noting that a significant own liberalization by Georgia in 2006 has been estimated to lead in the long run to an additional 1% growth of GDP. As expected the gains are lower in the case of Armenia, as the liberalization between 2004 and 2006 has been limited.

In Annex 3 Tables A4-A5 present the impact of Simple FTAs. The impact on individual countries depends both on the level of initial barriers and on their intensity to trade with the EU. The countries that gain the most from the Simple FTA are Ukraine, Russia and Azerbaijan. Both Georgia and Armenia have already very low barriers to trade with the EU, hence their elimination does not stimulate much new trade and welfare gains. In terms of the impact on the EU, it is also marginal.

This is explained by the very low share of EU trade being directed to/from the CIS countries, with only Russia and Ukraine accounting for a non-negligible share of total EU27 exports and imports (roughly 4% in the case of Russia and 1% in the case of Ukraine) – see Tables 12 and 13 below.

Table 12. Exports by partner as a share of total exports (2004)

	Russia	Ukraine	Armenia	Azerbaijan	Georgia	Turkey	EU27	CIS	ROW
Russia		5.90	0.18	0.57	0.15	2.96	43.30	3.73	43.21
Ukraine	17.99		0.22	0.67	0.37	5.26	32.64	3.24	39.61
Armenia	9.13	1.36		0.05	2.46	0.21	38.54	0.43	47.82
Azerbaijan	8.15	0.36	0.00		2.72	3.86	52.24	8.46	24.21
Georgia	14.13	3.33	15.21	3.69		16.77	18.25	13.37	15.25
Turkey	2.43	0.71	0.05	0.46	0.21		59.98	1.00	35.17
EU27	3.99	0.90	0.04	0.19	0.03	3.22		0.52	91.11
CIS	17.59	12.70	0.03	1.64	0.18	2.87	30.20		34.79
ROW	3.08	0.53	0.05	0.16	0.02	2.19	93.35	0.63	

Source: GTAP.

Table 13. Imports by partner as a share of total imports (2004)

	Russia	Ukraine	Armenia	Azerbaijan	Georgia	Turkey	EU27	CIS	ROW
Russia		22.60	13.21	10.24	12.89	4.40	3.81	19.57	3.76
Ukraine	4.57		4.31	3.11	7.77	2.08	0.76	4.22	0.92
Armenia	0.06	0.03		0.01	1.52	0.00	0.02	0.02	0.03
Azerbaijan	0.17	0.03	0.00		4.55	0.12	0.09	0.85	0.04
Georgia	0.09	0.07	6.54	0.44		0.16	0.01	0.41	0.01
Turkey	1.72	1.77	2.27	5.68	12.91		3.17	3.46	1.99
EU27	51.17	42.50	32.22	40.90	35.49	54.98		32.55	92.73
CIS	3.21	8.25	0.41	5.10	2.66	0.72	0.44		0.52
ROW	39.01	24.74	41.04	34.51	22.21	37.54	91.70	38.94	

Source: GTAP.

5.5.2. Deep FTAs

Finally, we come to the main focus of our study i.e. the impact of greater institutional harmonization between the EU and the CIS5 as proxied by the reduction of border and standard costs and barriers to foreign provision of services. There are several reasons why we should expect the elimination of NTBs to be beneficial to the CIS5 and the EU. The reductions in barriers to trade and transport costs

decrease the prices of goods for consumers, as well as prices of intermediates and capital goods for producers. The extent of these gains depends on the amount of trade between the trading partners and the trade creation and trade diversion effects. Apart from increased efficiency of resource allocation, as demand shifts to regions with the lowest cost suppliers, additional gains stem from increased competition. However all gains from trade also involve adjustment costs and may be associated with potentially painful restructuring in selected sectors and significant redistribution effects. The benefits of a Deep FTA for an individual country depend on many factors such as the level of initial NTBs, trade intensity in sectors mostly affected by the reduction of NTBs, the economies of scale in the mostly affected sectors and other.

Tables A6-A7 in the Annex 3 present the results of Deep FTAs. When analysing the results of Simple or Deep FTAs it has to be borne in mind that the benchmark for all simulations is 2004, hence the results for Simple and Deep FTAs also include the impact of the initial trade liberalisation between 2004 and 2006. The effects of the 2006 liberalization will take several years to fully materialize. Therefore to look, for example, at the additional welfare gains from a Deep FTA one needs to subtract the impact of the 2006 scenario. These net additional gains from a Deep FTA are presented in Table 14 below. Every column presents results for a given scenario e.g. the first one presents results for all countries of an EU-Armenia Deep FTA. In these FTA scenarios there are no changes assumed in EU relations with the remaining countries, hence in the first scenario the impact is the strongest on the integrating country - Armenia. Welfare is measured as a percentage change in equivalent variation as a share of GDP relative to it level in the benchmark 2006 scenario. Implications of deep FTA for wages and trade flows are also presented in percentage changes with respect to their levels under the benchmark 2006 scenario.

Table 14. Welfare, GDP, Wages and Trade Implications of Simple FTAs between Armenia, Azerbaijan, Georgia, Russia and Ukraine and the EU

	Armenia	Azerbaijan	Georgia	Russia	Ukraine
Welfare (% change)					
Russia	0.000	-0.003	-0.001	2.796	0.032
Ukraine	0.009	-0.002	-0.003	0.169	5.830
Armenia	3.130	0.008	0.012	0.041	0.004
Azerbaijan	0.000	2.862	-0.003	0.200	0.008
Georgia	0.108	-0.050	1.686	0.027	0.004
Turkey	-0.004	0.113	0.004	1.095	0.000
EU27	0.001	0.023	-0.001	0.713	0.085
CIS	0.001	0.019	0.001	0.617	0.224
ROW	-0.001	0.014	-0.001	0.328	0.032

	Armenia	Azerbaijan	Georgia	Russia	Ukraine
Wages of skilled workers (% change)					
Russia	0.000	-0.001	0.000	2.505	0.008
Ukraine	0.004	-0.002	-0.001	0.121	4.731
Armenia	2.380	0.010	-0.003	0.076	0.013
Azerbaijan	0.000	3.764	0.006	0.190	0.009
Georgia	0.026	-0.046	1.469	0.099	0.018
Turkey	-0.002	0.069	0.002	0.753	0.005
EU27	0.000	0.017	-0.001	0.532	0.065
CIS	0.000	0.014	0.000	0.497	0.128
ROW	0.000	0.009	0.000	0.224	0.022
Wages of unskilled workers (% change)					
Russia	0.000	-0.005	0.000	3.060	-0.004
Ukraine	0.009	-0.004	-0.001	0.098	6.385
Armenia	3.661	0.007	0.027	-0.002	-0.009
Azerbaijan	0.001	4.935	0.000	0.707	-0.007
Georgia	0.123	-0.050	2.048	0.062	0.002
Turkey	-0.002	0.088	0.003	0.861	-0.003
EU27	0.001	0.019	-0.001	0.578	0.070
CIS	0.000	0.012	0.001	0.645	0.138
ROW	-0.001	0.010	-0.001	0.232	0.021
Total exports (% change)					
Russia	-0.003	-0.001	-0.001	19.594	0.077
Ukraine	0.013	-0.018	-0.039	0.391	13.726
Armenia	21.219	0.069	-0.148	1.154	0.167
Azerbaijan	-0.090	13.289	-0.516	1.914	0.007
Georgia	0.560	-0.249	22.950	1.723	0.067
Turkey	-0.008	0.106	0.032	2.703	-0.020
EU27	0.007	0.047	0.012	2.344	0.262
CIS	-0.002	0.031	0.000	1.779	0.357
ROW	-0.003	0.022	0.007	1.214	0.045
Total imports (% change)					
Russia	-0.004	-0.017	-0.005	17.445	0.027
Ukraine	0.016	-0.032	-0.044	0.283	13.973
Armenia	13.187	0.037	-0.163	0.438	0.042
Azerbaijan	-0.039	2.199	-0.230	0.544	-0.035
Georgia	0.262	-0.223	9.065	0.808	0.021
Turkey	-0.006	0.189	0.052	2.886	-0.035
EU27	0.007	0.050	0.011	2.541	0.279
CIS	-0.002	0.024	-0.007	1.531	0.287
ROW	-0.004	0.029	0.011	1.274	0.037

Our estimates indicate that the major beneficiary of the institutional harmonisation would be Ukraine. Its estimated welfare gain could reach up to 5.8% in the long run. The welfare gains for the remaining countries are also sizeable i.e. Ar-

menia (3.1%), Russia (2.8%), Azerbaijan (1.8%) and Georgia (1.7%). Even though the estimated NTBs in Ukraine are not as high as in other CIS5 countries, the highest standard costs reductions are taking place in sectors where exports to the EU are particularly high e.g. 60–70% of the production of Textiles and textile products, Wood and wood products is being exported, out of which 70–80% to the EU. The impact on wages of skilled and unskilled workers in Ukraine is also the highest among the CIS5 contributing to sizeable welfare gains. In the CIS5 countries sectors using unskilled labour grow faster than sectors using skilled labour, as wages of unskilled workers increase at a faster pace.

According to our simulations, the Deep FTA would also lead to a significant increase in total trade for all CIS5 countries. In the long run total exports of Georgia, Armenia and Russia might go up by as much as about 20%, while total exports of Azerbaijan and Ukraine by about 13%. A negligible increase of trade would be also recorded in the EU27, apart from the EU-Russia Deep FTA where the EU imports and exports are expected to grow by about 2.5%. In all simulations the trade balance is held fixed hence an increase in total exports is accompanied by a compensating increase in total imports.

When interpreting the output changes (Table A7 in the Annex 3) one has to keep in mind that the overall employment is held constant in simulations, hence decreases in production of some sectors are compensated by increases in production in other sectors as skilled and unskilled workers shift between sectors. The changes in output are only indicative of the mechanisms at work and should not be treated as a forecast. Our results indicate significant structural changes in the CIS5 economies. As a result of a Deep FTA some sectors would record significant increases in total output, while other sectors would see their output decreasing dramatically.

In Armenia the main sectors expected to increase their output following a Deep FTA include Leather products, Manufactures NEC (not elsewhere classified), Mineral Products and Textiles. This would be at the expense of Wood products, Transportation and Storage, Communications. In Azerbaijan the major beneficiaries would include Textiles, Leather and Wood products. The contracting sectors are expected to include Mineral Products, Mining and quarrying, Paper products. In Georgia the expanding sectors include Textiles, Metals, Mining and quarrying. The contracting sectors include Leather products, Machinery and Electronic Equipment, Paper products. In Ukraine sectors gaining from a Deep FTA include Textiles and textiles products, Leather and Wood products. Generally most sectors see their output increasing, but the output of Manufactures NEC or Transportation and Storage would contract.

5.6. Conclusions

These simulations have presented a series of scenarios for EU-CIS free trade agreements. They begin with the effects of the 2006 unilateral free trade measures adopted by the CIS5 combined with the EU's granting it GSP+ preferences to Georgia and GSP preferences to the remaining countries. In the case of Georgia these liberalizing measures were expected to have a significant impact on GDP growth, but they will take years to fully materialize. The Simple FTA scenario might not add much, since only the remaining agro-food tariffs would be dismantled. It is the Deep FTA scenario that adds significant benefits as a result of a more complete elimination of a comprehensive definition of barriers to trade and investment. A reduction of NTBs and improved access to the EU market would bring significant benefits to the CIS5 countries in terms of welfare gains, GDP growth, increases in real wages and expansion of international trade. The possible welfare implications of deep integration with the EU range from 5.8% of GDP in Ukraine to sizeable expected gains in Armenia (3.1%), Russia (2.8%), Azerbaijan (1.8%) and Georgia (1.7%). The structural changes in their economies are significant with some sectors seeing their output decreasing significantly. However, these output, trade and GDP changes are expected to fully materialize over the period of 10–15 years and therefore the adjustment might be gradual and the transition less costly than indicated by total estimated changes in sectoral outputs.

6. Summary

The aim of this study was to estimate the impact of the removal of NTBs in trade between the EU and its selected CIS partners: Russia, Ukraine, Georgia, Armenia and Azerbaijan. We started with a review of methodologies and results of previous studies, concentrating on CEE and CIS regions. All methods can be divided into three main groups: frequency-type methods, surveys and gravity model approach. Frequency-type estimates are more common, as they are easier to obtain, at the same time there are very few surveys on NTBs in the CIS. The survey conducted in Ukraine showed that the costs of meeting EU technical standards are considered rather high and burdensome by local producers. Also, estimates of barriers to FDI in services sectors in Ukraine and Russia prove existence of significant restrictions to trade and foreign investment in service sectors.

This report further includes an overview of approaches to measurement of the effects from the improved market access (or NTB reduction), which include surveys, macro-level econometric analysis, partial equilibrium models, and computable general equilibrium (CGE) models. The reviewed studies report that internal market access and lessening of NTBs may lead to considerable aggregate trade increase for CEES countries as a result of their integration with EU market. The studies on CIS countries are scarce. A few available studies concentrate predominantly on the effects of WTO accession and deal with a limited range of countries.

For the estimation of the trade-related harmonisation effects we employed a computable general equilibrium model. The model encompassed the following three pillars of trade facilitation: legislative and regulatory approximation (reduction of standard costs), reform of customs rules and procedures (resulting in reduction of border costs), and liberalization of the access of foreign providers of services. In our assumptions on reduction these costs we relied upon the results of a survey of the non-tariff barriers and on barriers to foreign direct investment in services made for Ukraine and then made extrapolation to other countries based on the review of the respective barriers in these countries.

We conclude that an institutional harmonisation with the EU modelled here as a reduction of NTBs and improved access to the EU market would bring significant benefits to the CIS5 countries in terms of welfare gains, GDP growth, increases in real wages and expansion of international trade. The possible welfare implications of deep integration with the EU range from 5.8% of GDP in Ukraine

to sizeable expected gains in Armenia (3.1%), Russia (2.8%), Azerbaijan (1.8%) and Georgia (1.7%). The structural changes in their economies are significant with some sectors seeing their output decreasing significantly. However, these output, trade and GDP changes are expected to fully materialize over the period of 10–15 years and therefore the adjustment might be gradual and the transition less costly than indicated by total estimated changes in sectoral outputs.

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Annex 1. Details of Studies on Non-Tariff Barriers

Table A1 Non-Tariff Measures Applied in Ukraine (used by Veronika Movchan, Institute of Economic research and Policy Consulting, Kyiv, to form the NTBs database)

- Compulsory certification of conformity to standards
- Licensing of selected export and import activities
- Minimum value requirement (in effect from 1996-2000)
- Preliminary customs declaration
- Ecological control
- Sanitary control
- Phytosanitary control
- Veterinary control
- Permits for medicine imports
- State procurement regulations with regard to imports
- Customs value calculation inquiry (checking declared value for the purpose of tax and tariff calculations, in
- effect from 1996-2000)
- Customs controls
- Verification of contract price and origin for selected commodities
- Control over selected types of technology and equipment, such as energy-saving equipment, meteorological
- equipment, nuclear materials, weapons materials, materials that could be used to produce chemical and
- bacteriological weapons, and equipment for clandestine information gathering.

The augmented weighted index of NTBs (INB) is constructed as follows (see Movchan 2003):

$$INB_j = \frac{\sum_{i=1}^{I} NB_{ij} \times IM_j}{\sum_{j-1}^{J} IM_j}$$

where *INBj* is an index of non-tariff barriers for commodity group *j*, *NBij* is an indicator of application of non-tariff barrier *i* to commodity group *j*, *IMj* is the value of commodity group *j*; i=1,…,I, j=1,…J, where I is a number of non-tariff

barriers incorporated in the study, and *J* is the total number of groups of commodities. The *NBjj* is calculated as follows:

$$NB_{ij} = \begin{cases} 0 \\ 25 \\ 50 \\ 75 \\ 100 \end{cases}$$

where zero means absence of the non-tariff barrier *i* for commodity *j*, and 100 is a maximum value of severity of non-tariff barrier *i* for commodity *j*.

Annex 2. CGE model equations

Model structure

This model is based on the MRT – Multiregional Trade Model – by Harrison, Rutherford and Tarr (HRT) used in their evaluation of the Single Market (HRT, 1994)[42].

Markets and prices

The following notational conventions are adopted:

i, j – indexes of goods

r, s – indexes of regions

f – primary factors

p – market price index, 1 in the benchmark

$\bar{x}$ - benchmark value of quantity variable X.

The following market prices are included in the model:

PC_r – price index for final consumption in region r

PG_r - price index for government provision in region r

PA_{ir} – price index for the Armington aggregate of good i in region r, inclusive of all applicable tariffs, border costs and monopolistic markups

PY_{ir} - supply price (marginal cost) of good i from region r, excluding fixed costs associated with the production of goods in industries subject to IRTS

[42] Their code was obtained from Anders Hoffmann with the permission of Thomas Rutherford and our modelling exercise uses large parts of this code. This model in turn is based on the code employed in their evaluation of the Uruguay Round in HRT (1995, 1996a), which is available for public access on Harrison's Web site.

PF_{ir} - price index for factor inputs in sector i, region r

PT - price index for transport services.

Summary of the equilibrium relationships

Final demand in each region arises from a representative agent, maximising a Cobb-Douglas utility function subject to a budget constraint. Income is composed of returns to primary factors and tax revenue directed to the consumer as a lump sum.

Within each region, final and intermediate demands are composed of the same Armington aggregate of domestic and imported varieties. The composite supply is a nested CES function, where consumers first allocate their expenditures among domestic and imported varieties and in the second level the consumers choose among imported varieties. In the imperfect competition case firm varieties enter at the bottom of the CES function.

There is no distinction between goods produced for domestic market and for exports. Goods are produced with the use of intermediate inputs and primary factors. Primary factors are mobile across sectors, but not across regions. We assume a CES function over primary factors and a Leontief production function for intermediate inputs and factors of production composite. Exports are not differentiated by the country of destination.

All distortions are represented as ad valorem price-wedges. They consists of factor and intermediate input taxes in production, output tax, import tariffs, export subsidies, taxes on government and private consumption.

Equations

Markets

Regional output

(1) $$Y_{ir} = \sum_{s} X_{irs}$$

where Y_{ir} is output of good i in region r, X_{irs} is export of good i from region r to s and if r=s, X_{irs} represents domestic sales.

Regional demand

$$A_{ir} = C_{ir} + \sum_{j} a_{ijr} Y_{jr} + T_{ir} \quad (2)$$

where A_{ir} is total supply (production plus imports), C_{ir} is total final consumption, a_{ijr} is intermediate demand coefficient and T_{ir} is demand for good i in transport costs.

Value added

$$V_{ir} = a^{V}_{ir} Y_{ir} + f_{ir} N_{ir} \quad (3)$$

where V_{ir} is total sector i value added, a^{V}_{ir} is value added demand coefficient, f_{ir} is the fixed cost per firm and N_{ir} is the number of firms in IRTS sectors.

Primary factor markets

$$\overline{\overline{F}}_{fr} = \sum_{i} a^{F}_{fir} V_{ir} \quad (4)$$

where $\overline{\overline{F}}_{fr}$ is the endowment of factor f in region r and a^{F}_{fir} is the price-responsive demand coefficient for factor f in sector i.

Armington supply

$$A_{ir} = \overline{A}_{ir} \left(\alpha^{D}_{ir} \left(\frac{X_{irs}}{\overline{X}_{irs}} \right)^{\rho_{DM}} + \left(1 - \alpha^{D}_{ir}\right) \left\{ \sum_{r \neq s} \theta^{M}_{irs} \left(\frac{X_{irs}}{\overline{X}_{irs}} \right)^{\rho_{M}} \right\}^{\rho_{DM}/\rho_{M}} \right)^{1/\rho_{DM}} \quad (5)$$

where $\overline{A}_{ir}$ is the benchmark supply, α^{D}_{ir} is the value share of domestic supply, $\overline{X}_{irs}$ is benchmark exports of good i from region r to s, θ^{M}_{irs} is the benchmark value share of region r exports in region s imports and ρ_{DM} and ρ_{M} are determined by Armington elasticities of substitution σ_{DM} and σ_{M}: $\rho = \frac{\sigma}{\sigma - 1}$.

Value added supply

$$V_{ir} = \overline{V}_{ir} \left\{ \sum_{f} \alpha^{F}_{fir} \left(\frac{a^{F}_{fir}}{\overline{a}^{F}_{fir}} \right)^{\rho^{F}_{ir}} \right\}^{1/\rho^{F}_{ir}} \quad (6)$$

where $\overline{V}_{ir}$ is benchmark value-added, α^{F}_{fir} is the benchmark value share of factor f, $\overline{a}^{F}_{fir}$ is the benchmark input coefficient and ρ^{F}_{ir} is determined by the elasticity of substitution.

Border/transport costs

$$T_{ir} = \begin{cases} \sum_{js} \beta_{jrs} X_{jrs} & i = i_{\tau} \\ 0 & i \neq i_{\tau} \end{cases} \tag{7}$$

where τ is the index of single commodity used for transport services and β_{jrs} is the transportation cost coefficient.

Welfare index

$$W_{r} = \prod_{i} \left(\frac{C_{ir}}{\overline{C}_{ir}} \right)^{\alpha_{ir}} \tag{8}$$

where $\overline{C}_{ir}$ is benchmark final demand for good i in region r.

Profit conditions

Value added

$$PV_{ir} = \frac{1 + t^{F}_{ir}}{\overline{PV}_{ir}} \left(\sum_{f} \alpha^{F}_{fir} PF^{1-\sigma^{F}_{ir}}_{fr} \right)^{\frac{1}{1-\sigma^{F}_{ir}}} \tag{9}$$

where f^{F}_{ir} is the ad valorem factor tax rate, $\overline{PV}_{ir}$ is the benchmark (tax-inclusive) price.

Marginal cost.

$$PY_{ir} = a^{V}_{ir} PV_{ir} + \sum_{j} a_{jir} PA_{jr} \tag{10}$$

Armington composite supply price

$$PA_{ir} = \left\{ \alpha^{D}_{ir} \left(\frac{PD_{ir}}{\overline{PD}_{ir}} \right)^{1-\sigma_{DM}} + (1-\alpha^{D}_{ir}) \left(\frac{PM_{ir}}{\overline{PM}_{ir}} \right)^{1-\sigma_{DM}} \right\}^{\frac{1}{1-\sigma_{DM}}} \tag{11}$$

where $\overline{PA}_{ir} = 1$

(12) $$PD_{ir} = (1+\mu_{irs})PY_{ir}$$

and

(13) $$PM_{ir} = \left\{ \sum_{r \neq s} \theta^{M}_{irs} \left[(1+\mu_{irs})(1+\hat{t}_{irs})(PY_{is} + \beta_{irs} PT_{s}) \right]^{1-\sigma_M} \right\}^{\frac{1}{1-\sigma_M}}$$

and

(14) $$PT_{ir} = PA_{i_{\tau}r}$$

where μ_{irs} is the mark-up on marginal cost on sales of good i from a firm in region r in region s, $\hat{t}_{irs}$ is the ad valorem tax rate which incorporates import tariffs and export subsidies, $\overline{PD}_{ir}$ is the benchmark supply price for goods from domestic producers, $\overline{PM}_{ir}$ is the benchmark supply price for imports.

Regional income

Regional income is a sum of factor income, indirect taxes, taxes on intermediate demand, factor tax revenue, public tax revenue, consumption tax revenue, export tax revenue and tariff revenue net of investment demand, public sector demand and net capital outflows:

(15) $$M_r = \sum_f PF_{fr} F_{fr} + \sum_i t^{Y}_{ir} PY_{ir} Y_{ir} + \sum_{ij} t^{ID}_{ijr} PY_{ir} Y_{jr} a_{ijr} + \sum_{fi} t^{F}_{fir} PF_{fr} V_{fir} +$$
$$\sum_i t^{G}_{ir} PG_{ir} G_{ir} + \sum_i t^{C}_{ir} PC_{if} C_{ir} + \sum_{is} t^{X}_{irs} PY_{ir} X_{irs} + \sum_{is} t^{M}_{irs} (PY_{is} X_{isr} (1+t^{X}_{isr}) + p^{T} T_{isr}) -$$
$$\sum_i p^{D}_{ir} I_{ir} - \sum_i PG_{ir} (1+t^{G}_{ir}) G_{ir} - p^{C}_{n} CAPFLOW_r$$

Final demand

Public sector output consists of Cobb-Douglas aggregation of market commodities:

(16) $$G_r = \Gamma_r \prod_i G_{ir}^{\theta^{G}_{ir}}$$

A representative agent determines demand in each region. He is endowed with primary factors, tax revenue and exogenous capital flows from other regions. He allocates his income to investment (exogenous), public demand (held constant in

real terms) and private demand. Private demand is determined by the maximisation of Cobb-Douglas utility function:

$$U_r = \sum_i \theta_{ir}^C \log(C_{ir}) \tag{17}$$

Aggregate final demand is then determined by regional expenditures and the unit price of aggregate commodities gross of tax:

$$C_{ir} = \frac{\alpha_{ir}^C E_r}{p_{ir}^C (1 + t_{ir}^C)} \tag{18}$$

where E_r is regional expenditure, which equals income (M_r) net of investment and public expenditures.

Bilateral trade flows

There are two tax margins (import and export tax) and transport costs in the model. Transport costs are proportional to trade. Transport costs are defined by a Cobb-Douglas aggregate of international transport inputs supplied by different countries:

$$\sum_{irs} T_{irs} = \psi_T \prod_{i,r} TD_{ir}^{\theta_{ir}^T} \tag{19}$$

Bilateral trade flows are determined by cost-minimising choice given the fob export price of commodity from region r (PY_{ir}), the export tax rate (t_{ir}^X), and the import tariff rate (t_{ir}^M), where the export tax applies on the fob price net of transport margins, while the import tariff applies on a cif price.

Free entry zero-profit condition for monopolistic firms

$$N_{ir} = \frac{\sum_s \left[\mu_{irs}(1+\hat{t}_{irs})(PY_{ir} + \beta_{irs} PT_r) X_{ir}\right]}{PV_{ir} f_{ir}} \tag{20}$$

Monopolistic competition

- Goods are distinguished by firm, by region and area of origin (domestic or imported).
- Demands arise from a nested CES function with a supply from firms in a single region at the lowest level of the CES aggregate. At the next level,

the firms compete with supplies from other regions from the same area and at the top level consumers choose between goods from different areas. Demand for final composite arises from a Cobb-Douglas utility function.

- Producers compete in quantities based on a Cournot model with fixed conjectural variations. Markups over marginal costs are based on the profit maximisation. There is free entry, so profits in equilibrium are zero. Markup covers the fixed costs, which are fixed at the firm level and as the markup revenue in a region changes, so does the number of firms.
- The model does not incorporate gains from variety, only the rationalisation gains. A reduction in tariffs leads to loss of the market share by domestic firms. Domestic producers reduce the markup on marginal costs, some domestic firms exit, the remaining firms slide down their average cost curves and output per firm increases.

Algebraic relations

The equilibrium conditions for each market where there are IRTS are estimated separately. The following notation is adopted:

X – Aggregate demand
Yk – Supply from are k
Sr – Supply from region r
qfr – Supply from firm f in region r
P – Price index for aggregate demand
Pk – Price index for supply from area k
wr – Price index for supply from region r
πfr – Sales price for supply from firm f in region r.

CES aggregators are used to create the composite goods:

(21) $$X=\left[\sum_{k}\alpha_{k}^{1/\sigma}Y_{k}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}$$

(22) $$Y_k = \left[\sum_{r \in \eta_k = k} \beta_{rk}^{1/\eta} S_r^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}}$$

(23) $$S_r = \left[\sum_f q_{fr}^{\frac{\varepsilon-1}{\varepsilon}} \right]$$

The associated price indices:

(24) $$P = \left(\sum_k \alpha_k p_k^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$$

(25) $$p_k = \left(\sum_{r \in \eta_k = k} \beta_{rk} w_r^{1-\eta} \right)^{\frac{1}{1-\eta}}$$

(26) $$w_k = \left(\sum_f \pi_{fr}^{1-\varepsilon} \right)^{\frac{1}{1-\varepsilon}}$$

and associated demand functions:

(27) $$Y_k = \alpha_k \left(\frac{P}{p_k} \right)^{\sigma} X$$

(28) $$S_r = \beta_{rk} \left(\frac{p_k}{w_r} \right)^{\eta} Y_k \qquad \text{for } k = k_r$$

(29) $$q_{fr} = \left(\frac{w_r}{\pi_{fr}} \right)^{\varepsilon} S_r$$

Behaviour of firms

The profit of firm f in region r selling into a given market is as follows:

(30) $$\Pi_{fr}(q) = \pi_{fr} q - C_{fr}(q)$$

where C is total cost. First order conditions for profit maximisation may be written as follows:

(31) $$c_{fr} = \pi_{fr}(1 - m_{fr})$$

in which c_{fr} is the marginal cost of supply and m_{fr} is a markup over marginal cost (on gross basis):

(32) $$m_{fr} = -\frac{1}{e_{fr}} = -\frac{\partial \pi_{fr} q_{fr}}{\partial q_{fr} \pi_{fr}}$$

where e_{fr} is the perceived elasticity of demand. The expression for the elasticity of demand arises from the nested CES structure of demand and depends on the assumed reaction of other producers.

The perceived elasticity of demand

Derivation of the perceived elasticity of demand begins with the inverse demand function:

(33) $$\pi_{fr} = \left(\frac{S_r}{q_{fr}}\right)^{\frac{1}{\varepsilon}} w_r$$

Then compute the derivative:

(34) $$\frac{\partial \pi_{fr}}{\partial q_{fr}} = -\frac{1}{\varepsilon}\frac{\pi_{fr}}{q_{fr}} + \frac{1}{\varepsilon}\frac{\pi_{fr}}{S_r}\frac{\partial S_r}{\partial q_{fr}} + \frac{\pi_{fr}}{w_r}\frac{\partial w_r}{\partial q_{fr}}$$

Here, HRT develop further derivations with the simplifying assumption of unitary conjectural variations (Cournot conjectures). The non-unitary conjectures are introduced to reconcile the estimates of the economies of scale in production with the estimates of elasticities of substitution in demand. Under Cournot conjectures:

(35) $$\frac{\partial S_r}{\partial q_{fr}} = \left(\frac{S_r}{q_{fr}}\right)^{\frac{1}{\varepsilon}}$$

and the term $\frac{\partial w_r}{\partial q_{fr}}$ is computed using the chain rule the second time:

(36) $$\frac{\partial w_r}{\partial q_{fr}} = \frac{\partial w_r}{\partial S_r}\frac{\partial S_r}{\partial q_{fr}}$$

Substituting (34) and (35) into (33) we get:

$$\frac{\partial \pi_{fr} q_{fr}}{\partial q_{fr} \pi_{fr}} = -\frac{1}{\varepsilon} + \frac{1}{\varepsilon}\frac{q_{fr}}{S_r}\left(\frac{S_r}{q_{fr}}\right)^{\frac{1}{\varepsilon}} + \frac{q_{fr}}{w_r}\left(\frac{S_r}{q_{fr}}\right)^{\frac{1}{\varepsilon}}\frac{\partial w_r}{\partial S_r} \tag{37}$$

Then using (32):

$$\left(\frac{S_r}{q_{fr}}\right)^{\frac{1}{\varepsilon}} = \frac{\pi_{fr}}{w_r} \tag{38}$$

make the substitution to obtain:

$$\frac{1}{e_{fr}} = -\frac{1}{\varepsilon} + \frac{1}{\varepsilon}\frac{\pi_{fr} q_{fr}}{w_r S_r} + \frac{\partial w_r}{\partial S_r}\frac{S_r}{w_r}\frac{\pi_{fr} q_{fr}}{w_r S_r} \tag{39}$$

Applying the same steps at the next level we get an analogous expression:

$$\frac{\partial w_r S_r}{\partial S_r w_r} = -\frac{1}{\eta} + \frac{1}{\eta}\frac{w_r S_r}{p_k Y_k} + \frac{\partial p_k}{\partial Y_k}\frac{Y_k}{p_k}\frac{w_r S_r}{p_k Y_k} \tag{40}$$

Applying the same operations again at the highest level of the CES, given that the demand elasticity for the aggregate X is unity, we get:

$$\frac{\partial p_k Y_k}{\partial Y_k p_k} = -\frac{1}{\sigma} + \frac{1}{\sigma}\frac{p_k Y_k}{PX} + \frac{p_k Y_k}{PX} \tag{41}$$

When equations (39)-(41) are assembled, we obtain an expression for the optimal Cournot markup as follows:

$$m_{fr} = \frac{1}{\varepsilon} + \left(\frac{1}{\eta} - \frac{1}{\varepsilon}\right)\frac{1}{N_{fr}} + \left(\frac{1}{\sigma} - \frac{1}{\eta}\right)\frac{\theta_{fk}^{Y}}{N_{fr}} + \left(1 - \frac{1}{\sigma}\right)\frac{\theta_k^X \theta_{rk}^Y}{N_{fr}} \tag{42}$$

where the share of supply from region r in the supply from area k is denoted as:

$$\theta_{rk}^{Y} = \frac{w_r S_r}{p_k Y_k} \qquad \text{for } k = k_r \tag{43}$$

and the supply from area k in total supply of a given good is denoted as:

$$\theta_k^X = \frac{p_k Y_k}{PX} \tag{44}$$

In our model we assumed that products of different firms are imperfect substitutes in demand. The elasticity of demand depends on the country of origin. There are three elasticities of substitution associated with the nested CES structure of demand discussed earlier:

- σ_{DD} – elasticity of substitution between varieties supplied by domestic firms
- σ_{MM} – elasticity of substitution between products of any two foreign suppliers
- σ_{DM} – elasticity of substitution between domestic and imported varieties.

We assume that domestically produced goods are more easily substitutable among themselves than products from different countries and that σ_{DD} is 15. In addition imported goods are assumed to be better substitutes to each other than domestic and foreign goods. The elasticity of substitution between imported goods is assumed to be equal 10, while domestic and foreign goods enter the demand function with the elasticity of substitution of 5. These are priors used by HRT (1994).

Further let θ_{rs} denote the market share of region r firms in region s. Then we can apply equation (42) to represent the optimal markup applied in the domestic market and in the foreign markets:

$$\tilde{m}_{rs} = \begin{cases} \frac{1}{\sigma_{DD}} + \left(\frac{1}{\sigma_{DM}} - \frac{1}{\sigma_{DD}}\right)\frac{1}{N_r} + \left(1 - \frac{1}{\sigma_{DM}}\right)\frac{\theta_{rr}}{N_r} & r = s \\ \frac{1}{\sigma_{MM}} + \left(\frac{1}{\sigma_{DM}} - \frac{1}{\sigma_{MM}}\right)\frac{\theta_{rs}}{N_r\theta_s^M} + \left(1 - \frac{1}{\sigma_{DM}}\right)\frac{\theta_{rs}}{N_r} & r \neq s \end{cases} \tag{45}$$

These are the optimal markups expressed as a function of elasticities of substitution, market shares, θ^M_r the market share of imports in region r and N_r the number of firms producing in the region r.

Estimation of the equilibrium conditions in ITRS sectors

This paper adopts a simplification by estimating the equilibrium conditions in IRTS industries for each commodity in separate models. Demands and supplies for all regions are included into these calculations, but factor markets, intersectoral linkages and income effects are ignored. In each iteration of the IRTS models, regional demand functions are calibrated to the most recently estimated equilibrium conditions of the general model including all GE interactions. Given constant marginal cost, sales prices are determined by the markup equations.

The single commodity models are estimated as follows. The markup pricing equation (44) is specified given the benchmark elasticities of substitution, the number of firms and an adjustment parameter, the conjectural variation. First, the

values of elasticities of substitution at all nests of the CES function, as well as the number of firms and therefore their market shares are specified. Further, the value of production at consumer prices at the benchmark combined with the estimates of the cost disadvantage ratio taken from the literature (see next section), determine the value of fixed costs, i.e. $FC_{ir} = CDR_{ir}YC_{ir}$. Given the assumption of zero profits, the markup over marginal cost generates the revenue equal exactly to the fixed costs. This condition appears as a constraint in a non-linear least squares calculation.

The objective in the estimation is to calibrate the conjectural variations, which are as close as possible to one. This value is consistent with pure Cournot-Nash behaviour of players. Therefore a sequence of least-squares problems is solved for each commodity subject to IRTS. These problems look for implicit numbers of firms (N_r) which results in calibrated conjectural variations (CV_{rs}) which are as close as possible to 1. This looks as follows:

$$\min_{CV^{i}_{rs},N_{ir}} \sum_{rs} (CV^{i}_{rs} - 1)^2 \tag{46}$$

subject to:

$$\begin{aligned} FC_{ir} &= \sum_{rs} X^{i}_{rs} M^{G}(CV^{i}_{rs}, N_{ir}, \sigma, \theta) \\ 0 \le N_{ir} &\le 100 \\ CV^{i}_{rs} &\ge 0 \end{aligned} \tag{47}$$

where M^G is a markup equation, i.e. equation (45), and X^{i}_{rs} represents sales of i from region r in region s.

Therefore, the conjectural variations act as parameters, which allow reconciliation of the benchmark data with the estimates of the elasticities of substitution and CDR taken from the literature. In the majority of sectors calibrated conjectural variations are less than 1 indicating a more competitive behaviour than predicted by the Cournot model.

For sectors, where the assumption of free entry and zero profits in the benchmark, given values of the elasticity of substitution, is consistent with pure Cournot-Nash type behaviour, a second calculation is performed. It looks for the number of firms as small as possible subject to the consistency of conjectures with the Cournot behaviour.

$$\min_{r} N_{ir} \tag{48}$$

subject to:

$$FC_{ir} = \sum_{rs} X^{i}_{rs} M^{G}(CV^{i}_{rs}, N_{ir}, \sigma, \theta)$$

(49) $$0 \leq N_{ir} \leq 100$$

$$CV^{i}_{rs} = 1$$

Calibrating the Cost Disadvantage Ratio

The calibration of the cost disadvantage ratio (CDR) in IRTS sectors is based on the assumption of constant marginal cost. The total cost function is specified as follows:

(50) $$c = f + mq$$

where f is fixed cost, m is constant marginal cost and q denotes the output level. Average cost function looks as follows:

(51) $$ac = \frac{f}{q} + m$$

Assuming zero profits, the benchmark data provides the information on the industry total costs (C) and output (Q). If there are n representative firms in the initial equilibrium (1), then $nc_1 = N$ and $nq_1 = Q$. Since

(52) $$\frac{c_1}{q_1} = \frac{nc_1}{nq_1} = \frac{C_1}{Q_1}$$

given the initial data we know already one point on the firm's average cost curve i.e.:

(53) $$\frac{c}{q_1} = \frac{f}{q_1} + m$$

Given the assumption about a specific form of the average cost curve, we only need a second point in order to calibrate it. This is done with the use of information from the engineering estimates on changes in average cost accompanying changes in output. If output declines to αq_1 then average costs increase to $\beta\left(\frac{c_1}{q_1}\right)$ where $0<\alpha<1$, $\beta>1$ is required for the marginal cost to be nonnegative. Given the values of α and β we know the second point on the industry average cost curve:

(54) $$\beta \frac{c}{q_1} = \frac{f}{\alpha q_1} + m$$

By multiplying the nominators and denominators of the last two equations we obtain equations on the total output and costs of industry, on which the data is available. The equations look as follows:

(55) $$\frac{C}{Q_1} = \frac{F}{Q_1} + m \text{ and}$$

(56) $$\beta \frac{C}{Q_1} = \frac{F}{\alpha Q_1} + m .$$

where F is the fixed cost. Further, we solve the above equations for the fixed and marginal costs:

(57) $$F = C_1(\beta - 1)\frac{\alpha}{\alpha - 1} \text{ and}$$

(58) $$m = \left(\frac{C_1}{Q_1}\right)\left(\frac{\beta\alpha - 1}{\alpha - 1}\right).$$

Since the cost disadvantage ratio is defined as f/c, which by symmetry equals F/C, we know that at the initial equilibrium:

(59) $$CDR = \frac{(\beta - 1)\alpha}{1 - \alpha}.$$

We obtain the values of α and β from Pratten (1988). Since there are no estimates of the economies of scale for all 3-digit sectors according to NACE classification or the available estimates are not representative, we used a rage of estimated parameters for each GTAP sector. Based on those parameters we constructed three values of the CDRs i.e. low and high using the lowest and highest values of the estimated parameters and middle one. The only exception was the food sector, where the economies of scale differ a lot by products, so we used the average production values to aggregate the CDRs for more finely defined sectors.

Following others such as Gasiorek, Smith and Venables (1992) or HRT (1994), I am assuming that in the benchmark equilibrium firms operate at the minimum efficient scale (MES). Firms should have difficulties competing, if they were operating at less than MES. Given the function form used in this study, at the MES further expansion of output reduces average cost of production. If initially output is lower than the MES, then the CDRs will be underestimated since the slope of the average cost curve increases in absolute value for decreases in output. In all scenarios we assume low values for the economies of scale.

Table A2. Data on CDR values

	Share of MES (α)	Percentage Cost Increase at Output Level (β)	Implied CDR			Source of Data
			Low	Medium	High	
Agriculture	0.00	0	0.0	0.0	0.0	
Raw materials	0.00	0	0.0	0.0	0.0	
Food, Beverages, Tobacco			7.7	11.1	14.5	
Meat	0.67	5				412
Dairy	0.67	2				413
Other food	0.67	4 to 9				414, 416, 420, 422
Tobacco	0.33	2.2 to 5				429
Textiles	0.50	2 to 10	2.0	6.0	10.0	43
Clothing	0.00	0	0.0	0.0	0.0	
Leather	0.33	1.5	0.7	0.7	0.7	451
Wood	0.00	0	0.0	0.0	0.0	
Paper	0.50	8 to 13	8.0	10.5	13.0	471, 472
Petroleum	0.33	4	2.0	2.0	2.0	14
Chemicals	0.33	4 to 19	2.0	5.7	9.4	25
Non-metallic Minerals	0.33	10 to 26	4.9	8.9	12.8	241-247
Iron, steel	0.33	10 to 11	4.9	5.2	5.4	22
Other metals	0.33	11 to 11	4.9	5.2	5.4	224
Metal prod.	0.33	10	4.9	4.9	4.9	221
Motor vehicles	0.50	11	11.0	11.0	11.0	35
Other transport	0.50	8 to 20	8.0	14.0	20.0	361
Electronics	0.33	5 to 15	2.5	4.9	7.4	23, 344, 345
Machinery n.e.c.	0.50	3 to 10	3.0	6.5	10.0	321, 322, 326
Manufacturing n.e.c.	0.50	3 to 5	3.0	4.0	5.0	HRT
Utilities	0.00	0	0.0	0.0	0.0	
Trade	0.00	0	0.0	0.0	0.0	
Transport	0.50	2	2.0	2.0	2.0	HRT
Financial services	0.50	5	5.0	5.0	5.0	HRT

Notes:
Column 1: Parameter α in the CDR calibration equation.
Column 2: Data corresponds to (β-1)*100 where β is from the CDR calibration equation.
Column 3-5: CDR estimated according to equation 58.
Column 6: Numbers indicated in this column correspond to NACE sectors from Table 5.1 in Pratten (1988). The assumptions on CDRs in services follow assumptions of HRT (1994).

Annex 3. The Detailed Results of CGE Simulations

Table A3. Welfare, GDP, Wages and Trade Implications of the changes in tariffs and border costs (in Georgia and Armenia) between 2004 and 2006-2007

	Armenia	Azerbaijan	Georgia	Russia	Ukraine	ALL
Welfare (% change)						
Russia	0.00	0.00	0.00	0.40	0.00	0.40
Ukraine	0.00	-0.01	-0.02	0.28	0.03	0.29
Armenia	0.36	0.00	-0.02	0.16	-0.01	0.29
Azerbaijan	-0.01	0.11	-0.11	0.19	-0.01	0.09
Georgia	0.03	-0.02	0.93	0.15	-0.04	0.78
Turkey	0.00	0.00	0.03	0.67	0.01	0.71
EU27	0.00	0.00	0.01	0.51	0.02	0.54
CIS	0.00	-0.01	0.00	0.29	-0.01	0.28
ROW	0.00	0.00	0.01	0.43	0.01	0.45
GDP (% change)						
Russia	0.05	0.05	0.05	0.46	0.05	0.45
Ukraine	-0.26	-0.28	-0.29	0.01	-0.24	0.02
Armenia	0.38	0.03	0.00	0.18	0.00	0.33
Azerbaijan	0.01	0.13	-0.09	0.21	0.01	0.11
Georgia	0.11	0.07	1.03	0.22	0.04	0.87
Turkey	0.09	0.09	0.12	0.76	0.10	0.80
EU27	0.03	0.03	0.04	0.54	0.05	0.57
CIS	0.00	0.00	0.00	0.29	-0.01	0.28
ROW	0.01	0.02	0.02	0.44	0.03	0.46
Wages of unskilled workers (% change)						
Russia	0.00	0.00	0.00	0.48	0.00	0.48
Ukraine	0.00	-0.01	-0.02	0.15	0.13	0.27
Armenia	0.42	0.00	-0.04	0.15	-0.03	0.29
Azerbaijan	-0.02	0.00	-0.11	0.09	-0.03	-0.02
Georgia	0.03	-0.03	2.78	0.18	-0.04	2.60
Turkey	0.00	0.00	0.02	0.50	0.00	0.53
EU27	0.00	0.00	0.01	0.39	0.01	0.41
CIS	0.00	-0.01	0.00	0.20	-0.02	0.18
ROW	0.00	0.00	0.00	0.31	0.01	0.33
Wages of skilled workers (% change)						
Russia	0.00	0.00	0.00	0.50	0.00	0.50
Ukraine	0.00	-0.01	-0.02	0.22	0.24	0.45
Armenia	0.34	0.00	-0.01	0.19	-0.01	0.39

	Armenia	Azerbaijan	Georgia	Russia	Ukraine	ALL
Azerbaijan	-0.02	0.23	-0.10	0.14	-0.02	0.06
Georgia	0.02	-0.02	2.33	0.17	-0.02	2.26
Turkey	0.00	0.00	0.02	0.48	0.01	0.50
EU27	0.00	0.00	0.01	0.37	0.01	0.39
CIS	0.00	0.00	0.00	0.25	0.00	0.25
ROW	0.00	0.00	0.00	0.29	0.01	0.30

Table A4. Welfare, GDP, Wages and Trade Implications of Simple FTAs between Armenia, Azerbaijan, Georgia, Russia and Ukraine and the EU

	Armenia	Azerbaijan	Georgia	Russia	Ukraine
Welfare (% change)					
Russia	0.00	-0.01	0.00	1.59	-0.02
Ukraine	0.00	-0.03	-0.02	0.56	1.76
Armenia	0.51	0.01	-0.02	0.52	0.00
Azerbaijan	-0.01	0.85	-0.11	1.07	0.01
Georgia	0.02	-0.06	1.03	0.52	-0.02
Turkey	0.00	-0.01	0.03	-0.01	0.02
EU27	0.00	0.02	0.01	0.06	0.09
CIS	0.00	0.00	0.00	1.04	0.03
ROW	0.00	0.01	0.01	0.03	0.05
GDP (% change)					
Russia	0.05	0.05	0.05	1.65	0.04
Ukraine	-0.27	-0.30	-0.29	0.29	1.49
Armenia	0.53	0.03	0.00	0.55	0.03
Azerbaijan	0.01	0.87	-0.09	1.09	0.03
Georgia	0.11	0.02	1.12	0.60	0.07
Turkey	0.09	0.08	0.12	0.08	0.11
EU27	0.03	0.05	0.04	0.09	0.12
CIS	0.00	0.00	0.00	1.04	0.03
ROW	0.01	0.02	0.02	0.04	0.06
Wages of unskilled workers (% change)					
Russia	0.00	-0.01	0.00	2.08	-0.03
Ukraine	0.00	-0.04	-0.03	0.21	2.71
Armenia	0.83	0.01	-0.04	0.51	-0.02
Azerbaijan	-0.02	1.83	-0.11	0.81	-0.02
Georgia	0.02	-0.07	2.95	0.63	-0.03
Turkey	0.00	-0.01	0.02	-0.01	0.01
EU27	0.00	0.01	0.01	0.04	0.07
CIS	0.00	0.00	0.00	0.73	0.01
ROW	0.00	0.01	0.00	-0.01	0.03
Wages of skilled workers (% change)					
Russia	0.00	0.00	0.00	2.00	-0.02
Ukraine	0.00	-0.02	-0.02	0.37	2.14
Armenia	0.72	0.01	-0.01	0.57	0.01
Azerbaijan	-0.02	2.12	-0.10	0.88	0.00

	Armenia	Azerbaijan	Georgia	Russia	Ukraine
Georgia	0.02	-0.05	2.50	0.58	0.00
Turkey	0.00	-0.01	0.02	0.01	0.01
EU27	0.00	0.01	0.01	0.03	0.06
CIS	0.00	0.01	0.00	0.81	0.03
ROW	0.00	0.01	0.00	0.00	0.03
Total exports (% change)					
Russia	0.00	-0.02	0.00	11.70	-0.08
Ukraine	0.00	-0.05	-0.03	0.16	5.84
Armenia	6.12	0.04	0.00	2.59	0.08
Azerbaijan	-0.09	4.33	-0.50	4.71	0.06
Georgia	0.12	-0.12	16.20	2.68	0.02
Turkey	0.00	-0.01	0.03	1.27	0.04
EU27	0.00	0.03	0.01	1.59	0.21
CIS	0.00	0.01	0.00	1.63	0.06
ROW	0.00	0.01	0.01	1.02	0.05
Total imports (% change)					
Russia	0.00	-0.03	-0.01	7.55	-0.11
Ukraine	0.00	-0.06	-0.04	0.02	4.79
Armenia	3.14	0.02	-0.06	1.23	0.03
Azerbaijan	-0.04	-0.68	-0.23	1.59	0.00
Georgia	0.04	-0.16	4.04	1.25	0.02
Turkey	0.00	-0.03	0.05	1.06	0.00
EU27	0.00	0.04	0.01	2.00	0.21
CIS	0.00	0.01	0.00	1.21	0.04
ROW	0.00	0.02	0.01	1.01	0.07

Table A5. Percentage change in total output by sectors as a result of Simple FTAs

	Armenia	Azerbaijan	Georgia	Russia	Ukraine
Grains, fruits, vegetables, crops nec	0.2	-1.7	0.3	0.4	1.3
Livestock	-0.2	-2.8	-0.1	0.9	2.2
Forestry	-1.0	-0.8	-2.7	-0.6	-1.8
Fishing	10.2	-0.8		1.0	1.1
Coal			3.6	2.6	0.3
Oil		1.1	9.5	4.4	0.2
Gas		1.0	5.5	2.4	
Mining and quarrying	0.9	-9.1	14	3.8	-1.2
Food products, beverages and tobacco	-1.9	-3.4	-6.3	0.2	1.1
Textiles and textile goods	59.6	28.2	2.9	-3.7	84.0
Leather products	4.9	23.8	-21.2	-5.0	32.7
Wood products	-7.4	-45.7	4.1	-9.5	0.7
Paper products, publishing	0.2	-11.9	-20.8	-5.1	-1.6

	Armenia	Azerbaijan	Georgia	Russia	Ukraine
Petroleum, coal products	0.5	1.0	-2.0	2.6	0.4
Chemical, rubber, plastic products	-0.3	-0.6	2.6	0.1	-1.7
Mineral products nec	0.7	-7.7	-8.1	-5.1	-5.4
Metals and metal products	5.0	19.1	21.2	4.3	-0.3
Transport equipment	-2.2	10.5	-4.7	-1.2	2.6
Machinery and electronic equipment	2.4	5.1	-16.3	-6.4	1.6
Manufactures nec	4.3	-6.1	-20.2	-5.1	-7.1
Electricity	0.2	0.8	-0.2	0.8	0.9
Gas manufacture, distribution	0.6	0.7	3.7	1.6	0.4
Water	0.7	0.8	0.3	1.4	0.4
Construction	0.5	3.2	2.2	2.3	2.6
Trade	0.4	1.6	-0.4	1.5	1.2
Transportation and Storage Services	0.6	2.1	9.4	2.9	1.2
Communications	-0.3	0.4	-0.8	1.2	0.7
Banking lending and insurance	-0.5	4.0	-0.6	1.2	0.6
Business services nec	0.8	0.9	-0.3	2.3	0.6
Other Communal, Social and Personal Services	0.1	1.0	0.8	1.5	
Public administration, education, health care	0.1	0.3	-0.2	1.0	0.1
Investments	0.4	0.9	2.2	2.0	2.6

Table A6. Welfare, GDP, Wages and Trade Implications of Deep FTAs between Armenia, Azerbaijan, Georgia, Russia and Ukraine and the EU

	Armenia	Azerbaijan	Georgia	Russia	Ukraine	ENP5
Welfare (% change)						
Russia	0.00	-0.01	0.00	3.20	0.03	0.48
Ukraine	0.01	-0.01	-0.02	0.45	5.86	2.63
Armenia	3.49	0.01	-0.01	0.20	-0.01	0.23
Azerbaijan	-0.01	2.98	-0.12	0.39	0.00	3.21
Georgia	0.13	-0.07	2.62	0.17	-0.03	1.18
Turkey	0.00	0.11	0.03	1.76	0.01	0.18
EU27	0.00	0.03	0.01	1.22	0.10	0.07
CIS	0.00	0.01	0.00	0.91	0.22	0.65
ROW	0.00	0.02	0.00	0.76	0.05	0.05
GDP (% change)						
Russia	0.05	0.05	0.05	3.25	0.08	0.53
Ukraine	-0.25	-0.28	-0.29	0.18	5.58	2.36
Armenia	3.50	0.03	0.03	0.23	0.03	0.25

	Armenia	Azerbaijan	Georgia	Russia	Ukraine	ENP5
Azerbaijan	0.01	3.00	-0.10	0.41	0.02	3.23
Georgia	0.22	0.02	2.70	0.27	0.07	1.27
Turkey	0.09	0.20	0.12	1.86	0.10	0.27
EU27	0.03	0.06	0.04	1.26	0.13	0.10
CIS	0.00	0.02	0.00	0.91	0.22	0.65
ROW	0.01	0.03	0.02	0.77	0.06	0.06
Wages of unskilled workers (% change)						
Russia	0.00	-0.01	0.00	3.54	-0.01	0.32
Ukraine	0.01	-0.02	-0.03	0.25	6.51	2.30
Armenia	4.08	0.01	-0.01	0.15	-0.03	0.21
Azerbaijan	-0.02	4.94	-0.11	0.80	-0.04	5.01
Georgia	0.15	-0.08	4.83	0.24	-0.04	1.13
Turkey	0.00	0.09	0.02	1.36	0.00	0.15
EU27	0.00	0.02	0.00	0.97	0.08	0.06
CIS	0.00	0.01	0.00	0.85	0.12	0.64
ROW	0.00	0.01	0.00	0.55	0.03	0.03
Wages of skilled workers (% change)						
Russia	0.00	0.00	0.00	3.00	0.01	0.41
Ukraine	0.00	-0.01	-0.02	0.34	4.97	1.95
Armenia	2.72	0.01	-0.01	0.27	0.01	0.23
Azerbaijan	-0.02	3.99	-0.10	0.33	-0.01	4.92
Georgia	0.05	-0.06	3.80	0.26	0.00	1.25
Turkey	0.00	0.07	0.02	1.23	0.01	0.13
EU27	0.00	0.02	0.00	0.91	0.08	0.05
CIS	0.00	0.01	0.00	0.74	0.13	0.49
ROW	0.00	0.01	0.00	0.51	0.03	0.03
Total exports (% change)						
Russia	0.00	0.00	0.00	19.59	0.08	2.17
Ukraine	0.01	-0.02	-0.04	0.39	13.73	4.29
Armenia	21.22	0.07	-0.15	1.15	0.17	0.89
Azerbaijan	-0.09	13.29	-0.52	1.91	0.01	15.34
Georgia	0.56	-0.25	22.95	1.72	0.07	5.97
Turkey	-0.01	0.11	0.03	2.70	-0.02	0.15
EU27	0.01	0.05	0.01	2.34	0.26	1.41
CIS	0.00	0.03	0.00	1.78	0.36	0.10
ROW	0.00	0.02	0.01	1.21	0.05	0.00
Total imports (% change)						
Russia	0.00	-0.02	-0.01	17.45	0.03	2.48
Ukraine	0.02	-0.03	-0.04	0.28	13.97	4.80
Armenia	13.19	0.04	-0.16	0.44	0.04	0.43
Azerbaijan	-0.04	2.20	-0.23	0.54	-0.04	1.56
Georgia	0.26	-0.22	9.07	0.81	0.02	3.79
Turkey	-0.01	0.19	0.05	2.89	-0.04	0.29
EU27	0.01	0.05	0.01	2.54	0.28	0.14
CIS	0.00	0.02	-0.01	1.53	0.29	1.45
ROW	0.00	0.03	0.01	1.27	0.04	0.10

Table A7. Percentage change in total output by sectors as a result of Deep FTAs

	Armenia	Azerbai-jan	Georgia	Russia	Ukraine
Grains, fruits, vegetables, crops nec	3.6	3.7	4.5	-1.8	6.5
Livestock	3.0	-5.1	1.6	2.7	7.4
Forestry	-0.7	3.6	-3.0	13.4	2.4
Fishing	18.7	-0.9	1.1	2.1	5.2
Coal			0.9	9.9	5.2
Oil		7.7	6.2	4.6	3.1
Gas		3.9	5.0	2.9	-1.0
Mining and quarrying	-3.1	-16.9	19.3	8.5	2.1
Food products, beverages and tobacco	-1.6	-6	-6.8	2.0	7.1
Textiles and textile goods	9.3	71.8	58.3	8.7	53.6
Leather products	35.4	28.2	-20.7	-4.2	47.1
Wood products	-4.7	18.6	15.9	44.3	23.9
Paper products, publishing	0.1	-15.4	-23	3.3	3.5
Petroleum, coal products	-3.3	17.7	-4.3	7.3	6.8
Chemical, rubber, plastic products	-2.4	4.1	14.2	3.9	4.9
Mineral products nec	31.3	-19.3	-7.0	-6.2	1.8
Metals and metal products	18.8	23.2	42.5	10	8.5
Transport equipment	-0.5	5.9	-6.1	-0.3	6.5
Machinery and electronic equipment	5.2	17.1	-18.1	-5.7	
Manufactures nec	40.5	34.7	-10.1	-0.9	-4.6
Electricity	1.0	3.1	0.7	4.7	6.0
Gas manufacture, distribution	0.4	2.4	-0.3	3.7	2.6
Water	5.3	2.7	1.9	2	2.7
Construction	3.7	6.2	3.8	3.6	6.6
Trade	3.1	3.2	1.6	3.6	4.3
Transportation and Storage Services	-7.4		5.7	-1.3	-5.1
Communications	-3.7	0.4	-3.0		2.0
Banking lending and insurance	10.7	-10.8	-1.2	-11.7	-1.6
Business services nec	4.3	1.0	1.2	2	1.1
Other Communal, Social and Personal Services	-2.7	2.2	1.9	2.2	-0.4
Public administration, educa-tion, health care	1.2	1.3	0.4	2.1	1.1
Investments	3.7	3.1	3.8	3.6	7.1