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FREE TRADE BETWEEN THE EU AND RUSSIA: SECTORAL EFFECTS AND IMPACT ON NORTHWEST RUSSIA

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ABSTRACT: We analyse the implications of free trade between the EU25 and Russia using GTAP, a computable general equilibrium model. We review the sectoral effects by countries and make a tentative assessment of the impact on the regions in northwest Russia. Free trade on its own would have a negative terms-of-trade effect in Russia and cause a small decline in welfare. If coupled with an increase in productivity, welfare would increase. This emphasises the importance of reforms in the Russian economy. The quantity of production in Russia in ferrous and non-ferrous metallurgy, machine building and metal working, and wood and paper are the principal declining sectors with free trade. Production in capital goods, fuel industry, and services increases. Thus there are some symptoms of Dutch disease. Due to its production structure the northwest would seem to benefit slightly less than Russia on average in terms of the volume of gross regional product. In this respect there are differences between the regions of northwest Russia.

KEY WORDS: EU, Russia, free trade, integration

JEL CODES: F15, F17

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TIIVISTELMÄ: Tässä tutkimuksessa analysoidaan EU25-maiden ja Venäjän välisen vapaakaupan vaikutuksia yleisen tasapainon GTAP-mallin avulla. Tutkimuksessa tarkastellaan myös toimialakohtaisia vaikutuksia eri maissa ja tehdään arvio vaikutuksista Luoteis-Venäjän eri alueilla. Vapaakauppa itsessään heikentää Venäjän vaihtosuhdetta ja alentaa hieman hyvinvointia. Kun vapaakauppaan yhdistetään pieni tuottavuuden paraneminen, hyvinvointi kasvaa. Tämä korostaa uudistusten merkitystä Venäjän talouskehityksen kannalta. Tuotannon määrä metallien jalostuksessa, metallituotteiden valmistuksessa, koneiden ja laitteiden valmistuksessa sekä puu- ja paperiteollisuudessa vähenee. Sen sijaan investointitavaroiden, öljy- ja kaasusektorin sekä palvelualojen tuotanto kasvaa. Siten vapaakaupasta aiheutuu Venäjällä Hollannin taudin oireita. Bruttokansantuotteen osalta Luoteis-Venäjä hyötyy keskimäärin hieman vähemmän kuin koko Venäjä. Tämä johtuu tuotantorakenteesta. Eri Luoteis-Venäjän alueiden välillä on kuitenkin tässä suhteessa eroja.

AVAINSANAT: EU, Venäjä, vapaakauppa, integraatio

JEL-LUOKAT: F15, F17

1 INTRODUCTION

A Partnership and Co-operation Agreement (PCA) between the European Union and Russia entered into force in December 1997.[1] Among other things, the agreement established as an objective 'to create the necessary conditions for the future establishment of a free trade area between the Community and Russia covering substantially all trade in goods between them, as well as conditions for bringing about freedom of establishment of companies, of cross-border trade in services and of capital movements.' However, reaching this objective as well as the other ones listed in the agreement has been relatively sluggish, if not inexistent. Still, free trade between the EU and Russia would be a positive step for the whole continent. It is thus important to analyse the effects of free trade.

We follow in the footsteps of Sulamaa and Widgrén (2004, 2005) who analysed the effects of free trade between the EU25 and Russia using the GTAP model. They also included an increase in the rate of substitutability between imported and domestically produced goods, that is higher Armington elasticities, and an increase in total factor productivity.

Our analysis differs from Sulamaa and Widgrén's in that we do not liberalise trade in agricultural produce or foodstuffs, just everything else. This is because – despite the wording in the PCA – we think that full liberalisation of trade in these goods is relatively unlikely for political reasons in both the EU and Russia. We also do not change the Armington elasticities. Instead, we include an analysis of sectoral effects along with a tentative assessment of the possible impact of trade liberalisation on the ten regions in northwest Russia.

We use the GTAP model, same as Sulamaa and Widgrén. The GTAP database 6.0 has been constructed with 2001 as the base year. This means that the EU still has 15 member countries. In order to bring the data more up to date with the enlargement of the EU in 2004, we need to assimilate the ten new member countries (EU10).[2] This is done in our baseline scenario. After that we analyse two simulation scenarios which are compared with the results from the baseline scenario.

- Baseline scenario: Free trade within the EU25 region with Common External Tariffs implemented for the new member countries;[3]
- Scenario 1: Free trade between the EU25 and Russia in all products except agricultural produce and foodstuffs; and
- Scenario 2: Free trade between the EU25 and Russia in all products except agricultural produce and foodstuffs and a 1 per cent increase in productivity in Russia for all inputs and in all sectors (see Section 2.2 about the productivity increase).

According to our results, free trade between the EU25 and Russia would have a small negative effect on welfare in Russia due to a deterioration in Russia's terms of trade. Following the removal of tariffs, the volume of Russian imports would grow twice as much as that of exports. Combining free trade with a small increase in productivity in Russia, welfare would increase substantially despite the deterioration in the terms of trade. The increase in productivity would also lead to an increase in the quantity of output.

The quantity of production in Russia in ferrous and non-ferrous metallurgy, machine building and metal working, and wood and paper are the principal declining sectors with free trade. Production in capital goods, fuel industry, and services increases. Thus there are symp-

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1 The EU has PCAs with other CIS countries, also.

2 We will ignore the 2007 enlargement.

3 We do not take into account other implications of EU membership of which CAP-related and other income transfers are a major one, see further discussion in Section 4.1.

toms of Dutch disease with the fuel industry growing and manufacturing shrinking. Taking into account the local production structure, the northwest of Russia would seem to benefit slightly less than Russia on average in terms of the volume of gross regional product. There are considerable differences between the regions in the northwest depending on the local production structure. We emphasise the importance of economic reforms coupled with increasing competition where the presence of foreign companies through trade and investment would be beneficial.

In Section 2, we will discuss the changes that we make in the tariffs and the positive productivity shock that we introduce. Section 3 includes a presentation of the GTAP model. Section 4 shows the results from the simulation scenarios and Section 5 concludes. Appendix 1 shows the sectoral aggregation that we use. Appendix 2 shows the readjustments we have made to official economic data of the structure of Russia's GDP and the northwest regions. The readjustments make the regional data more in line with the GTAP database and thus improves the results.

2 CHANGES IN TARIFFS AND PRODUCTIVITY

2.1 Changes in Tariffs and Subsidies

The changes that we make in the import and export tariffs and subsidies drive the results we get in the free trade scenarios. The baseline scenario requires us to remove all the remaining barriers in trade between the EU15 and the new member countries (EU10). In 2001, there were not a lot of these left, mainly just in agricultural produce and foodstuffs. The common external tariffs of the EU15 countries are then used for the EU10 countries. Furthermore, non-EU25 countries will start to use those tariffs that they have with the EU15 countries also in their trade with the EU10 countries. These are done at the level of aggregation of sectors and regions discussed in Section 3.6. As far as trade in textiles is concerned, we do not take into account the end of the WTO Agreement on Textiles and Clothing which was in place during 1995-2004 (see the end of Section 4.3, however). Also the very likely Russian WTO membership is not considered.

In addition to the changes made in the baseline scenario, Scenario 1 will remove all tariffs in trade between the EU25 countries and Russia in all except agricultural produce and foodstuffs. Russia's tariffs with non-EU25 countries will remain unchanged. Compared with the Union, Russia has relatively high import tariffs. Table 1 shows the weighted averages of Russia's average applied import MFN tariff rates on non-agricultural and non-fuel products.

Table 2 shows the pre-shock trade barriers between the EU and Russia according to the GTAP database. These are all nullified in Sections 4.2 and 4.3 apart from the trade barriers in agricultural produce and foodstuffs, which are left unchanged. The nullified tariffs and subsidies are shown in bold. We see that the largest changes will have to be made by Russia.

On the EU side, no export subsidies need to be removed. However, the EU has to remove some tariffs in its imports from Russia. This will make Russian products more competitive. As for Russia, it needs to remove duties in its exports to the EU, which also will make Russian products more competitive. Finally, Russia needs to remove the tariffs it charges in its imports from the EU. These measures will all tend to increase trade between the EU and Russia. Looking at the mere percentages, Russian tariffs in its imports are larger than those in its exports. Ceteris paribus, we may therefore expect there to be a larger increase in Russia's imports from the EU25 than in its exports there.

Table 1 **Average applied import MFN tariff rates on non-agricultural and non-fuel products in Russia, weighted averages**

Year	Total of non-agricultural and non-fuel products	Of which				
		Ores and metals	Manufactured products	Of which		
				Chemical products	Machinery and transport equipment	Other manufac-tured products
1993	7.2	3.7	7.5	7.6	6.3	8.7
1994	9.2	3.5	9.5	5.8	8.8	11.8
1996	9.1	5.4	9.3	7.7	8.1	11.9
1997	11.5	5.7	11.8	9.3	11.2	13.9
2001	9.0	6.4	9.3	8.5	8.6	10.8
2002	8.8	6.8	9.0	8.7	7.9	11.0

Source: UNCTAD Handbook of Statistics 2004.

Table 2 **Tariffs and subsidies in trade between the EU and Russia, %**

Sector	Export subsidy in exports from the EU to Russia, paid in the EU rTXS(i, EU, s); Positive values indicate a subsidy	Import tariffs in imports from Russia to the EU, levied in the EU rTMS(i, r, EU); Positive values indicate a tariff	Export duties in exports from Russia to the EU, levied in Russia rTXS(i, r, EU); Negative values indicate a tariff	Import tariffs in imports from the EU to Russia, levied in Russia rTMS(i, EU, s); Positive values indicate a tariff
Agricultural produce	*41.48*	*1.66*	*-0.02*	*11.73*
Electric power industry	**0**	**0**	**0**	**0.26**
Fuel industry	**0**	**0**	**-9.66**	**4.82**
Ferrous metallurgy	**0**	**0.91**	**-1.93**	**11.79**
Non-ferrous metallurgy	**-0.00**	**1.89**	**-1.57**	**13.09**
Chemical and petroleum products	**0**	**2.39**	**-7.96**	**9.60**
Machine building and metal working	**0.00**	**0.43**	**-5.04**	**9.23**
Wood and paper	**0.00**	**0.20**	**-1.38**	**13.95**
Building materials	**0**	**1.15**	**-7.27**	**15.14**
Textiles	**0**	**6.36**	**-4.59**	**16.88**
Food processing	*6.81*	*10.31*	*0*	*15.39*
Manufacturing, n.e.c.	**0**	**0.01**	**-3.49**	**14.28**
Services	**0**	**0**	**0**	**0**

Rutherford and Tarr (2006) construct a computable general equilibrium model of the regions of Russia to estimate the effects of the country's accession to the WTO. According to their results, the average gain in welfare as a percentage of GDP for the whole country is 4.3 per cent, but the northwest will gain 6.2 per cent and St. Petersburg 5.7 per cent, that is more than Russia on average. This is because these regions are expected to attract more foreign direct investment (especially in business services) than Russia on average. The FDI inflows are assumed to increase productivity. Some three-quarters of the total positive effect comes from FDI liberalisation. The results differ from our results which indicate that the northwest would benefit slightly less than Russia on average from free trade with the European Union. The setup is of course different, because Rutherford and Tarr's research question concerns the effects of Russia's WTO membership. Furthermore, they expect the northwest to receive above-average FDI inflows which are the driving force behind the increase in productivity.

Even so their results indicate that the northwest would benefit more than Russia on average from a halving of Russia's import tariffs. On the other hand, they do not change Russia's export taxes as we do. They of course also cut the import tariffs for all Russian imports, not just in trade with the EU.

2.2 Change in productivity

Production and productivity have increased considerably in Russia in recent years. This is largely due to a rise in capacity utilisation from its lows in the late 1990s and an increase in employment. Presently and in the near future, investment activity will need to pick up to support production capacity and productivity growth. Otherwise GDP growth is likely to slow down.

It is slightly difficult to argue where the positive productivity shock that we introduce in Scenario 2 comes from and even more difficult to decide how large it should be.[4] The increase in productivity could be due to an increase in competition and better functioning of the markets. Foreign direct investment could be a driver here especially if the investment originates in a more developed country, thus probably raising the level of technological as well as business and managerial know-how in the receiving country. We will take a closer look at empirical evidence on FDI-induced productivity growth. Other possible channels are mostly ignored here.

The OECD (2003) argues that foreign corporate presence may 1) act as a trigger for transfers of technology and know-how, 2) assist enterprise development and restructuring (especially in connection with privatisation), 3) contribute to fuller international (trade) integration, 4) bolster business sector competition, and 5) support human capital formation in the host country. Saggi (2002), for example, is a survey of the literature dealing with the role of trade and FDI in technology transfer.

The firm that makes the business investment, say purchases and improves upon an old manufacturing company or builds a totally new one, is likely to invest in the stock of machinery and equipment in the plant, maybe not state-of-the-art equipment, but still more modern and labour-saving equipment than what was used in the old plant. This will have a small positive effect on the average quality of equipment in that sector of manufacturing. The firm is also likely to bring in more modern business management, especially relative to what has been used in developing countries or transition economies. Increased competition may also force less efficient local firms to close down or to sharpen up. The latter may also start to imitate the products as well as production and other practices of foreign companies.

But how large an effect, if any, can we presume FDI to have on the economy or a sector on average. Besides, in many cases the first investments in transition countries have been assembly lines etc. that have rather low value added with only a small contribution to GDP. Furthermore, the case for the positive effects of FDI inflows is far from evident on the basis of empirical research.

Javorcik (2004) uses firm-level data for Lithuania and finds positive productivity spillovers arising from the contacts between foreign affiliates and their local suppliers, that is in connection with vertical backward linkages. According to the results, these effects arise in projects with shared local and foreign ownership, but not with fully foreign-owned foreign investments. A number of other micro-level studies have failed to find positive effects from spillovers in transition countries. The results for industrialised countries show a more positive impact (see the references in, for example, Javorcik, 2004, and Görg and Greenaway,

[4] The shock we will introduce is a primary factor augmenting technical change (variable 'afeall' in GTAP) of 1 per cent in all factors and all sectors in Russia. The shock is also introduced in those sectors, agriculture and foodstuffs industries, that are not opened up to free trade. Sulamaa and Widgrén (2004, 2005) use a 6 per cent shock in total factor productivity.

2002). Javorcik argues that the spillovers are more likely to be vertical than horizontal. She finds no robust evidence of either horizontal or vertical forward linkages.

Alfaro et al. (2006) find that if financial markets in the host country work well, backward linkages between foreign and domestic firms create positive FDI spillovers. Financially well-developed economies experience much higher GDP growth rates than economies with weak financial markets. Furthermore, other local conditions such as market structure and human capital are also important for the effect of FDI on economic growth.

Mencinger (2003) does not find evidence of FDI having a positive impact on GDP growth in the Central and Eastern European countries that joined the EU in 2004. In fact, he finds a negative correlation between GDP growth and FDI inflows. He argues that this is because of the characteristics of the FDI inflows and of the EU10 countries. The FDI inflows have mainly been acquisitions following large-scale privatisations. Acquisitions have not automatically resulted in investments in real assets, as proceeds of the sales have been spent on consumption and imports. Mencinger argues that this is shown by the absence of a relationship between FDI and gross fixed investment and a positive relation between FDI and the current-account deficit.

Sohinger (2005) argues in favour of the positive effects from FDI for the European transition economies, but the article does not include any econometric analysis. She argues that FDI increased the capital stock and is making it possible for these countries to move from product imitation to innovation. However, she admits that an initially low level of technological development still causes the general absorptive capacity of local companies to be low.

An empirical microanalysis of a developed country is presented in Aghion et al. (2004). They conclude that after the UK economy opened up in the 1980s more entry as measured by a higher share of industry employment in foreign firms led to faster total factor productivity growth in incumbent domestic firms and faster growth in aggregate productivity in the economy.[5] They argue that entry stimulates growth in the incumbents by inducing those close to the technological frontier to innovate.[6,7] They also present other possibilities, namely that the entrants may force the incumbents with low productivity and growth to exit the market, or that the entrants demonstrate new business methods and products to the incumbents and these better methods then spill over to the latter.

Figure 1 shows that the inward stock of FDI relative to the country's GDP is considerably smaller in Russia than it is in the Czech Republic, Hungary or Poland. Partly this can be explained by the Central European countries' EU membership process. We can also see that the larger the country, the smaller the inward FDI stock, which is natural. Also note that the inward FDI stock as a percentage of GDP declined in Russia in 2003-05. These investments are partly originally Russian finances.

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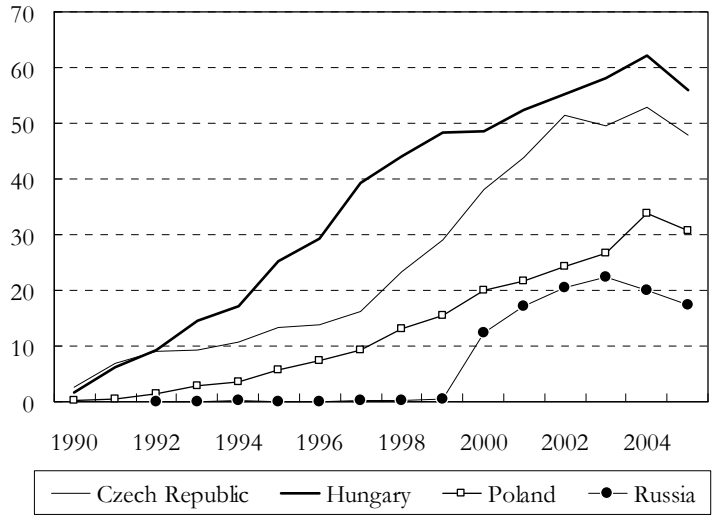
[5] According to the results in Haskel et al. (2002), who also use British plant-level data, a 10 percentage-point increase in foreign presence in a UK industry raised total fator productivity in that industry's domestic plants by about 0.5 per cent. Egger and Pfaffermayr (2001) find positive effects for general and labour-augmenting productivity from FDI inflows in the case of Austria.

[6] See also Aghion et al. (2005).

[7] For a country such as Russia this may not be a relevant case, however, because the distance to the techological frontier may be too large.

Figure 1 Inward FDI stock, % of GDP



Sources: UNCTAD, IMF.

Overall therefore we may not be able to say that a presumed increase in FDI would offer us a reasonable justification for increased productivity. Another reasoning, perhaps a more likely one, is economic and other restructuring and reform,[8] and we will base our assumption of a positive productivity shock on this argument. From the point of view of our analysis the source of the productivity rise is irrelevant, however.

3 THE GTAP MODEL

The GTAP (Global Trade Analysis Project) model is a computable general equilibrium model of the world economy with a comparative static approach, perfect competition and full employment. The model is especially suited to simulate the effects of trade policy and resource-related shocks on global production and trade in the medium term. The development of GTAP was started at Purdue University in 1993 and since then its development has become a global project with a GTAP network extending around the world.

3.1 Regional Household and Consumption

The GTAP 'world' consists of regional[9] households which allocate their expenditure across private consumption, government consumption and savings on the basis of a Cobb-Douglas utility function (see Figure 2).[10] The utility structure is nested. Utility from private consumption is assumed to be determined by a constant difference of elasticities utility function. The demand for private consumption is non-homothetic so that the share of necessities such as foodstuffs in consumption declines as incomes rise. Demand for government consumption is based on a Cobb-Douglas utility function making it and savings homothetic. The optimal

8 See e.g. Havrylyshyn and van Rooden (2003) on the importance of the institutional framework and economic reforms for growth.

9 A region refers to countries in most cases although some smaller and less developed countries have been aggregated into larger groups.

10 We rely largely on Hertel and Tsigas (1997) in this description of the GTAP model.

share of expenditure devoted to private and public consumption and savings varies as a function of per capita expenditure.

Either government consumption or savings can be shocked in which case private consumption will adjust to satisfy the household's budget constraint. Otherwise the shares of these three components are exogenous. This setup does not link government expenditure with its tax revenues and, therefore, the government does not need to run a balanced budget. This is because the database is lacking in data on national/regional tax instruments.

The effects of shocks can be assessed through a number of relevant variables. One such variable is equivalent variation (EV), which gives us the change in welfare in money-metric terms in US dollars. The equivalent variation of a price rise, for example, is the amount of money that needs to be taken away from the consumer at the original prices to reduce his or her welfare by the same amount as the price rise does.

3.2 Firms and Production

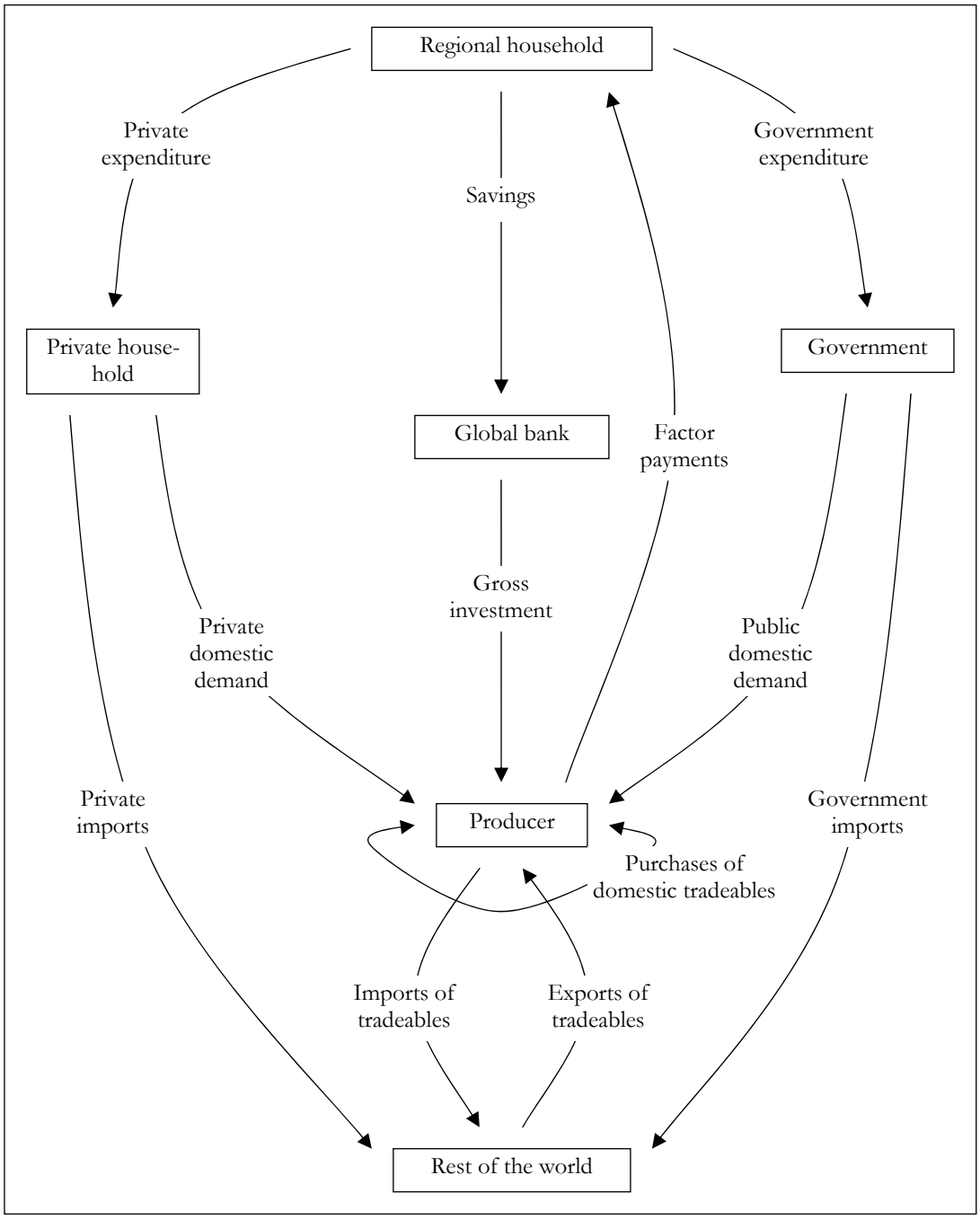
Firms are assumed to maximise their profits under perfect competition and constant returns to scale. Producer prices equal the marginal cost of production. Consequently, firms' pure profits are equal to zero. Firms' production function is a nested production tree. First, the firm sets its optimal mix of primary factors of production, owned by the regional household, and intermediate inputs. As a second step, the firm chooses between the different primary factors (land[11], skilled and unskilled labour, capital, and natural resources) and between domestic and imported intermediate inputs, both using constant elasticity of scale production functions. The firms are assumed to choose their optimal combination of primary factors independently of the prices of intermediate inputs, and vice versa for the selection of domestic vs. imported intermediate inputs.

The sum of private consumption, government consumption and demand on the part of other firms is equal to the demand for the final goods produced by the firms. Savings are channelled into investment although they do not raise the production capacity in this comparative static model. Investment does translate into demand for investment goods (CGDS) that are produced by the firms. Thus changes in investment will affect production and trade through their effect on the amount and structure of final demand. Investment goods have a constant depreciation rate over time. The regional household receives its income from selling endowment commodities (e.g. labour input) to the firms. This income is equal to the sum of the three demand components listed above. GTAP is a full-employment model and thus the price of labour (relative to the international numeraire, the world price index of primary factors) will adjust so that full-employment is maintained in the new equilibrium after the shock. The size of the population is fixed.

The primary factors may be either perfectly mobile or sluggish in their adjustment. If sluggish, they can have different equilibrium rental rates depending on their use. A constant elasticity of transformation revenue function determines to what extent the use of the sluggish factors responds to changes in rental rates in the concerned sectors. Labour is immobile between regions. Domestic and foreign goods are imperfect substitutes for each other, the degree of which is dictated by the Armington elasticities that can be changed exogenously in the model.

[11] Land is only used in agriculture.

Figure 2 Structure of GTAP



Source: Hertel and Tsigas (1997).

3.3 Investment and Saving

To introduce the global market to investment goods, the model has a 'global bank', which 'collects' all the savings from all regions and allocates them according to the demand for regional investments. As noted above, savings are a constant share of household income, but they can be shocked.

The global bank creates a composite investment good, which is based on a portfolio of net regional investment, and offers it to the regional households to satisfy their demand for savings. The price of the savings commodity is the same everywhere. There is no money in the model so there are no interest rates, but the rate of return for investments may differ be-

tween regions, which determines regional investment. On the other hand, all expected regional rates of return change by the same percentage rate. Investment capital is created by assembling composite intermediate inputs in fixed proportion. It does not require any further services of primary factors, which are already embodied in the intermediate inputs. Regional savings do not need to equal regional investment. Thus the balance of payments can be in disequilibrium. However, global savings are equal to global investment.

3.4 International Trade Transports

Besides the global bank there is a second global sector, a global transport sector for international trade. The value of the total export, transport and insurance services is equal to the difference between global exports on a *fob* basis and global imports on a *cif* basis. The supply of these services is provided by individual regions, which export the services to the global transport sector. The services are provided via a Cobb-Douglas production function, and thus the share of each region is unchanged. Consequently, the supply is pooled as was the supply of savings above. The price of transport services is a mix of the prices of all transport services exports.

3.5 Taxes

Prices are set in the market by supply and demand, but taxes (and subsidies in some cases) drive a wedge between the price paid by one agent and the price received by another agent. Taxes accrue from household income taxes, consumption taxes, taxes on foreign trade, and taxes on production, and they can also be negative, that is subsidies. Trade tariffs and subsidies are destination or source specific by regions and can be changed exogenously. Taxes always accrue to the household in the region where they are levied. As such there is no actual fiscal policy agent in the model. Public consumption can be shocked as we have already seen. Public sector finances do not have to be balanced.

3.6 Database and the Aggregation Used Here

We use the GTAP database Version 6. It has 87 regions and 57 sectors that can be aggregated into larger groups with 2001 as the base year. The extensive database is one of the strengths of the GTAP model. The regions/countries that we analyse are EU13, Germany, Finland, EU10 (the new member countries), Russia, Rest of the FSU (former Soviet Union), and Rest of the world. EU13 refers to the EU15 less Germany and Finland. We have separated Germany because of its importance.

The sectoral aggregation that we use (see Appendix 1 for details) is the following: Electric power industry; Fuel industry; Ferrous metallurgy; Non-ferrous metallurgy; Chemical and petroleum products; Machine building and metal working; Wood and paper; Building materials; Textiles; Food processing; Manufacturing, n.e.c.; Agricultural produce; Services; CGDS (capital goods, also equivalent to gross capital formation). This aggregation is due to the disaggregation used by the Russian statistical authorities until recently. CGDS is a composite good compiled from the actual sectors of the economy. We will compare the results given by GTAP with the economic structure in northwest Russia in order to make a tentative assessment of the impact on that region. We will use the Gragg 2-4-6 steps extrapolation as the solution method.

4 GTAP SIMULATION SCENARIOS

4.1 Baseline Scenario: EU Enlargement

Our baseline scenario is the enlarged European Union (EU25). According to the results, the enlargement has a positive effect on welfare, as measured by equivalent variation (EV), in all regions except the new member countries themselves and Finland (see Table 3). This is due to a negative terms of trade effect in these two regions. The effect on the EU10 countries' GDP is positive in volume terms. With these results, as with all other results presented here, more interest should be placed on their sign rather than on the size of the figures. For example, the effect on the EU10 countries aggregate production is very small. One reason for this is that the model is static.[12]

Table 3 Effects of EU enlargement

Country	Change in EV, mill. USD	Change in value of GDP, %	GDP quantity index, %	Volume of merchandise imports, %	Volume of merchandise exports, %	Terms of trade,%
EU13	323	-0.0	0.0	0.1	0.1	0.0
Germany	270	0.0	0.0	0.2	0.1	0.0
Finland	-30	-0.1	-0.0	-0.2	-0.0	-0.1
EU10	-525	-0.0	0.1	5.3	4.7	-0.4
Russia	208	0.1	0.0	0.3	0.1	0.2
Rest of the FSU	145	0.3	0.0	0.8	0.4	0.2
Rest of the world	152	-0.0	0.0	-0.0	0.0	0.0

Due to the lack of intra-EU25 income transfers our baseline scenario is not very representative of EU enlargement. However, our results are in line with the static GTAP scenarios run by Sulamaa and Widgrén (2004, 2005) which also lack these transfers. On the other hand, our main interest is the impact on Russia, and any free trade arrangements between the EU and Russia will not entail income transfers between the two regions. This the arrangement differs from any enlargement of the EU.

The changes in the quantity of output by sectors are mostly quite small in the EU13 countries on average (see Table 4). Typically those sectors, notably ferrous metallurgy as well as machine building and metal working, where a decline takes place in the EU15 countries, show an increase in the new member countries (EU10). On the other hand, there are sectors such as building materials and wood and paper that grow in the EU15 but decline in the EU10. The changes are larger in the EU10 countries than in the incumbent EU15. This is because the EU15 is much larger in economic terms than the EU10.

As for Russia, the changes are quite small. Russia (and the rest of the former Soviet Union and the rest of the world) is mainly affected by the introduction of the common external tariff in its trade relations with the EU10 countries.

[12] Vaittinen (2000) estimates the effects of the enlargement using the dynamic version of GTAP. According to his results, the impact is larger than what we get using the static model. Also, Vaittinen gets a positive welfare effect for the new member countries. This is due to the dynamic nature of his model, which affects investment, and the introduction of income transfers from the incumbent EU15 countries to the new member countries due to Common Agricultural Policy, among other things. Most of the welfare change in Vaittinen (2000) arises from these income transfers. Thus there is also a negative impact on welfare in the EU15 countries.

Table 4 Change in the quantity of output by sectors, %

Sector	EU13	Germany	Finland	EU10	Russia	Rest of the FSU	Rest of the world
Agricultural produce	0.0	0.0	0.1	2.6	-0.4	-0.1	-0.1
Electric power industry	0.0	0.0	0.1	-0.5	0.0	0.2	0.0
Fuel industry	0.0	0.0	0.2	-0.7	-0.0	-0.2	0.0
Ferrous metallurgy	-0.2	-0.3	-0.5	1.6	0.6	0.4	0.0
Non-ferrous metallurgy	0.1	-0.0	0.4	-2.2	-0.7	-0.3	0.1
Chemical and petroleum products	0.0	0.0	-0.1	-1.8	0.2	0.3	0.0
Machine building and metal working	-0.1	-0.1	-0.2	1.6	0.1	-0.1	0.0
Wood and paper	0.1	0.1	0.3	-2.6	0.1	0.2	0.0
Building materials	0.1	0.1	0.2	-3.6	0.2	0.1	0.0
Textiles	0.3	0.6	-0.3	-0.9	0.1	-0.2	-0.1
Food processing	-0.1	-0.0	0.3	2.9	-0.1	-0.2	-0.1
Manufacturing, n.e.c.	-0.0	-0.0	-0.2	-4.1	-0.0	0.1	0.1
Services	0.0	0.0	0.0	-0.2	0.0	0.0	0.0
Capital goods, CGDS	-0.0	0.0	-0.1	3.2	0.1	0.5	-0.1

4.2 EU25-Russia Free Trade

In Sections 4.2 and 4.3 we will use Section 4.1, i.e. the post-EU-enlargement situation, as the baseline scenario to which Scenarios 1 and 2 are now compared. Section 4.4 reviews the tentative regional effects in Russia in the different scenarios.

The effects of free trade between the EU25 and Russia resemble the effects of EU enlargement on the EU10 countries (see Table 5). Now Russia's welfare (EV) will decline, although only very little in per-capita terms, while its GDP will increase in volume terms. The negative welfare effect is due to a deterioration in Russia's terms of trade (see also Table 6), mostly in fuels but partly also in chemical and petroleum products and machine building and metal working. The deterioration in the fuel sector is almost the same in value terms as that in the Russian economy as a whole, while the changes in the other sectors net out to zero. There is a positive terms of trade effect in ferrous and non-ferrous metallurgy. These changes arise mainly from a decline in Russia's export prices, which follow from the removal of Russia's export tariffs thus raising the price competitiveness of Russian products and leading to an increase in Russian exports in volume terms. An increase in allocative efficiency due to free-trade induced specialisation according to countries' comparative advantage and world market prices supports welfare in the EU25 and Russia, but not elsewhere (see Table 6). The positive terms of trade effect is rather large in the EU countries, and negative elsewhere. In terms of volume, there is trade diversion towards trade between the EU25 and Russia. Trade in the rest of the world declines.

There is a very small decline in the value of private and government expenditure in Russia and a considerable increase in the value of gross investment, imports and exports. Also the volume of imports and exports increases. As a result, there is a small positive effect on the volume of GDP, although a negative one on its value. If this were a dynamic model, we would probably find a larger positive effect on Russia's GDP because of higher investment. In the four EU entities we find a small positive effect on private and government expenditure, investment and the value of exports. Also the value of imports increases. The rest of the world and especially the rest of the FSU face a negative impact.

Table 5 Effects of free trade between EU25 and Russia

Country	Change in welfare (EV), mill. USD	Change in value of GDP, %	GDP quantity index, %	Volume of merchandise imports, %	Volume of merchandise exports, %	Terms of trade, %
EU13	1,898	0.1	0.0	0.1	0.0	0.1
Germany	1,136	0.2	0.0	0.3	0.1	0.2
Finland	239	0.5	0.0	0.8	0.1	0.5
EU10	952	0.5	0.0	0.6	-0.1	0.4
Russia	-462	-0.3	0.1	10.6	5.9	-0.7
Rest of the FSU	-671	-1.3	-0.1	-3.4	-1.2	-1.2
Rest of the world	-2,233	-0.1	-0.0	-0.1	-0.0	-0.0

Note: Basic scenario is EU25.

Table 6 Decomposition of the change in welfare, mill. USD

Country	Allocative efficiency	Terms of trade	Investment-savings balance	Total
EU13	330	1,538	30	1,898
Germany	224	1,015	-103	1,136
Finland	54	225	-40	239
EU10	146	748	57	952
Russia	250	-823	111	-462
Rest of the FSU	-72	-604	6	-671
Rest of the world	-67	-2,105	-61	-2,233

Table 7 Change in the quantity of output by sectors, %

Sector	EU13	Germany	Finland	EU10	Russia	Rest of the FSU	Rest of the world
Agricultural produce	-0.0	-0.1	-0.3	-0.1	-0.4	0.2	0.0
Electric power industry	0.0	0.1	0.3	0.3	-2.4	0.1	0.0
Fuel industry	-0.9	-1.0	-1.4	-2.2	2.5	2.8	-0.4
Ferrous metallurgy	0.1	0.1	0.6	-0.1	-6.7	0.1	0.1
Non-ferrous metallurgy	-0.3	0.8	0.8	-0.1	-6.0	-0.6	0.4
Chemical and petroleum products	-0.1	-0.0	1.7	1.5	-0.3	-0.0	0.0
Machine building and metal working	-0.0	-0.1	-0.8	-0.5	-4.6	-1.0	0.1
Wood and paper	0.2	0.1	-0.4	-0.2	-5.9	-0.5	0.0
Building materials	0.1	-0.1	1.3	0.4	-2.9	-0.3	0.0
Textiles	0.5	0.4	3.3	-0.5	3.5	-0.7	-0.1
Food processing	-0.0	-0.1	-0.2	-0.1	-0.7	0.2	0.0
Manufacturing, n.e.c.	-0.0	0.1	2.6	0.1	-2.4	-0.0	0.0
Services	-0.0	0.0	0.1	0.1	0.3	-0.1	-0.0
Capital goods, CGDS	0.0	0.1	0.6	0.6	3.3	-2.6	-0.1

In terms of the volume of output by sectors, Russia will gain in fuels and textiles, and capital goods in general (see Table 7). On the other hand, there will be a decrease in metallurgy, wood and paper, machine building and metal working, building materials, and electric power industry. In the EU13 area we find a negative impact on the output of fuels, in Germany there is a negative impact on the output of fuels and a positive one in non-ferrous metallurgy,

and in Finland there is a negative impact on fuel production and a positive one on chemical and petroleum products and building materials, among other things. In the EU10 countries there is a negative impact on fuel production and a positive one on chemical and petroleum products, among other things.

4.3 EU25-Russia Free Trade With a Positive Productivity Shock

Scenario 2 has the same starting point as Scenario 1, that is an enlarged EU25. Then we again introduce free trade between the EU25 and Russia, but also add a primary factor augmenting technical change (variable 'afeall' in GTAP) of 1 per cent in all factors and all sectors in Russia. A 1 per cent increase in productivity may not sound like much, but the impact is clear. See also Section 2.2 above for a discussion of the productivity shock.

Compared with Scenario 1, where there was no change in productivity in Russia, the decline in welfare that was USD 462 million is now a gain of USD 2,628 million. Thus, increasing productivity is very important for Russia's economic development. Also the per-capita utility from aggregate household expenditure and the volume of GDP have much more favourable development when productivity increases. Higher GDP translates into slightly higher imports, but otherwise there is not much difference in the volume change of foreign trade. Compared with Scenario 1, also the increase in the EU25 countries' welfare is now slightly higher.

Table 8 Effects of EU-Russia free trade with a positive productivity shock in Russia

Country	Change in welfare (EV), mill. USD	Change in value of GDP, %	GDP quantity index, %	Volume of merchandise imports, %	Volume of merchandise exports, %	Terms of trade, %
EU13	1,965	0.1	0.0	0.1	0.0	0.1
Germany	1,172	0.2	0.0	0.3	0.1	0.2
Finland	246	0.5	0.0	0.8	0.1	0.5
EU10	977	0.5	0.0	0.6	-0.1	0.4
Russia	2,628	0.9	1.1	12.3	5.6	-0.7
Rest of the FSU	-658	-1.3	-0.1	-3.3	-1.2	-1.2
Rest of the world	-2,352	-0.1	-0.0	-0.1	0.0	-0.1

Note: Basic scenario is EU25.

The value of private and public consumption in Russia increase by 1.1 per cent, while investment surges by 6.4 per cent, exports by 4.8 per cent and imports by 12.2 per cent in value terms. As in Scenario 1, there is slight positive development in all these components in the EU regions also, while the impact is negative on the rest of the world and, in particular, on the rest of the FSU.

The largest positive effects by sectors in Russia compared with Scenario 1 are in capital goods, implying that there is an increase in investment, and services. Other significant gainers now are textiles and the fuel industry. There are also some sectors that are worse off even with the productivity increase, metallurgy and wood and paper in particular.

Table 9 Change in the quantity of output by sectors, %

Sector	EU13	Germany	Finland	EU10	Russia	Rest of the FSU	Rest of the world
Agricultural produce	-0.0	-0.1	-0.3	-0.1	0.4	0.2	0.0
Electric power industry	0.0	0.1	0.3	0.4	-1.6	0.1	0.0
Fuel industry	-0.9	-1.0	-1.5	-2.2	3.3	2.6	-0.4
Ferrous metallurgy	0.1	0.1	0.6	-0.1	-6.9	0.1	0.1
Non-ferrous metallurgy	-0.3	0.8	0.8	-0.1	-6.6	-0.6	0.4
Chemical and petroleum products	-0.0	0.0	1.8	1.5	0.3	-0.0	0.0
Machine building and metal working	-0.0	-0.1	-0.8	-0.5	-4.0	-0.9	0.1
Wood and paper	0.2	0.1	-0.4	-0.2	-6.1	-0.5	0.0
Building materials	0.1	-0.1	1.4	0.5	-2.0	-0.3	0.0
Textiles	0.5	0.4	3.4	-0.5	3.5	-0.7	-0.1
Food processing	-0.0	-0.1	-0.2	-0.1	-0.0	0.3	0.0
Manufacturing, n.e.c.	-0.0	0.1	2.6	0.1	-2.1	-0.0	0.1
Services	-0.0	0.0	0.1	0.1	1.6	-0.1	-0.0
Capital goods, CGDS	-0.0	0.1	0.6	0.6	6.6	-2.5	-0.1

As argued above, it is difficult to make a case for any particular magnitude of the primary factor augmenting technical change. If we were to use a 10 per cent shock instead of the 1 per cent shock, we would find for example that Russia's welfare increases by USD 30 billion instead of less than 3 billion. Also welfare in the EU25 countries would increase a little more than in the 1 per cent scenario, but the multiplication is much smaller than for Russia. In the rest of the former Soviet Union welfare would decline slightly less and in the rest of the world slightly more than in the 1 per cent case. As for the volume of GDP, it would rise by ten per cent in Russia thus matching the increase in productivity, and would be almost unchanged everywhere else.

Despite the strong 10 per cent increase in productivity, the volume of Russia's exports would rise slightly less than in the 1 per cent case, while the volume of imports would increase by 27 per cent, considerably more than in the 1 per cent case, thanks to higher incomes (GDP) and therefore stronger demand. The relatively small negative terms of trade and investment-savings-balance effects are easily compensated for by the much larger positive effects on allocative efficiency and especially technical change arising from the increase in productivity.

Looking at the results superficially, it might seem that free trade is relatively insignificant and just (somehow) raising productivity is the key issue. However, free trade which will increase competition and investment by foreign firms should not be underestimated in this respect. Russia should introduce many market-friendly reforms that will also help the economy, but an increase in foreign competition may act as an important catalyst for these reforms.

Above we found that textile production will increase in Russia. Concerning the WTO liberalisation of textile trade, we also ran Scenario 2 so that we removed all tariffs and subsidies from textile exports and imports between all regions in the world. The result was that compared with Scenario 2, welfare in Russia increased slightly more and in the EU15 countries and the rest of the world considerably more than without the removal of all textile tariffs and subsidies. Furthermore, the quantity of output in textile industries in Russia declined by 3.3 per cent instead of the 3.5 per cent increase reported in Table 9. Textile output would also decline by 12-20 per cent in the EU25 countries and by 6 per cent in the FSU, but increase by 5 per cent in the rest of the world instead of the close to zero-per-cent development seen in Table 9. However, as our interest is the impact of free trade between the EU25 and Russia,

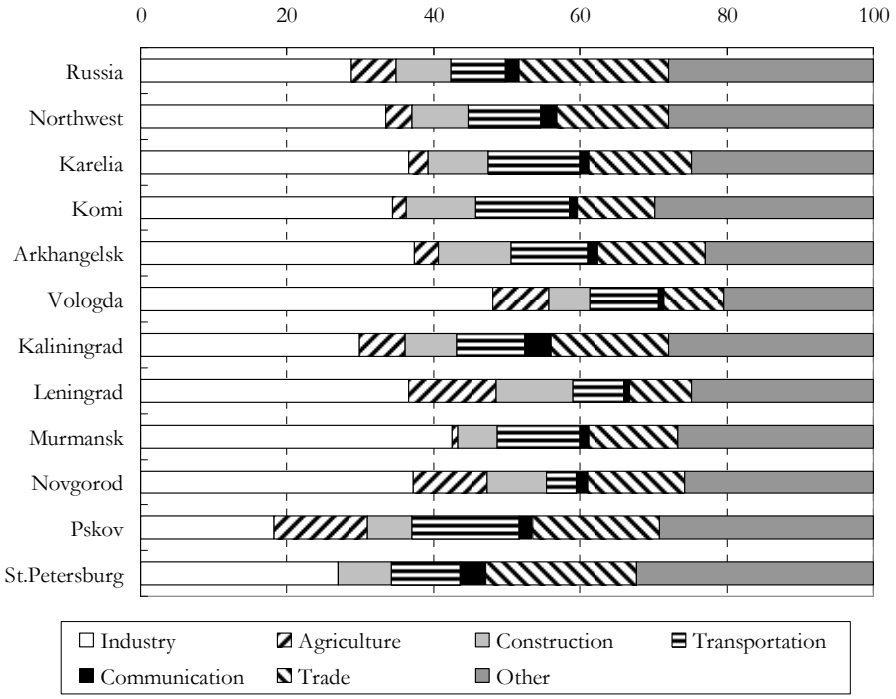
we have not included a removal of tariffs and subsidies in textile trade in our scenarios. If we were to include global free trade in all textile products in our baseline scenario, free trade between the EU and Russia might still have a positive effect on Russia's textile production.

4.4 A Tentative Assessment of the Regional Effects

Next we will combine the regional structure of Russia's economy with the results from the simulation scenarios in order to make a tentative assessment of the impact on the volume of gross regional product (GRP) in northwest Russia. We have simply used the sectoral results for Russia reached in GTAP and weighted these with the regional economic structure.

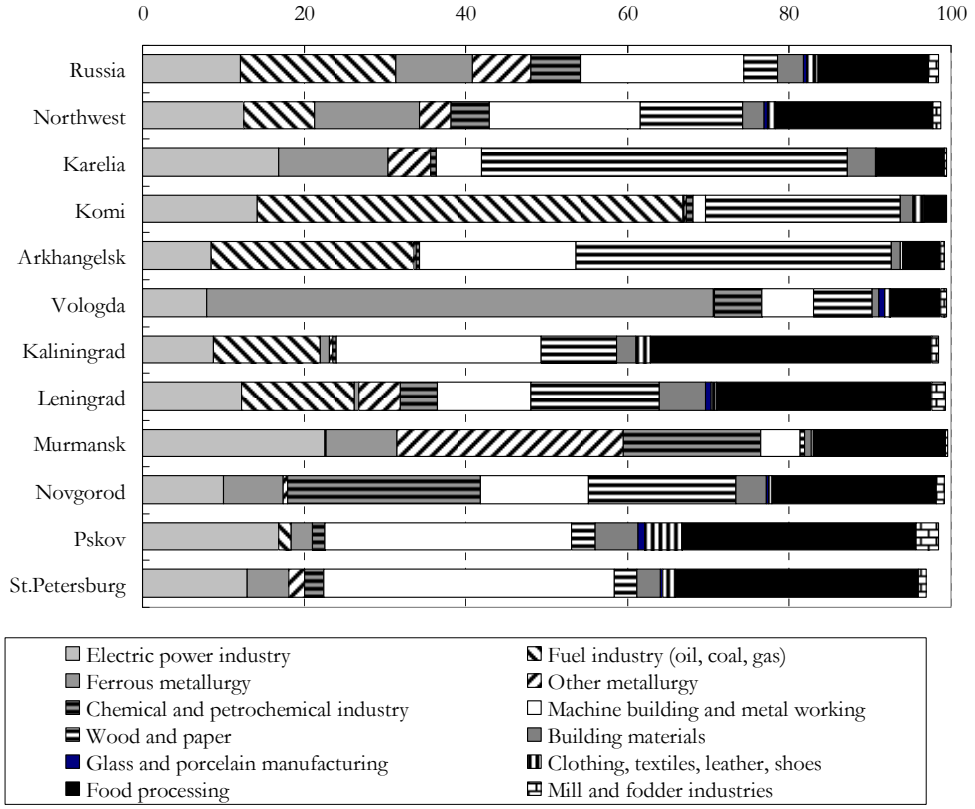
The structure of Russia's GDP and that of GRP in the regions of northwest Russia is shown in Figure 3. Furthermore, the structure of industrial production is shown in Figure 4. The latter shows large differences between the regions. We have readjusted the official economic data for two principal reasons (see Appendix 2). First, we only have regional gross output data for the manufacturing sectors, not data for value added. Consequently, we have to readjust the available figures to arrive at an estimate of the corresponding value-added shares. Second, official Russian statistics, unreliable to begin with, seem to underestimate the size of the oil and gas sectors (see for example World Bank, 2004 and 2005). The GTAP database is more in line with the latter than with the national statistics. Consequently, we need to readjust the official regional data to be able to use the GTAP results to assess the impact on the regions. Basically, the readjustment increases the share of the fuel sector and decreases that of services, mostly trade, in GDP. The readjustment improves the results as can be seen in Table A1 in Appendix 2.

Figure 3 Structure of Russia's gross regional product in 2003, %



Source: Russia's statistical authorities.

Figure 4 **Structure of gross industrial output in Russia and the northwest regions in 2003, %**



Source: Russia's statistical authorities.

Table 10 shows the results for the impact on GRP in northwest Russia after the statistical readjustments have been made. The northwest would seem to benefit slightly less than Russia on average from free trade in terms of the quantity of value added. Karelia, Vologda, Murmansk and Novgorod seem to do the worst. Karelia is strongly specialised in wood and paper industries and Vologda in ferrous metallurgy, which are declining sectors. Better than average development is seen in Komi, Arkhangelsk and Kaliningrad, of which the first two are specialised in fuel extraction which is an expanding sector. However, note that fuel, oil in particular, may increase regional GDP in the area where it is extracted, but most of the new financial wealth is likely to be channelled to other areas, notably Moscow, and support private consumption and the local service sector there.

Table 10 **Impact on the volume of gross value added at basic prices in the different scenarios in northwest Russia, %**

Region	EU25 enlargement	EU25-Russia free trade	EU25-Russia free trade + productivity shock in Russia
Russia	-0.0	-0.1	0.9
Northwest	0.0	-0.3	0.6
Karelia	0.0	-1.6	-0.7
Komi	-0.0	1.3	2.1
Arkhangelsk	-0.0	0.4	1.1
Vologda	0.2	-2.2	-1.4
Kaliningrad	-0.0	-0.1	1.0
Leningrad	-0.0	-0.6	0.2
Murmansk	-0.0	-1.0	0.0
Novgorod	0.0	-1.0	-0.1
Pskov	-0.0	-0.4	0.7
St. Petersburg	0.0	-0.5	0.6

5 CONCLUSIONS

We have analysed the implications of free trade between the EU25 and Russia using GTAP, a computable general equilibrium model of the world economy with a comparative static approach, perfect competition and full employment. We also studied free trade in combination with an increase in productivity in Russia. Productivity could rise following increased competition and foreign direct investment after trade liberalisation but it is more likely to follow from economic and other reforms in Russia. Free trade could act as a catalyst for reforms. We also reviewed the effects on the sectors of the Russian economy. Finally we made a tentative assessment of the possible impact on the regions in northwest Russia. We emphasise the importance of economic reforms and better functioning markets coupled with increasing competition, where the presence of foreign companies via both trade and investment is important.

With an enlarged EU25 as the baseline scenario, free trade between the EU25 and Russia would have a small negative effect on welfare in Russia due to a deterioration in Russia's terms of trade. Following the removal of tariffs in all except agricultural produce and foodstuffs that we have excluded from free trade, the volume of imports would grow twice as much as that of exports. Combining free trade with a small increase in productivity, welfare in Russia would increase substantially despite a deterioration in the terms of trade. The increase in productivity would also lead to an increase in the quantity of output.

In terms of the quantity of production in different sectors in Russia, ferrous and non-ferrous metallurgy, machine building and metal working, and wood and paper are the principal declining sectors in free trade. Output in capital goods, fuel industry, textiles and services increases. There are symptoms of Dutch disease with the fuel industry growing and manufacturing shrinking. The WTO agreements in global textile trade have not been incorporated in the model. Removing all tariffs and subsidies in the exports and imports of textiles between all regions of the world would result in a decline in textile production in Russia and a slightly larger gain in welfare than otherwise.

The northwest of Russia would seem to benefit slightly less than Russia on average in terms of the quantity of gross regional product (gross value added) from free trade. Karelia, Vologda, Murmansk and Novgorod seem to do the worst in this respect. Karelia is strongly specialised in wood and paper industries and Vologda in ferrous metallurgy, which are declining sectors. Better than average development is seen in Komi, Arkhangelsk and Kaliningrad, of which the first two are specialised in fuel extraction, which is an expanding sector.

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APPENDIX 1 SECTORAL AGGREGATION

We have used the following sectoral aggregation.

- Electric power industry: Electricity.
- Fuel industry: Coal; Oil; Gas; Minerals n.e.c.
- Ferrous metallurgy: Ferrous metals, Metal products.
- Non-ferrous metallurgy: Metals n.e.c.
- Chemical and petroleum products: Petroleum, coal products; Chemical, rubber, plastic prods; Gas manufacture, distribution.
- Machine building and metal working: Motor vehicles and parts; Transport equipment n.e.c.; Electronic equipment; Machinery and equipment n.e.c.
- Wood and paper: Forestry; Wood products; Paper products, publishing.
- Building materials: Mineral products n.e.c.
- Textiles: Textiles; Wearing apparel; Leather products.
- Food processing: Meat products n.e.c.; Vegetable oils and fats; Dairy products; Processed rice; Sugar; Food products n.e.c.; Beverages and tobacco products.
- Manufacturing, n.e.c.: Manufactures n.e.c.
- Agricultural produce: Paddy rice; Wheat; Cereal grains n.e.c.; Vegetables, fruit, nuts; Oil seeds; Sugar cane, sugar beet; Plant-based fibres; Crops n.e.c.; Cattle, sheep, goats, horses; Animal products n.e.c.; Raw milk; Wool, silk-worm cocoons; Fishing; Meat: cattle, sheep, goats, horses.
- Services: Water; Construction; Trade; Transport n.e.c.; Sea transport; Air transport; Communication; Financial services n.e.c.; Insurance; Business services n.e.c.; Recreation and other services; Public administration, defence, health, education; Dwellings.

APPENDIX 2 REGIONAL DATA AND ITS READJUSTMENT

In this appendix we will discuss the regional Russian data needed in Section 4.4 and explain why and how we have readjusted it. The readjustment improves the results. There are two principal problems that we try to address and a few caveats that need to be mentioned. First, from Russian statistical sources we only have regional gross output data for the manufacturing sectors, not data for value added. Consequently, we have to readjust the available figures to arrive at an estimate of the corresponding value-added shares. Second, official Russian statistics, unreliable to begin with, seem to underestimate the size of the oil and gas sectors, according to some international estimates greatly so (see below). The GTAP database is more in line with the latter than with the national statistics. Consequently, we need to recalibrate the official regional data to be able to use the GTAP results to assess the impact on the regions.

As for the caveats, note that the GTAP data are for 2001, while our regional data are constructed and readjusted using data for 2002 and 2003. This is likely to have some effect on the measured structure of the regional economies. A further caveat is that as the level of sectoral aggregation is rather high, and as many of the regions are quite small economic units, it may be that some sector in a given region is largely dominated by a single factory that produces a specific product. When we apply the GTAP results for the total Russian economy on this particular region and sector, there may be considerable inaccuracy due to aggregation bias that we are not in a position to address. Consequently, even with the adjustments we make, it is advisable to interpret the results with caution.

The average production structure in northwest Russia is about the same as in Russia on average using the level of disaggregation shown above in Figure 3. At the margin, industry and transportation are a little more important and trade and agriculture slightly less important in the northwest than in Russia on average. There are, of course, larger differences than this between the regions in the northwest. For example, industry is considerably more important in Vologda, Murmansk and Arkhangelsk, and slightly less so in Pskov and the cities of St. Petersburg and Kaliningrad, than in Russia or the northwest on average. Trade liberalisation is likely to have a direct impact on industry and thereafter an indirect effect on services.

Figure 4 above shows the structure of industry in terms of gross output. The sectoral disaggregation differs from the one used internationally. GTAP has 2001 as the base year and also at the time this study was made only this old disaggregation was available for Russia's regions. Since then, Russia has modified its statistical system so that for future purposes it will be more in line with international standards.

Based on the readjusted gross value added data, the northwest is more specialised in food processing, wood and paper industries, and ferrous metallurgy than Russia on average, and less specialised in machine building and metal working, non-ferrous metallurgy, and fuel extraction. As for the regions, Karelia and Arkhangelsk are specialised in wood and paper, Komi in fuel and wood and paper, Vologda in ferrous metallurgy, Kaliningrad in food processing, the Leningrad region in food processing and wood and paper industries, Murmansk in chemical and petrochemical industry and non-ferrous metallurgy, Novgorod in chemical and petrochemical industry and wood and paper industries, and Pskov and St. Petersburg in machine building and metal working and food processing. The differences are relative large, so it should be possible to also find considerable differences between the regions in terms of the effects in the different scenarios. However, note that fuel, oil in particular, may increase regional GDP in the area where it is extracted, but most of the new financial wealth is likely to be channelled to other areas, notably Moscow, and support private consumption and the local service sector there.

We will take the following steps to readjust the data. First, from the Russian statistical yearbook for regions we find regional data for the share of agriculture, industry and services in GDP (value added) in 2003. These are shown above in Figure 3. As for the disaggregation of industry by regions, we only have gross industrial output for 2003. There is another source that we can use here. We find value added and the share of value added in output by sectors at a very disaggregated level for manufacturing industries in Russia in 2002 from the UNIDO database. After some sectoral aggregation we can calculate an average ratio between value added and gross output for Russia using the sectoral disaggregation we have used in this study. We can then use this average ratio to readjust the gross output data available from Russian statistical authorities so that it should more or less correspond to value added in the regions. Of course we are thus making the unrealistic assumption that this ratio in each region is the same as in Russia as a whole.

However, the UNIDO database does not include electric power industry or oil and gas extraction, which are included in industrial output in Russian statistics. We have made a crude guesstimate of the ratio in the electric power industry so that we get a more reasonable value for its share in Russian GDP. The oil and gas sector is then calculated as a residual so that the share of total industry in GDP remains unchanged from what is reported in official Russian statistics. As a first step therefore, we have readjusted the internal composition of industry so that the share of oil and gas has increased compared with the raw data on gross output shares and, in particular, the share of food processing and electric power production has declined. Table A1 shows in its first numerical column the shares of each sector in Russia's GDP before this adjustment and the second numerical column shows them after this first adjustment has been made.

This way we reach a share in GDP of 8.2 per cent for the fuel sector. This is not enough, however. According to the GTAP database, fuel industry (i.e. coal, oil, gas and other minerals) accounted for 19.3 per cent of Russia's GDP at basic prices when measured as a share in the variable EVFA, or factor income by sectors. This GTAP structure for Russia's GDP is shown in the fourth numerical column in Table A1. Furthermore, according to World Bank (2004, 2005), the share of oil and gas in Russian GDP in 2002 was 25 per cent (see the last numerical column in Table A1). Indeed, the World Bank argues that the share of industry in GDP was actually 52 instead of 32 per cent in 2002. They argue that this is because transfer pricing and the differences between domestic and export prices on main commodities lead to a considerable overestimation of the trade sector in Russia's national accounts. They use UK and Dutch trade and transport margins to recalculate the composition of Russia's GDP while keeping total GDP unchanged.

We will use the recalculation made in World Bank (2004) to further readjust our regional data in order to get closer to the economic structure in the GTAP database. We will use the UK trade and transport margins as reported in World Bank (2004), where it is argued that the value added of the oil and gas sector – while keeping total GDP unchanged – is in fact 185 per cent higher than what official statistics indicate. These products account for 95 per cent of the total of oil, gas, coal and other energy raw materials produced in Russia.

To the extent that regions are specialised differently in the extraction of these raw materials, our recalculation is of course again biased. According to the World Bank results, there should also be an increase of 49 per cent in the value added of chemical and petrochemical industry and an increase of about one-third in wood and paper industry, and building materials industry, as well as an 18 per cent increase in food processing industry, all compared with official statistics. Because total GDP is unchanged in the World Bank recalculation, some sectors' value added has to decline. The big loser is trade where the World Bank estimates that 64 per cent of the value added should not be there. With these adjustments, our final economic structure for the Russian economy is shown in the third numerical column in Table

A1. In the end, it is largely a compromise between the GTAP database and the World Bank calculations.

Table A1 The structure of the Russian economy at basic prices and the GTAP result recalculated on the basis of these

Sector	Russian statistics based on industry gross output	Russian statistics after our UNIDO adjustment	Russian statistics after our World Bank adjustment	GTAP	World Bank
Agriculture	6.0	6.0	5.9	6.1	6.6
Industry	28.5	28.5	46.0	40.0	50.4
Electric power industry	3.4	2.2	2.2	0.7	2.8
Fuel industry	5.5	8.2	23.4	19.3	25.2
Ferrous metallurgy	2.7	2.4	2.5	2.1	2.4
Non-ferrous metallurgy	2.1	2.5	2.6	1.2	3.4
Chemical and petroleum products	1.8	1.6	2.3	3.3	2.9
Machine building and metal working	5.8	5.3	5.5	4.8	5.3
Logging, woodworking, pulp, and paper	1.2	1.2	1.6	1.8	2.0
Building materials	0.9	1.0	1.4	1.6	1.2
Clothing, textiles, leather, shoes	0.4	0.3	0.3	0.8	0.5
Food processing	3.9	3.0	3.6	3.0	4.0
Other manufacturing	0.9	0.7	0.7	1.1	0.7
Services	65.5	65.5	48.1	53.9	43.0
Total	100.0	100.0	100.0	100.0	100.0
Change in the volume of gross value added at basic prices in the different scenarios, %					
Baseline scenario: EU25 enlargement	0.00	0.00	-0.01	0.00	-0.02
Scenario 1: EU25-Russia free trade	-0.48	-0.37	-0.09	-0.02	-0.14
Scenario 2: EU25-Russia free trade + productivity increase in Russia	0.57	0.69	0.86	0.98	0.78

Now, how well does our data readjustment work? The last three rows in Table A1 show this in the different scenarios. For example in Scenario 2, the GTAP result for the increase in Russia's GDP in market prices is 1.09 per cent and the increase in GDP at basic prices we arrive at using the EVFA decomposition is 0.98 per cent (4th numerical column). This is not a large difference although in principle the figures should be the same. Without the UNIDO adjustment – that is if we only used the gross output figures to calculate sectoral disaggregation for industry – we arrive at an increase of 0.57 per cent (as shown in the last row, 1st numerical column). The UNIDO adjustment raises this to 0.69. Finally the readjustment based on the World Bank calculation raises this to 0.86 per cent (3rd numerical column). This is relatively close to the GTAP result. Using the structure of Russia's GDP in World Bank (2004) we arrive at an increase of 0.78 per cent in Russia's GDP. In Scenarios 1 and 2 the readjustment of the GDP data thus improves the results for Russia as a whole. We presume that it then also improves the results for individual regions in northwest Russia.

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