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Measuring trade diversion

-the case of Russian exports in the advent of EU enlargement

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Abstract

This paper is an attempt to assess the possible trade diversion from the Russian Federation caused by the 2004 EU enlargement to 10 Central and Eastern European Countries (CEECs). Left out of the club, Russia has been confronted with potential losses of CEECs and EU15 markets. The effect of the factual enlargement is approximated by the transformations introduced by earlier regional integration in the region. The Europe Agreements (EA) and other Preferential Trade Agreements (PTA) among the CEECs anticipated most of the transformations related to the EU enlargement, at least as far as trade is concerned.

The method rests on the gravity model enriched with the Michaely indices of potential trade diversion, potential trade creation and export compatibility, as a new measure for trade diversion and trade creation. The use of the indices in this context provides several advantages over the use of PTA dummies. They constitute a more accurate measure of trade diversion, they can be correctly estimated since they are not incorporated in the bilateral importer-exporter effects and they do not suffer from endogeneity. In our exercise, the dynamic panel setting reveals to be the correct specification, from a theoretical and empirical point of view.

The results of the estimations do not confirm the trade diversion hypothesis for the aggregated data. Although intra-EU25 trade increased tremendously, this was not at the expense of Russian exports. The low level of Russian exports to the EU and the CEECs could thus be caused by other factors than the EU enlargement.

1. Introduction

The EU enlargement to 10 Central and Eastern European Countries is one of the most important events in the history of the European Community. It became possible as a result of the fall of communist regimes, which tottered the political and economic architecture in the CEECs. From the fall of the Iron Curtain at the end of the '80s until the factual enlargement's first wave in 2004, the CEECs' accession to the EU was progressively prepared through new regional integration arrangements.

Fervent in cutting off the links with the former communist past, CEECs worked their way out of Soviet-led political and economic cooperation. The Council of Mutual Economic Assistance (CMEA or Comecon) used to be the platform for economic cooperation among the communist countries, the Eastern counterpart of the Western European Community. Set up in advance of the European Coal and Steel Community, CMEA functioned from 1949 until 1991, when it was officially dissolved. Prior to its demise, CMEA established in June 1988 its first official relations with the European Community. Bilateral trade agreements with the European Community followed: Hungary (1988), Poland (1989), Czechoslovakia (1990), Bulgaria (1990) and Romania (1991).

Since the CEECs' attention was progressively shifting westwards, the European Community responded subsequently by providing enhanced assistance under PHARE and started negotiations for economic cooperation. Bilateral Europe Agreements with the European Community, were signed between 1991 and 1996[1], and entered into force between 1994 and 1999 (table 1). Similar agreements were in place with Cyprus, Malta and Turkey[2], under the name of Association Agreements. The scope and degree of liberalization under the Association Agreements were, however, narrower than those of the more integrationist Europe Agreements (EA).

Table 1. CEECs bilateral relations with the European Union, previous to 2004 EU enlargement

Country	Europe Agreement signed	Europe Agreement came into force	Interim Agreements	Official application for EU Membership	CEFTA[3]	BFTA[4]
Bulgaria	March 1993	February 1995	February 1994	December 1995	January 1999	
Czech Rep.	October 1993	February 1995	May 1992	January 1996	March 1993	
Estonia	June 1995	February 1998		November 1995		April 1994
Hungary	December 1991	February 1994	May 1992	March 1994	March 1993	
Latvia	June 1995	February 1998		October 1995		April 1994
Lithuania	June 1995	February 1998		December 1995		April 1994
Poland	December 1991	February 1994	May 1992	April 1994	March 1993	
Romania	February 1993	February 1995	May 1993	June 1995	January 1997	
Slovakia	October 1993	February 1995	May 1992	June 1995	March 1993	
Slovenia	June 1996	February 1999		June 1996	January 1996	

Source: European Commission and OECD data.

[1] The year varies from country to country, depending on the stage of the reforms' implementation.

[2] Enjoying preferential status, Turkey has been in a Customs Union with the European Community (EC) since 1963. This has been extended to the new EU members (in July 2005). Malta and Cyprus signed Association Agreements with the EC in 1970 and 1972, into force since 1971 and 1973 respectively.

[3] In December 1992, Former Czechoslovakia, Hungary and Poland signed the Central European Free Trade Agreement (CEFTA). Duties were progressively abolished since. In 1997, duties on industrial products are completely abolished except for some "sensitive items". Slovenia (1996), Romania (1997) and then Bulgaria (1999) joined in.

[4] The Baltic Free Trade Area (BFTA) was signed by Estonia, Latvia and Lithuania in 1994. In 1996, it was extended to include agricultural trade, with effect from 1997.

An important component of the Europe Agreements covered trade liberalisation, under the so called Interim Agreements. The Interim Agreements[5] started even earlier than the Europe Agreements: in 1992 with the VISEGRAD[6] countries, in 1993 with Romania and in 1994 with Bulgaria. The essential reason was to secure a level playing field, especially for CEECs' exporters (Baldwin, 1997). Their provisions concerned gradual and asymmetric trade liberalization in conformity with a predefined schedule, by the end of a 10 year transition period, measured since 1992, i. e. March 2002.

On the one hand, the European Community engaged to eliminate all tariffs and quotas on most CEECs' imports ever since the entering into force of the Interim Agreements. Several sectors were excluded, mainly agricultural products, while other sectors were progressively liberalised: steel, coal, textiles and clothing. The progressive liberalisation consisted mainly in annual reductions, within four or five years from the entry into force of the Interim Agreements, negotiated country by country. As a result, customs duties and quantitative restrictions were gradually eliminated by 1997 on most products, and by 2002 (the end of the grace period) on sensitive products.

On the other hand, the CEECs opened up their markets to the EU products at a slower pace. For instance, Poland lifted trade barriers for most industrial products within seven years after the implementation of the Interim Agreements, while the Czech Republic, Hungary and the Slovak Republic did as much within nine years. In all the CEECs, however, duties and quantitative restrictions on sensitive products were phased out by the end of 2002. A detailed description of the liberalisation schedule, per country and product category, is provided by OECD (1995).

A widely shared view is that, due to the EA, "most adjustment of trade flows has already occurred and the expected further effects of the completion of EU enlargement will be modest" (De Benedictis, De Santis and Vicarelli, 2005). Since the EA eliminated the tariff and the non-tariff restrictions, the factual enlargement's additional impact remains the expansion of the single market to the CEECs (Brenton *et al.*, 2001).Therefore, further adjustment may occur following the removal of the technical barriers and contingent protection not covered by the EA's provisions. Brenton *et al.* (2001) find that because of different specialisation patterns between CEECs' exports to and imports from the EU, no significant trade creation is expected in the products falling under the incidence of these technical barriers. Similar, they regard trade diversion as limited due to "low degree of overlap between EU imports from the CEECs and EU imports from non-member countries". In the light of these findings, the limitation of not accounting for the single market transformations can be seen as acceptable at this stage of research.

Moreover, there has been a myriad of bilateral and multilateral PTAs crisscrossing the CEECs (Sapir, 2001). This has anticipated the effect the enlargement would have on intra-CEECs trade flows. In the Central European Free Trade Area (CEFTA), by 1997, duties on industrial products have been completely abolished except for some sensitive products. The Baltic Free Trade Agreement (BFTA) has gone even further than the elimination of tariffs on industrial goods. Since

[5] Data on the start of the Interim Agreements is available for several countries, as presented in table 1.1.1.
[6] VISEGRAD is the name under which the group formed by Poland, Czech Republic, Slovakia and Hungary is sometimes referred.

1997, BFTA has extended to liberalising trade in agriculture. On these bases, we can already approximate the impact of the 2004 EU enlargement as far as trade flows are concerned.

Since there are numerous studies on the impact of the EU enlargement on the new and old EU members[7], we focus on its consequences on the Russian Federation, where little research has been undertaken. Due to strong traditional trade links with the CEECs, Russia is likely to be the most affected third country. When the EU-Russia Partnership and Cooperation Agreement[8]'s (PCA) extension to the new comers was negotiated by the EU and Russia, Russian officials claimed that the EU enlargement caused trade diversion from Russian exports. However, these estimations are not available and we take the challenge to further investigate the hypothesis of trade diversion from Russian exports.

Trade diversion is defined as the loss of exports a third country faces when its trading partner shifts to less efficient intra-Preferential Trade Agreement (PTA) imports. The shift is due to cheaper imports, as resulting from lower intra-PTA barriers to trade. Low Russian exports and their slow growth when compared with the CEECs exports to the EU could be a first indication of trade diversion.

A first source of trade diversion may be the elimination of trade barriers between the EU15 and the CEECs. The tariffs the EU applied to CEECs' exports almost halved from 1990 till 2003 (annex 1). Even so, they were not lower than the EU tariffs applied to Russia (annex 1), which also decreased during this period. Higher increase in the EU trade flows with the CEECs than with Russia may thus be explained by EA-induced elimination of non-tariff and technical barriers and better provision of contingent protection. This is the kind of trade diversion we regard as likely to occur with the EU enlargement.

A second cause of trade diversion could be the change in the CEECs' trade regime at the adoption of the EU trade policy, including the Common External Tariff (CET). The tariffs applied by CEECs and EU15 to Russian Federation exports (annex 1) do not show a significant difference. We cannot say that CEECs' were lower or higher than those of the EU15. Nevertheless, neither the former nor the latter were high. Therefore, the extension of the CET to the CEECs is not expected to have had a large impact on the trade with Russia.

Moreover, the model used in this paper contributes to the debate in terms of methodology, since it could be equally used for analysing the impact of other PTAs. A variable measuring the potential trade diversion is introduced in a gravity equation specification, where its significance would determine the realisation or non-realisation of the potential trade diversion. The Michaely index of potential trade diversion is chosen since it allows for ordinal inferences in a sample of countries and since it is compatible with additionally employed indices -the trade creation and export compatibility indices, calculated in a similar manner.

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[7] By EU enlargement the paper refers to both 2004 and 2007 EU enlargement waves. The 10 new EU members are also referred to as the Central and Eastern European Countries (CEEC). Cyprus and Malta are not considered since their Association Agreements date back to the early 1970s.

[8] The Partnership and Cooperation Agreement between the EU and Russia constitutes the framework of their bilateral relations. It was signed in 1994, but it came into force only in 1997 due to EU disapproval of Russian military interventions in Chechnya. It concerns political and economic issues, among which trade relations.

In this context, the most appropriate specification of the gravity equation reveals to be the Partial Adjustment Model (PAM). Since the period analysed is a transition period, trade flows are expected to adjust slowly to equilibrium, itself in motion. But an adjustment process is even more likely due to the pre-1989 artificially low trade flows between the Central-Eastern and Western Europe, on the one hand, and to centrally-planned high trade flows between the former USSR and the Central-Eastern Europe, on the other hand. Pent-up demand and supply are likely to be released and thus reflected in increased post-1989 trade flows between the CEECs and the EU. Thus, these trade flows are gradually converging to "natural" trade flow levels.

Another theoretical rationale is that sunk costs of exporting firms induce inertia in the trade flows, which are consequently expected to adjust slowly. Therefore, the static panel data specification appears to be inappropriate, since it does not model the dynamics of adjustment. In addition, there is also an econometric justification for using a dynamic panel data setting. The estimation of a static panel specification points to first order autocorrelation in the residuals. This is often regarded as a consequence of a dynamic misspecification, more exactly of an omitted lagged variable.

The organisation of the paper is as follows. Section 2 explains the methodology used in the literature to estimate trade diversion caused by PTA and, based on the gravity equation, it proposes an alternative method. The theoretical background of the gravity equation and its compatibility with various trade models are discussed in section 3. Section 4 takes us to the empirical framework of the gravity equation and examines a broad range of specifications and estimation procedures. It subsequently introduces the proposed way of measuring trade diversion: adding the indices of compatibility between imports and exports to the gravity setting and testing for their significance. The data is also discussed, with a focus on the potential trade diversion indices. The results of the estimations and empirical considerations are presented in section 5, whereas section 6 concludes.

2. Methods of measuring trade diversion caused by Preferential Trade Agreements

One traditionally refers to the impact of a Preferential Trade Agreement (PTA) by considering its static and dynamic effects. The static effects are trade diversion and trade creation, improvement of terms of trade vis-à-vis third countries, reduction of other costs within a Customs Union, such as those related to customs borders and non tariff barriers, reduced market power reflected in lower mark-ups, larger variety of products. The dynamic effects, more important in the long run but also more difficult to quantify, are positive impact of increased market size on investment, economies of scale and scope, increased competitiveness and growth, technological spillovers, more efficient allocation of R&D activities, other common policies. Furthermore, the new economic geography brings in a new category of effects - the location effects. Producers will trade off the transport costs on the one hand, and the benefits from scope and scale economies, on the other hand. They will either choose to locate in a sparse structure, closer to the consumers so as to pay lower transport costs, or cluster their production activity in order to benefit from economies of scale and scope in spite of larger transport costs.

In the empirical literature, there are two established ways to measure the trade effects of a PTA: ex-ante and ex-post. Partial equilibrium models (PEM) and general equilibrium models (GEM) are used for ex-ante calculations, when one wants to quantify the impact of a change in trade policy. The other method is ex-post empirical data analysis, undertaken usually with the gravity equation. GEMs' benefit is that they offer a good overview by incorporating all the sectors in the economy. However, they are severely criticised, firstly for restrictive and often ad hoc assumptions. Although *w*ell-built GEMs do not picture the economy like a black box, the numerical values assumed for different parameters are to a large extent arbitrary and span a wide range. Considerable variation gives very different results, transforming GEMs into "theory with numbers" (Baldwin and Venables, 1995). Secondly, the quality and availability of data, such as the level of disaggregation, influence noticeably the quality of the results. Data at the micro level, on which GEMs are based, is difficult and expensive to collect. The third limitation of the GEMs is that they often underestimate changes in trade. One reason is the exclusive consideration of the tariff barriers and disregard of non-tariff barriers, which although difficult to quantify, play a significant role. The second reason is that taking into account "all the various channels and the influence of the endogenous political behaviour" is "virtually impossible" (Baier and Bergstrand, 2004). For these considerations, GEMs results have to be interpreted carefully and preferably in connection with other estimation methods.

A critical analysis of several GEMs used in the context of the 1992-EU single market is provided by Baldwin and Venables (1995). Recently, Hufbauer and Goodrich (2003) survey several GEMs applied to NAFTA. In the context of EU-Russia trade relations, we identify three relevant papers employing a GEM. Sulamaa and Widgren (2003) finds that EU enlargement would have no significant impact on the Former Soviet Republics (below 0.171 per cent rise in exports under different assumptions). Samson and Greffe (2002) find a 0.14 per cent drop in Russian exports under a just-CU type of enlargement, and a 0.27 per cent rise in exports under a CU plus high Armington elasticities. In line with previous findings, Brenton (2003) calculates a rise of Russian exports to the EU15 by 3.98 per cent and to the CEEC by 1.2 per cent.[9]

An attempt of calculating the trade diversion produced by the EU enlargement in a PEM is made by Kawecka-Wyrzykowska and Rosati (2002). Departing from the elasticity of import demand, they calculate the change in CEECs' (only Poland, Hungary, Czech Republic, Slovakia are considered) imports from Russia resulting from the adoption of the EU CET. They find a rise by 0.17 per cent in mineral imports, a drop by 0.92 per cent in industrial imports (that becomes a rise by 0.66 per cent if aluminium is excluded) and a rise by 2.33 per cent for agricultural products. However, these calculations have two main shortcomings. First, the elasticity is assumed constant and equal to 1.5 for all products[10]. Second, the terms-of-trade effect is absent from their model, based on the small country assumption, ignoring the EU's impact as a bloc.

The ex-post method is based on the gravity equation, one of the most employed empirical tools to explain bilateral trade flows. Departing from Newton's law of universal gravitation, trade flows

[9] It considers Russia separately from the other Former Soviet Union (FSU) Republics, whereas the previous two cover the FSU as a whole.

[10] This could be solved in at least two ways. Bilateral import elasticities with respect to prices could be calculated by using the gravity equation (that will further be discussed). Or a flexible demand model could be employed, such as Almost Ideal Demand System (AIDS) used by Chaaban and Thomas (2003), to calculate import elasticities by sector.

(assimilated with the attractive force) are considered directly proportional with a constant (gravitational constant) and the size of the two partner countries represented usually by their GDPs[11] (the masses of two objects), and inversely proportional with the distance between the two countries (objects). Taking the logarithms of these variables, the basic specification of the gravity equation is obtained:

$$\ln Y_{ij} = \alpha_0 + \alpha_1 \ln GDP_i + \alpha_2 \ln GDP_j + \alpha_3 \ln Dist_{ij} + \varepsilon_{ij} \qquad (1)$$

Where Y_{ij} represents the trade flows from country i to country j, usually expressed as exports (occasionally also as imports or total trade), GDP_i and GDP_j are the supply and the demand of country i and j, and $Dist_{ij}$ is the distance between the two countries. The GDP is expected to display a positive, since it proxies the market potential of the countries. On the contrary, the coefficient of the distance variable is expected to be negative, mainly as a reflection of transport costs.

The gravity equation has been extensively employed in the literature, usually by augmenting the specification with one or several variables meant to capture other influences on trade flows than those of distance and GDP. The most commonly used are incomes per capita of partner countries, populations, adjacency (common border), common language, common currency, colonial links and so on. To our knowledge, there is no such exercise applied to the EU enlargement's impact on Russia.

To measure the trade impact of a PTA in the gravity setting, some authors use dummy variables to capture the PTA effect. Frankel, Stein and Wei (1998) introduce dummies for trade between members of the same PTA, expecting their coefficients to be significant and to display a positive sign if the PTA is trade creating. Hamilton and Winters (1992), Frankel and Wei (1993) and Hassan (2001) introduce two dummies, one for trade between members of the same PTA and one for trade between a PTA member and a non-member. Thus, if the coefficient on the former variable is positive this is said to be evidence for trade creation. Analogous, if the latter variable's coefficient is negative and significant this is considered evidence for trade diversion. The sum of the two dummy coefficients will give the net impact of the preferential trade agreement. Soloaga and Winters (1999) use three sets of dummy variables per PTA: one for intra-bloc trade, a second for the importing and a third for the exporting PTA members only[12]. The intra-bloc trade dummy is interpreted in relation to the second and third dummy. If its coefficient is positive and significant, this points to increased intra-PTA trade flows but it says little yet about trade diversion and trade creation. If, in addition, intra-bloc trade increases at the expense of the third countries, the coefficient of the second dummy becomes negative and significant. This indicates "import diversion", or what is traditionally called trade diversion. Alternatively, if the coefficient of the third dummy is negative and significant, the interpretation is "export diversion". In other words, PTA countries reduce exports to non-members, concentrating on exports within the PTA.

[11] As the dependent variable is *bilateral* trade, some authors, such as Hassan (2001), take the countries GDPs summed up, bearing thus the same coefficient.
[12] The paper uses imports as dependent variable, as justified by Winters (1997).

The use of dummies has to be carefully approached for mainly three reasons. First, there is an identification problem, namely that the PTA dummy is not a very precise proxy for trade diversion. This can capture also other effects, simultaneous with the PTA, such as any change in policy not directly related to trade diversion.

The dummy variable incorporates all the influences coming from omitted variables. This makes it difficult to isolate "genuine regional integration effects" (Greenaway and Milner, 2002) and to draw inferences about trade flows (Polak, 1996). Bayoumi and Eichengreen (1995) try to eliminate "unobserved heterogeneity across countries that is constant over time" by using differences and not levels in the gravity equation. However, the omitted variable bias remains for unobserved heterogeneity that varies with time. With further refinement, unobserved heterogeneity is accounted for in the time as well as in the cross sectional dimensions (Egger and Pfaffermayr 2003, Baltagi et al. 2003, Cheng and Wall, 2004).

Yet, even with a proper specification and supposing the dummy captures exclusively the PTA effect, an estimation problem reveals as the second shortcoming. In a Fixed Effects (FE) model, one cannot distinguish between the PTA dummy and the specific bilateral (importer-exporter) effects, since the former incorporates the latter. And this is often the case, since the theory behind the estimations together with the econometric tests[13] rejects the Random Effects (RE) model in favour of a Fixed Effects model. What is more, in a dynamic panel data specification one usually uses a FE model, and thus the dummies cannot be estimated if a proper econometric specification with bilateral effects is employed.

Third, PTAs are usually concluded by countries belonging to "natural" trading blocs, and therefore their signature may be a consequence rather than a cause of high trade flows. In other words, it is not just the trade that is enhanced by a PTA, but also the formation of a PTA may depend on pre-existent high levels of trade. An endogeneity bias occurs as the dummy variable is simultaneous with the trade flows.

In this context, we propose an alternative way to measure trade diversion in the gravity framework, based on a better proxy for trade diversion. We put forward a measure of trade diversion, namely the potential trade diversion index developed by Michaely (1996). This measures to what extent the importing profile of a country is matched by the exporting profile of another country or group of countries[14]. In the case of a high match, it is expected that trade between the two countries would increase once they enter a PTA. Several studies have calculated this index for partner countries about to sign a PTA, among which World Bank (1995), Ng and Yeats (2003), Kemal (2004). High values were interpreted as evidence for a to-be-successful trade agreement, whereas low values were considered evidence for to-fail trade agreements.

[13] The test usually used to distinguish between a FE or a RE model is the Hausman test. More on the theoretical support for FE is provided in section 1.4.1, page 11.

[14] If country A is an importer of agricultural products and if country B exports agricultural products, or/and if country A is an exporter of industrial products and B imports industrial products, then B's exports could potentially go to country A or/and A's exports to county B. These illustrate a good match of exporting and importing profiles, where a PTA among A and B could therefore be expected to increase trade. Otherwise, the match is weak and a PTA is not likely to induce additional trade between the two partners.

However, it is important to notice that, to different degrees, an increase in trade might be caused by both trade diversion and trade creation. The index of potential trade diversion as such would thus incorporate both. Therefore, we look for an additional variable that controls separately for the potential trade creation. Consequently, we also consider the Michaely indices of potential trade creation and of export compatibility to accompany the potential trade diversion index. This way, the variable of interest -the index of potential trade diversion, would only capture the effect of trade diversion.

The potential trade creation index measures the extent to which the production profile of a country is matched by the exporting profile of another country. A high value indicates likely replacement of the less efficient domestic production source by more efficient imports from the PTA partner. However, if both countries have similar exporting structure, as measured by the index of export compatibility, the replacement is no longer expected to occur. Thus, the index of export compatibility completes the index of potential trade creation.

Our use of the indices is different, namely we test for their significance in a gravity equation specification[15]. If proven to be significant, the index of potential trade diversion points to realised trade diversion. This suggests that EU-CEEC increase in trade is in the detriment of trade with Russia.

Another important advantage of using these variables instead of the dummies is that the indices vary both in the importer-exporter and in the time dimensions. Consequently, they will not be incorporated in the fixed effects and therefore they can be estimated in a static or dynamic FE model.

We use time varying variables to capture the trade diversion and trade creation *processes* that might have taken place from 1993 until 2002, time when the EU and CEECs markets have opened. The reason is that the Europe Agreements have been implemented in a gradual manner; the elimination of customs duties was asymmetric and progressive. Thus, the impact of EA manifested as a process rather than a one-off event.

Another benefit of the proposed variable is that the endogeneity problem is minimal in this context. The dependent variable is Russia's exports to EU25 individual countries. The calculation of the indices is broader, based on the individual country's imports and exports from and to the world. Since they are not limited to bilateral EU25 trade flows, the risk of endogeneity becomes minimal.

[15] In line with our method, Otsubo and Umemura (1998) include a trade complementarity index in the gravity equation. They find that "trade complementarity turns out to be a significant determinant of the direction of trade, and its significance has grown in the past decade" for APEC countries. As a measure for trade complementarity, they use Michaely's potential trade diversion index.

3. Theoretical background for the gravity equation

Despite the initial lack of theoretical underpinnings, the gravity equation has been performing very well empirically. Since Tinbergen's (1962) first use of the gravity equation in international trade, much progress has been achieved and the equation has been made theoretically consistent with a large category of trade models. There are numerous theoretical studies that derive the gravity equation under a certain specification, departing from established trade models. Among them, the best theoretically grounded are acknowledged to be Anderson (1979), Bergstrand (1985, 1989), Helpman and Krugman (1985), Deardorff (1998), Anderson and Van Wincoop (2001).

Both Anderson (1979) and Deardorff (1998) assume product specialisation[16] and derive similar specifications, which include countries' GDPs, a measure for distance and some other terms implied by the derivations. Anderson (1979) uses an expenditure system and raises the question of several econometric problems: income endogeneity and biasedness from including tariffs and transport costs. These problems become however marginal in a sample of countries "with relatively small interdependence" with similar traded goods preferences and with similar "tax structures and transport cost structures". Deardorff (1998) obtains a similar specification from a HO model setting, and he focuses on explaining the specification rather than on the econometrics. Under Constant Elasticity of Substitution (CES) utility functions and trade with frictions, he finds that trade falls for countries more distant than the average, that trade with distant countries increases and decreases with neighbour countries as a result of a drop in transport costs, and that for large elasticities of substitution distant countries would trade less. Bergstrand (1985) derives a gravity equation specification based on a general equilibrium world trade model with perfect international product substitutability. Relaxing this assumption, Bergstrand (1989) incorporates factor endowment differences and non-homothetic tastes "in the spirit of Linder". It is the first theoretically consistent paper to include importer and exporter per capita incomes and bilateral exchange rates. Estimating the gravity equation at a product level (one digit SITC) in successive years, he finds a positive (negative) coefficient estimate for the exporter per capita income for capital (labour) intensive in production goods and a positive (negative) coefficient estimate of importer per capita income for luxuries (necessities) in consumption.

Anderson and Van Wincoop (2001) contribute the multilateral resistance terms to the theoretical discussion. Their model is similar to Anderson's (1979), based on CES preferences, goods differentiated by place of origin but regional specialisation in the production of a single good. Through elegant calculations, they reach a simple operational form of the gravity equation. The proposed multilateral resistance terms account for the average trade barrier in relation to all trading partners, previously ignored in the literature.

From a good performance of the gravity equation's estimates in a sample of OECD countries, Helpman (1987) concludes that the gravity equation supports the monopolistic trade model,

[16] In Anderson (1979) product specialisation is the consequence of the assumption that each product is differentiated by country of origin (what is called at present the Armington assumption). In Deardorff (1998) product specialisation is originated in the Heckscher-Ohlin (HO) factor abundance differential.

supposed to be behind the OECD sample. According to Deardorff (1998)[17], at most, this is evidence that the gravity equation is theoretically consistent with a monopolistic competition model, but it does not exclude its consistency with other trade models (such as a HO setting). Evidence for Deardorff's (1998) previous conclusion is also found in the paper by Hummels and Levinsohn (1995). They proceed in the same way as Helpman (1987), this time using a non-OECD country sample, expected to contain a large degree of inter industry trade. They find the gravity equation performing equally well under a factor proportions model.

The reconciliation comes from Evenett and Keller (1998) who find that "factor endowments and increasing returns explain different components of the international variation of production patterns and trade volumes." The gravity equation is estimated with data from two samples, one of countries trading mainly inter-industry and the other with countries trading mainly intra-industry[18]. Good performance in both samples becomes supportive equally for IRS and for HO imperfect specialised models. When estimating the gravity equation, the difference using alternative theories is in key parameter values, resulting from slightly different specifications (Feenstra, Markusen and Rose (2001)). Consequently, Russian exports to the EU can be estimated without concern over the kind of trade developed between the two partners.

4. The empirical framework

As a point of departure, we discuss the empirical insights of the gravity model. The limitations and the suitability of each specification are explained, in close relation with the specificity of our data sample. Based on this analysis, we motivate the choice of the Partial Adjustment Model for our exercise. We then introduce the variable proposed to test for and measure the presupposed trade diversion induced by the EU enlargement on Russia. The data is subsequently described.

4.1 Quest for the appropriate gravity equation specification

Besides the theoretical derivation of the gravity equation, the literature has become increasingly concerned with the improvement of the specification from an econometric point of view. A *before-after* EA gravity model approach in cross section makes sense from a theoretical point of view. Using as dependent variable the average trade flows post-EA's full implementation and as explanatory variable of interest the average indices ante-EA entering into force, one captures the initial potential trade diversion and creation's impacts on adjusted trade flows. However, this approach is criticised because the cross section specification proves to suffer from insufficient degrees of freedom and to be misspecified.

Most of the studies before mid-90s employing cross sectional analysis have been reproached to suffer from a serious omitted variable bias and from imposing economic and econometric unjustified restrictions. The latter critique points to the fact that the hypothesis of a common intercept imposed in cross section, as an alternative for different intercepts, is rejected (Cheng and Wall, 2005). Heterogeneity is thus not accounted for, and hence the *before-after* EA equation is misspecified.

[17] Berstrand supports this conclusion, as mentioned in a comment on Deardorff (1998).
[18] The split between large and low intra industry trade is done arbitrarily, at an average Grubel Lloyd (GL) index of 0.05.

Alternatively, panel data models have imposed themselves since the mid-90s through several advantages. Besides the main advantage that they can account for known and unknown heterogeneity, they provide "more informative data, more variability, less colinearity among the variables, more degrees of freedom and more efficiency". In large enough samples, they also offer the possibility to study the dynamics of adjustment (Baltagi, 2003).

In an early static panel data setting, Hummels and Levinsohn (1995) include country-pair specific effects, invariant in time. Two years later, Matyas (1997) uses importer, exporter and time effects in order to account for heterogeneity in both cross section and time. This way, he allows for time-invariant individual country effects in their quality of both importers and exporters, as well as for time effects common to all the observations (business cycle, globalisation). This is what is now called the three-way model:

$$Y_{ijt} = \alpha_0 + \alpha_i + \alpha_j + \alpha_t + \beta_{ijt} X'_{ijt} + \chi_{ij} Z'_{ij} + \varepsilon_{ijt} \qquad (2)$$

Egger and Pfaffermayr (2003) go further than that and demonstrate that Matyas's model is just a restricted form of a more general specification that additionally includes time invariant (exporter-importer) bilateral interactions as well:

$$Y_{ijt} = \alpha_0 + \alpha_i + \alpha_j + \alpha_t + \underline{\alpha_{ij}} + \beta_{ijt} X'_{ijt} + \varepsilon_{ijt} \qquad (3)$$

In Matays (1997) only known bilateral effects such as distance, common language and adjacency are accounted for, whereas Egger and Pfaffermayr's specification captures both known and unknown time-invariant country pair factors (Z'_{ij} is only a part of α_{ij}). The latter factors prove to be significant and therefore their omission can only cause biased results. Christensen (1987) has shown that, this more generalised specification is equivalent with a two-way model with time and bilateral (importer-exporter) interaction effects only, under orthogonality restrictions between main and interaction effects.

Additionally, the asymmetry of the time-invariant bilateral effects ($\alpha_{ij} \neq \alpha_{ji}$) implicitly assumed in Egger and Pfaffermayr (2003), is proven in Cheng and Wall (2005). It is shown that the sense of trade relations matters for the exporter-importer effects and that assuming the contrary imposes a restriction, unjustified from an economic and statistical point of view. As studies such as Glick and Rose (2001) assume symmetry, the results should be carefully interpreted.

Baltagi, Egger and Pfaffermayr (2003) include two additional interaction terms in Egger and Pfaffermayr's (2003) specification. They are the interaction terms between the exporter and importer respectively, and the time variant effects. Each captures any exporter/ importer specific time-variant effects like the country's business cycle, and both the observed and unobserved time variant cultural, political, historical or institutional characteristics of the country.

$$Y_{ijt} = \alpha_0 + \alpha_i + \alpha_j + \alpha_t + \alpha_{ij} + \underline{\alpha_{it} + \alpha_{jt}} + \beta_{ijt} z'_{ijt} + \varepsilon_{ijt} \qquad (4)$$

Since the explanatory variable in our model is Russian exports to EU15 and CEECs, there is no variation as far as the exporter is concerned. This simplifies the choice between the specifications

2, 3 and 4, as $\alpha_{ij} = \alpha_j$, $\alpha_{jt} = \alpha_t$, $\alpha_{it} = \alpha_i = 0$. All controversy is eliminated as the mentioned specifications reduce to the following one:

$$Y_{jt} = \alpha_0 + \alpha_t + \alpha_j + \beta X'_{jt} + \varepsilon_{jt} \qquad (5)$$

The two-way model has become the "workhorse" of most of the recent papers using gravity, and a Hausman test is usually employed to decide which estimation procedure is appropriate: a Random Effects (RE) model or a Fixed Effects (FE) model. When the specific effects are not correlated with the other explanatory variables, one should opt for the RE estimator, which is more efficient than the FE one. However, if this is not the case, the RE estimator is inconsistent and one should choose the FE estimator that is less efficient but always consistent.

An apparent drawback of the FE model is that a number of variables of interest may be incorporated in some of the effects. The typical concern is that estimating the impact of variables such as distance, common language and adjacency is no longer straightforward. Unless one is directly interested in these coefficients, the advantage is that error measures, frequently occurring when calculating distance, do not influence negatively the quality of the results. Nevertheless, applying Hausman Taylor (1981) estimation procedure, one can obtain the coefficients of the mentioned variables, as discussed shortly.

To make sure we choose the correct estimation procedure, we equally look at the theoretical underpinnings of our model. Egger (2000) offers theoretical support for the FE, based on what "stands behind the country-specific and time invariant export and import effects (…) tariff policy measures, and export driving or impeding "environmental" variables". He considers the former to be tariff and non-tariff barriers, and the latter size of country, access to transnational infrastructure networks, geographical and historical determinants. These factors are not random but rather deterministically linked to certain historical and geo-political factors. As this is also our case, a FE imposes itself.

Another important argument supporting the FE over the RE holds when the sample is ex-ante predetermined and not a random drawn sample. Commonly, one is interested in a particular trade relationship of a group of countries, and in this case the sample is predetermined and exhaustive. When the interest is placed on estimating the effect of particular variables on trade volumes in general (exercise performed usually in a large sample), and not in a particular set of countries, a RE is justified (Matyas, 1998). Since we are interested in a particular sample, namely Russian exports to individual MS in the enlarged EU, the sample coincides with the population. This gives additional support to the use of the FE estimator.

However, the decision between a FE and a RE is not always the best one can make, as it is an "all or nothing choice" (Baltagi et al., 2003). In reality, the individual effects are usually correlated with some of the covariates but uncorrelated with the others. Applying a FE, although consistent, may waste many degrees of freedom when the effects are correlated only with a few explanatory variables (Egger, 2002). In this case, the Hausman Taylor (HT) estimator (1981) is more efficient than the FE, and is still consistent unlike the RE. Under the HT model, the regressors are divided into four categories: the exogenous and endogenous time-variant variables; and the exogenous and endogenous time-invariant variables. Endogeneity in this case is defined with respect to the fixed effect component of the residual; exogeneity with respect to the idiosyncratic residuals is a preliminary condition for all the variables. First, a FE is estimated in order to obtain the within-residuals. Next, the latter are regressed on the time-invariant variables. In this case, the endogenous time-invariant regressors are instrumented with the time-variant exogenous regressors, provided that the latter outnumber the former and that they are sufficiently correlated. Once the coefficients are obtained this way, they are used to calculate within and overall residuals that are further employed in the estimation of the variance components. The new estimated variance components are then used to perform a GLS transform on the set of variables. Therefore, the coefficients of the covariates are not the same under a FE or a HT estimation procedure. It does not suffice to regress the estimated fixed effects (obtained under a FE) on the time-invariant variables in whose coefficients one is interested, as several papers wrongly assume. The appropriateness of the HT estimator can be decided upon a Hausman test between a FE and a HT model[19].

However, the gradual character of the liberalisation process implied by CEECs' transition can be better accounted for in a dynamic panel data specification than in a static panel data framework. In a static panel data, one can capture either the short run or the long run effects, depending on the estimation method. It is often assumed that the between estimator measures long run effects, while the within estimator measures short run effects (Pirotte, 1999; Egger and Pfaffermayr, 2003). Moreover, Pirotte (1999) shows that "when only individual dimension tends to infinity (i.e. the time dimension is fixed), long run effects can be obtained by estimating a static relation whereas the true model is a dynamic one, as long as the coefficients are homogenous among individual units". Since we have a limited sample in both dimensions, the between estimator proves inappropriate for calculating long run impacts in our case.

According to another related view, while the static panel framework is more suitable for long run relationships, the dynamic panel setting addresses better the short term influences (De Benedictis, De Santis and Vicarelli, 2005). "Given the novelty of the phenomenon" and the shortness of the sample, when dealing with the enlargement, they consider more appropriate to analyse its short run effects.

Moreover, due to CEECs' transition period between 1992 and 2004, trade flows were in a process of adjustment to equilibrium levels. Transition to equilibrium is a process that can be ideally captured in a partial adjustment model. Modelling Slovenia-EU trade, Damijan and Masten (2002) considers it as the natural choice "to describe the process of trade reorientation as a process of transition between two trade regimes: from an initial protectionist regime, when trade was on a low level, to a liberalized one".

Likewise, certain inertia in bilateral trade flows is a well-known fact. Countries that used to trade a lot with each other will continue to do so in spite of raising obstacles, at least for a certain period. Thus, another important theoretical rationale for the use of a dynamic panel setting is that "trade history" matters. In practice, this is justified by both consumer preferences or biases and by the

[19] For a detailed procedure on choosing the endogenous and exogenous variables in a HT estimation, see Carrere (2003).

existence of sunk costs paid by the exporting firms to enter foreign markets. The sunk costs[20] constitute entry and exit barriers that render sluggish the response of trade flows to other factors.
Several studies, from which we mention De Benedictis and Vicarelli (2005) and De Benedictis, De Santis and Vicarelli (2005), motivate the sticky behaviour of bilateral trade flows by "investment in export-oriented infrastructure" and by the accumulation of political, cultural and geographical invisible assets. Since energy exports form the bulk of Russia's exports to the EU and CEECs, the massive investment in energy export infrastructure justifies the high importance of sunk costs in this particular trade relation.
A PAM is a simple dynamic process, which assumes the equilibrium or target value of the dependent variable Y_t* related to one or more explanatory variables:

$$Y_t^* = \beta_1 + \beta_2 X'_t + u_t \quad (6)$$

The idea is that the actual value of the dependent variable deviates from the equilibrium value. At any time period, its increase is proportional with the divergence of the actual value in the previous time period from the equilibrium value.

$$Y_t - Y_{t-1} = \lambda(Y_t^* - Y_{t-1}) \quad (7)$$

The actual value of the dependent variable can then be written as a weighted average of the equilibrium value and the previous actual value. λ measures the speed of the adjustment, and should be between 0 and 1. 1 implies full adjustment in the first period, whereas 0 means no adjustment at all.

$$Y_t = \lambda Y_t^* + (1-\lambda)Y_{t-1} \quad (8)$$

Plugging (6) into (8), the result is a specification with observable variables only, which can then be estimated.

$$Y_t = \beta_1\lambda + \beta_2\lambda X'_t + (1-\lambda)Y_{t-1} + \lambda u_t \quad (9)$$

Equation 1.4.1.8 allows us to model the dynamics of adjustment, i.e. the short and long run coefficients as well as the speed of convergence. The long run coefficients are calculated imposing the equilibrium condition Y_t=$Y_{t-1,}$ subsequently plugged in 9. Thus, the short run impact of X on Y is given by $\beta_2\lambda$, whereas the long run impact is β_2.
In a nutshell, our theoretical quest for the most appropriate model ends with the PAM as final choice. The cross section *before-after* exercise is disqualified on the basis of little degrees of freedom and misspecification. Although it corrects for these shortcomings, the static panel data setting remains inappropriate for our study. The transition towards equilibrium level implied by the EU enlargement coupled with the resilience of trade flows are not properly modelled by a static panel specification.

4.2. The model and the data

Since we concluded that the dynamic panel data framework corresponds best from a theoretical point of view, we estimate the following model:

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[20] For a literature review on sunk costs, one might look at Dixit (1989), Eichengreen and Irwin (1997).

$$LExp_{jt} = \beta_1\lambda + \beta_2\lambda\alpha_j + (1-\lambda)LExp_{jt-1} + \beta_3\lambda LGDP_{jt} + \beta_4\lambda LRER_{jt} + \beta_5\lambda LTD_{jt} + \beta_6\lambda LTC_{jt} + \beta_7\lambda LEC_{jt} + \beta_8\lambda LcompSD_{jt} + \lambda u_{jt} \qquad (10)$$

Where:

Exp_{jt} stands for exports from Russia to country j at time t, $\beta_1\lambda$ is the intercept common to all observations, α_j is the time-invariant heterogeneity of country j in relation to Russia, or country j's deviation from the baseline Russian propensity to export. The explanatory variables varying both in the cross sectional and the time dimensions come subsequently. GDP_{jt} is importing country j 's GDP. RER_{jt} is the real exchange rate with respect to the Rouble. TD_{jt} is the potential trade diversion index, TC_{jt} is the potential trade creation index and EC_{jt} is the export compatibility index. The last variable, $compSD_{jt}$, is the index proposed to measure supply-demand compatibility. ε_{jt} is the remaining error term. All variables are expressed in logarithms, symbolised by the letter L in front of the variables.

The potential trade diversion index (TD) is the index of compatibility of reporter country's imports with partner country's exports. It measures how the imports of one country could be matched by the exports of another country and it is calculated using the following formula:

$$TD_{jk} = 1 - \frac{\sum_i \left| m_{ij} - x_{ik} \right|}{2}$$

Where j is the reporting country, k is the partner country, i is a good in a category[21], *m* is the share of imports of product i in the country's in-category imports from the world and x is the share of exports of product i in the country's in-category exports to the world. After calculations per category, the indices are aggregated per importing country, using weighed averages (the weights are the shares of the partner country's category imports in partner country's total imports). TD ranges from 0 to 1. When the match is almost perfect (mij is almost equal to xij), meaning one country imports what the other exports, TD gets closer to 1. This is the indication of the largest trade diversion potential. Whereas, if country j would import exactly what country k does not export, TD becomes 0, indicating no trade diversion potential.

So far, we obtained an intermediary index, i.e. the potential trade diversion indices of the reporting country with respect to a single partner country. To obtain the potential trade diversion index for the reporting country vis-à-vis a group of partner countries, we can calculate it as a weighted average, the weights being the countries' trade shares. This way we calculate the EU15 individual country's indices in relation to the CEECs; and the individual CEE country's indices with respect to the group of CEECs and the EU15:

[21] In the Standard International Trade Classification (SITC), categories range from 0 to 9. In the International Standard Industrial Classification (ISIC), categories range from 01 to 40.

$$TD_{EU15} = \sum_{CEEC} TD_{CEEC} * T_{CEEC} / \sum_{CEEC} T_{CEEC}$$

$$TD_{CEEC} = \sum_{EU25, EU25 \neq CEEC} TD_{EU25} * T_{EU25} / \sum_{EU25, EU25 \neq CEEC} T_{EU25}$$

Where EU15 stands for a country in the group of EU15 (the **existing** EU member), CEEC stands for a country in the group of CEECs (the **new** EU member), and EU25 stands for a country in the larger group of EU15 plus CEECs.Thus, TD_{EU15} is the index of potential trade diversion of a EU15 country to the CEECs' group. TD_{CEEC} is the individual CEE country index of potential trade diversion to the EU25 group but itself. $T / \sum T$ is the share of the country total's trade in its group, i. e. the weight of each country's compatibility index.

The reason for including the group of the CEECs in the calculation of the individual CEE country's indices is justified, although the Europe Agreements did not have an interregional component. As the purpose is to proxy the effect of enlargement, intra-CEEC trade integration that will occur with the enlargement should be accounted for. Moreover, in parallel with the bilateral Europe Agreement, regional integration occurred among the CEECs through two main sub-regional groupings: the CEFTA and the Baltic FTA.

The trade creation potential (TC) and export compatibility (EC) indices have a similar structure to the trade diversion potential index. The variable m_{ij} in the TD's formula is replaced by q_{ij} in the TC's and by x_{ij} in the EC's. The indices become:

$$TC_{jk} = 1 - \frac{\sum_i |q_{ij} - x_{ik}|}{2} \qquad EC_{jk} = 1 - \frac{\sum_i |x_{ij} - x_{ik}|}{2}$$

q_{ij} is the share of production of product i in the country's total production, whereas x_{ij} is the share of exports of product i in the country's total exports.

The index of potential trade creation measures the similarity of the reporter country's production structure with the partner country's export structure. A high compatibility (close to one) indicates a large potential of replacement of domestic production with exports from the partner and vice versa. The presence of this index serves to isolate from TD other structural changes within the EU25 leading to trade creation. Otherwise, it could be argued that TD will capture not only trade diversion but also trade creation.

The export compatibility index, serves to verify the correctness of the potential trade creation index. High export compatibility shows that two countries have specialised in the export of the same goods, i. e. they have very similar export structures. In this case, the potential of replacing the local production with imports from the partner is very low. Following this reasoning, large export compatibility would prove wrong a high potential trade creation index.

In addition, we are concerned with the impact of domestic preferences on trade flows. A country is likely to find exporting markets in another country if it exports what the partner country's consumers are looking for. Damijan and Masten (2002) control for that by introducing the variable domestic consumption at product level in the gravity equation. Since we work at an aggregate level, we propose an index of supply-demand compatibility. Thus, CompSD is for the first time calculated on the model of the Michaely indices, and it measures to what extent Russian export structure matches the structure of the partner country's demand for imports (i.e. consumer preferences). In other words, if Russia exports what the partner country does not import, this should be regarded as a reduced demand factor and not as trade diversion. Its formula is the following:

$$CompSD_{jk} = 1 - \frac{\sum_i \left| x_{ji} - m_{ki} \right|}{2},$$

where j is Russia in our case, k the partner country and i the commodity. x and m are shares of exports and imports of commodity i in total category by country and by trade flow. The CompSD indices are thus calculated first per category and then per total by weighting them with their shares in total importing country's imports.

Recalling the advantages of using the indices in this way, one can use the indices in a proper specification of the gravity equation, where bilateral (importer-exporter) effects are controlled for. There is no risk that the indices will be included in the bilateral effects, since they vary in both the cross sectional and the time dimensions. Thus, the estimated coefficients of the indices will be unbiased, since all kinds of heterogeneity are controlled for. Last but not least, endogeneity of the indices is minimal in this context. The dependent variable is Russia's exports to EU25 individual countries. The calculation of the indices is broader, based on the individual country's imports and exports from and to the world.

In this exercise, the interest is merely focused on the potential trade diversion index, since the potential trade creation and export compatibility indices are secondary, serving the purpose of the former. As a measure of potential trade diversion per se, TD becomes a tangible measure of trade diversion in the gravity equation if proven to be significant. If insignificant, this is evidence for the fact that potential trade diversion did not "transform" into real trade diversion. The sign of TD is expected to be negative, since trade diversion is diminishing Russian trade flows to the enlarged EU.

The model uses a panel data series of 24 countries: 14 old EU members[22] and 10 new EU members often referred to as CEECs. The CEECs are the first wave (2004) Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia; and the second wave (2007) Bulgaria and Romania. The time dimension varies according to data availability, since not all the variables span the whole time range 1993-2004. The length of the sample is first restricted by data limitations concerning the dependent variable. Then, limited data on production define the upper limit of the operational sample to 2001.

- Exp_{jt}, the exports of Russia to country j, are expressed in constant US Dollars. In the paper, two cases are considered: the total exports on the one hand, and the total exports without

[22] Due to data availability, Belgium and Luxembourg are considered one country. The two countries used to form a monetary union before 1999, reason why their trade data has been also reported together.

mineral fuels on the other hand. The purpose is to check whether the fuels, which account for the largest part of Russia's exports, display a different pattern.

However, one has to face several trade-offs, due to data availability. Russia's aggregate exports are available since 1992 at the IMF/DOTS. However, disaggregated exports and particularly exports of fuels, are not available at the IMF/DOTS. They are provided by COMTRADE, but in COMTRADE database Russian exports are reported only since 1996. Thus, one can either consider total exports in the longest sample (IMF/DOTS) or exports without fuels in a shorter sample (COMTRADE).

Total exports from IMF/DOTS are expressed in 1992 US Dollars. Exports without fuels are derived from Russia's current US dollars exports free on board (World Integrated Trade Solution-COMTRADE) divided by the Russian export deflator-1995 basis. Export deflators are based on data collected from the World Development Indicators, in both cases.

Since data for aggregate Russian exports is available from 1993 until 2001, 196 observations are available. When considering exports without fuels, we have data for 6 years, from 1996 when first export data for Russia becomes available to 2001, so a total number of 144 observations. We start from 1993 rather than 1992, because in 1992, there is still data missing for several variables.

- GDP_{jt}, the Gross Domestic Product of country j at time t is expressed in 1992/1995 (depending on the chosen dependent variable) US dollars and is taken from the World Development Indicators database.
- Pop_{jt}, population of country j at time t comes from World Development Indicators database.
- RER_{jt}, real exchange rate of the Rouble with respect to country j's currency is expressed in foreign currency per Rouble. It is calculated as an index, reported to the baseline year 1992, 1995 respectively.

$$RER_t = \frac{NER_t}{NER_{1992/1995}} * \frac{GDPDeflatorbasis_t}{GDPDeflatorbasis_t*}.$$

- Annual average bilateral nominal exchange rates (NER) are taken either from EUROSTAT or IFS. GDP deflators are calculated with GDP variables expressed in local currencies; * represents the foreign country.
- TD_{jt}, TC_{jt}, EC_{jt} are potential trade diversion, creation and export compatibility indices of country j at time t.
- Production data, required for the calculation of the trade creation indices, has been extracted from the CEPII trade and production database. Since production data is under the ISIC classification (ISIC rev 2 in CEPII database), trade flows had to be expressed under the same system of classification.

Obviously, the level of data aggregation is essential for the calculations of all the indices. To a large extent, one-digit data treats differentiated goods as substitutes, which explains the large values of the potential trade diversion indices. Therefore, the more disaggregate the data is, the more accurate the values calculated for the potential trade diversion indices are. Table 2 illustrates the importance in the calculations of the appropriate aggregation level.

Table 2. Aggregate indices of potential trade diversion - calculated with data at 1 and 4 digit level

	1995		1996		1997	
	4digit	1digit	4digit	1digit	4digit	1digit
Austria	0.51	0.80	0.52	0.82	0.53	0.82
Belgium-Luxembourg	0.44	0.81	0.44	0.81	0.46	0.80
Denmark	0.44	0.78	0.43	0.80	0.47	0.81
Finland	0.44	0.74	0.44	0.74	0.45	0.76
France	0.46	0.78	0.47	0.80	0.47	0.80
Germany	0.45	0.79	0.45	0.81	0.45	0.79
Greece	0.45	0.80	0.45	0.81	0.46	0.80
Ireland	0.36	0.68	0.37	0.69	0.39	0.72
Italy	0.42	0.77	0.42	0.78	0.43	0.76
Netherlands	0.45	0.78	0.44	0.79	0.44	0.79
Portugal	0.44	0.79	0.44	0.80	0.46	0.80
Spain	0.44	0.75	0.44	0.76	0.45	0.77
Sweden	0.45	0.76	0.45	0.78	0.46	0.79
United Kingdom	0.45	0.76	0.45	0.78	0.47	0.79

Source: Own calculations with WITS data, SITC 3

Still, TC cannot be calculated at four-digit level due to limited data on production. Since CEPII and UNIDO were found to be the only databases containing data on production, CEPII was chosen as it contained less missing values. But CEPII data is available only at three-digit level. Moreover, production data contains only 26 categories, less than traded goods. These required recalculation of the potential trade diversion and export compatibility indices, with the same 26 categories, to ensure they are compatible and comparable with the potential trade creation indices. The correlation between the recalculated TD indices and the previous ones, accounting for the whole trade: 0.75 (oil excluded) and 0.72 (oil included), is high enough to consider them interchangeably. All in all, for reasons of compatibility, we use the newly calculated trio of indices in our regressions (table 3).

Table 3. Aggregate indices of potential trade diversion calculated with data at 3-digit level for only 26 categories

TD country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Austria	0.68	0.71	0.7	0.73	0.74	0.76	0.78	0.77	0.76	0.77
Belgium-Luxembourg	0.71	0.71	0.69	0.71	0.7	0.7	0.71	0.7	0.68	0.69
Bulgaria	0.73	na	na	na	0.72	0.7	0.72	0.76	0.74	0.75
Czech Republic	na	0.78	0.78	0.79	0.79	0.79	0.78	0.79	0.78	0.77
Denmark	0.73	0.74	0.73	0.75	0.75	0.76	0.77	0.75	0.74	0.75
Estonia	na	na	na	0.73	0.73	0.76	0.73	0.72	0.7	0.72
Finland	0.7	0.68	0.68	0.7	0.7	0.71	0.73	0.73	0.71	0.72
France	0.72	0.72	0.71	0.73	0.73	0.75	0.76	0.75	0.75	0.75
Germany	0.73	0.75	0.74	0.75	0.76	0.77	0.78	0.77	0.76	0.76
Greece	0.69	0.71	0.72	0.73	0.74	0.75	0.76	0.75	0.74	0.74
Hungary	0.76	0.79	0.78	0.77	0.76	0.75	0.75	0.74	0.73	0.72
Ireland	0.68	0.65	0.64	0.64	0.64	0.65	0.65	0.66	0.65	0.63
Italy	0.72	0.72	0.72	0.74	0.74	0.74	0.74	0.74	0.73	0.73

Latvia	na	na	0.68	0.71	0.69	0.74	0.75	0.74	0.72	0.74
Lithuania	0.61	na	0.64	0.74	0.76	0.76	0.77	0.74	0.74	0.77
Netherlands	0.73	0.74	0.72	0.73	0.72	0.72	0.72	0.71	0.7	0.69
Poland	0.76	0.77	0.76	0.77	0.79	0.79	0.8	0.8	0.79	0.78
Portugal	0.67	0.71	0.69	0.72	0.71	0.73	0.76	0.76	0.76	0.77
Romania	0.73	0.75	0.75	0.73	0.73	0.71	0.71	0.69	0.7	0.7
Slovakia	0.76	0.79	0.78	0.79	0.82	0.81	0.82	0.81	0.8	0.8
Slovenia	na	na	0.78	0.79	0.78	0.77	0.78	0.78	0.76	0.75
Spain	0.69	0.7	0.68	0.7	0.7	0.72	0.74	0.74	0.74	0.75
Sweden	0.71	0.71	0.7	0.7	0.71	0.72	0.74	0.72	0.73	0.74
United Kingdom	0.68	0.68	0.66	0.68	0.69	0.7	0.74	0.74	0.73	0.74

Source: Own calculations with WITS trade data under ISIC revision 2

A low ascendant trend in TD is noticed for most of the countries, those calculated at the beginning of the period are generally lower than those from the end of the period. Therefore, one can conclude that the CEECs' trade structures adjusted, becoming more compatible with the EU's. Put it differently, the CEECs have been importing more products similar to EU's exports, and have been increasing exports of products similar to EU's imports. Overall, it might mean that Russia has got less "room" to export to the enlarged EU markets.

Ireland is also eliminated since it is found to be an outlier (data in Annex 2). In 1997, a tremendous drop in Russian exports to Ireland (over 74 per cent) is reported. This renders the correlation between exports and GDP negative. The plummeting exports are caused by a fall in the exports of mineral fuels, which fell by more than 78 per cent from 1997 to 1998. Taking into account that in 1997 fuel exports represented over 91 per cent of the total exports, it becomes evident why their fall had such a large impact on total exports.

The mirror image of Russian exports to Ireland, i.e. Irish imports from Russia, show however a completely different situation. The latter equal only around 1.6 per cent of the former in 1996 and 11 per cent in 2004. The reason might be that Russia bills mineral fuels to Ireland that in reality do not reach Ireland, for taxation reasons. Thus, data proves unreliable and Ireland's elimination is justified.

For detailed information on the indices disaggregate by commodity, one may look at table 4. As expected, the potential trade diversion indices per category illustrate low potential trade diversion for low processed and labour intensive goods (categories 0 to 4), and larger potential trade diversion for highly processed and capital intensive goods (categories 5 to 8). Since fuels (category 3) form the bulk of Russia's exports, this is a first indication of low potential trade diversion from Russian aggregate exports.

Table 4. EU 15 disaggregate indices of potential trade diversion -calculated with data at four-digit level

Country	0 Food and live animals	1 Beverages and tobacco	2 Crude materials excepting food and fuels	3 Mineral fuel/ Lubricants	4 Animal, veg oil, fat, fax	5 Chemicals	6 Manufactured goods	7 Machinery and transport equipment	8 Miscellaneous
Austria	0.46	0.50	0.42	0.40	0.26	0.49	0.57	0.56	0.56
Belgium	0.44	0.53	0.40	0.29	0.29	0.47	0.44	0.53	0.54
Bulgaria	0.40	0.30	0.20	0.32	0.39	0.63	0.52	0.60	0.52
Cyprus	0.45	0.33	0.29	0.57	0.39	0.60	0.54	0.57	0.53
Czech Republic	0.50	0.44	0.37	0.50	0.46	0.64	0.65	0.62	0.64
Denmark	0.39	0.38	0.44	0.25	0.22	0.50	0.55	0.49	0.55
Estonia	0.48	0.54	0.32	0.33	0.41	0.54	0.57	0.55	0.62
Finland	0.41	0.44	0.28	0.30	0.21	0.50	0.53	0.50	0.51
France	0.43	0.55	0.36	0.22	0.25	0.49	0.55	0.51	0.53
Germany	0.45	0.48	0.35	0.24	0.23	0.49	0.56	0.52	0.57
Greece	0.43	0.43	0.43	0.22	0.29	0.51	0.51	0.49	0.49
Hungary	0.42	0.35	0.41	0.35	0.38	0.68	0.62	0.55	0.61
Ireland	0.43	0.50	0.39	0.38	0.27	0.46	0.53	0.36	0.46
Italy	0.40	0.51	0.40	0.24	0.12	0.50	0.50	0.51	0.48
Latvia	0.47	0.53	0.34	0.35	0.41	0.55	0.57	0.57	0.58
Lithuania	0.44	0.46	0.32	0.42	0.44	0.56	0.56	0.59	0.61
Malta	0.53	0.47	0.30	0.43	0.48	0.57	0.51	0.36	0.56
Netherlands	0.46	0.48	0.36	0.25	0.25	0.49	0.55	0.45	0.50
Poland	0.43	0.33	0.35	0.48	0.41	0.66	0.63	0.63	0.62
Portugal	0.38	0.46	0.29	0.22	0.20	0.52	0.50	0.53	0.51
Romania	0.43	0.33	0.22	0.41	0.37	0.63	0.45	0.54	0.50
Slovak Republic	0.50	0.49	0.33	0.39	0.47	0.64	0.62	0.59	0.61
Slovenia	0.53	0.45	0.42	0.52	0.44	0.66	0.62	0.64	0.63
Spain	0.39	0.41	0.38	0.21	0.23	0.51	0.53	0.53	0.47
Sweden	0.42	0.50	0.38	0.28	0.25	0.49	0.52	0.52	0.52
United Kingdom	0.44	0.45	0.36	0.33	0.25	0.50	0.48	0.50	0.48

Source: Own calculations with WITS data, SITC 3

The indices are calculated as average values for the period 1995-2003.

5. Estimation results

The estimation of a dynamic panel data model is confronted initially with the fact that even after first-differencing aimed at eliminating the fixed effects, the lagged dependent variable as well as the predetermined explanatory variables, in differences, become endogenous. Arellano and Bond (1991) propose a GMM estimator that instruments them with lags of their own levels. As it estimates a system of differenced equations, this Arellano-Bond estimator has been called the “difference estimator”. However, lags are often weak instruments, especially for highly persistent variables. Therefore, the original Arellano-Bond estimator is biased in finite samples.

To overcome the weak instruments limitation, Arellano and Bover (1995) propose the addition of level equations in which the predetermined and endogenous variables are instrumented with their first differences. Known as the “system estimator”, this augmented estimator is fully developed in Blundell and Bond (1998). Both the difference and the system estimators can be computed in one or two steps. The one-step estimator has been preferred to the two-step estimator which besides “modest efficiency gains (…) even in the presence of heteroskedasticity”, renders the asymptotic standard errors too small or the asymptotic t-ratios too big (Bond, 2002). Furthermore, Windmeijer (2000) rehabilitates the two-step estimator by proposing a finite-sample correction for its asymptotic variance. Based on these findings, we use the two-step "system estimator". The estimations[23] are presented in table 5.

The Hansen test for overidentifying restrictions gives support to the null hypothesis of valid additional moment conditions. First order autocorrelation is expected, since this is equivalent to the initial assumption of no serial correlation in the idiosyncratic residuals. Our results confirm the existence of first order autocorrelation in first differences. At the same time, no higher order autocorrelation is expected, since that would mean the instruments are still endogenous. Consequently, new instruments would be required, often at the cost of weakening the explanatory power.

Since in specification (5) the Arellano-Bond test m2 accepts the null hypothesis of no second order autocorrelation at a too low level, we consider employing second and third order lags as instruments for the lagged dependent variable (specifications (7) and (8)). The results change slightly because these lags are weaker instruments, but they remain in line with our previous findings (pattern and signs).

Estimations from (1) to (6) display a similar pattern and results do not show high variations. The lagged dependent variable is very significant (at 1 per cent), varying from 0.68 to 0.89. This proves right our theoretical assumptions, namely that there is a high inertia in trade flows. Thus, ceteris paribus, to a 1% per cent exports in the past corresponds on average 0.68-0.89% higher current exports. The coefficient is even higher for exports including fuels than for exports excluding fuels. This might be the effect of larger sunk costs for oil exports, where specific infrastructure is needed, such as pipelines to transport the fuels to the destination countries.

The coefficient of GDP displays the correct sign, and it is significant at 5 or 10 per cent in 3 out of 4 cases in the specification with oil. It proves to be rather low in the short run, but it is becoming larger in the long run as calculated shortly. When we introduce population, due to high correlation with the GDP (0.80), the GDP's coefficients are no longer reliable. Since population is not significant, we decide to eliminate it.

As expected, the coefficient of the real exchange rate is negative, confirming the fact that an appreciation of the Rouble affects negatively the competitiveness of Russian exports. It is higher and significant for the total exports specification, which is however unexpected. This might be due to the way the RER variable is calculated: the GDP deflators incorporate also mineral fuels, and therefore the RER is not such a good proxy for net-of-oil exports' competitiveness.

The variable of interest, TD, displays an expected negative coefficient in all but one of the cases, and it is always insignificant. This does not change when we consider exports without fuels, which may be more appropriate, since trade diversion, if any, is not expected to occur in energy exports.

[23] We use alternatively exports without mineral fuels and total exports as dependent variable. In addition, on data availability considerations, we use two data samples: IMF/DOTS and COMTRADE (WITS).

Table 5. Two-*step system GMM estimations*

	Exports without oil WITS sample		Exports with oil WITS sample		Exports with oil IMF sample		Exports with oil-further lags IMF sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lag1LExp	0.683	0.727	0.839	0.892	0.829	0.785	0.909	0.862
	(5.37)**	(4.95)**	(11.41)**	(11.17)**	(14.15)**	(10.32)**	(15.91)**	(14.13)**
LGDP	0.080	0.082	0.063	0.064	0.086	0.084	0.038	0.050
	(1.58)	(1.52)	(1.81)$^{+}$	(1.53)	(1.82)$^{+}$	(2.21)*	(1.11)	(1.56)
LRER	-0.195	-0.083	-0.310	-0.235	-0.280	-0.248	-0.198	-0.210
	(1.30)	(0.41)	(3.78)**	(3.27)**	(1.92)	(3.58)**	(1.42)	(2.91)**
LTC	0.132	0.110	-0.082	-0.040	0.224	0.144	0.268	0.208
	(0.43)	(0.42)	(0.59)	(0.24)	(1.41)	(0.77)	(2.61)**	(1.50)
LTD	-1.001	-0.824	-0.515	-0.176	0.196	-1.475	-0.251	-1.332
	(0.54)	(0.42)	(0.40)	(0.16)	(0.12)	(0.85)	(0.17)	(0.81)
LEC	-1.006	-0.891	-0.318	-0.412	-0.487	-0.332	-0.407	-0.331
	(1.87)	(1.75)	(0.94)	(0.92)	(0.95)	(0.69)	(1.11)	(0.88)
lcompSD		-0.079	0.856		1.129		0.620	
		(0.09)	(2.19)*		(2.53)*		(1.64)	
Constant	3.676	2.804	2.343	0.493	3.119	2.583	1.898	1.764
	(1.57)	(1.09)	(1.41)	(0.43)	(2.03)*	(1.32)	(1.54)	(1.29)
Observations	95	93	93	95	114	161	114	161
Number of country	23	23	23	23	23	23	23	23
Hansen χ^2	14.30 (0.282)	19.42 (0.079)	17.26 (0.140)	17.13 (0.145)	19.91 (0.338)	20.45 (0.671)	19.90 (0.279)	19.66 (0.604)
m1	-2.21 (0.027)	-2.19 (0.028)	-2.05 (0.041)	-1.75 (0.081)	-2.16 (0.031)	-2.76 (0.006)	-1.86 (0.063)	-2.84 (0.004)
m2	0.19 (0.849)	0.23 (0.819)	-0.59 (0.556)	-0.84 (0.400)	-1.74 (0.082)	-0.91 (0.363)	-1.93 (0.054)	-0.98 (0.329)

t statistics in parentheses

** significant at 1% ; * significant at 5%; $^{+}$ significant at 10%

Hansen χ^2 is a test for overidentifying restrictions, p-values are reported in parentheses

m1 and m2 are Arellano-Bond tests for AR(1) and AR(2) in first differences- p-values in parentheses.

We thus found that trade diversion did not occur for aggregate (with or without fuels) export flows coming from Russia into the EU. However, trade diversion at a product level is not excluded, but this does not constitute the object of our research.

Neither do TC and EC show significant coefficients in any of the specifications. Their signs, however, are of no direct interest as their purpose is just to isolate trade creation. We did not expect that trade creation influenced Russian exports to the EU25 in any particular, positively or negatively.

The index of compatibility between imports and exports, which is a way to account for consumers' import preferences, is significant at 5 per cent in the specification of exports including fuels. However, in the specification without fuels it is not significant. This indicates that Russia exports what the EU25 countries import, which is principally mineral fuels.

By now, we have reported the short run coefficients estimates. To calculate the long term coefficients, we divide the coefficient of the explanatory variable by 1 minus the coefficient of the lagged dependent variable.[24] As expected, the results reported in table 6 show much higher impact of the variables in the long term.

Table 6. Long run coefficients of several explanatory variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
β_{GDP}	0.25	0.30	0.39	0.59	0.50	0.39	0.42	0.36
se	**0.16**	**0.20**	**0.22**	**0.39**	**0.28**	**0.18**	**0.38**	**0.23**
β_{RER}	-0.62	-0.30	-1.93	-2.18	-1.64	-1.15	-2.18	-1.52
se	**0.47**	**0.74**	**0.51**	**0.66**	**0.85**	**0.32**	**1.53**	**0.52**
β_{TD}	-3.16	-3.02	-3.20	-1.63	1.15	-6.86	-2.76	-9.65
se	**5.86**	**7.24**	**8.02**	**10.21**	**9.89**	**8.11**	**16.05**	**11.95**
β_{compSD}	0.00	-0.29	5.32	0.00	6.60	0.00	6.81	0.00
se		**3.36**	**2.42**		**2.61**		**4.15**	

Calculations based on the coefficients in table 5.

If we consider A as being the initial gap between the equilibrium trade flows Y* and the initial trade flows Y_0, the gap at time t would be $Y_t - Y^* = A(1-\beta_{\text{GDP short run}})^t$. The time it takes for the gap to halve (i.e. $Y_t - Y^* = 1/2$), appears to be approximately 6.5 years (where $\beta_{\text{GDP short run}} \cong 0.1$ from

[24] The calculations are based on equation 9: $Y_t = \beta_1\lambda + \beta_2\lambda X'_t + (1-\lambda)Y_{t-1} + \lambda u_t$. To obtain the long run coefficient β_2, we need to divide the short run coefficient $\beta_2\lambda$ to λ. λ is 1 minus the coefficient of the lagged dependent variable $(1-\lambda)$.The standard error of the long run coefficient is calculated according to the Delta method (Beyene and Moineddin, 2005), as a square root of:

$$V\left(\frac{a}{1-b}\right) = \begin{bmatrix} \frac{1}{1-b} & \frac{a}{(1-b)^2} \end{bmatrix} \begin{bmatrix} \sigma_a^2 & \sigma_{ab} \\ \sigma_{ab} & \sigma_b^2 \end{bmatrix} \begin{bmatrix} \frac{1}{1-b} \\ \frac{a}{(1-b)^2} \end{bmatrix}$$

, where a= $1-\lambda$ and b= $\beta_2\lambda$.

table 4). This confirms once more the choice of a PAM, since trade flows are found to be extremely sluggish.

Furthermore, we provide additional empirical support for the use of dynamic over static panel data in our exercise. Supposing that our model is described by a static panel data setting, we have specified and estimated it as such (equation 5). A Hausman test in our exercise rejects the RE estimator. Therefore, we opt for a FE and then a HT model to estimate equation 5. Nevertheless, the FE and the HT estimators are no longer efficient since we find autocorrelation in the residuals.

The presence of autocorrelation in the residuals constitutes a first indication that the model is not well specified. Spanos and McGuirk (2003) show that correcting for it in a Linear Regression Model imposes "highly unrealistic restrictions and produces inconsistent estimates". Instead of a common practice of "autocorrelation correct", Mizon (1995) suggests "a general-to-specific" modelling process. Under this reasoning, since the residuals in our static model display autocorrelation[25], this can be taken as a first warning of omitted autoregressive explanatory variable, or more generally a dynamic misspecification. De Grauwe and Skudenly (1999) mention that "the lagged dependent variable catches up some of the effect of omitted variables varying over time, so that it helps to correct for autocorrelation." Thus, autocorrelation in the residuals becomes another valuable empirical argument that dynamic panel data specification models best the data.

6. Conclusions

One can conclude that there has been no trade diversion in the advent of the EU enlargement to 10 CEECs, as proxied by the EAs and the other regional integration agreements between the CEECs since early 90s. Thus, the increase in EU15-CEECs trade flows has not taken place at the expense of trade with Russia. The results refer to aggregate trade flows, and further research might be undertaken if one is interested in trade diversion at a product level.

The method proposed can be used to analyse the impact of any Preferential Trade Agreement on third countries. In brief, it consists of testing for the significance of the potential trade diversion in a correctly specified gravity equation. Besides the potential index of trade diversion, two other Michaely indices are introduced, in order to control separately for trade creation. A first advantage of the method is that it provides a concrete measure for potential trade diversion. Potential turns into realised trade diversion when the TD index becomes significant. Second, the indices are not incorporated in the bilateral importer-exporter effects, and hence they can be estimated as such in a fixed effects model. And third, there is a very low risk of endogeneity. The indices are calculated with EU member states' trade flows to the world, while the dependent variable is Russian exports to individual EU countries.

A properly specified gravity equation is of major importance. A before-after exercise in a cross sectional specification is misspecified and has too few degrees of freedom. Hence, analysis of trade flows is improved when using a static panel two-way FE model. However, short and long run effects can be properly captured only in a dynamic panel model. Since the trade flows are analysed

[25] We applied a simple test for autocorrelation in panel data, as developed by Wooldridge (2002, 282-283) -xtserial command in Stata.

in a transition period, a partial adjustment model (PAM) is the theoretically appropriate interpretation of the dynamic specification. In a PAM, one can capture the adjustment towards equilibrium trade flows, equilibrium itself in motion.
The results confirmed the theory that Russian exports to the EU25 are very resilient and thus the choice of a PAM. Additionally, econometric considerations also support the use of the dynamic model. In the static panel framework, first order autocorrelation in the residuals, which points to a dynamic miss-specification, is identified. The risk of an omitted variable bias is also reduced to a minimum, because the lagged dependent variable already captures an important part of the omitted variables.
It is a fact that Russian exports of fuels increased whereas exports of processed goods are at best stagnating. Since this is not due to trade diversion induced by the EU enlargement, other factors may be responsible for low levels of Russian exports.

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Annex 1.

Table 1. EU and CEEC MFN tariff rates applied to Russia's exports

Tariff Year	Simple Average		Weighted Average		Standard Deviation		Maximum Rate		Nbr of Total Lines		Imports Value	
	CEEC	*EU*	*CEEC*	*EU*	*CEEC*	*EU*	*CEEC*	*EU*	*CEEC*	*EU*	*CEEC*	*EU*
1991	9.1		2.16		8.35		100		416		1439965	
1992	9.1	6.52	2.16	3.24	8.35	5.68	100	42	416	4644	1439965	8649829
1993	9.35	6.6	2.94	2.54	8.57	5.41	80	90	1451	5640	1673017	14523259
1994	na	6.56	na	2.38	na	5.28	na	90	na	5946	na	18088706
1995	1.96	6.04	1.67	2.32	6.16	5.56	50	180	10095	6399	3432040.7	23357790
1996	5.32	5.14	1.4	1.81	16.68	5.36	369.3	103	9446	10242	7034305.7	23795643
1997	3.82	5.14	1.18	1.72	14.67	4.94	205	79.2	11760	9678	6304754.2	25330040
1998	12.2	4.6	2.35	1.76	26.89	4.94	318.7	68.4	1099	8351	2358024	21175170
1999	8.71	4.49	1.63	1.36	9.18	5.31	111.7	88.9	5747	12772	4911382.9	31212252
2000	2.69	4.3	1.38	1.17	8.86	5.1	70	74.9	5313	10989	5317568.2	47464893
2001	4.79	4.33	1.57	1.36	9.4	4.85	102	57.6	13496	10794	7125582.6	46975155
2002	4.8	4.58	1.86	1.31	9.58	5.47	160	74.9	16816	11700	13114392	49414840
2003	3.65	4.31	0.93	1.12	7.82	5.29	102	74.9	15743	12030	11146780	65027502
2004	9.75		1.92		9.42		98		3677		2510022.6	

Source: TRAINS

Table 2. EU MFN tariff rates applied to CEECs' exports

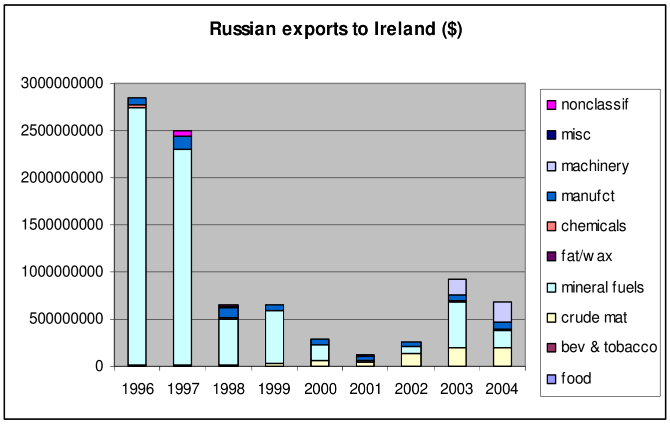
Tariff Year	Simple Average	Weighted Average	Standard Deviation	Maximum Rate	Nbr of Total Lines	Nbr of Domestic Peaks	Nbr of International Peaks	Imports Value
1990	8.33	8.25	7.27	117	7936	124	1432	12814782
1991	7.11	7.41	6.1	117	8262	227	585	14579469
1992	7.15	7.61	6.13	117	8750	196	645	20336741
1993	6.99	7.42	5.81	90	9145	175	598	28105721
1994	7.05	7.17	6.25	117	9367	213	663	36624469
1995	6.32	6.33	5.82	180	9461	209	466	57256805
1996	5.52	5.79	5.72	103	15115	337	887	59105297
1997	5.61	5.82	5.68	103	15199	357	916	63555038
1998	5.02	5.43	5.53	88.9	13547	446	720	75157775
1999	4.79	6.63	5.72	88.9	12037	445	560	9159455
2000	4.52	6.18	5.22	74.9	10233	409	431	10578883
2001	4.47	6.46	4.89	74.9	10239	282	352	12306301
2002	4.68	6.76	5.42	74.9	11920	379	591	14178521
2003	4.45	6.42	5.21	57.6	12038	414	547	18297052

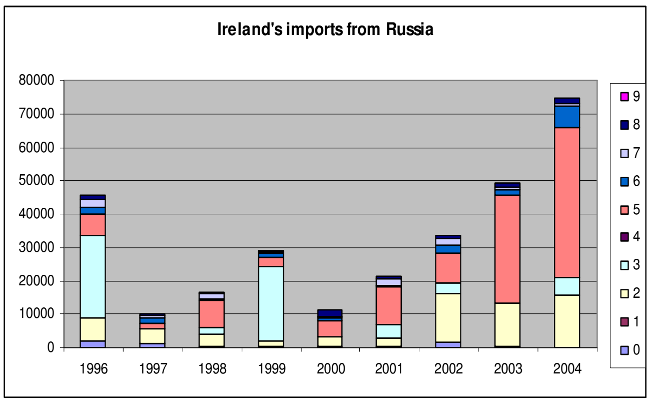
Source: TRAINS

Annex 2.

Ireland's imports from Russia (imp) and Russia's exports to Ireland (exp) in USD

imp	1996	1997	1998	1999	2000	2001	2002	2003	2004
0	1825232	1052854	485325	437908	443141	165442	1684097	255445	14928
1	11092	60038	55699	51968	60013	71362	54688	71146	39199
2	6899141	4628887	3297693	1390872	2565691	2645722	14476411	13089482	15829996
3	24804824	0	2097316	22166832	71631	4141012	3211494	0	5099856
4	0	0	0	3781	0	2070	0	0	0
5	6576026	1602794	8046485	3186783	5005772	11175153	8866177	32406840	44912662
6	2057288	1676903	738200	1094175	659038	393167	2550858	1509383	6306632
7	2311711	693892	1440443	473326	448360	1915094	1707227	905781	881932
8	1261733	361987	494033	322077	1936745	943854	936915	1246374	1644487
9	38118	0	0	0	2288	1034	2852	0	801
	45785165	10077355	16655194	29127722	11192679	21453910	33490719	49484451	74730493
exp	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
0	1663043	3520287	107913	46641	124615	685351	2001751	138128	91069
1	2856889	0	50039	26608	0	20453	5850	4491	0
2	13128423	13203503	15914237	29416000	53590600	51937892	133375904	193048448	198205749
3	**2719828480**	**2,281E+09**	**484369440**	**559632088**	**166646496**	**1870723**	**70263360**	**489727904**	**185625045**
4	0	0	0	0	0	1590	0	0	0
5	30776424	3963525	7501329	680242	1548284	5966967	4135171	17415498	13580210
6	74355720	139215920	107020472	54883121	61845724	45763456	47329524	53749188	65860704
7	5942453	900356	27875556	493387	1063864	7087484	2274830	169904544	213244635
8	574641	597526	223876	45228	3611937	2734412	533566	553726	1432588
9	0	57247280	1020894	12998863	0	0		0	0
	2,849E+09	2,499E+09	644083756	658222178	288431520	116068328	259919956	924541927	678040000
imp/ exp (%)	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
0	109,75%	29,91%	449,74%	938,89%	355,61%	24,14%	84,13%	184,93%	16,39%
1	0,39%	na	111,31%	195,31%	na	348,91%	934,84%	1584,19%	na
2	52,55%	35,06%	20,72%	4,73%	4,79%	5,09%	10,85%	6,78%	7,99%
3	0,91%	0,00%	0,43%	3,96%	0,04%	221,36%	4,57%	0,00%	2,75%
4	na	na	na	na	na	130,19%	na	na	na
5	21,37%	40,44%	107,27%	468,48%	323,31%	187,28%	214,41%	186,08%	330,72%
6	2,77%	1,20%	0,69%	1,99%	1,07%	0,86%	5,39%	2,81%	9,58%
7	38,90%	77,07%	5,17%	95,93%	42,14%	27,02%	75,05%	0,53%	0,41%
8	219,57%	60,58%	220,67%	712,12%	53,62%	34,52%	175,59%	225,09%	114,79%
9	na	0,00%	0,00%	0,00%	na	na	na	na	na
	1,61%	0,40%	2,59%	4,43%	3,88%	18,48%	12,89%	5,35%	11,02%


Russian exports to Ireland ($)
3000000000
2500000000
2000000000
1500000000
1000000000
500000000
0
1996 1997 1998 1999 2000 2001 2002 2003 2004
nonclassif
misc
machinery
manufct
chemicals
fat/w ax
mineral fuels
crude mat
bev & tobacco
food


Ireland's imports from Russia
80000
70000
60000
50000
40000
30000
20000
10000
0
1996 1997 1998 1999 2000 2001 2002 2003 2004
9
8
7
6
5
4
3
2
1
0


Exports/Imports aggeg Russia/Ireland
3000000000
2500000000
2000000000
1500000000
1000000000
500000000
0
1996 1997 1998 1999 2000 2001 2002 2003 2004
exports
imports


Exports/Imports of oil Russia/Ireland
3000000000
2500000000
2000000000
1500000000
1000000000
500000000
0
1996 1997 1998 1999 2000 2001 2002 2003 2004
exp
imp