How much borders matter? Trade effect of EU accession

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Abstract

As international trade research documents the existence of national borders act as an important trade barrier. Their existence may divert trade through several channels, such as certain non-tariff barriers, different technical requirements, lengthy customs control procedures, and all the related administrative burden. The entering of the eight Central and Eastern European countries into the EU in 2004 provides a case for natural experiment to identify the effects of such trade costs. For a major subset of manufactured products trade was already tariff-free within the pan-European zone at the time of accession. Nevertheless, a considerable increase in bilateral exports can be observed from raw data, especially in trade among CEEC's. This paper documents stylized facts on export flows broken down to both the extensive and intensive margin and shows that trade creation occurred mostly in the deepening of existing trade relationships. Then, an aggregate gravity estimation is performed. For the baseline estimations huge accession effects are found: exports among CEEC's were up by 60% and exports from CEEC's to EU15 by 30-40%. After better accounting for the time-varying unobserved heterogeneity in a model with country-specific year dummies, the trade effect still remains sizeable and significant for exports among CEEC's.

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1 Introduction

As international trade research documents, the existence of national borders acts as an important trade barrier. Even for free trade areas with strong economic integration, trade within a nation is larger than trade across borders. Anderson and van Wincoop (2003) found that trade among Canadian provinces was by a factor of 6 larger than trade across the US border. Chen (2004) on European Union data found similar border effect: despite the close integration inside the EU, intra-national trade is on average around 6 times larger than international trade. The existence of trade-diverting borders and the mechanism through which they work is therefore still in the focus of international trade research and policy-related analysis.

The mechanism through which the "border effect" works is still in the focus of international trade research and policy-related analysis. Apart from tariffs, the existence of national borders may divert trade through several channels, such as certain non-tariff barriers, different technical requirements, lengthy customs control procedures, and all the related administrative burdens. Such costs can affect trade not only through a direct channel, but also indirectly through the endogenous location of industries: industries agglomerate to reduce trade costs, which in turn causes an increase in intra-national relative to international trade.

The entering of the eight Central and Eastern European countries (CEEC's: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) into the EU in 2004 provides a reasonably good case for natural experiment to identify the trade effect of such trade costs. Within the Pan-European Free Trade Zone (consisting of EU, EFTA, CEFTA and the Baltic FTA) a major subset of manufactured products was already traded tariff-free and rules of origin were harmonized in all bilateral relations several years before the accession. Any trade effect that can be observed for this set of manufactures after accession therefore can entirely be attributed to trade costs other than tariffs or restrictive rules of origin. More specifically, the measured effect must be the result of the elimination of customs control procedures (lengthy waiting hours at borders and burdensome documentation) and the final elimination or harmonization of some non-tariff barriers and technical requirements.

The literature of the trade integration of NMS to the EU, to my knowledge, has

not yet provided evidence on the trade effects of EU accession. There have been many papers written on the effects of trade opening of the NMS markets during the 1990's and early 2000's, and numerous gravity studies estimated the current and potential level of trade integration.[1] Earlier EU accessions do not provide good cases for natural experiments. Several of the previous EU accessions occurred parrallel with explicit tariff reductions (Greece, Portugal, Spain). In contrast, the accession of Austria, Finland and Sweden in 1995 may serve as a useful case, since these countries' trade of manufactures was also already completely liberalized with the EU well before their EU entry. Breuss (2005) however notes that the possible effect of these countries' EU accession was completely masked by the parallel economic integration process of the Central and Eastern European countries to the EU.

On a detailed HS6 product-level European database of bilateral exports I report raw data stylized facts around the EU enlargement. Evidence is reported for a major subset of manufactures (excluding e.g. food products), for which free trade was already established. Raw data reflects an acceleration of bilateral export flows in all relationships which involved at least one CEEC after 2004. In particular, trade among CEEC's increased to a remarkable extent. A decomposition of growth to the intensive and extensive margins, as defined along with Besedes and Prusa (2006), reveals that, although growth was present on both margins, the major part of it occurred on the intensive margin, i.e. in the form of deepening existing trade relationships. Moreover, the phenomenon seems to be general across several manufacturing industries, although the exports of the group "Machinery and equipment" was affected the most.

Then an aggregate gravity analysis for the same subset of manufactures is carried out in the model framework of Anderson and van Wincoop (2003). The use of gravity estimation can control for business cycle and individual country effects as well as the trade effects of the change in third-country tariff rates of CEEC's. The gravity analysis also justifies the trade creating effect of accession. For the baseline model I find huge accession effects: exports among CEEC's were up by 60% and exports between CEEC's and EU15 countries by around 30-40% as a result of enlargement. In order to better control for the time-varying unobserved heterogeneity, I also estimate an alternative equation with country-specific time

[1] See Bussiére *et al.* (2005) and Herderschee and Qiao (2007) to mention only two of them.

dummies. In the modified estimation the trade effect still remains sizeable and significant for exports among CEEC's, although it looses significance in many of the cases for exports between CEEC's and EU15.

The remainder of the paper is as follows. Section 2 discusses some of the important details of NMS' trade integration to the EU. Section 3 presents the product-level dataset and basic stylized facts about the extensive and intensive margins both on aggregate and industry level. Section 4 introduces the gravity model and formulates the estimating equation. Then, the trade effect of EU accession is estimate within an aggregate gravity framework for a subset of manufactures and robustness checks are performed. Section 5 concludes.

2 The European trade liberalization process

If any trade effect of EU accession can be observed, that have to be associated with some decrease in the cost of international trade. Below I argue that it is very unlikely that such an effect came from tariff changes, since tariff rates of most manufactured goods (except mainly for foodstuff) had already been driven down to zero several years before accession. A possible EU effect may have rather come from the elimination of the remaining nontariff barriers, the final harmonization of technical requirements, as well as the reduced waiting hours for cargos crossing the borders.

2.1 A Free Trade Area with harmonized rules of origin

NMS have already gone through a massive trade liberalization prior to EU accession as a result of the Europe Agreements which were signed between the EU and each NMS in the first half of the 1990's. The Europe Agreements with the Czech Republic, Hungary, Poland and Slovakia entered into force in 1992, those with the three Baltic countries in 1995 and with Slovenia in 1997, and remained in force until the EU accession in 2004. With a specific phase-in period, the Europe Agreements granted mutual duty-free access for all nonagricultural products. Preferential treatment was however not completely symmetric, because the phase-in period was longer for NMSs than for EU countries.

Free trade of manufactures was also extended to bilateral trade between the NMS themselves by the formation of the Central European Free Trade Agreement (CEFTA) and the Baltic Free Trade Agreement (Baltic FTA). CEFTA was formed in 1993 by the Czech Republic, Hungary, Poland and Slovakia, which Slovenia joined in 1996. The Baltic FTA was established in 1994 by Estonia, Latvia and Lithuania. Finally, free trade among CEFTA countries and the Baltic states was established by several bilateral trade agreements which entered into force sequentially during the second half of the 1990's.[2] The two free trade areas and the bunch of free trade agreements basically extended the Europe Agreements to bilateral NMS trade.

A further step towards free trade was the establishment of the pan-European system of rules of origin with diagonal cumulation in 1997 across the whole region consisting of the EU, CEFTA, the Baltic FTA and EFTA. Within an FTA rules of origin ensure that third-country products cannot move freely between FTA members. This practice is necessary because in an FTA, as opposed to a customs union, third country tariffs are not harmonized and without rules of origin third country imports can reach any member of the FTA by entering the member country with the lowest level of extra-FTA trade protection. *Bilateral* rules of origin, which applied also in Europe before 1997, however can be very restrictive. They also prevent products originating from a third FTA member to freely move across two other FTA members' border, say e.g. a manufactured good with substantial Polish content to be exported from the Czech Republic to Germany duty-free. In contrast, *diagonal* cumulation allows for the cumulation of such intermediate contents across countries with parallel or overlapping FTAs.

Meanwhile trade of NMS with non-EU third countries was subject to individual national trade policies as long as in 2004 these countries had to apply the common external trade policy of the European Communities. Trade protection of most CEFTA members before EU accession was higher, that of the Baltic states was lower than the EU common external protection. In particular, as Table 6 in Appendix shows the Most Favored Nation (MFN) average tariff rates for Hungary, Poland and Slovenia before accession were around twice as high as those for the EU15 even in non-agricultural trade.[3] In contrast, Estonia applied close to zero

[2]See Herderschee and Qiao (2007) for exact dates of bilateral FTA's.

[3]The Most favoured nation (MFN) principle is a cornerstone of trade relations within the

tariffs to imports from third countries. Although trade in manufactures within the pan-European zone was free at the time of EU accession, differences in third-country treatment may have affected the trading pattern within the pan-European zone as well.

2.2 Nontariff and administrative barriers

International trade costs comprise much more than mere tariff measures. The literature on trade costs is abundant, a comprehensive survey of which is provided in Anderson and van Wincoop (2004). Some of these costs are at least partially observable, others can only be indirectly inferred from trade data. Partially observable costs include nontariff barriers such as price or quantity measures (quotas, price controls), quality measures (safety or health requirements), or threat measures (antidumping duties). Evidence up to the end of the 1990's reported by Fink (2001) confirms that nontariff barriers were of widespread use among the CEFTA and the Baltic countries for a wide range of manufactures even in trade with the EU.

Administrative barriers like technical certification and labeling requirements on products can also serve as barriers to trade. Apart from the mere need of complying to the requirement, the issuance of the relevant certificates with the required detail may in some cases take several months. Recent empirical studies using data on such technical barriers (Chen, 2004 and Manchin *et al*, 2007) confirm that inferred trade costs tend to be larger for products with more stingent technical requirements. In order to harmonize such requirements well before the 2004 enlargement the EU has concluded the PECA agreements (Protocols to the Europe Agreement on Conformity Assessment and Acceptance of Industrial Products) in 1997 with all the CEE countries but Poland. Such harmonization efforts were however only of a limited success and in some CEE countries the application of PECA's had been postponed until accession.

The Market Access Database of the EU provide some evidence on the administrative tasks related to the numerous types of nontariff barriers and technical

World Trade Organization (WTO). It states that a country with an MFN status cannot be treated worse than another country also with MFN status. Exceptions allow for free trade areas, customs unions or preferential treatment of developing countries.

requirements faced by EU exporters.[4] To present a simple example, an EU company who wishes to export waterproof footwear to Russia has to face the burden of producing 12 different documents, several of them in Russian language, including among others the Customs Import Declaration, Declaration of Dutiable Value, Commercial Invoice, Certificate of Origin, the Certificate of Fire Safety or the Sanitary-Epidemiological Conclusion. The number of documents to be completed are comparable or only slightly less for countries that levy no tariffs on EU exports of footwear, such as the three EFTA countries, the accession country Croatia, or Turkey which is in a customs union with the EU.

A further border-related element of nontariff barriers is the burden of the customs clearence procedure and the correspondig waiting time at borders. With only a few border crossing points or insufficiently trained or corruptible customs officers, the cost of border crossing may be large. Fink (2001) presents data on average waiting hours at several CEE border crossing points for years 1997-1998, which shows that waiting hours were especially long at Polish borders (5-15 hours) and relatively moderate for Czech, Slovak and Hungarian borders (0.5-4 hours). My informal consultation with a market-leading logistics provider in CEE (Waberer's Holding) confirmed that the elimination of the customs clearence procedure was a large efficiency improvement in international transportation. The effect of time on trade was also studied by Hummels (2007) who argues that in international trade of manufactures an additional day of waiting acts on average as a 0.8% increase in ad-valorem tariffs.

It can be concluded that changes in several of the nontariff and administrative barriers might have contributed to a trade effect of EU accession. Although information on these barriers are often imprecise and incomplete, it can be stated with certainty that, as opposed to harmonization and liberalization efforts on the part of the EU, some of these barriers were eliminated only as late as at the time of accession. Furthermore, the elimination of border controls and the corresponding decline in the waiting time provide a clear case for declining trading costs, which might have resulted in increasing trade.

[4] www.mkacdb.eu.int. Unfortunately, the database does not include historical records for NMS or information for intra-EU trade.

2.3 On the timing of effect

When identifying the trade effect of accession one needs to have a view on when exactly these effects are likely to appear. Considering such timing issues brings up three disclaimers to the current analysis. First of all, the data enables me to analyse only the first three years after accession. This naturally restricts the measured effect to be only of short-term nature. Firms responding to the reduction in trade costs need time to adjust their production, build up new capacities or redirect their sales to new markets. Some of these responses may appear already in the first months, while others might need several years to unfold.

Second, it cannot be ruled out that there was some early trade effect in anticipation of accession, since the decision on accession became certain already in 2003. On the part of the EU, the decision was made at the Copenhagen Summit in December 2002, which was followed by subsequent referenda in individual acceeding countries during the following year. Moreover, the positive outcome of the referendum was quite certain for a couple of countries. Against this background one would expect that part of the accession effect has appeared already as early as 2003. Note that the presence of such early effect may bias our estimates downward.

The third potentially important timing issue relates to the effect of earlier liberalization measures. As described above most of the tariff-based trade liberalization in manufactured goods affecting the NMS occurred until the millenium. One would therefore expect that the years around EU accession should not have been affected by their direct consequences. Trade consequences of such measures however may have unfolded only gradually, and export growth rates around accession could still have been affected to some extent by these earlier tariff reductions. If one accepts that the effect of previous liberalizations is front-loaded, then the pre-accession years in our sample should be affected more then the post-accession period, and our EU effect estimates may again be biased downwards.

3 Product-level analysis

3.1 Description of the dataset

The dataset contains annual product-level bilateral export flows between a set of old and new EU members in the nine years of 1999-2007. Trade data is from the Eurostat Comext database and is reported in euro value terms. The product classification is the Harmonized Systems (HS6) at six-digit level, while concordance with the economically more meaningful (4-digit) ISIC rev. 2 classification is however also provided.

The dataset is restricted to a subset of manufactures, i.e. manufactured goods excluding food, beverages, tobacco (ISIC group 31), petroleum refineries (subgroup 3530) and non-ferrous basic metal industries (subgroup 3720). The choice of products is motivated by the fact that these goods were freely traded under the Europe Agreements throughout the whole sample. Moreover, petroleum and non-ferrous metal flows are generally excluded from similar studies due to their strongly variable price movements. All in all, the restricted subset of manufactures still corresponds to a substantial fraction (more than 80%) of all trade flow values and 4700 out of the total 5900 HS6 product categories.

Altogether 20 countries are considered: Austria, Belgium, Germany, Denmark, Spain, Finland, France, Ireland, Italy, Luxembourg, Netherlands, Portugal and Sweden as old EU members and the Czech Republic, Estonia, Hungary, Lithuania, Latvia and Slovenia as new EU members. Data for Poland and Slovakia are unfortunately not available before 2004 at this level of disaggregation. These countries therefore will be analysed only in the aggregate gravity estimation part and left out otherwise. Greece is omitted because its late euroarea entry may complicate matters. Similarly, I need to consider the euroarea entry of Slovenia in 2007 when interpreting data from that year.

The unit of observation is export flow of product per country-pair in a given year and, since the dataset contains all possible trade flows including missing trade, the number of observations is around 4700 * 20 * 19 = 1.8 million per year, i.e. around 16 million altogether. A large part of this data is zero trade showing that in a considerable number of product-countrypair relationships no trade occurs among EU countries. On average non-zero bilateral trade is present only in one-third

of the cases, with strong variation among individual countries. Larger economies (Germany, France, Italy, United Kingdom) tend to export in more than half of the cases, while smaller ones, and those with a more concentrated export sector in a much smaller fraction (10-20 percent) of the cases.

3.2 Statistical methodological considerations

Thresholds in Intrastat

An important methodological consideration is related to the EU entry itself. The method of trade data collection changes when a country joins the EU. While previously all trade data were collected by the customs authorities at the time when traded goods crossed borders, after EU entry data for trade with other EU members are collected by the Intrastat system, a questionnaire-based method where reporters are the trading firms directly. Within Intrastat, in order to reduce the burden of reporting companies, countries apply a system of thresholds. An enterprise, whose annul trade flow value falls below the threshold, is exempt from reporting to Intrastat. Thresholds are determined each year so that total reported trade covers at least 97 percent of the country's total trade flows.[5] Thresholds therefore differ across reporting countries and depend on the distribution of firms' trade values within each country (Table in Appendix).

National statistical authorities perform adjustments on trade below the threshold to compensate the missing information. The application of thresholds may however still result in structural breaks. Developments on the extensive margin around EU entry may e.g. be distorted if small exporters falling under the threshold trade very different products than larger ones. In this case, the reported number of traded products may seem to decline due to the introduction of the threshold. Such a distortion is however "on the safe side" of my investigation, since if I observe trade creation on the extensive margin, the possible threshold distortion only stengthens the finding.

[5]For a detailed description see Quality Report on International Trade Statistics, 2007 by Eurostat.

Missing trader intra-community fraud

A second issue is misreporting of trade by enterprises. Without customs control, it is the trading enterprises' responsibility to report the correct value of their trading activities. Due to value-added tax (VAT) evasion motivations however it is not necessarily the interest of enterprises to provide correct reporting. Within EU intra-community trade, the VAT on traded products should be payed by the importer to the importer country's budget, while the exporter can ask for a refund from its own state. Enterprises who intentionally commit a so-called "missing trader intra-community (VAT) fraud" are therefore interested in underreporting their importing and overreporting their exporting activities. The most well documented case is that of the UK where such fraudalent practices caused a substantial bias in trade statistics and only in 2005/2006 the total value of VAT fraud was estimated to be around 4 billion Brittish pounds.[6]

The reporting of trade transactions to the Statitical Office within the Intrastat system and the VAT declarations to the Tax Authority are done separately for most of the EU countries, with the exceptions of France and Italy where these two reportings are done in the same document. Fraudsters therefore could in theory report correctly to the Statistical Office, while misreporting only to the Tax Authority. It is possible even more in those cases when the Intrastat questionnaire explicitly states that Intrastat data cannot be made available to the Tax Authority (e.g. in Hungary). Evidence however shows that if VAT fraud occurs Intrastat data is also misreported. The explanation lies in the close interconnectedness of the system of Intrastat and VAT declarations whithin the EU. All enterprises engaged in intra-EU trade must have a VAT registry number and only an enterprise with such number can report to Intrastat. Both VAT and Intrastat reporting is due after the transaction has taken place and it is possible only as long as an enterprise exists and has a VAT registry number. VAT fraudster enterprises however often carry out the fraud by liquidating themselves right after the transaction, thereby failing to report to any of the authorities.

It should be noted that statistical adjustment for fraudalent practices are by nature very problematic and in the majority of EU countries statistical authorities adjust

[6]See Stopping the Carousel: Missing Trader Fraud in the EU. Report with Evidence by the House of Lords European Union Committee, May 2007.

for these missing or erroneous data only at a more aggregate HS2 level. This analysis therefore can be affected by these phenomena. To minimize the impact of the missing-trader intra-community fraud on the analysis I take two considerations. First, it was shown that in an average case imports are more strongly affected than exports. Second, the evidence of UK shows that these activities occur mostly in the trade of high value/low volume goods such as mobile phones and computer components. Consequently, this paper focuses only on the export side of bilateral trade flows and carries out robustness check by excluding trade of the typically high value/low volume product groups from the analysis.

Zero versus missing trade

I treat all units where trade data is not provided as zero trade. This is justified by the fact that in principle, trade statistics are complete, because - apart from the thresholds in Intrastat - they are generally expected to cover the whole population that they describe. In practice however zero observation does not necessarily mean zero trade. Data can be missing partly because some transactions are considered as confidential in a HS6 detailed level. These data are reported under the heading "Confidential trade" at chapter level and their aggregate magnitude can be known. Confidential exports within the EU in most countries and most years are only 2-3 percent of total, although in certain cases their importance can substantially increase (see e.g. Hungary in 2001 and 2003). Moreover, it's magnitude is quite stable in time, i.e. EU accession does not seem to have an effect on its importance.

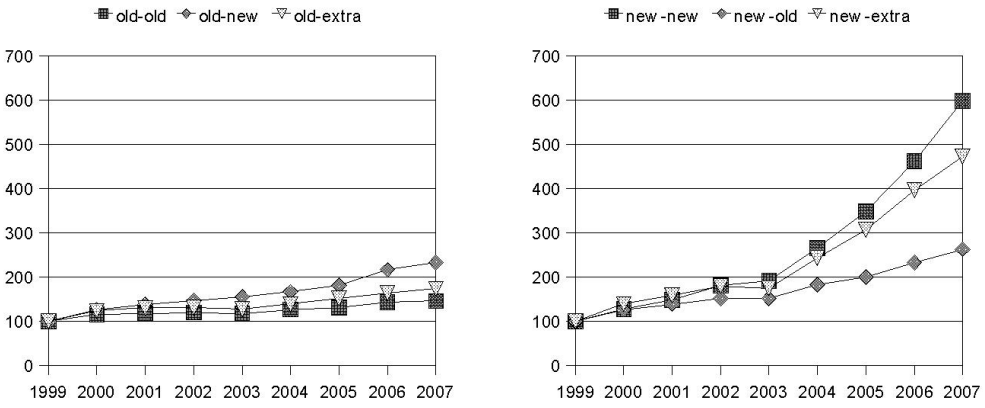
Other data are not available either because the reporter is exempt from reporting (threshold) or because the trade flow is simply not reported such as in the case of VAT fraud. As already said most national statistical authorities make adjustments for these missing data, although the method of adjustment varies substantially. In most of the cases adjustment is based on VAT data or historical figures and is either made at the most detailed product level (CN8) or a more aggregate one (HS2). The detailed HS6 data therefore contains these adjustments for some countries and does not contain them for others. Adjustments which are only at an aggregate level are reported as "Trade broken down at chapter level only" in Eurostat data and as Figure 3 in Appendix shows their magnitude is on average at around 2 percent of total trade flows. An exception is year 2007 when it is around

4 percent, which calls for a more cautious interpretation of data in this year.

3.3 Raw data stylized facts

I document basic raw data evidence based on the product level database. Country pairs are grouped according to whether they are old EU members or belong to the NMSs. Four groups are differentiated accordingly: export between two old members (old-old), export between two new members (new-new), export from an old member to a new one (old-new) or vice versa (new-old). At this point I also report exports of old versus new members to extra-EU25 markets (old-extra, new-extra) in order to have some insight into the possible effects of adopting the Community trade policy measures after accession.

Figure 1: Aggregate export in different relations (1999=100)



A first look at raw aggregated export flows reveals strong trade creation on the part of new members following EU enlargement. Most apparently bilateral export flows among NMS and, to a lesser extent, between new and old members accelerated after 2004. In contrast, exports between old members remained relatively stable. An interesting note that extra-EU25 exports of new countries grew also at a remarkable extent, which may partly be explained by the decline in average extra-EU tariffs for some of the NMS.

At the same time, however, another (partial) explanation for the strong extra-EU growth lends itself directly from deeper investigation: the parallel economic surge

in Russia boosted exports from NMS, and especially from the Baltic countries, to a large extent. When it comes to extra-EU exports the three Baltic countries are dependent on the export demand of the Russian market to a considerable extent. Around one-third of their extra-EU exports is directed to Russia and, in the case of Latvia and Lithuania, the average annual growth rate of extra-EU exports could have been 8-10 percentage points lower in 2004-2007 without the boost from the Russian market.

Table 1: Export exposure to Russia of New Member States (%, averages of years 2004-2007)

	Share of Russia in extra-EU25 exports	Intra-EU25 export growth	Extra-EU25 export growth	Extra growth w/o Russia
Czech Republic	12	19	26	24
Estonia	28	15	41	41
Hungary	10	13	27	25
Latvia	34	20	18	11
Lithuania	37	21	34	23
Poland	19	20	27	25
Slovenia	12	18	18	17
Slovakia	11	22	22	20
Total NMS	**16**	**18**	**26**	**22**

3.3.1 Decomposition into intensive and extensive margins

In the followings I decompose total trade flow changes into the extensive and intensive margins in the spirit of Besedes and Prusa (2006). Total export value in period t is perceived as the product of the number of non-zero countrypair-product relationships at HS6 level (n_t) and the average export value per such relationship ($\bar{x}_t$). Export growth is therefore

$$x_t - x_{t-1} = n_t \bar{x}_t - n_{t-1} \bar{x}_{t-1}$$

what can be further decomposed by realizing that n_t is the sum of non-zero relationships which survived from period $t-1$ (n_t^{st}, where st denotes "surviving-to-t") and those which newly appeared in period t (n_t^a). Similarly, n_{t-1} is the sum of relationships which are to survive and which are to disappear from period $t-1$ to period t (n_{t-1}^{st} and n_{t-1}^d, respectively). Note that by definition $n_{t-1}^{st} \equiv n_t^{st}$. By

also constructing the corresponding average export values for the above indices, the expression for export growth can be re-written as

$$x_t - x_{t-1} = n_t^{st}\left(\bar{x}_t^{st} - \bar{x}_{t-1}^{st}\right) + n_t^a \bar{x}_t^a - n_{t-1}^d \bar{x}_{t-1}^d$$

The first term shows the total export growth of survivor relationships, the second term is the total value of export in newly appearing relationships and the third term is the total value of export in disappearing relationships from period $t-1$ to t. Similarly to Besedes and Prusa (2006) I define the growth on the *intensive* margin as the sum of the first and the third terms and the growth on the *extensive* margin as the second term.

$$IM_t = n_t^{st}\left(\bar{x}_t^{st} - \bar{x}_{t-1}^{st}\right) - n_{t-1}^d \bar{x}_{t-1}^d$$

$$EM_t = n_t^a \bar{x}_t^a$$

The growth on the extensive margin reflects export flows of only newly traded goods and therefore its value can only be non-negative. On the other hand, the intensive margin is a composition of two phenomena: the deepening of surviving export relationships minus past export flows of relationships which failed to survive from the previous period.

Table 2 reveals that the acceleration in exports after 2004 among NMS was the result of growth both at the extensive and the intensive margins. It was however to a major extent caused by the deepening of already existing product-countrypair relationships, rather than the contribution of newly created ones. On the contrary, new-old and old-new exports increased only at the extensive margin, i.e. exports expanded either to new markets or in new product categories. Finally, the rate of decline from product-countrypair relationships which failed to survive was larger for all but new-new directions. This indicates that, beside the growing intensity of exports in almost all directions, certain restructuring of export relationships can also be observed after EU enlargement.

Table 2: Decomposition of export growth (% in average annual growth rates)

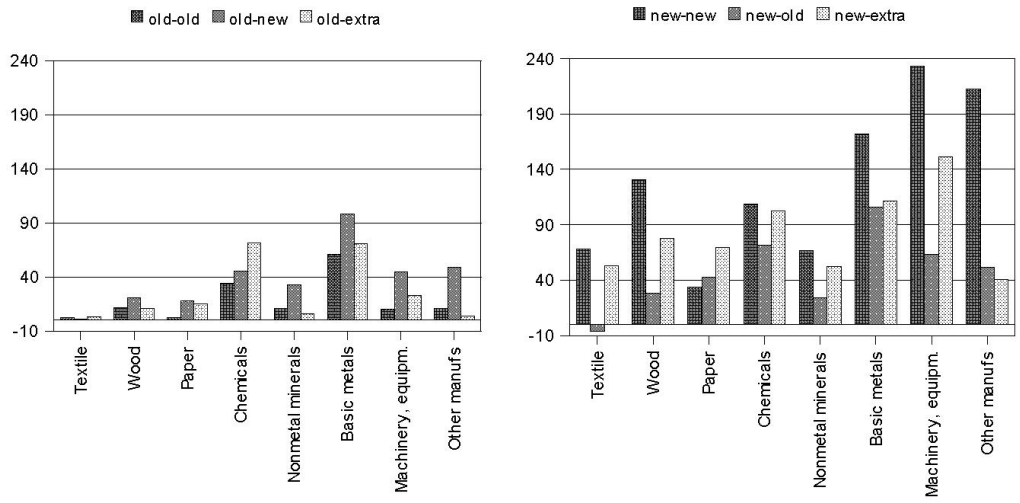
	old-old	new-new	new-old	old-new
		TOTAL		
2000-2003	4.5	18.0	11.5	11.9
2004-2007	5.4	32.9	14.7	10.9
Contribution of				
		EXTENSIVE		
2000-2003	2.0	6.7	2.6	2.9
2004-2007	2.7	8.2	7.0	3.8
		INTENSIVE		
2000-2003	2.5	11.3	8.9	9.0
2004-2007	2.7	24.7	7.6	7.1
Of which				
		SURVIVING		
2000-2003	4.3	16.0	12.0	11.4
2004-2007	5.8	29.4	12.0	10.8
		FAILURES		
2000-2003	-1.8	-4.7	-3.1	-2.4
2004-2007	-3.1	-4.7	-4.4	-3.8

3.3.2 Industry level evidence

I break down export flows into eight manufacturing industry branches based on the 2-digit ISIC classification. For a description of ISIC (rev. 2) branches see Table 8 in Appendix. Looking at the growth rates between the average export flows in the two four-year periods before and after the accession, one can see that the basic patterns which we could observe on aggregate flows are also present in industry breakdown. Exports in trade directions which contain at least one NMS, and especially trade among NMS's, grew considerably faster than trade among old EU members.

The large growth of exports among NMS's cannot be attributed to one single industry branch but is strongly present in at least five of the eight branches. The most remarkable increase occurred in the exports of Machinery and equipment (ISIC 38) and Other manufactures (ISIC 39), the export of which in the four years of 2004-2007 was by 230% and by 210%, respectively, larger than in the four years of 2000-2003. Looking at the decomposition of this growth in Table 3 one can again conclude that most of it occurred on the intensive margin. The trade creation effect of falling trade costs of these goods therefore manifested itself more through the deepening of already existing trade relationships than through new

Figure 2: Export growth by branches (2004-2007/2000-2003, %)



trade relationships and the increase in product varieties.

The large growth of exports in Machinery and equipment however needs a closer look, because this category contains the products which are most prone to be subjects of MTIC fraud. To control for the possible export-inflating effect of such fraudalent activities I calculated the above growth rates by excluding the typically high value/low volume 4-digit ISIC categories 3825 "Manufactures of office computing and accounting machinery", 3832 "Manufacture of radio, television, communication equipment and apparatus", 3851 "Manufacture of professional and scientific, and measuring and controlling equipment" and 3852 "Manufacture of photographic and optical goods". Altogether the correction has not affected substantially the results. The biggest discrepancy is between the export growth rates for new-to-new transations (230% originally and 210% after the correction).

4 Aggregate gravity analysis

In the followings I perform gravity estimation on aggregate data. My aim is to identify the pure trade effect of EU accession which is not related to any formal changes of trade barriers, fluctuations in the real business cycle or the trend of real economic integration which would have occurred anyway irrespective of the

Table 3: Decomposition by branches (% in annual average growth rates)

	old-old		new-new		new-old		old-new	
	2000-2003	2004-2007	2000-2003	2004-2007	2000-2003	2004-2007	2000-2003	2004-2007
				TOTAL				
Textile	1.0	2.2	11.7	18.0	3.1	-1.3	6.2	2.1
Wood	2.7	4.7	25.6	29.7	8.5	6.4	7.5	9.8
Paper	4.0	1.7	9.2	17.0	14.8	11.4	11.5	5.7
Chemicals	9.0	8.1	12.5	27.0	12.8	17.5	12.4	11.3
Nonmetal minerals	2.1	4.8	19.8	14.4	6.2	7.1	11.5	8.4
Basic metals	6.0	18.1	17.5	29.9	9.9	25.2	13.8	25.1
Machinery, equipm.	3.6	4.0	24.2	41.5	13.4	16.7	13.0	11.2
Other manufs	3.1	5.9	25.0	38.6	20.8	23.8	4.0	16.5
Contribution of								
				EXTENSIVE				
Textile	1.7	1.0	7.8	5.7	2.8	2.2	5.0	2.1
Wood	1.4	3.2	6.9	9.9	0.8	2.0	2.8	6.0
Paper	9.5	1.4	7.6	3.5	8.2	3.0	8.7	2.1
Chemicals	1.8	1.3	3.3	4.3	5.1	4.6	2.0	2.1
Nonmetal minerals	2.0	1.5	7.2	2.9	1.8	3.7	2.9	2.7
Basic metals	0.6	1.6	3.6	7.4	4.2	5.3	2.0	2.8
Machinery, equipm.	1.8	3.3	9.0	10.4	2.3	8.5	2.4	4.3
Other manufs	0.9	11.6	12.1	21.6	2.9	17.1	3.4	11.7
				INTENSIVE				
Textile	-0.7	1.2	3.9	12.3	0.3	-3.5	1.2	0.1
Wood	1.4	1.3	18.6	19.8	7.7	4.4	4.7	3.9
Paper	-5.4	0.4	1.5	13.5	6.6	8.4	2.8	3.6
Chemicals	7.1	6.8	9.2	22.7	7.7	12.9	10.4	9.2
Nonmetal minerals	0.1	3.2	12.6	11.5	4.5	3.4	8.6	5.7
Basic metals	5.5	16.5	13.8	22.5	5.7	19.8	11.8	22.2
Machinery, equipm.	1.9	0.6	15.2	31.2	11.2	8.2	10.6	6.8
Other manufs	2.2	-5.6	12.9	17.0	17.9	6.7	0.6	4.8
Of which								
				SURVIVING				
Textile	1.2	2.2	11.5	16.4	2.9	-1.0	5.9	1.7
Wood	2.6	4.4	24.1	26.2	8.2	5.9	6.9	8.5
Paper	4.1	1.8	10.0	15.4	14.2	10.0	11.2	5.3
Chemicals	8.7	7.8	11.7	24.7	12.3	15.4	12.2	11.1
Nonmetal minerals	1.7	4.7	17.6	13.8	6.5	7.0	10.6	8.1
Basic metals	6.0	17.9	16.1	26.2	8.3	22.7	13.0	24.7
Machinery, equipm.	3.4	4.8	20.2	37.0	14.0	13.3	12.5	11.2
Other manufs	2.8	5.3	17.3	31.9	33.2	21.7	3.1	17.9
				FAILURES				
Textile	-1.9	-1.0	-7.6	-4.1	-2.5	-2.4	-4.6	-1.6
Wood	-1.2	-3.1	-5.5	-6.4	-0.5	-1.5	-2.2	-4.7
Paper	-9.5	-1.4	-8.5	-1.9	-7.7	-1.6	-8.4	-1.7
Chemicals	-1.5	-1.0	-2.5	-2.0	-4.5	-2.5	-1.7	-1.9
Nonmetal minerals	-1.6	-1.5	-5.0	-2.4	-2.0	-3.6	-2.0	-2.4
Basic metals	-0.6	-1.4	-2.3	-3.8	-2.6	-2.9	-1.2	-2.4
Machinery, equipm.	-1.5	-4.2	-5.1	-5.8	-2.9	-5.0	-1.9	-4.4
Other manufs	-0.7	-10.9	-4.4	-14.9	-15.4	-15.0	-2.5	-13.1

EU entry. Remember that I restrict the attention to a subset of manufactured products, which were freely traded under the Europe Agreements throughout the whole sample, so any trade effect of tariff changes can be ruled out.

4.1 The gravity model

The empirical application of the gravity equation is extremely widespread in the international trade literature. The basic idea pioneered by Tinbergen (1962) is that trade flows between two countries depend on the GDP's of the countries and some measures of distance and trade costs. The majority of the applications either investigate the effects of some trade policy variables (tariff changes, FTAs or customs unions) or estimate the potential of trade between geographical entities. More recent applications also concern the trade effect of a monetary union (the literature initiated by Rose (2000)) and the effects of national borders when all policy trade barriers are zero (the border puzzle literature related to McCallum (1995)).

In its original form the gravity equation was not derived from solid theoretical foundations and theoretical derivatons appeared only later starting with Anderson (1979) and followed by Bergstrand (1985), Deardoff (1998) and Anderson and VanWincoop (2003). All in all the original idea of the gravity specification proved to be quite robust in the face of different assumptions of different trade theories. It can be derived assuming CRS or IRS preferences, under endowment or technological differences across countries, as well as models with complete or partial specialization.

Recent developments in panel data econometrics as well as the availability of micro-level trade databases initiated further modifications in the theoretical modelling and the proper empirical specification of the gravity relationship. Mátyás (1997) and Egger and Pfaffermayr (2003) suggested panel data gravity specifications where individual country heterogeneity and time effects are more properly handled. A challenge with micro-level or large international databases is the presence of a lot of zero trade relationships. In contrast to the earlier practice of dropping these observations, accounting for zero trade carries additional useful information. Helpman, Melitz and Rubinstein (2007) propose a firm-level gravity theory and a corresponding empirical estimation method where zero trade flows

are also included in the estimation. In the current aggregate gravity estimation however the problem of zeros does not arise, since total exports is positive in all bilateral relationships.

4.1.1 The theoretical equation

I build on the theoretical foundations of Anderson and VanWincoop (2003) which is a restricted case of the Helpman-Melitz-Rubinstein model, but in an aggregate analysis with no zeros it serves as a good starting point. The model assumes identical CES preferences and differentiated goods by place of origin, i.e. every country is specialized in the production of one good. The supply side of the model is fixed. Prices differ between location only due to trade costs which are not observable directly. Under the assumption that all bilateral trade costs are symmetric and markets clear, the gravity equation becomes

$$X_{ij} = \frac{Y_i Y_j}{Y^W} \left(\frac{T_{ij}}{\Pi_i P_j} \right)^{1-\sigma}$$

subject to the constraints on the relationship between Π_i and P_j

$$P_j^{1-\sigma} = \sum_i \frac{Y_i}{Y^W} \left(\frac{T_{ij}}{\Pi_i} \right)^{1-\sigma}$$

and

$$\Pi_i^{1-\sigma} = \sum_j \frac{Y_j}{Y^W} \left(\frac{T_{ij}}{P_j} \right)^{1-\sigma}$$

where X_{ij} is exports from country i to j, Y_i and Y_j are the output variables in the exporting and importing countries, respectively, and Y^W is world income. T_{ij} is the bilateral trade barrier, Π_i and P_j are the so-called multilateral trade resistence terms for the individual countries and σ is the constant demand elasticity. More intuitively, Π_i is a measure of trade resistence of foreign markets to the exports of country i and P_j is a measure of county j's resistence to importing from abroad.[7]

[7] Anderson and van Wincoop (2003) also makes the simplification that, under symmetrical bilateral trade costs ($T_{ij} = T_{ji}$), the two types of multilateral resistence are also equal: $\Pi_i = P_i$. Baldwin and Taglioni (2006) however argue that such a simplification is valid only in a cross-

Needless to say that the two multilateral resistence terms are functions of all bilateral trade barriers of a given country vis-a-vis all other countries in the world. In a gravity framework therefore trade between two countries depends not only on the bilateral trade barriers between them, but also on all the trade barriers with the rest of the world. An increase in bilateral trade barriers reduces bilateral trade, while an increase in the trade barriers with the rest of the world for both the exporter and the importer increases it.

In order to derive an estimating equation, we need to assume some form for the bilateral trade barrier T_{ij} term. As it is normally assumed, we take it to be a log-linear function of different trade barrier components

$$T_{ij} = DIST_{ij}^{\delta_1} \cdot \exp\left(EU_{ij}\right)^{\delta_2} \cdot \boldsymbol{Z}_{ij}^{\boldsymbol{\delta}_3}$$

where $DIST_{ij}$ denotes the distance between the exporting and importing countries, EU_{ij} is a dummy for common EU membership, i.e. our variable of interest, and $\boldsymbol{Z}_{ij}$ is a set of other barrier measures, which are typically used in similar studies, containing e.g. dummy variables for common border or common currency.

After taking logs of the original gravity equation and substituting the trade cost expression, the equation becomes

$$\begin{aligned} x_{ij} \quad = \quad & y_i + y_j - y^W + (1-\sigma)\,\delta_1 dist_{ij} + (1-\sigma)\,\delta_2 EU_{ij} + (1-\sigma)\,\boldsymbol{\delta}_3 \boldsymbol{z}_{ij} - \\ & - (1-\sigma)\,\pi_i - (1-\sigma)\,p_j \end{aligned}$$

where small letters denote logarithms.

4.1.2 The panel empirical specification

Making the above theoretical gravity equation operational in empirical work is surrounded by difficulties. The Anderson and van Wincoop (2003) model was built for cross-section analysis, while panel data estimation also involves the time dimension. Moreover, the time dimension has an important role in my estimation

section framework or, in other words, when all trade costs are time-invariant. In a panel data framework however such a simplification is not appropriate.

strategy: I want to identify the EU effect by comparing after-accession to before-accession trade of NMS, using trade among old EU countries as reference.

Perhaps the most severe problem in finding the proper estimating equation for the above model equation is that the last two terms of multilateral resistence are not observable. Since they are functions of bilateral trade barriers, when they become part of the error term, the error term will be correlated with the right-hand-side trade barrier variables, causing omitted variable bias. The easiest remedy for this problem, which is often applied in the literature, is to include individual-specific fixed effects in the estimation. If one assumes that multilateral resistence is *time-invariant*, individual-specific fixed effects wipe them out from the error term.

In a panel data setting however this solution is not sufficient, since one can no longer assume that multilateral resistence is time-invariant. It is all the more so in the case of EU accession. By entering the EU, NMS had to apply the common external trade policy of the EU and modify their third-country tariff rates accordingly. Their multilateral resistence to imports from the rest of the world therefore must have changed substantially. Although some statistics are available to explicitly control for such changes, part of the time-varying component of multilateral resistence remains unobservable.

Baldwin and Taglioni (2006) suggest to include individual-specific time dummies in the estimating equation to control for such time-varying unobservables. Note that this involves a lot of dummies to be estimated. In fact, if an individual is defined as a direction-specific country-pair, the number of individual-specific time dummies is the size of the panel $N(N-1)T$, and the estimation is not possible. If a country is taken as individual (exporter and importer separately), the number of such dummies is $2NT$. This can provide sufficiently large degrees of freedom if N is getting large. In our case N is 20 (22 with Poland and Slovakia), and therefore estimates even with country-specific time dummies must be taken with care.

Fixed Effects estimation Against this background I choose an estimating equation with only individual-specific fixed effects as a baseline specification equation. Including direction-specific country-pair fixed effect, the estimation becomes the traditional FE estimation. Hence, coefficients on time-invariant variables such as distance, common border or the EU dummy for exports among old EU members

cannot be identified. This is however not a problem in our case, since our variable of interest (EU dummy for trade which involves at least one NMS) is time-varying. The estimating equation is the following

$$\begin{aligned} exp_{ijt} &= \beta_1 gdp_{it} + \beta_2 gdp_{jt} + \beta_3 EU_{ijt} + \boldsymbol{\beta}_4 \boldsymbol{z}_{ijt} + \\ &\quad + \beta_5 tar_{it} + \beta_6 tar_{jt} + \beta_7 rer_{it} + \beta_8 rer_{jt} + \delta_t + \gamma_{ij} + \varepsilon_{ijt} \end{aligned}$$

where exp_{ijt} is bilateral exports in euro value terms and gdp_{it} and gdp_{jt} are nominal GDP's in euros.[8] I allow for non-unitary coefficients for the GDP variables (β_1 and β_2), because GDP also captures non-traded demand and therefore the assumption of a one-sector economy and unitary income elasticity of trade cannot hold for the data.

EU_{ijt} is the dummy of special interest, which takes value 1 if both countries are EU members and zero otherwise. Because the enlargement took place in May, it takes value 2/3 in 2004 for all exports that involved at least one NMS. In the estimation I will also interact the EU dummy with dummies showing whether the country-pair is a new-new, new-old or old-new relationship. This way separate EU effects can be obtained for the three different directions and one can check whether the raw data evidence that exports grew fastest in new-new relationships is supported. Besides, as motivated by evidence on extra-EU exports, the EU dummy might also be interacted with a dummy of sharing border with Russia (taking value 1 in case of Finland, the three Baltic countries and Poland, if included).

Now $\boldsymbol{z}$ includes only one time-varying variable: the common currency dummy, changing only once at Slovenia's euro adoption in 2007. In order to account for some of the time-varying multilateral resistence, I include third-country (most-favoured-nation) average tariff rates (tar_{it}, tar_{jt}) for both the exporter and importer countries and their real effective exchange rates against the major trading partners' currencies (rer_{it}, rer_{jt}). Although the use of real exchange rates as prox-

[8] I opt for not deflating either exports or the GDP variable because of the potential measurement bias one can introduce by using price deflators measured with large error. In particular, the deflation of exports is problematic, since there is no export price index to use. Instead, as Baldwin and Taglioni (2006) suggests I use current value exports and GDP's expressed in a common currency (euro) and let the time dummies to capture, among others, the conversion factor that converts year-t euros to base-year euros.

ies for multilateral resistence has been criticized, I also include them for another reason. Old EU members and NMS's are not homogenous, since NMS's are still under a real convergence process. The inclusion of real exchange rates may control for some of this heterogeneity.

Finally, year dummies (δ_t) and country-pair fixed effects (γ_{ij}) are included, and ε_{ijt} is the error term. Country-pair effects are differentiated according to the direction of trade which allows for asymmetry in bilateral trade flows ($\gamma_{ij} \neq \gamma_{ji}$) and, as it was noted above, they control for any time-invariant unobserved heterogeneity, including the time-invariant multilateral resistence. Year dummies can control for common business cycle trends, and hence, capture the world output variable (y^W) from the theoretical equation.

Alternative estimation with country-specific time dummies The obvious drawback of the previous Fixed Effects specification is that it cannot control for the time-varying unobserved heterogeneity. However, controlling for it by including individual-specific time dummies, as it was discussed above, may involve too many dummies to estimate. In an alternative specification I try to control for, at least partially, the time-varying unobservable. The alternative estimating equation is the following.

$$\begin{aligned} exp_{ijt} &= \beta_1^{'} gdp_{it} + \beta_2^{'} gdp_{jt} + \beta_3^{'} dist_{ij} + \beta_4^{'} EU_{ijt} + \boldsymbol{\beta}_5^{\boldsymbol{'}} \boldsymbol{z}_{ijt}^{\boldsymbol{'}} + \\ &\quad + \delta_{it} + \delta_{jt} + \gamma_i + \gamma_j + \varepsilon_{ijt}^{'} \end{aligned}$$

where $2N(T-1)$ exporter and importer country-specific year effects (δ_{it} and δ_{jt}) and $2N$ exporter and importer fixed effects (γ_i and γ_j) are included.[9] Note that in the Fixed Effect estimation all direction-specific country-pair heterogeneity was controlled for by the γ_{ij}'s, given that it was time-invariant. In contrast, the alternative specification leaves a part of the country-pair unobserved heterogeneity in the error term, while controlling for part of the time-varying unobserved heterogeneity. In fact, it controls fully for the time-varying unobserved multilateral resistence.

[9] In this case I do not have to estimate more dummies than under the FE estimation, since there the number of fixed effects were $N(N-1)$ plus $T-1$ year dummies.

With the country-specific year dummies in place, including the tariff and the real exchange rate variables are no longer necessary. On the other hand, in the alternative specification the identification of the effects of time-invariant regressors such as bilateral distance ($dist_{ij}$) is possible. Now the $\boldsymbol{z}_{ijt}$ matrix includes the common currency and a historical ties dummy. Unfortunately, European countries are too homogenous for many of the traditional gravity variables to be of much use; the common language and the common border dummies are very much collinear with the historical ties dummy.

The interpretation of the other variables are the same as before apart from the fact that now we can estimate the EU effect also for trade between old EU countries. This coefficient will have the interpretation of by how much exports between old EU countries were larger than exports which involved at least one NMS before the EU enlargement. I estimate this alternative equation by pooled OLS, using robust standard error estimates.

4.2 Aggregate data

I use annual data for the period 1999-2007, although export data for Poland and Slovakia is available only until 2006. Bilateral exports are aggregated series from the detailed HS6 database. Again, export data is from the Eurostat's Comext database, although data on Poland and Slovakia is from the UN's Comtrade database.

Data for nominal GDP and real effective exchange rates are from Eurostat. Real effective exchange rates are calculated relative to 35 industrial countries with double export weights, and are based on unit labor costs. The third-country tariff variables are the average applied tariff rates for all goods from the World Bank database. The tariff variable is an indicator of extra-EU trade barriers, which is of course identical for all countries as long as all have entered the EU.

Bilateral distances are taken from a CEPII database.[10] There are two geographical distance measures, a scatter plot of them is presented on Figure 4 in the Appendix. The first is the simple great-circle distance between the two most

[10] Centre d'Etudes Prospectives et d'Informations Internationales (www.cepii.org). For a description of the distance measures see: http://team.univ-paris1.fr/teamperso/mayer/data/noticedist_en.pdf.

populated cities/agglomerations of each country-pair (dist).[11] The second is a weighted distance which is calculated as a weighted average of the bilateral great-circle distances between several of the largest cities in each country-pair, using the population share of cities as weights (distwces). The baseline estimation is performed with the weighted distance, while the simple distance is applied under the robustness checks. The historical ties variable is also from the CEPII database.

Among the robustness checks I reproduce the estimates also for real exports and real GDP variables. The price indices for deflating export flows are the national producer price indices (PPI) from the IMF's IFS database converted into euros. GDP was deflated by the corresponding GDP deflator from the Eurostat database.

4.3 Estimation results

I perform estimations on two different sample. First, I use a sample of 1999-2006 which also includes data for Poland and Slovakia. Then, I exclude Poland and Slovakia and use the whole sample of 1999-2007. Estimates in the first case for both the Fixed Effects and the alternative specifications are presented in Table 4. Several modifications of the baseline models were performed in order to check the robustness of the results.

The first column (FE.1) contains the baseline FE estimates. The coefficient on the EU dummy for new-new relationships is around 0.5, i.e. it shows a 60% increase in bilateral exports in the first 2-3 years following accession.[12] The same effect for exports from NMS to old members is somewhat lower 35-40%, while the effect for old to NMS exports is only around 10%.

These results are quite robust across several modifications of the Fixed Effects estimation (FE.2-FE.4). In FE.2 EU dummies are interacted with a Russian neighbour dummy. Exports to Russia increased substantially for countries which share a border with Russia, which could have caused trade diversion from EU markets. Indeed, the "gravity" of a booming Russian market seems to affect the EU effect negatively in both exports from Russia's neighbouring NMS to old EU members (new-old) and exports from a Russia neighbour old country (Finland) to

[11] The great-circle or geodesic distance is the shortest distance between two points on the Earth's surface, which is the analogue of a straight line in spherical geometry.

[12] % change = $100 \cdot (\exp(coeff)\text{-}1)$

NMS (old-new). Interestingly, however, no such export diversion can be shown to new-new relationships, i.e. trade among Baltic countries and Poland.

FE.3 reports estimates for a regression with real exports and real GDP's, where exports are deflated by national producer price indices. In this real regression the EU effects are somewhat inflated, although do not differ significantly from the baseline figures. FE.4 shows estimates for a regression of export flows excluding the products typically sensitive to VAT fraud.[13] In this case the EU effect for old-new relationships becomes insignificant, which suggests that in old-new directions the EU effect comes dominantly from exports in VAT fraud sensitive product categories. Note however that it is not an evidence that VAT fraud actually happened.

The last five columns show estimation results of the alternative specification with country-specific year dummies (A.1-A.5). As already noted, in these regressions the effects of time-invariant regressors could also be estimated. In particular, estimates are obtained for the distance variable, the EU dummy in old-old relationships and for the euro area dummy.

In the alternative specification, the EU effects are estimated with at least twice larger standard errors and the point estimates are also less robust across modifications. The point estimates for the EU effect are somewhat smaller than under FE estimation, which suggests that not controlling for the time-varying unobserved heterogeneity caused an upward bias in the FE estimates. In the baseline estimation of the alternative specification (A.1), however, the EU effect for new-new and, to a lesser extent, for new-old exports is still significant and sizeable (50% and 30%, respectively). On the other hand, exports from old EU members do not show a significant impact.

As for the other variables, the coefficients on the GDP variables are, as expected, in most of the cases around or slightly less then unity and strongly significant in all specification. Similarly, the coefficients on the distance measure in the alternative specifications are also in line with expectations. Estimates for the euro area dummy are interpretable only in the alternative estimations (A.1-A.5), since

[13] The 4-digit ISIC categories 3825 "Manufactures of office computing and accounting machinery", 3832 "Manufacture of radio, television, communication equipment and apparatus", 3851 "Manufacture of professional and scientific, and measuring and controlling equipment" and 3852 "Manufacture of photographic and optical goods".

Table 4: Estimates on a sample of all countries (1999-2006)

	FE.1	FE.2	FE.3	FE.4	A.1	A.2	A.3	A.4	A.5
GDP reporter	0.95***	1.02***	0.38*	0.80***	0.91***	0.91***	0.92***	0.93***	0.93***
	(0.17)	(0.17)	(0.23)	(0.15)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
GDP partner	1.11***	1.11***	0.92***	1.26***	0.80***	0.80***	0.80***	0.81***	0.81***
	(0.15)	(0.15)	(0.20)	(0.14)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Distance					-1.29***	-1.29***	-1.29***	-1.31***	-1.01***
					(0.06)	(0.06)	(0.06)	(0.05)	(0.07)
EU_new_new	0.48***	0.47***	0.68***	0.46***	0.40**	0.63***	0.31*	0.48**	0.38**
	(0.08)	(0.09)	(0.08)	(0.07)	(0.18)	(0.17)	(0.19)	(0.21)	(0.18)
EU_new_old	0.33***	0.46***	0.42***	0.35***	0.27*	0.19	0.15	0.25*	0.26*
	(0.06)	(0.06)	(0.06)	(0.05)	(0.16)	(0.24)	(0.16)	(0.14)	(0.16)
EU_old_new	0.12**	0.15***	0.21***	0.05	0.08	0.57***	0.11	0.15	0.07
	(0.05)	(0.05)	(0.05)	(0.05)	(0.11)	(0.16)	(0.12)	(0.15)	(0.11)
EU_old_old					0.15	0.14	0.15	0.05	0.37**
					(0.15)	(0.15)	(0.15)	(0.15)	(0.16)
EU_new_new x Russia		0.05				0.01			
		(0.10)				(0.27)			
EU_new_old x Russia		-0.24***				-0.34			
		(0.08)				(0.23)			
EU_old_new x Russia		-0.32***				-0.05			
		(0.09)				(0.11)			
EU_old_old x Russia						0.05			
						(0.14)			
Historical ties					0.49***	0.49***	0.49***	0.53***	0.76***
					(0.14)	(0.14)	(0.14)	(0.13)	(0.15)
Euro area					0.25**	0.24**	0.25**	0.27**	0.30***
					(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
Tariff reporter	-0.01	0.00	0.01	-0.01					
	(0.01)	(0.01)	(0.01)	(0.01)					
Tariff partner	0.01	0.01	0.01	0.00					
	(0.01)	(0.01)	(0.01)	(0.01)					
REER reporter	-0.80***	-0.98***	-0.55***	-0.92***					
	(0.19)	(0.20)	(0.16)	(0.17)					
REER partner	-0.50***	-0.51***	0.15	-0.58***					
	(0.18)	(0.17)	(0.15)	(0.16)					
constant	-12.2***	-12.2***	-16.7***	-11.6***	-5.19***	-5.18***	-17.2***	-5.6***	-7.5***
	(2.38)	(2.40)	(6.04)	(2.18)	(0.96)	(0.97)	(1.40)	(0.98)	(1.02)
N	3696	3696	3696	3696	3696	3696	3696	3696	3696
Within R^2 or Adj. R^2	0.60	0.61	0.48	0.62	0.94	0.94	0.94	0.94	0.93
F-test	110***	95.9***	59.5***	119***	204***	208***	174***	208***	181***

Notes: FE.1-FE.4 Fixed Effects estimation. Year dummies are included. A.1-A.5 Pooled OLS with exporter and importer fixed effects and exporter- and importer-specific year dummies. Robust standard errors are in parenthesis. *** denotes significance at 1%, ** significance at 5%, * significance at 10% levels. FE.2 and A.2: with Russian neighbor exporter dummy. FE.3 and A.3: real exports and real GDP's. FE.4 and A.4: VAT fraud sensitive products excluded. A.5: Simple great-circle distance measure applied.

in the FE case it only captures the euro adoption of Slovenia in 2007. The positive trade effect of euro area membership is estimated to be around 25-30%, which is roughly in line with, though somewhat larger than, the recent findings of the "Rose effect" literature as documented in Baldwin (2006).

Unfortunately, the coefficients on the tariff variables are not significant in either one of the FE regressions. Moreover, the point estimates for the exporter tariff is sometimes of the wrong sign: larger tariff barriers with the rest of the world should have increased (and not decreased) exports within the pan-European area. In contrast, the real exchange rate variables are strongly significant in almost all the regressions, reflecting both smaller export value from and smaller import value to countries experiencing real appreciation. The response of exports is however always greater than the response of imports, along with the expectation that a real appreciation should cause trade balance deterioration.

The same estimations are also performed on the sample without Poland and Slovakia but extended to year 2007. Results are in Table 5. The FE estimates for the EU effects are again quite robust across modifications. The point estimate of EU effect for new-new exports is again around 60%, for new-old exports it is somewhat lower at around 30%, while the EU effect for exports of old EU countries is not significant in the majority of the cases.

The estimates for the EU effects in the alternative regressions (A.1-A.5) are very inprecise and not robust across modifications. The effect for new-new exports varies between zero and 130%. As opposed to it the coefficient estimates for the other regressors are remarkably stable and of an acceptable magnitude. In these regressions the inclusion of the country-specific year dummies probably remove much of the time heterogeneity that anyway would be needed for the identification of the EU effects.

4.4 EU effect on the extensive and intensive margins

(To be done.)

Table 5: Estimates on a sample without Poland and Slovakia (1999-2007)

	FE.1	FE.2	FE.3	FE.4	A.1	A.2	A.3	A.4	A.5
GDP reporter	0.86***	0.99***	0.55**	0.64***	0.90***	0.90***	0.90***	0.90***	0.92***
	(0.18)	(0.18)	(0.23)	(0.16)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
GDP partner	1.15***	1.17***	1.05***	1.29***	0.79***	0.79***	0.80***	0.80***	0.81***
	(0.17)	(0.17)	(0.21)	(0.15)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
Distance					-1.31***	-1.31***	-1.31***	-1.32***	-1.05***
					(0.06)	(0.07)	(0.06)	(0.06)	(0.06)
EU_new_new	0.46***	0.40***	0.56***	0.46***	0.29*	-0.01	0.84***	0.20	0.26*
	(0.10)	(0.12)	(0.10)	(0.10)	(0.16)	(0.24)	(0.21)	(0.15)	(0.16)
EU_new_old	0.25***	0.37***	0.29***	0.31***	-0.03	0.01	0.25*	-0.04	-0.08
	(0.06)	(0.07)	(0.07)	(0.05)	(0.13)	(0.16)	(0.15)	(0.14)	(0.14)
EU_old_new	0.05	0.07	0.10*	-0.01	0.13	0.06	0.41*	0.04	0.15
	(0.06)	(0.06)	(0.06)	(0.05)	(0.19)	(0.26)	(0.24)	(0.20)	(0.19)
EU_old_old					0.04	0.04	0.04	-0.01	0.16
					(0.20)	(0.25)	(0.20)	(0.20)	(0.21)
EU_new_new x Russia		0.12				0.12			
		(0.15)				(0.29)			
EU_new_old x Russia		-0.25***				-0.40**			
		(0.09)				(0.17)			
EU_old_new x Russia		-0.33***				-0.06			
		(0.10)				(0.13)			
EU_old_old x Russia						0.02			
						(0.16)			
Historical ties					0.45***	0.44**	0.45***	0.51***	0.81***
					(0.17)	(0.17)	(0.17)	(0.15)	(0.18)
Euro area	0.10**	0.07	0.12**	0.01	0.33***	0.32***	0.33***	0.36***	0.39***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.11)	(0.11)	(0.11)	(0.11)	(0.12)
Tariff reporter	-0.01	0.00	0.00	-0.01					
	(0.01)	(0.01)	(0.01)	(0.01)					
Tariff partner	0.01	0.01	0.01	0.00					
	(0.01)	(0.01)	(0.01)	(0.01)					
REER reporter	-0.53**	-0.71***	-0.21	-0.52**					
	(0.27)	(0.27)	(0.22)	(0.24)					
REER partner	-0.29	-0.31	0.47***	-0.47**					
	(0.21)	(0.21)	(0.16)	(0.19)					
constant	-14.0***	-14.9***	-25.3***	-12.4***	-4.86***	-4.86***	-16.8***	-5.02***	-7.2***
	(2.53)	(2.59)	(6.21)	(2.19)	(1.18)	(1.20)	(1.75)	(1.15)	(1.22)
N	3420	3420	3420	3420	3420	3420	3420	3420	3420
Within R^2 or Adj. R^2	0.56	0.60	0.42	0.60	0.94	0.94	0.94	0.94	0.93
F-test	86.1***	79.9***	42.2***	100***	1044***	1136***	880***	992***	849***

Notes: FE.1-FE.4 Fixed Effects estimation. Year dummies are included. A.1-A.5 Pooled OLS with exporter and importer fixed effects and exporter- and importer-specific year dummies. Robust standard errors are in parenthesis. *** denotes significance at 1%, ** significance at 5%, * significance at 10% levels. FE.2 and A.2: with Russian neighbor exporter dummy. FE.3 and A.3: real exports and real GDP's. FE.4 and A.4: VAT fraud sensitive products excluded. A.5: Simple great-circle distance measure applied.

5 Conclusion

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Appendices

Table 6: MFN applied tariff rates (%)

	All Goods	Non-Agricultural
2000-2004		
EU15	6.14	4.23
CEFTA		
Czech Republic	4.93	4.16
Hungary	9.50	6.96
Poland	20.04	9.76
Slovenia	9.61	9.35
Slovakia	4.93	4.16
Baltic FTA		
Estonia	1.59	0.08
Lithuania	3.53	2.43
Latvia	3.48	2.24
2005-2006		
EU25	5.32	3.95

* World Bank WDI database

Table 7: Intrastat thresholds for exports in 2005 (thousand euros)

Austria	250	Italy	200
Belgium	250	Latvia	78
Czech Republic	125	Lithuania	46
Denmark	604	Luxembourg	150
Estonia	64	Netherlands	400
Finland	100	Portugal	85
France	100	Slovenia	100
Germany	300	Spain	130
Hungary	400	Sweden	498
Ireland	635	United Kingdom	323

Table 8: 2-digit ISIC branches and the number of corresponding HS6 products

ISIC	Description	#products
11	Agriculture and Hunting	297
12	Forestry and Logging	40
13	Fishing	116
21	Coal Mining	6
22	Crude Petroleum and Natural Gas Production	8
23	Metal Ore Mining	23
29	Other Mining	85
31	Manufacture of Food, Beverages and Tobacco	454
32	Textile, Wearing Apparel and Leather Industries	994
33	Manufacture of Wood and Wood Products, including Furniture	112
34	Manufacture of Paper and Paper Products, Printing and Publishing	192
35	Manufacture of Chemicals and Chemical, Petroleum, Coal, Rubber and Plastic Products	1192
36	Manufacture of Non-Metallic Mineral Products, except Products of Petroleum and Coal	186
37	Basic Metal Industries	493
38	Manufacture of Fabricated Metal Products, Machinery and Equipment	1543
39	Other Manufacturing Industries	196
41	Electricity, Gas and Steam	1
99	Activities not adequately defined	21
Manufacturing Total (31-39)		5362
Total (11-99)		5959

Figure 3: The share of trade flow values known to be missing at HS6 level

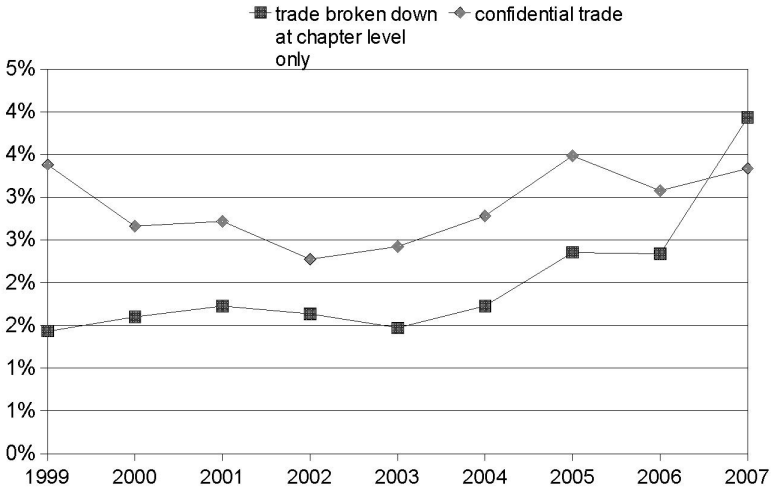

Figure 4: Scatter plot of the simple (ldist) and the weighted (ldistwces) log distance measures