Trade Without Borders: Trade Effect of EU Accession by Central and Eastern European Countries

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Abstract

This paper uses the episode of the EU accession of eight Central and Eastern European countries (CEECs) in 2004 as a natural experiment to identify the trade effect of declining border barriers across otherwise well integrated markets. Such barriers may include burdensome customs control procedures, technical barriers to trade, as well as differences in national legal frameworks. A considerable acceleration of bilateral exports can be observed around accession, especially in trade among CEEC's, which is quite general across industries. A gravity estimation is performed and the identification is based on a difference-in-difference strategy, where export growth in trade relationships with at least one CEEC is compared to growth among EU15 countries. In general, EU entry increased exports by around 15%, consistent with a 1.5-3.5% ad valorem tariff equivalent, in the first 3 years. When allowing for varying treatment effects across country groups, large differences are found. Estimates for exports among CEECs are as large as 4.5-10% tariff equivalent. This growth occurred mostly on the intensive (surviving) margin, contrasting with the evidence on the euro's trade effect, which emphasizes the role of the extensive margin.

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1 Introduction

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 EU15, intra-national trade is on average around 6 times larger than international trade. The mechanism through which the "border effect" works is 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, ranging from different product-specific technical requirements and other administrative burdens to, sometimes completely unobservable, cultural differences. 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 (CEECs: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) into the EU in 2004 provides a reasonably good case for a natural experiment to identify the trade effect of some of these trade costs across otherwise well integrated markets. Within the Pan-European Free Trade Zone (consisting of EU, EFTA, CEFTA and the Baltic Free Trade Area) a major subset of manufactured products was already traded tariff-free and rules of origin were harmonized several years before the accession. Any trade effect that can be observed for this set of manufactures after accession therefore cannot be attributed to the above "traditional" trade policy barriers. Rather, the measured effect must be the result of other factors that has caused decreasing trade costs with accession such as the elimination of customs control procedures (lengthy waiting hours at borders and burdensome documentation), the further harmonization of technical barriers to trade, as well as the harmonization of the general legal framework.

The literature of the trade integration of the CEECs to the EU, to my knowledge, has not yet provided evidence on the trade effects of the 2004 accession. There have been many papers written on the effects of trade opening of these markets

during the 1990's and early 2000's, and numerous gravity studies estimated the current and potential level of their trade integration.[1] Earlier EU accessions do not provide good cases for similar natural experiments either, since most of them occurred with explicit tariff reductions (Greece, Portugal, Spain). In this respect, the accession of Austria, Finland and Sweden in 1995 is more similar to the 2004 enlargement, but as Breuss (2005) argues, the possible effect of these countries' accession was completely masked by the parallel economic integration process of the CEECs to the EU.

Exploiting the episode of the 2004 accession as a natural experiment, this paper estimates the magnitude of the trade effect of EU entry for markets where trade liberalization, in terms of the traditional trade policy measures, were already complete. Even raw data evidence suggests that such a trade-creating effect exists and may be sizeable. Bilateral export flows accelerated in European trade at the time of accession in all country relationships that involved at least one CEEC, and especially among the CEECs themselves. Moreover, this phenomenon seems to be general across several manufacturing industries, more technological intensive sectors being affected the most.

Estimates based on an empirical gravity analysis reveal that the trade-creating effect of a common EU treatment in the first three years of membership is around 15%, which is consistent with a hypothetical 1.5%-3.5% ad valorem tariff reduction. In other words, bilateral exports accelerated as if there was a 1.5%-3.5% reduction in ad valorem tariffs in the export markets. A significant anticipatory trade effect is also identified for the immediate pre-accession year. Such an effect is justified by the fact that the decision on enlargement was already publicly known at least one year before. When allowing for varying treatment effects across country groups, estimates for exports among new members are the largest, having followed by exports from new to old countries. The tariff equivalent in the first case is estimated to be in the range of 4.5% to 10%, comparable to the magnitude of total tariff reductions during the liberalization process of the 1990's.

The paper provides a contribution to the literature on the relative importance of the extensive and intensive margins in trade growth. A decomposition of export growth into three margins (surviving, extensive and failure margins along with the

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

decomposition of Besedes and Prusa (2007)) reveals that the EU effect increased trade on the intensive (surviving) margin, while the role of the extensive margin remained very small. In other words, the export growth was mostly the result of more intense trade in products that were already traded before accession. This finding contrasts with the parallel evidence on the euro's trade effect, which emphasizes the role of the extensive margin. The difference however also lies in the calculation of margins; the formula applied here incorporates the fact that new trade starts in small magnitudes and, if having survived, deepens only gradually in several years.

The remainder of the paper is as follows. Section 2 discusses some of the important details of the trade integration of CEECs to the EU. Section 3 presents the product-level dataset and basic stylized facts about the different margins of export growth both on aggregate and industry level. Section 4 formulates the gravity estimating equation and presents the estimates for both total trade and trade growth on the separate margins. Robustness checks follow. Finally, 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 for a large set of manufactured goods it is very unlikely that such an effect came from changes in traditional trade policy measures such as tariffs, quantitative restrictions or rules of origin.

2.1 A Free Trade Area with harmonized rules of origin

CEECs 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 CEEC 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 CEECs than for EU countries.

Free trade of manufactures was also extended to bilateral trade between the CEECs 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 trade among CEECs.

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 CEECs with third countries outside the pan-European zone 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. Third-country tariffs of most CEFTA members before EU accession were higher, those of the Baltic states were lower than the level of common EU external protection (for average applied tariffs see Table 7 in Appendix). Hence, with accession

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

CEFTA countries had to decrease and the Baltics had to increase their third-country tariffs, which - apart from having an effect on trade with third-countries - might have influenced the trading patterns within the pan-European zone as well.

2.2 What other barriers changed with accession?

Although for most manufactured products EU accession brought no further trade liberalization with respect to the above discussed measures, an enterprise survey conducted by the European Commission in 2006 reflects that a majority of firms in CEECs experienced improved access to new markets after accession (Table 8 in Appendix). Such an improvement must be then the result of decreases in trade costs other than traditional trade policy measures.[3] Unfortunately, many of these "other" costs are not directly observable or very hard to quantify and, due to limited information, it is also hard to assess exhaustively which of them have changed with accession. The possible candidates include the followings.

Waiting time at border crossings. EU accession brought a radical decline in the waiting time at border crossings, due to the abolition of the customs clearence procedure. Evidence shows that the cost of waiting at borders can be large, especially if only a few border crossing points are available. Fink (2001) presents data on average waiting hours in several CEECs 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). The total waiting time may be multiple of these, if several borders should be crossed, e.g. in pre-accession trade of CEECs without common border. Hummels *et al.* (2007) quantify the cost of waiting in international trade of manufactures and find that an additional day of waiting acts on average as a 0.8% increase in ad-valorem tariffs.

Technical barriers to trade (TBT). Even nowadays, TBTs, i.e. differences in national technical and labeling requirements on products, are thought to be serious trade-distoring policy measures within the EU (see e.g. Chen (2004) or Manchin (2007) for empirical evidence). Apart from the need of complying to the requirement, only the issuance of the relevant certificates with the required detail may in

[3] A comprehensive survey on trade costs is provided by Anderson and van Wincoop (2004).

some cases take several months. Efforts to harmonize these requirements within the EU has been so far of limited success. CEECs were also involved in these efforts before accession through the PECAs (Protocols to the Europe Agreement on Conformity Assessment and Acceptance of Industrial Products), concluded in 1997. They were expected to apply the PECAs at the latest by the date of accession and some indeed took advantage of the transitional period.

Administrative costs of trading. A straightforward reduction in the administrative costs was the elimination of the customs administration within the enlarged EU. Although information on trading should still be provided to the authorities for statistical data collection, enterprises with trade flows below a threshold are exempt from doing so (see details later in Section 3.2). As indicated above, reduced administrative costs may also be due to the harmonization of TBTs and the reduced need of providing documents such as safety, health or consumer protection certificates.[4]

Differences in legal frameworks. Probably the less well-defined, but certainly not the least important, source of cost reduction can be associated with the harmonization of national legal frameworks or, in other words, the adoption of the *acquis communautaire*. A more harmonized legal framework and the corresponding reduction in legal and information costs can not only facilitate cross-border trade, but also encourage the setting-up of business in the foreign country. Although the process of legal harmonization with the EU had been more than a decade long in CEECs, the ultimate adoption of some community legislation was most probably concentrated at the date of accession.

2.3 The timing of the accession 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

[4]The Market Access Database of the EU (www.mkacdb.eu.int) provides some evidence on the administrative tasks related to the numerous types of nontariff barriers and technical requirements faced by EU exporters in third-markets. 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. Unfortunately, the database does not include historical records for CEECs or information for intra-EU trade.

four considerations to the current analysis. First of all, EU enlargement occurred in the middle of the year, at 1st of May 2004. Having annual frequency data, one needs to decide how to treat year 2004, of which only two-thirds falls after enlargement.

Second, 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.

Third, 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.

The fourth potentially important timing issue relates to the effect of earlier liberalization measures. As described above most of the trade liberalization occurred until the millenium, but their consequences may have unfolded only gradually. Hence, 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 such a late liberalization effect may bias our EU effect estimate 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 International Standard Industrial Classification (ISIC rev. 2) 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 potential short-term effect of 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.[5] On average non-zero bilateral trade is present only in 40% of the cases, with strong variation among individual countries.

[5] In practice, 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. Confidential exports within the EU in most countries and most years are only 2-4 percent of total, although in certain cases their importance can substantially increase (e.g. Hungary in 2003 with 25%). In general however it's magnitude is quite stable in time, i.e. EU accession does not seem to have an effect on its importance.

3.2 Statistical methodological considerations

When analysing this period one has to face some potentially serious statistical issues. Below the two most important of them is treated in detail.

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 is collected by the customs authorities at border crossings, after EU entry intra-EU trade has to be reported by the trading companies themselves based on a questionnaire. In order to reduce the administrative burden, companies with an annual trade flow below a certain threshold are exempt from reporting. Thresholds are determined each year so that total reported trade covers at least 97 percent of the country's total trade flows.[6] Thresholds therefore differ across reporting countries and depend on the distribution of firms' trade values within each country (Table 9 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.

Value-Added Tax (VAT) 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 VAT evasion motivations however it is not necessarily the interest of enterprises to provide correct reporting. Within 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 VAT fraud are therefore interested in underreporting their importing and overreporting their exporting activities. The

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

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.[7]

In order to minimize the impact of VAT 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.

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 new members that joined in 2004. 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.

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 CEECs 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 CEECs.

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 CEECs, and especially from the Baltic countries,

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

Figure 1: Export value flows in different relations (1999=100)

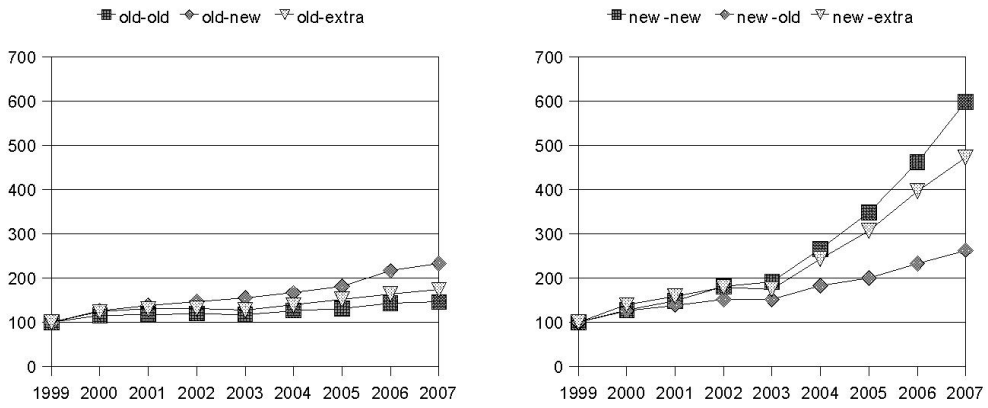


Table 1: Export exposure to Russia

Exporter	Russia's share in extra-EU25 exports (%)	Extra-EU25 export growth per annum (%)	of which: to Russia (% ps)
Czech Republic	12	26	4
Estonia	28	41	12
Hungary	10	27	4
Latvia	34	18	11
Lithuania	37	34	17
Poland	19	27	7
Slovenia	12	18	3
Slovakia	11	22	4
All (unweighted average)	20	27	8

Note: Averages of years 2004-2007.

to a large extent. When it comes to extra-EU exports the three Baltic countries were dependent on the export demand of the Russian market to a considerable extent. Around one-third of their extra-EU exports was directed to Russia, and out of their total extra-EU export growth in 2004-2007 some 10-20 percentage points can be attributed to the boost of the Russian market.

3.3.1 Decomposition into the three margins

In the followings, I decompose the change in the total export value into the surviving, extensive and failure margins in the spirit of Besedes and Prusa (2007). Total export value in period t between country i as exporter and country j as importer (denoted by X_{ijt}) is a sum of all such bilateral exports by product categories of

index k. Bilateral export growth from period $t-l$ to t is therefore

$$X_{ijt} - X_{ijt-l} \equiv d_l X_{ijt} = \sum_k d_l X_{ijt,k} \tag{1}$$

where l is any number of periods over which the differencing is done and d_l is the corresponding differencing operator. The formula can further be decomposed by realizing that total bilateral export growth in period t is the sum of all non-zero relationships that survived from period $t-l$ to t (surviving margin, $SM^{(l)}$), those that newly appeared in period t relative to $t-l$ (extensive margin, $EM^{(l)}$) minus those that have disappeared from period $t-l$ to t (failure margin, $FM^{(l)}$).

$$\begin{aligned}
\sum_k d_l X_{ijt,k} \quad &\equiv SM_{ijt}^{(l)} + EM_{ijt}^{(l)} - FM_{ijt}^{(l)} = \\
&= \underbrace{\sum_k d_l X_{ijt,k}\Big|_{X_{ijt,k}>0, X_{ijt-l,k}>0}}_{surviving} + \\
&+ \underbrace{\sum_k X_{ijt,k}\Big|_{X_{ijt,k}>0, X_{ijt-l,k}=0}}_{extensive} - \\
&- \underbrace{\sum_k X_{ijt-l,k}\Big|_{X_{ijt,k}=0, X_{ijt-l,k}>0}}_{failure}
\end{aligned} \tag{2}$$

Besedes and Prusa (2007) define the growth on the intensive margin as the sum of the suviving and failure margins, I will however maintain the distinction among the three, since they inherently reflect different phenomena. The growth on the surviving margin shows the deepening of bilateral trade in a product category that was already traded before. It can therefore be either positive or negative depending on whether such trade grows or declines. In contrast, the extensive margin is always non-negative and shows new trade in products that were not traded before.

Table 2 shows the decomposition of annual bilateral trade growth, averaged across country group pairs (new-new, new-old, old-new, old-old), either weighted by the

Table 2: Decomposition of export growth

	old-old	new-new	new-old	old-new
Weighted averages of bilateral growth rates within country group pairs				
Total				
2000-2003	4.5	18.0	11.5	11.9
2004-2007	5.4	32.9	14.7	10.9
Surviving				
2000-2003	4.3	16.0	12.0	11.4
2004-2007	5.8	29.4	12.0	10.8
Extensive				
2000-2003	2.0	6.7	2.6	2.9
2004-2007	2.7	8.2	7.0	3.8
Failures				
2000-2003	-1.8	-4.7	-3.1	-2.4
2004-2007	-3.1	-4.7	-4.4	-3.8
Unweighted averages of bilateral growth rates within country group pairs				
Total				
2000-2003	7.4	31.5	26.3	17.3
2004-2007	8.0	34.1	23.1	19.1
Surviving				
2000-2003	6.6	18.9	18.3	14.2
2004-2007	8.0	26.8	13.3	17.7
Extensive				
2000-2003	4.2	23.5	16.5	9.7
2004-2007	5.2	15.8	18.7	9.1
Failures				
2000-2003	-3.3	-10.9	-8.6	-6.5
2004-2007	-5.2	-8.5	-8.9	-7.7

Note: Period averages of annual growth rates.

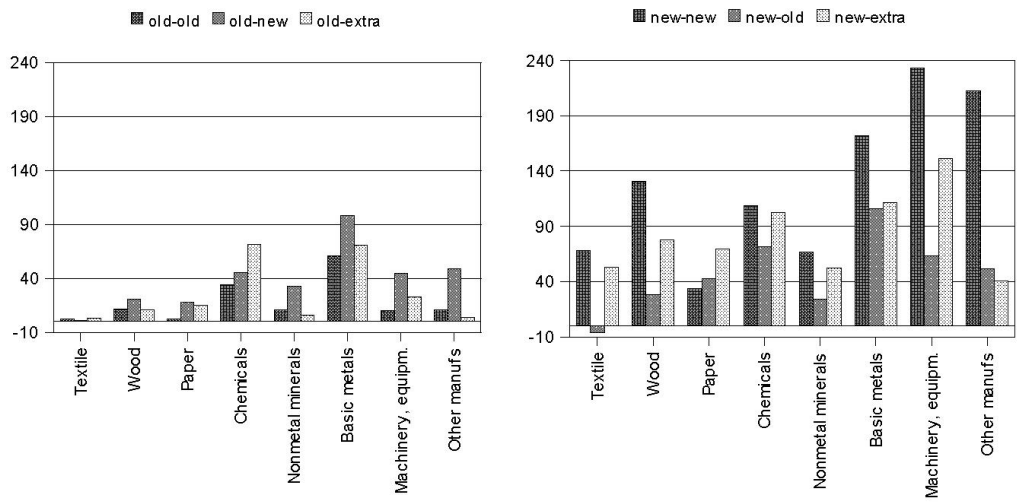
share of bilateral trade in total country group pair trade or unweighted. The decomposition is done for k standing for HS6 products at the 6-digit level and $l = 1$. I calculate pre- and post-accession 4-year averages of growth rates, so that the figures are less affected by individual year effects. The weighted and unweighted figures differ substantially, since the unweighted ones assign disproportionately larger shares to smaller countries. Growth on the extensive and failure margins are generally larger when unweighted, in line with the observation that smaller countries' trade relationships are usually less permanent.

The acceleration in exports after 2004 among CEECs occurred to a major extent on the surviving margin, i.e. by the deepening of already existing trade relationships. On the contrary, new-old and old-new exports increased only at the extensive margin, i.e. exports expanded in newly traded 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.

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 10 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, that we could observe on aggregate flows, are also present in industry breakdown. Exports in trade directions that contain at least one CEEC, and especially trade among CEECs, grew considerably faster than trade among old EU members.

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



The large growth of exports among CEECs 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 11 in the Appendix 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 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 VAT 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, a workhorse model in the empirical trade literature. 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 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.

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 zero trade flows 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

$$X_{ij} = \frac{Y_i Y_j}{Y^W} \left(\frac{T_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \tag{3}$$

subject to the constraints on the relationship between Π_i and P_j

$$P_j^{1-\sigma} = \sum_i \frac{Y_i}{Y^W} \left(\frac{T_{ij}}{\Pi_i} \right)^{1-\sigma} \tag{4}$$

and

$$\Pi_i^{1-\sigma} = \sum_j \frac{Y_j}{Y^W} \left(\frac{T_{ij}}{P_j} \right)^{1-\sigma} \tag{5}$$

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 elasticity of subsitution between all goods. 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 country j's resistence to importing from abroad.[8] 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.

4.2 Setting up a panel estimating equation

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

$$T_{ij} = DIST_{ij}^{\delta_1} \cdot e^{\delta_2 EU_{ij} + \boldsymbol{\delta_3 Z_{ij}} + \varepsilon_{ij}} \tag{6}$$

[8] 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-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.

$DIST_{ij}$ denotes the geographical distance between the exporting and importing countries, which is mainly a proxy for transportation costs. EU_{ij}, the centre of my interest, is a dummy variable for common EU membership and it takes value 1 when both countries engaged in trade with each other are members of the EU and 0 otherwise. The $\boldsymbol{Z}_{ij}$ is a set of dummy variables for proxying trade costs typically used in similar gravity studies: dummies for sharing a border, having a common language, common historical ties, or a common currency. Finally, an error term ε_{ij} also enters the expression accounting for the fact that some bilateral trade barriers are not observed or are proxied by the above variables with an error.

In other applications bilateral tariffs, as other important observable trade barriers, may also be part of the trade cost function. In the current exercise however the trade flow is restricted to products where all tariffs were already eliminated in all bilateral relations.

The theoretical gravity model is set up for the steady state, where the time dimension has no role whatsoever. Many of the recent applications - including this one - however use panel data sets with several years of observations. Moreover, the time dimension has an important role in my estimation strategy: I want to identify the EU effect by comparing after-accession to before-accession trade of CEECs, using the change in trade among old EU countries as a benchmark. In the followings I derive the estimating equation based on this strategy, accounting for two important questions: 1. how to control for the unobserved heterogeneity that may introduce biases in my estimates, and 2. how to account for the uncertainty about the timing of the effect that I want to measure.

After taking logs of the original gravity equation and substituting the trade cost expression, the equation for a panel framework becomes

$$\begin{aligned} x_{ijt} &= y_{it} + y_{jt} - y_t^W + (1-\sigma)\,\delta_1 dist_{ij} + (1-\sigma)\,\delta_2 EU_{ijt} + \\ &\quad + (1-\sigma)\,\boldsymbol{\delta}_3 \boldsymbol{Z}_{ijt} - (1-\sigma)\,\pi_{it} - (1-\sigma)\,p_{jt} + (1-\sigma)\,\varepsilon_{ijt} \end{aligned} \tag{7}$$

where small letters denote logarithms and t is an index for years. Note that the variable of geographical distance and most of the elements of $\boldsymbol{Z}$ are not dependent on time. In fact, the only time-varying variable in $\boldsymbol{Z}$ in the current application

is the dummy for common currency, which changes once for Slovenia's euro area entry in year 2007. The effect of the EU membership on trade is captured by the expression $(1-\sigma)\delta_2$, i.e. it depends on two separate parameters, the elasticity of substitution between goods and the parameter that shows how much EU membership changes the cost of cross-border trade, i.e. the tariff equivalent for trade partners of not jointly being members of the EU.

4.2.1 Correcting for potential biases

One of the most severe problems in finding the proper estimation technique relates to the fact that the last two variables in the above equation, i.e. the two multilateral resistence terms (π_{it} and p_{jt}) are not observed. If they are correlated with some of the other right-hand-side variables, but remain in the error term, they may cause omitted variable bias in the estimates. As it was stated above, multilateral resistence is a function of all the bilateral trade barriers between either country i or j and the countries in the rest of the world. Hence, they may indeed be correlated with some of the bilateral trade barriers between i and j, notably the EU dummy.

A straightforward example for such a bias is the following. When a country enters the EU it also enters a customs union and it has to adjust its third-country tariffs to the level of the common union tariffs. The level of third-country tariffs are in turn correlated with EU membership and, at the same time, are obvious elements of the multilateral resistance terms. In particular, for all CEFTA countries third-country tariffs had to be lowered with accession, which corresponded to a fall in their multilateral resistence. For these countries, less costly imports from outside the EU may have diverted intra-EU trade, which can cause a downward bias in the estimate of the EU effect.

In a cross-section framework the unobservable multilateral resistence, as well as any unobservable bilateral trade barrier, can be controlled for by including separate dummy variables for each country-pair in the estimation, i.e. a fixed effects estimation in the panel analogy. Unfortunately, in a panel data setting this solution is sufficient only under the assumption that such unobserved heterogeneity is time-invariant. This assumption clearly does not hold in the present case. Instead, Baldwin and Taglioni (2006) suggest that, in addition to the fixed effects, a full set

of individual-specific time dummies should be included. In general, a drawback of this approach is that it involves a lot of dummies to be estimated (the number of exporter- plus importer-specific time dummies is $2NT$) and hence a significant degrees of freedom loss.

4.2.2 The estimating equation

Against this background I set up an estimating equations, which is basically a Fixed Effects (FE) model of the theoretical gravity equation with other control variables added to control for the unobservable time-varying part of the multilateral resistence. The estimating equation is

$$\begin{aligned} x_{ijt} &= \beta_1 gdp_{it} + \beta_2 gdp_{jt} + \boldsymbol{\beta_3 EU}_{ijt}\boldsymbol{D}_{ij} + \beta_4 EA_{ijt} + \\ &\quad + \beta_5 tar_{it} + \beta_6 tar_{jt} + \beta_7 reer_{it} + \beta_8 reer_{jt} + \delta_t + \gamma_{ij} + u_{ijt} \end{aligned} \tag{8}$$

where index i denotes exporter, j importer and t years. On the left-hand side, x_{ijt} is the log of bilateral exports in euro value terms, on the right-hand side, gdp_{it} and gdp_{jt} are the logs of nominal GDP's in euros.[9] 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 unitary income elasticity of trade, as suggested by the theory, may not necessarily hold for the data.

The term $\boldsymbol{EU}_{ijt}\boldsymbol{D}_{ij}$ is the focus of interest, the interaction of the dummy for common EU membership and a set of dummy variables indicating which group the country-pair involved in trade belongs to. As previously, four direction-specific country-pair groups are differentiated: new-new, new-old, old-new and old-old. Interacting the EU dummy with the latter set of dummies helps to identify varying EU treatment effects across these groups. Estimating a common EU effect is therefore a special case of the above specification with $\boldsymbol{D}_{ij} = 1$. Note that the EU

[9] 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.

dummy for the old-old group is time-invariant and drops out from the estimation; hence all estimated EU effects should be interpreted as being relative to this group.

The two variables that are meant to control for the time-varying part of the multilateral resistence are the 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 ($reer_{it}$, $reer_{jt}$). Although the use of real exchange rates as proxies for multilateral resistence has been criticized in the literature, I also include them for another reason. Old EU members and CEECs are not homogenous, since CEECs are still under a real convergence process. The inclusion of real exchange rates may control for some of this heterogeneity.

EA_{ijt} is the dummy for common currency, which actually changes only once in time at Slovenia's euro adoption in 2007. Year dummies (δ_t) and country-pair fixed effects (γ_{ij}) are also included. 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_t^W) from the theoretical equation.

Due to the inclusion of country-pair fixed effects time-invariant variables are not identified and intentionally left out from the equation. The error term u_{ijt} includes the time-varying unobserved bilateral trade costs (the time-varying part of $(1-\sigma)\,\varepsilon_{ijt}$) and all the time-varying multilateral resistence that is not captured by the tariff and real exchange rate control variables. The assumption for unbiased EU effect estimates is therefore that these latter two unobservables are not correlated with the EU dummy.

The inclusion of exporter- and importer-specific year effects, as perfect controls for the time-varying part of multilateral resistence, is unfortunately not feasible in the present analysis due to their perfect collinearity with the $\boldsymbol{EU}_{ijt}\boldsymbol{D}_{ij}$ term. Although estimating only a common EU dummy removes the perfect collinearity, the variation in the EU dummy left for identification after netting out the year effects remains very small (around 8%).

4.2.3 Addressing the timing issues and serial correlation

As discussed in Section 2.3, there are some potentially serious issues regarding the timing of the EU affect. First of all, the enlargement occurred in the middle of the year, so the treatment of year 2004 is not straightforward. I solve this issue by keeping only the odd years between 1999 and 2007 in the estimation. This way I can get rid of the problematic accession year and, at the same time, keep the time frequency balanced by changing it from annual to biannual. Hence, the restricted dataset contains three years data before (1999, 2001, 2003) and two years data after accession (2005, 2007).

The three years before accession provide possibility to test for anticipatory EU effects (as if accession occurred from 2001 to 2003) and to carry out a "placebo experiment" (as if accession occurred from 1999 to 2001). The presence of a positive anticipatory effect may be justified by the fact that the date of accession became known already in 2003. In contrast, a significant placebo effect would indicate that, having controlled for all the right-hand-side variables, something other than EU accession also characterises new members' trade as opposed to trade among old members. In other words, a placebo experiment is a test whether the empirical strategy is designed so that no other effect is measured in addition to the accession effect.

A further issue that should be address when estimating on a panel with more than two time periods is serial correlation. As it was discussed in Bertrand *et al.* (2004) and Kézdi (2004), the treatment dummy in a panel estimation framework is strongly serially correlated, since normally it changes only once in time, and in a fixed-effects estimation with multiple time periods it can cause a serious downward bias on the standard error estimates. Although by taking the biannual frequency I can mitigate the serial correlation considerably, to fully overcome this problem I use the so-called "cluster" variance-covariance matrix estimator that provides unbiased estimates for both serial correlation within cross-sectional units and for cross-sectional heteroskedasticity.[10] The clustering is done on a direction-specific country-pair level, so the estimator is unbiased for any serial correlation within each direction-specific country-pair in the sample.

[10] Kézdi (2004) shows that the "cluster" estimator is unbiased even for a moderatly large cross-sectional dimension (N=50). Clearly, in the present case this condition is satisfied. In practice, the estimator is implemented by using the *cluster* option in Stata.

4.3 Data

I use annual data for the odd years between 1999 and 2007, although export data for Poland and Slovakia is not available for 2007. Unless indicated otherwise, the results are presented for the sample without these two countries and including 2007. If Poland and Slovakia is also included, the sample does not contain 2007. 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. Their increase corresponds to appreciation. 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.

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.

4.4 Estimation results

The main estimates for the EU effect are presented in Table 3 either with a common EU dummy (common treatment) or group-specific EU dummies (varying treatment). Note that, since I use a biannual sample, the EU dummy turns from 0 to 1 from year 2003 to year 2005. The two-year lead of the treatment, EU(+2), intends to capture an anticipated accession effect by taking value 1 already in 2003. The differences between the common and varying treatments reveal a strong country group-specific nature of the accession effect. The common effect, which is relatively moderate though still strongly significant, masks a large effect for exports in new-new and, to a lesser extent, in new-old relationships and no significant effect in old-new ones.

Table 3: Estimation results - level equation

Variable	Common treatment		Varying treatment	
EU	0.136***	0.084**		
	0.044	[0.038]		
EU_new_new			0.447***	0.384***
			[0.097]	[0.091]
EU_new_old			0.276***	0.191***
			[0.063]	[0.054]
EU_old_new			0.029	0.003
			[0.058]	[0.050]
EU(+2)		0.118***		
		[0.035]		
EU_new_new(+2)				0.213**
				[0.089]
EU_new_old(+2)				0.227***
				[0.060]
EU_old_new(+2)				0.059
				[0.039]
Gravity variables	yes	yes	yes	yes
Country-pair fixed effects	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes
Observations	1900	1900	1900	1900
Number of groups	380	380	380	380
Within R-squared	0.62	0.62	0.63	0.63

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level. The sample includes every odd year between 1999-2007. * significant at 10%; ** significant at 5%; *** significant at 1%.

The coefficient on the common EU dummy shows around a 15% acceleration of trade in all relations that contained at least one CEEC, taking the development of old-old trade as a benchmark.[11] When controlling for a possible anticipation effect it turns out that a considerable part of this increase seems to have occured in anticipation. The coefficient for new-new relationships only is around 0.4, i.e. it shows a 50% increase in bilateral exports following accession. Altough this group also experienced a significant anticipation effect, its magnitude is only half of the measured post-accession acceleration. The EU effect for exports from new to old members is lower than for new-new relations (20-25%) with an anticipation effect of a similar magnitude.

According to equation (7), the estimate on the EU effect can be decomposed as $(1-\sigma)\,\delta_3$. A large estimated EU effect can therefore capture either a large elasticity of substitution between goods or a large effect of EU membership on trade costs, i.e. a large tariff equivalent of not being an EU member. Having a measure of σ one can give an estimate for the latter parameter. Hummels (2001) provides estimates for σ at an industry breakdown and finds that its cross-industry average value differs for different levels of disaggregation. His estimates

[11] % change = $100 \cdot (\exp(coeff) - 1)$

Table 4: Placebo estimates (as if accession in 2000)

Variable	Common treatment	Common treatment with PL, SK	Varying treatment	Varying treatment with PL, SK
EU_placebo	0.036	0.052		
	[0.048]	[0.045]		
EU_new_new_placebo			-0.050	-0.038
			[0.101]	[0.081]
EU_new_old_placebo			0.052	0.079
			[0.064]	[0.058]
EU_old_new_placebo			0.017	0.017
			[0.064]	[0.059]
Gravity variables	yes	yes	yes	yes
Country-pair fixed effects	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes
Observations	760	924	760	924
Number of groups	380	462	380	462
Within R-squared	0.51	0.49	0.52	0.49

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level. The sample includes years 1999 and 2001.
* significant at 10%; ** significant at 5%; *** significant at 1%.

for manufacturing goods range from 5.8 to 8.3 when he moves from less to more detailed industry breakdown.

Assuming that σ falls in the range of 5 to 10, the estimated ad valorem tariff equivalent of at least one partner in trade not being in the EU should range between 1.5% to 3.5% according to the common treatment estimate. The same measure however gets as large as 4.5% to 10% in the case when neither of the trading countries are EU members, although they form a Free Trade Area. This means that the joint EU accession for new countries acted as a decrease in ad valorem tariffs of 4.5-10%, regardless of the fact that their trade was tariff-free already before accession.

One can check it as to what extent these numbers reflect the effect of accession (or its anticipation) alone by carrying out a "placebo experiment", when accession is assumed to have occurred in a date when in fact there was not even a decision about it. The sample allows me to test the effect of a placebo accession that occurred from 1999 to 2001, i.e. before the Copenhagen Summit. Table 4 reports estimates of equation (8) for such an experiment, when the sample is cut after 2001 in order to exclude any effect afterwards. The placebo EU dummies are practically the original EU dummies led by 4 years (EU(+4)). The placebo estimates are numerically small and not different from zero statistically. This suggests that the main results are most probably not driven by other sources of heterogeneity across country groups that could have been present even in the early years of the sample.

An alernative way of placebo estimation is to include the placebo EU dummies in the main regressions in addition to the original and anticipatory EU dummies and running the regression on the whole sample. Results are in Tables 12 and 13 in the Appendix. The interpretation of these estimates is less clear-cut. For trade between old and new countries (new-old and old-new) the placebo effect is now significantly different from zero, although of a moderate magnitude. This means that there was a source of trade growth in these relations relative to old-old trade even in the early years that remains to be unexplained by the gravity equation. Interesingly, since in the old-new relation no significant EU effect is estimated, this early source of growth, at least in the old-new relation, seems to have faded away by the time of accession.

Tables 12 and 13 in the Appendix also give a detailed presentation of the estimation results, including estimates for the coefficients of the other gravity variables. The coefficients on the GDP variables are, as expected, in most of the cases around or slightly less then unity. In fact, the null hypothesis of unit income elasticities cannot be rejected in the majority of the cases. The third-country tariff variables are mostly significant only in shorter sample estimations (after accession there is no variation in them) and, as expected, have a positive estimated effect on exports. In contrast, coefficients on the real exchange rate variables are significant and negative in most of the regressions. This negative effect mostly reflects a valuation effect: if the exchange rate of countries not in the euro area appreciates, the value of their trade in euros should decrease for simply accounting reasons, unless their trade pricing is fully in euros. When, as a robustness check, the regression is re-run for volumes, the valuation effect is filtered out, and the signs of the real exchange rate effects are in line with theory: an appreciation leads to smaller exports and larger imports.

4.5 Estimates on the margins

Based on the decomposition of export growth into the three margins, as discussed in Section 3.3, it can be checked on which margin the EU effect actually evolved. Since the margins are defined on changes, the estimating equation (8) should be transformed into first-differences, i.e. in differences between period t and $t-2$ in the biannual case. Taking the two-period (rather than the one-period) differences

has an additional advantage. Recent empirical evidence, as demonstrated e.g. in Ruhl and Willis (2009), shows that new exporters' trade needs several years to unfold completely. Hence, taking two-year differences can leave more room for such a gradual evolution. Besides, the difference estimates for total exports can serve as an important cross-check for the main results.

After differencing, the estimating equations becomes

$$\begin{aligned} d_2 x_{ijt} &= \beta_1 d_2 gdp_{it} + \beta_2 d_2 gdp_{jt} + \boldsymbol{\beta_3 d_2 EU_{ijt} D_{ij}} + \beta_4 d_2 EA_{ijt} + \\ &+ \beta_5 d_2 tar_{it} + \beta_6 d_2 tar_{jt} + \beta_7 d_2 reer_{it} + \beta_8 d_2 reer_{jt} + \xi_t + d_2 u_{ijt} \quad (9) \end{aligned}$$

where d_2 is a differencing operator that takes the difference between year t and $t-2$ and ξ_t is a new set of common time dummies.

Estimates on the different margins are done by replacing the left-hand-side variable to $\frac{SM_{ijt}^{(2)}}{X_{ijt-2}}$ in the case of the surviving margin, $\frac{EM_{ijt}^{(2)}}{X_{ijt-2}}$ for the extensive margin and $\frac{FM_{ijt}^{(2)}}{X_{ijt-2}}$ for the failure margin. Note that the $^{(2)}$ index denotes that the margin is defined on the biannual frequency, i.e. the extensive margin is the sum of the export values from i to j in all products that were not traded in period $t-2$ but became traded in period t. An increase on the failure margin means a larger value of disappearing trade flows. The percentage increases on the margins sum up to total export growth, i.e. $d_2 x_{ijt} \approx \frac{X_{ijt}}{X_{ijt-2}} - 1 = \frac{SM_{ijt}^{(2)} + EM_{ijt}^{(2)} + FM_{ijt}^{(2)}}{X_{ijt-2}}$.

The EU effect estimates for total exports (the first columns in Table 5 and 6) justify the main results. The sum of the coefficients on the EU dummy and its lagged counterpart (EU(-2)), the effects that emerged in 2005 and 2007, respectively, is very much in line with the effect found in the main estimation. An interesting piece of result is that the overall longer-run effect in 2007 is found to be stronger than the immediate effect in 2005. In particular, in the longer run even old-new trade seems to be positively affected by EU accession. The results also confirm the presence of a sizeable anticipatory accession effect.

The results on the three margins clearly reveal the dominance of adjustment on the surviving margin. Basically, all the trade-creating effect of accession occurred in those products that were already traded before accession. This result is a

Table 5: Estimates on the margins - common treatment

Variable	Total	Surviving	Extensive	Failure
EU	0.040	0.079	-0.017	0.051***
	[0.038]	[0.052]	[0.046]	[0.010]
EU(-2)	0.139***	0.088**	0.133	-0.014
	[0.039]	[0.044]	[0.117]	[0.016]
EU(+2)	0.085**	0.085	-0.003	0.002
	[0.036]	[0.053]	[0.052]	[0.011]
Gravity variables	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes
Observations	1520	1520	1520	1520
Within R-squared	0.16	0.12	0.05	0.16

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level. The sample includes two-year differences of every odd year between 1999-2007. * significant at 10%; ** significant at 5%; *** significant at 1%.

contribution to the literature on the relative role of the intensive and extensive margins in trade growth and contrasts with the findings about the important role of new goods' trade in trade development (e.g. Kehoe and Ruhl (2002) and Hummels and Klenow (2005)). It is also in contrast with the empirical evidence on the effects of euro adoption, since the euro literature emphasizes the dominant, or in some cases exclusive, role of the extensive margin in the trade creation of the common currency.[12]

When comparing these results, however, one needs to account for the differences in the calculation of the margins. The formula (eq. 2) applied here is different from those applied in the above mentioned studies. In particular, unlike the other formula, the current calculation of the margins also incorporates the fact that new trade starts in small magnitudes and, if having survived, deepens only gradually in several years. Not surprisingly, the current result is more supportive for the work of Besedes and Prusa (2007), who use the same formula and also find less role for the extensive margin.

As an additional finding, the estimates on the failure margin, i.e. disappearing trade, reveal some sign of restructuring in the set of traded products between old and new countries after accession. EU accession seems to have increased the failure of trade flows significantly in both new-old and old-new trade: exports fell by 6.4% and 4%, respectively, for these two groups between 2003 and 2005 due to disappearing trade. Such failures were however compensated (or even outweighed)

[12]See e.g. Flam and Nordström (2006) and two recent firm-level studies from De Nardis *et al.* (2008) and Berthou and Fontagné (2008) on Italian and French data.

Table 6: Estimates on the margins - varying treatment

Variable	Total	Surviving	Extensive	Failure
EU_new_new	0.257***	0.286***	0.036	0.026
	[0.082]	[0.093]	[0.143]	[0.024]
EU_new_old	0.099*	0.144**	0.002	0.062***
	[0.054]	[0.072]	[0.056]	[0.018]
EU_old_new	-0.058	-0.021	-0.073	0.039***
	[0.047]	[0.060]	[0.053]	[0.015]
EU_new_new(-2)	0.200**	0.236***	-0.153	-0.069**
	[0.097]	[0.081]	[0.101]	[0.033]
EU_new_old(-2)	0.195***	0.060	0.416	-0.007
	[0.056]	[0.055]	[0.261]	[0.022]
EU_old_new(-2)	0.102**	0.103**	-0.075	-0.014
	[0.042]	[0.051]	[0.056]	[0.019]
EU_new_new(+2)	0.157**	0.035	0.033	-0.026
	[0.076]	[0.089]	[0.124]	[0.023]
EU_new_old(+2)	0.180***	0.236**	0.083	0.018
	[0.063]	[0.103]	[0.098]	[0.016]
EU_old_new(+2)	-0.010	-0.025	-0.115**	-0.011
	[0.035]	[0.036]	[0.047]	[0.013]
Gravity variables	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes
Observations	1520	1520	1520	1520
Within R-squared	0.18	0.13	0.07	0.17

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level. The sample includes two-year differences of every odd year between 1999-2007. * significant at 10%; ** significant at 5%; *** significant at 1%.

by increases on the surviving margin.

4.6 Robustness checks

Several modifications of the baseline estimations are performed in order to check the robustness of the results. First of all, estimations were run for the sample including data for Poland and Slovakia but ending before 2007. Though for these two countries the data source is different, completely eliminating them would limit the scope of the results - all the more because Poland is the largest economy among the CEEC's. The results for the modified sample are only marginally different. Despite that the EU effect is measured only until 2005, its magnitude is in general not lowered. Moreover, unlike in the baseline estimates, a significant positive effect is found for exports from old to new countries.

Further robustness checks are presented in Table 17 in the Appendix. In order to control for the possible export-inflating effect of VAT fraud, I carried out the estimations on a sample excluding the typically VAT fraud sensitive products.[13]

[13] I exclude the 4-digit ISIC categories 3825 "Manufactures of office computing and accounting

The results are basically unaltered. The VAT fraud sensitivity check was also done for estimates on the margins and, again, the results are qualitatively unaffected (Table 18 in Appendix).

The analysis was also reproduced for real exports and real GDP's, where exports were deflated by national producer price indices and GDP's by their corresponding deflators. In this regression the EU effects are somewhat larger, although they do not differ significantly from the baseline figures.

Finally, the last robustness check was motivated by the evidence on the importance of the Russian market in extra-EU exports of some countries (see Section 3.3). The substantial increase of exports to Russia from countries that share a border with Russia could cause trade diversion from EU markets. To control for this possible effect, I include a Russian neighbour dummy (taking value 1 in case of Finland, the three Baltic countries and Poland) interacted with the EU dummies. The results show a strong diversion of trade from Russian neighbour new countries to old ones and from Finland to new countries and a correspondingly higher EU effect estimates for these groups. In fact, the EU estimate for new-old trade is almost twice as large as in the baseline estimation, i.e. Poland and the Baltic countries would have exported even more to EU markets without the strong "gravitation" of the Russian market. Interestingly, however, no such export diversion can be shown for exports of these countries to other new EU members.

5 Conclusion

This paper provides empirical evidence on the magnitude of the trade effect of EU accession by taking the episode of the 2004 accession as a natural experiment. Since tariffs were already eliminated for a large subset of traded goods several years before the accession in the whole now-enlarged EU area, the trade effect estimates can shed some light on the importance of other (non-tariff) barriers of trade. A difference-in-difference econometric strategy is built up, where the identification is based on differences between before- and after-accession as well as old and new EU members' trade.

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".

The effect for a common EU treatment reveals a 15% increase in bilateral exports in country relations with at least one new member state, which is consistent with a hypothetical 1.5%-3.5% ad valorem tariff reduction. Moreover, a significant anticipatory trade effect is also identified for the immediate pre-accession year. When allowing for varying treatment effects accross country groups it turns out that exports among new members grew the fastest, having followed by exports from new to old countries. The tariff equivalent of being out of the EU for new countries is estimated to be in the range of 4.5% to 10%, comparable to the magnitude of total tariff reductions during the liberalization process of the 1990's. A decomposition of export growth into three margins reveals that the EU effect increased trade on the intensive (surviving) margin, while the role of the extensive margin remained small. This finding contrasts with the parallel evidence on the euro's trade effect, which emphasizes the role of the extensive margin.

A natural extension of this research is to identify the exact sources of the decline in trade barriers that could explain the above empirical findings, namely the varying treatment effect accross country groups and the importance of the intensive margin adjustment. Candiates for these sources are numerous, ranging from reduced waiting hours at borders and lower administrative costs to the increased confidence due to more harmonized legal environments. Such an investigation is a topic for future research.

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Appendix

Table 7: 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

Table 8: Impact of enlargement on activities in New Member States

	Positive impact	No impact	Negative impact	DK/NA
Access to new markets	54	37	4	5
Productivity	46	44	6	4
Profitability	34	39	21	6
Selling prices	30	39	28	3
Growth in employment	30	54	13	4
The cost of wages	21	46	29	4
The cost of raw materials	19	40	33	9

Notes: % of companies. European Commission Internal Market Survey in 2006. Question Q6. "For each of the following, could you please tell me whether the 2004 enlargement of the EU had a positive or negative effect on..."

Table 9: Intrastat thresholds for exports in 2005 (in 1000 euros)

Exporter	Threshold	Exporter	Threshold
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 10: 2-digit ISIC branches and the number of corresponding HS6 products

ISIC code	Description	Number of 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-Metalling 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
31-39	Manufacturing	5362
11-99	All	5959

Table 11: Decomposition by branches

	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	12.5	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
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
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
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

Note: Period averages of annual growth rates, weighted averages of bilateral flows within country group pairs.

Table 12: Results - level equation, common treatment

Variable	sample until 2007					sample with PL, SK, until 2005				
				sample until 2003	sample until 2001				sample until 2003	sample until 2001
EU	0.136***	0.084**	0.091**			0.187***	0.092***	0.100***		
	[0.044]	[0.038]	[0.038]			[0.040]	[0.035]	[0.036]		
EU(+2)		0.118***	0.084**	0.136***			0.213***	0.181***	0.222***	
		[0.035]	[0.034]	[0.035]			[0.030]	[0.030]	[0.029]	
EU(+4)			0.078**		0.036			0.077**		0.052
			[0.037]		[0.048]			[0.036]		[0.045]
gdp_i	1.262***	1.173***	1.143***	0.865***	0.511	1.408***	1.186***	1.144***	0.876***	0.566*
	[0.171]	[0.177]	[0.180]	[0.217]	[0.352]	[0.162]	[0.169]	[0.173]	[0.183]	[0.316]
gdp_j	1.122***	1.032***	1.002***	0.976***	1.556***	1.052***	0.844***	0.801***	0.845***	1.265***
	[0.153]	[0.163]	[0.167]	[0.176]	[0.328]	[0.143]	[0.151]	[0.157]	[0.149]	[0.272]
EA	0.077	0.070	0.065							
	[0.057]	[0.056]	[0.056]							
tariff_i	-0.026**	-0.025**	-0.024**	0.007	0.003	-0.014	-0.014	-0.014	0.020*	0.009
	[0.011]	[0.011]	[0.011]	[0.014]	[0.026]	[0.010]	[0.010]	[0.010]	[0.012]	[0.024]
tariff_j	0.004	0.006	0.006	0.017*	0.035*	0.014	0.014	0.015	0.026***	0.038**
	[0.013]	[0.013]	[0.013]	[0.010]	[0.021]	[0.010]	[0.010]	[0.010]	[0.009]	[0.019]
reer_i	-0.622**	-0.576**	-0.575**	-0.254	0.750*	-0.951***	-0.817***	-0.831***	-0.567***	0.258
	[0.285]	[0.283]	[0.282]	[0.306]	[0.454]	[0.216]	[0.212]	[0.213]	[0.198]	[0.372]
reer_j	-0.223	-0.177	-0.176	0.064	0.017	-0.408**	-0.296	-0.314	-0.219	-0.737***
	[0.232]	[0.237]	[0.238]	[0.256]	[0.459]	[0.192]	[0.192]	[0.193]	[0.168]	[0.279]
Constant	-18.27***	-16.63***	-15.95***	-15.07***	-22.16***	-16.76***	-12.93***	-11.82***	-10.99***	-13.64***
	[2.259]	[2.443]	[2.544]	[3.768]	[5.802]	[2.433]	[2.569]	[2.796]	[2.688]	[4.814]
Country-pair fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1900	1900	1900	1140	760	1848	1848	1848	1386	924
Number of groups	380	380	380	380	380	462	462	462	462	462
Within R-squared	0.62	0.62	0.62	0.49	0.51	0.60	0.61	0.61	0.55	0.49

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level.
The sample includes every odd year between 1999-2007 (1999-2005 with PL, SK)
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 13: Results - level equation, varying treatment

Variable	sample until 2007					sample with PL, SK, until 2005				
				sample until 2003	sample until 2001				sample until 2003	sample until 2001
EU_new_new	0.447***	0.384***	0.405***			0.422***	0.328***	0.352***		
	[0.097]	[0.091]	[0.092]			[0.072]	[0.067]	[0.069]		
EU_new_old	0.276***	0.191***	0.203***			0.291***	0.173***	0.191***		
	[0.063]	[0.054]	[0.056]			[0.056]	[0.047]	[0.048]		
EU_old_new	0.029	0.003	0.014			0.084*	0.021	0.026		
	[0.058]	[0.050]	[0.051]			[0.051]	[0.044]	[0.045]		
EU_new_new(+2)		0.213**	0.179**	0.192**			0.334***	0.303***	0.303***	
		[0.089]	[0.075]	[0.083]			[0.059]	[0.055]	[0.057]	
EU_new_old(+2)		0.227***	0.181***	0.221***			0.316***	0.255***	0.301***	
		[0.060]	[0.061]	[0.059]			[0.048]	[0.048]	[0.047]	
EU_old_new(+2)		0.059	0.012	0.044			0.144***	0.110***	0.128***	
		[0.039]	[0.035]	[0.042]			[0.034]	[0.032]	[0.034]	
EU_new_new(+4)			0.097		-0.050			0.098*		-0.038
			[0.088]		[0.101]			[0.059]		[0.081]
EU_new_old(+4)			0.107**		0.052			0.150***		0.079
			[0.054]		[0.064]			[0.050]		[0.058]
EU_old_new(+4)			0.109**		0.017			0.075*		0.017
			[0.043]		[0.064]			[0.042]		[0.059]
gdp_i	0.900***	0.647***	0.596***	0.608***	0.536	1.046***	0.551***	0.430**	0.598***	0.574*
	[0.175]	[0.197]	[0.206]	[0.230]	[0.366]	[0.172]	[0.187]	[0.198]	[0.194]	[0.338]
gdp_j	1.168***	1.121***	1.069***	1.161***	1.708***	1.081***	0.901***	0.871***	0.988***	1.523***
	[0.159]	[0.187]	[0.196]	[0.221]	[0.390]	[0.148]	[0.174]	[0.189]	[0.175]	[0.345]
EA	0.110**	0.105**	0.100*							
	[0.053]	[0.052]	[0.052]							
tariff_i	-0.008	-0.003	-0.002	0.009	0.004	0.000	0.003	0.004	0.018	0.009
	[0.012]	[0.012]	[0.013]	[0.014]	[0.025]	[0.011]	[0.011]	[0.011]	[0.011]	[0.023]
tariff_j	0.003	0.004	0.005	0.016*	0.038*	0.013	0.013	0.014	0.027***	0.044**
	[0.012]	[0.012]	[0.012]	[0.009]	[0.021]	[0.010]	[0.010]	[0.010]	[0.009]	[0.020]
reer_i	-0.618**	-0.503*	-0.500*	-0.199	0.759	-0.817***	-0.543***	-0.555***	-0.421**	0.261
	[0.280]	[0.275]	[0.274]	[0.308]	[0.461]	[0.205]	[0.204]	[0.206]	[0.206]	[0.379]
reer_j	-0.213	-0.193	-0.190	0.024	0.075	-0.389**	-0.287	-0.302	-0.287	-0.691**
	[0.219]	[0.226]	[0.227]	[0.260]	[0.462]	[0.188]	[0.194]	[0.194]	[0.181]	[0.283]
Constant	-14.63***	-11.75***	-10.57***	-14.25***	-24.54***	-13.57***	-7.45***	-5.57*	-9.69***	-16.96***
	[2.494]	[2.780]	[2.975]	[3.728]	[6.129]	[2.535]	[2.624]	[2.939]	[2.640]	[5.453]
Country-pair fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1900	1900	1900	1140	760	1848	1848	1848	1386	924
Number of groups	380	380	380	380	380	462	462	462	462	462
Within R-squared	0.63	0.63	0.63	0.50	0.52	0.61	0.62	0.63	0.56	0.49

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level.
The sample includes every odd year between 1999-2007 (1999-2005 with PL, SK).
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 14: Results - differenced equation, common treatment

Variable	sample until 2007			sample with PL, SK, until 2005		
			sample until 2003			sample until 2003
d2_EU	0.030	0.040		0.076**	0.091***	
	[0.037]	[0.038]		[0.034]	[0.034]	
d2_EU(-2)	0.129***	0.139***				
	[0.039]	[0.039]				
d2_EU(+2)		0.085**	0.089**		0.173***	0.176***
		[0.036]	[0.037]		[0.032]	[0.032]
d2_gdp_i	1.081***	0.980***	0.858***	1.305***	1.085***	0.928***
	[0.179]	[0.190]	[0.227]	[0.162]	[0.171]	[0.191]
d2_gdp_j	1.267***	1.165***	1.117***	1.210***	1.004***	0.979***
	[0.154]	[0.163]	[0.182]	[0.139]	[0.142]	[0.151]
d2_EA	-0.059	-0.062				
	[0.052]	[0.052]				
d2_tariff_i	-0.017	-0.018	0.000	-0.011	-0.013	0.010
	[0.014]	[0.014]	[0.017]	[0.011]	[0.011]	[0.014]
d2_tariff_j	0.005	0.005	0.011	0.014*	0.011	0.021***
	[0.008]	[0.008]	[0.008]	[0.007]	[0.007]	[0.008]
d2_reer_i	-0.645**	-0.579*	-0.093	-0.942***	-0.742***	-0.613***
	[0.328]	[0.323]	[0.320]	[0.180]	[0.182]	[0.187]
d2_reer_j	-0.372*	-0.306	0.052	-0.772***	-0.591***	-0.503***
	[0.201]	[0.206]	[0.261]	[0.149]	[0.152]	[0.158]
Constant	-0.16***	-0.14***	-0.13***	-0.09**	-0.02	-0.03
	[0.030]	[0.032]	[0.044]	[0.039]	[0.041]	[0.032]
Common year effects	yes	yes	yes	yes	yes	yes
Observations	1520	1520	760	1386	1386	924
Adjusted R-squared	0.16	0.16	0.18	0.14	0.15	0.16

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level. The sample includes two-year differences of every odd year between 1999-2007 (1999-2005 with PL, SK). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 15: Results - differenced equation, varying treatment

Variable	sample until 2007			sample with PL, SK, until 2005		
			sample until 2003			sample until 2003
d2_EU_new_new	0.232***	0.257***		0.241***	0.283***	
	[0.082]	[0.082]		[0.066]	[0.064]	
d2_EU_new_old	0.072	0.099*		0.110**	0.139***	
	[0.053]	[0.054]		[0.047]	[0.046]	
d2_EU_old_new	-0.056	-0.058		0.007	0.016	
	[0.046]	[0.047]		[0.041]	[0.042]	
d2_EU_new_new(-2)	0.174*	0.200**				
	[0.095]	[0.097]				
d2_EU_new_old(-2)	0.167***	0.195***				
	[0.056]	[0.056]				
d2_EU_old_new(-2)	0.103**	0.102**				
	[0.041]	[0.042]				
d2_EU_new_new(+2)		0.157**	0.149**		0.273***	0.263***
		[0.076]	[0.074]		[0.056]	[0.056]
d2_EU_new_old(+2)		0.180***	0.173***		0.241***	0.237***
		[0.063]	[0.065]		[0.050]	[0.052]
d2_EU_old_new(+2)		-0.010	-0.010		0.093***	0.088**
		[0.035]	[0.038]		[0.033]	[0.034]
d2_gdp_i	0.908***	0.602***	0.621**	1.129***	0.701***	0.714***
	[0.186]	[0.213]	[0.253]	[0.168]	[0.185]	[0.206]
d2_gdp_j	1.302***	1.326***	1.294***	1.192***	1.043***	1.072***
	[0.165]	[0.197]	[0.221]	[0.146]	[0.165]	[0.174]
d2_EA	-0.061	-0.064				
	[0.052]	[0.052]				
d2_tariff_i	-0.011	-0.011	-0.001	-0.003	-0.008	0.007
	[0.014]	[0.014]	[0.017]	[0.012]	[0.012]	[0.014]
d2_tariff_j	0.004	0.004	0.011	0.014*	0.012*	0.023***
	[0.008]	[0.008]	[0.008]	[0.007]	[0.007]	[0.008]
d2_reer_i	-0.644**	-0.456	0.027	-0.875***	-0.512***	-0.443**
	[0.322]	[0.307]	[0.319]	[0.173]	[0.179]	[0.196]
d2_reer_j	-0.364*	-0.380*	-0.037	-0.739***	-0.602***	-0.575***
	[0.201]	[0.217]	[0.276]	[0.150]	[0.165]	[0.173]
Constant	-0.038	0.007	0.024	-0.055	0.033	0.037
	[0.047]	[0.051]	[0.051]	[0.041]	[0.043]	[0.044]
Common year effects	yes	yes	yes	yes	yes	yes
Observations	1520	1520	760	1386	1386	924
Adjusted R-squared	0.17	0.18	0.19	0.15	0.17	0.17

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level. The sample includes two-year differences of every odd year between 1999-2007 (1999-2005 with PL, SK). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 16: Results on the margins

Variable	Surviving		Extensive		Failure	
d2_EU	0.079		-0.017		0.051***	
	[0.052]		[0.046]		[0.010]	
d2_EU_new_new		0.286***		0.036		0.026
		[0.093]		[0.143]		[0.024]
d2_EU_new_old		0.144**		0.002		0.062***
		[0.072]		[0.056]		[0.018]
d2_EU_old_new		-0.021		-0.073		0.039***
		[0.060]		[0.053]		[0.015]
d2_EU(-2)	0.088**		0.133		-0.014	
	[0.044]		[0.117]		[0.016]	
d2_EU_new_new(-2)		0.236***		-0.153		-0.069**
		[0.081]		[0.101]		[0.033]
d2_EU_new_old(-2)		0.060		0.416		-0.007
		[0.055]		[0.261]		[0.022]
d2_EU_old_new(-2)		0.103**		-0.075		-0.014
		[0.051]		[0.056]		[0.019]
d2_EU(+2)	0.085		-0.003		0.002	
	[0.053]		[0.052]		[0.011]	
d2_EU_new_new(+2)		0.035		0.033		-0.026
		[0.089]		[0.124]		[0.023]
d2_EU_new_old(+2)		0.236**		0.083		0.018
		[0.103]		[0.098]		[0.016]
d2_EU_old_new(+2)		-0.025		-0.115**		-0.011
		[0.036]		[0.047]		[0.013]
d2_gdp_i	1.043***	0.693***	1.755***	1.400**	0.424***	0.419***
	[0.255]	[0.254]	[0.611]	[0.575]	[0.117]	[0.113]
d2_gdp_j	1.131***	1.307***	1.444***	1.892***	0.356***	0.425***
	[0.237]	[0.235]	[0.336]	[0.508]	[0.070]	[0.082]
d2_EA	-0.062	-0.050	-0.231	-0.270	-0.061***	-0.067***
	[0.061]	[0.061]	[0.142]	[0.169]	[0.021]	[0.022]
d2_tariff_i	0.022	0.029	-0.033	-0.033	0.010***	0.011***
	[0.022]	[0.022]	[0.029]	[0.030]	[0.003]	[0.003]
d2_tariff_j	0.017*	0.016*	-0.009	-0.008	0.001	0.000
	[0.010]	[0.010]	[0.011]	[0.011]	[0.003]	[0.003]
d2_reer_i	-1.036**	-0.845*	-0.383	-0.442	-0.092	-0.074
	[0.468]	[0.433]	[0.550]	[0.638]	[0.099]	[0.096]
d2_reer_j	-0.017	-0.246	-1.094**	-0.916**	-0.222***	-0.240***
	[0.263]	[0.276]	[0.471]	[0.399]	[0.068]	[0.070]
Constant	0.043	0.071	-0.338***	-0.350**	-0.042**	-0.052**
	[0.055]	[0.058]	[0.125]	[0.143]	[0.020]	[0.021]
Common year effects	yes	yes	yes	yes	yes	yes
Observations	1520	1520	1520	1520	1520	1520
Adjusted R-squared	0.12	0.13	0.05	0.07	0.16	0.17

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level. The sample includes two-year differences of every odd year between 1999-2007.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 17: Robustness checks - level equation

Variable	No VAT fraud sensitive prods	with PL, SK	Deflated flows	with PL, SK	Russian neighbour	with PL, SK
EU_new_new	0.426***	0.351***	0.539***	0.569***	0.412***	0.414***
	[0.094]	[0.065]	[0.096]	[0.073]	[0.119]	[0.082]
EU_new_old	0.305***	0.280***	0.307***	0.348***	0.426***	0.436***
	[0.056]	[0.053]	[0.065]	[0.056]	[0.076]	[0.061]
EU_old_new	-0.035	0.006	0.089	0.158***	0.056	0.108**
	[0.049]	[0.045]	[0.058]	[0.051]	[0.059]	[0.052]
gdp_i	0.755***	1.030***	0.576***	0.601**	1.074***	1.103***
	[0.163]	[0.168]	[0.219]	[0.250]	[0.176]	[0.173]
gdp_j	1.320***	1.285***	1.091***	0.982***	1.182***	1.083***
	[0.142]	[0.139]	[0.201]	[0.216]	[0.159]	[0.148]
EA	0.025		0.130**		0.076	
	[0.061]		[0.052]		[0.054]	
tariff_i	-0.009	-0.004	0.009	0.019	0.007	0.010
	[0.012]	[0.011]	[0.012]	[0.011]	[0.014]	[0.011]
tariff_j	-0.007	0.003	0.006	0.016	0.003	0.013
	[0.014]	[0.010]	[0.012]	[0.010]	[0.012]	[0.010]
reer_i	-0.610**	-0.978***	-0.249	-0.541***	-0.875***	-1.003***
	[0.248]	[0.185]	[0.238]	[0.171]	[0.276]	[0.197]
reer_j	-0.388*	-0.496***	0.536***	0.250	-0.240	-0.396**
	[0.198]	[0.174]	[0.169]	[0.165]	[0.214]	[0.185]
EU_new_new*RU					0.061	0.042
					[0.142]	[0.102]
EU_new_old*RU					-0.302***	-0.265***
					[0.091]	[0.072]
EU_old_new*RU					-0.346***	-0.314***
					[0.091]	[0.086]
Constant	-14.07***	-14.67***	-26.68***	-22.48***	-15.56***	-13.40***
	[2.185]	[2.400]	[5.881]	[6.589]	[2.535]	[2.526]
Country-pair fixed effects	yes	yes	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes	yes	yes
Observations	1900	1848	1900	1848	1900	1848
Number of groups	380	462	380	462	380	462
Within R-squared	0.67	0.62	0.48	0.47	0.63	0.61

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level.
The sample includes every odd year between 1999-2007 (1999-2005 with PL and SK).
* denotes significant at 10%; ** significant at 5%; *** significant at 1%.

Table 18: Results on the margins - excluding VAT fraud sensitive products

Variable	Surviving	Extensive	Failure
d2_EU_new_new	0.223***	-0.064	0.010
	[0.080]	[0.149]	[0.026]
d2_EU_new_old	0.152**	-0.108	0.040**
	[0.061]	[0.066]	[0.018]
d2_EU_old_new	-0.068*	-0.118**	0.029**
	[0.041]	[0.057]	[0.014]
d2_EU_new_new(-2)	0.249***	-0.137	-0.083***
	[0.074]	[0.092]	[0.024]
d2_EU_new_old(-2)	0.061	0.390	-0.024
	[0.047]	[0.267]	[0.017]
d2_EU_old_new(-2)	0.093**	-0.010	-0.024*
	[0.037]	[0.045]	[0.014]
d2_gdp_i	0.897***	2.035***	0.527***
	[0.264]	[0.590]	[0.119]
d2_gdp_j	1.299***	1.694***	0.446***
	[0.204]	[0.396]	[0.073]
d2_EA	-0.091	-0.288*	-0.013
	[0.061]	[0.168]	[0.018]
d2_tariff_i	0.020	-0.047	0.010***
	[0.022]	[0.032]	[0.003]
d2_tariff_j	0.019**	-0.035	-0.004
	[0.009]	[0.032]	[0.004]
d2_reer_i	-1.127**	-0.954	-0.073
	[0.483]	[0.616]	[0.100]
d2_reer_j	-0.375*	-0.987***	-0.256***
	[0.218]	[0.323]	[0.068]
Constant	-0.013	-0.454***	-0.067***
	[0.043]	[0.145]	[0.021]
Common year effects	yes	yes	yes
Observations	1520	1520	1520
Adjusted R-squared	0.13	0.07	0.13

Notes: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country-pair level. The sample includes every odd year between 1999-2007. * denotes significant at 10%; ** significant at 5%; *** significant at 1%.