Trade Without Borders: Trade Effect of the 2004 EU Enlargement

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Abstract

This paper uses the episode of the European Union (EU) enlargement in 2004 as a natural experiment to identify the trade effect of declining border barriers across otherwise well integrated markets. Estimation is based on the gravity theory and a difference-in-difference identification strategy, with country-pairs involving at least one new member being the treatment group and country-pairs of EU15 countries the control group. EU entry increased trade in the treatment group by around 14%, consistent with a 1.5-3.3% ad valorem tariff equivalent, in the first 3 years. When allowing for varying treatment effects across country groups, large differences are found. Estimates for trade among new countries are as large as 4-9% tariff equivalent. The effect is the strongest mainly in technology-intensive industries and a significant anticipatory effect can also be detected in year 2003. The growth occurred dominantly on the surviving margin, consistent with the evidence that extensive margin growth tends to be of small magnitude in short horizons. Placebo estimation and robustness checks confirm the results.

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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. Despite their close integration, similarly large border effects were found for the 15 countries of the European Union by several studies (Nitsch (1997), Head and Mayer (2000), or Chen (2004)).

What constitutes the 'border effect' is still in the focus of international trade research. Apart from the traditional trade policy measures like tariffs and quotas, the existence of national borders may divert trade through several channels, ranging from differences in product standards or administrative burdens to sometimes largely hidden cultural differences. Such barriers can affect trade not only in a direct way, but also indirectly through the endogenous location of firms: firms agglomerate to minimize the cost of trade, contributing to the increase in intra-national relative to international trade.

The entering of the Central and Eastern European countries[1] and the Baltic states[2] (henceforth, new members) into the EU in 2004 provides a reasonably good case for a natural experiment to infer the importance of border barriers across otherwise well integrated markets. Since free trade was established for most manufactured goods between the EU15 (denoted also as old members) and the new members and among the new members themselves well before enlargement, the trade effect of EU enlargement can be attributed to elements of diminishing border effects, different from traditional trade policy measures.

Earlier EU accessions do not provide good cases for similar natural experiments, 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 opening-up process of the Central and Eastern European economies to the EU.

Evidence on the effect of the 2004 EU enlargement has been so far extremely rare, despite the numerous earlier studies on the effects of the trade liberalization processes of the the 1990's and early 2000's.[3] Antimiani and Costantini (2009) is a rare example, who analyse the trade developments around EU enlargement in a dynamic gravity framework, with a special focus on

[1] Czech Republic, Hungary, Poland, Slovakia, Slovenia

[2] Estonia, Latvia, Lithuania

[3] Numerous gravity studies estimated the current and potential level of trade integration between the EU15 and the, then will-be, new members. See e.g. Bussiére *et al.* (2005), De Benedictis *et al.* (2005), and Herderschee and Qiao (2007).

the technological upgrading of trade structures. They find evidence that EU accession brought a change in the export structure of new members towards more high-technology products.

Exploiting the episode of the 2004 accession as a natural experiment, this paper estimates the magnitude of the trade effect of EU enlargement for markets where trade liberalization, in terms of the traditional trade policy measures, were already complete. The estimation is based on a difference-in-difference strategy, where the treatment group involves country-pairs with at least one new member and the control group contains old-old pairs.

Results reveal that the trade-creating effect in the first three years is around 14%, which is consistent with a hypothetical 1.5%-3.3% ad valorem tariff reduction. In other words, bilateral exports accelerated as if there was a 1.5%-3.3% reduction in ad valorem tariffs in the export markets. When allowing for varying treatment effects accross country-pair groups (export from new to new, new to old, and old to new) estimates for exports among new members are by far the largest. The tariff equivalent for new-new pairs is estimated to be in the range of 4% to 9%, similar in magnitude to the total tariff reductions during the trade liberalization process of the 1990's. The effect is also sizeable and significant for exports from new to old countries, while often not different from zero for old to new exports. A significant anticipatory effect is also identified for the immediate pre-accession year. Such an effect is justified by the fact that the decision on enlargement was known already in 2003. Industry-specific estimates reveal that almost all technology-intensive industries (NACE 30 to 34) were significantly affected, though some others such as Basic metals were also important contributors to the overall effect.

The paper provides a contribution to the literature on the relative importance of the different margins of adjustment in trade growth. Separate estimates for three margins (surviving, extensive, failure) reveal that the EU effect increased trade dominantly on the surviving margin. In other words, the export growth was mostly the result of more intense trade in already traded products and with established partner countries. This result is not unexpected, since the decomposition applied here accounts for the empirical regularity that growth on the extensive margin is typically of small magnitudes. New trade is small and, if having survived, deepens only gradually in the longer horizon.

The remainder of the paper is as follows. Section 2 discusses the pre-accession trade integration process of the new members to the EU and lists the possible causes for an enlargement effect. Section 3 presents the dataset and basic stylized facts. Section 4 describes the empirical strategy, formulates the estimating equation, and presents the estimates, complemented with placebo experiments and robustness checks. Section 5 decomposes trade growth into the different margins of adjustment and performs estimations for each margin. Section 6 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 Free Trade Area before enlargement

The eight new EU member states considered in this study have undergone a massive trade liberalization process already prior to EU accession. The Europe Agreements, which were signed between the EU and each of these countries in the first half of the 1990's[4], granted mutual duty-free access with a specific phase-in period for all non-agricultural products. At the same time, free trade of manufactures was also extended to trade among the new members themselves by the formation of the Central European Free Trade Agreement (CEFTA) and the Baltic Free Trade Agreement (Baltic FTA).[5] 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.[6] CEFTA, the Baltic FTA and the bunch of bilateral free trade agreements basically extended the Europe Agreements to bilateral trade among the new members.

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 the European Free Trade Association (EFTA). In general, rules of origin ensure that third-country products cannot move freely between members of a free trade area. Bilateral rules of origin, which were applied in Europe before 1997, however can be very restrictive. They also prevent products originating from a free trade area member to freely move across two other members' border, say e.g. a manufactured good with substantial Polish content to be exported from the Czech Republic to Germany tariff-free. In contrast, diagonal cumulation allows for the cumulation of such intermediate contents across countries with parallel or overlapping free trade agreements.

Meanwhile trade of the new members with third countries outside the pan-European area was subject to individual national trade policies up until 2004, when these countries had to apply the common external trade policy of the European Communities. Third-country tariffs

[4] The EA's entered into force in 1992 with the Czech Republic, Hungary, Poland and Slovakia, in 1995 with the three Baltic countries, and in 1997 with Slovenia, and remained in force until the EU accession in 2004.

[5] 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.

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

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 6 in Appendix). Hence, with accession 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 barriers changed with accession?

For most manufactured products EU accession brought no further trade liberalization with respect to the above discussed trade policy measures. Trade developments however suggest that there must be declines in trade barriers other than the traditional policy measures.[7] Unfortunately, many of these 'other' trade barriers are not directly observable or very hard to quantify.

Determining which trade barriers, and to what extent, caused the trade effect of EU accession is out of the scope of this paper. Below I only list the possible candidates.

1. *Waiting time at border crossings.* EU accession practically eliminated the cargo delays at border crossings, since customs-related border controls were abolished. The cost of waiting at borders could be large, especially if only a few border crossing points were available, and if several borders had to be crossed.[8]

2. *Technical barriers to trade (TBT).* Differences in national technical and labeling requirements on products are trade-distoring policy measures within the EU even nowadays.[9] Efforts to harmonize these requirements has been so far of limited success. New members were also involved in these efforts through the PECAs[10] from 1997 on, though they could postpone the application at the latest by the date of accession.

3. *Administrative costs of trading.* With the elimination of the customs procedure and the harmonization of TBTs enterprises face less administrative burden within the 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.

[7] To cite a complementary evidence, firms in the new member states reported improved access to new markets after accession in an enterprise survey of the European Commission in 2006 (see Table 7 in Appendix).

[8] Fink (2001) presents data on average waiting hours in several Central and Eastern European countries 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).

[9] See e.g. Chen (2004) or Manchin and Pinna (2007) for empirical evidence.

[10] Protocols to the Europe Agreement on Conformity Assessment and Acceptance of Industrial Products.

4. *Differences in legal frameworks.* The reduction in legal and informational costs due to the adoption of the *acquis communautaire* can facilitate cross-border trade and encourage the setting-up of businesses abroad. Although the process of legal harmonization had been more than a decade long in the new member states, the ultimate adoption of some community legislation was most probably concentrated at the date of accession.

5. *Political risk.* A less well-defined, but certainly not the least important, source of cost reduction is the increased confidence in the political stability of the Central and Eastern European region following EU enlargement.

3 Trade developments around enlargement

3.1 Trade data

The dataset contains annual 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.[11] I chose exports rather than imports mainly in order to decrease the possible statistical distortions due to VAT fraud activities of trading enterprises (see more on this in Appendix 2). Export flows between country pairs at various levels of disaggregation are taken: total flows, flows at two-digit NACE industry classification, and at the detailed six-digit Harmonized Systems (HS) product classification.[12]

The dataset is restricted to a subset of manufactures, i.e. manufactured goods excluding food, beverages and tobacco (NACE group 15 and 16) and coke, refined petroleum products and nuclear fuel (NACE 23). The choice of products is motivated by the fact that these goods were freely traded under the Europe Agreements throughout the whole sample. Energy products are excluded due to their strongly variable price movements. The restricted subset of manufactures corresponds to around 80% of all trade flow values and 4140 out of the total 5680 six-digit HS product categories.

22 countries are considered: Austria, Belgium, Germany, Denmark, Spain, Finland, France, Ireland, Italy, Luxembourg, Netherlands, Portugal, Sweden and the United Kingdom as old EU members and the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Slovenia and Slovakia as new EU members. Greece is omitted because its late euroarea entry may

[11] Data is complemented by exports from Poland and Slovakia from the UN's Comtrade database, due to missing data for these countries at the six-digit product level in the Comext database.

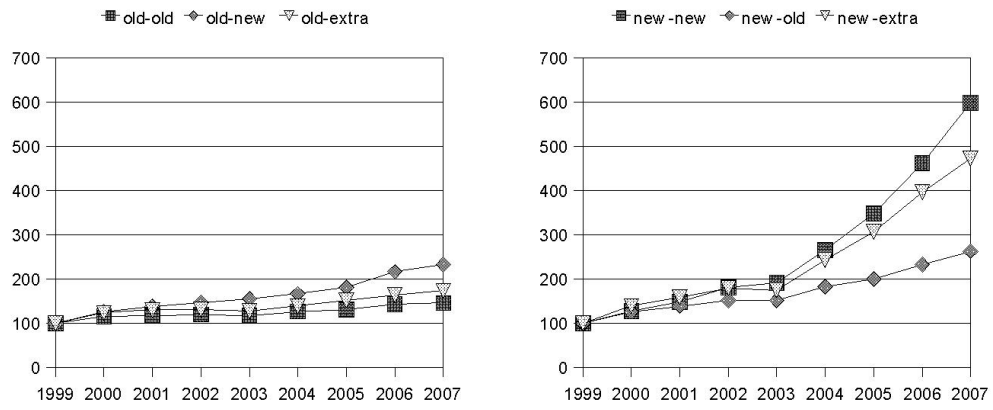
[12] At the six-digit HS and country-pair level a large part of this data is zero trade, showing that in a considerable number of product-countrypair relationships no trade occurs among EU countries. On average non-zero bilateral trade is present only in 40% of the cases, with strong variation among individual countries.

complicate matters. Similarly, I need to consider the potential short-term effect of the euro adoption by Slovenia in 2007 when interpreting data from that year.

3.2 Stylized facts

I document basic raw data evidence. Four direction-specific country-pair groups are differentiated: exports between two old members (old-old), exports between two new members (new-new), exports from an old member to a new one (old-new) and vice versa (new-old). At this point I also report exports 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.

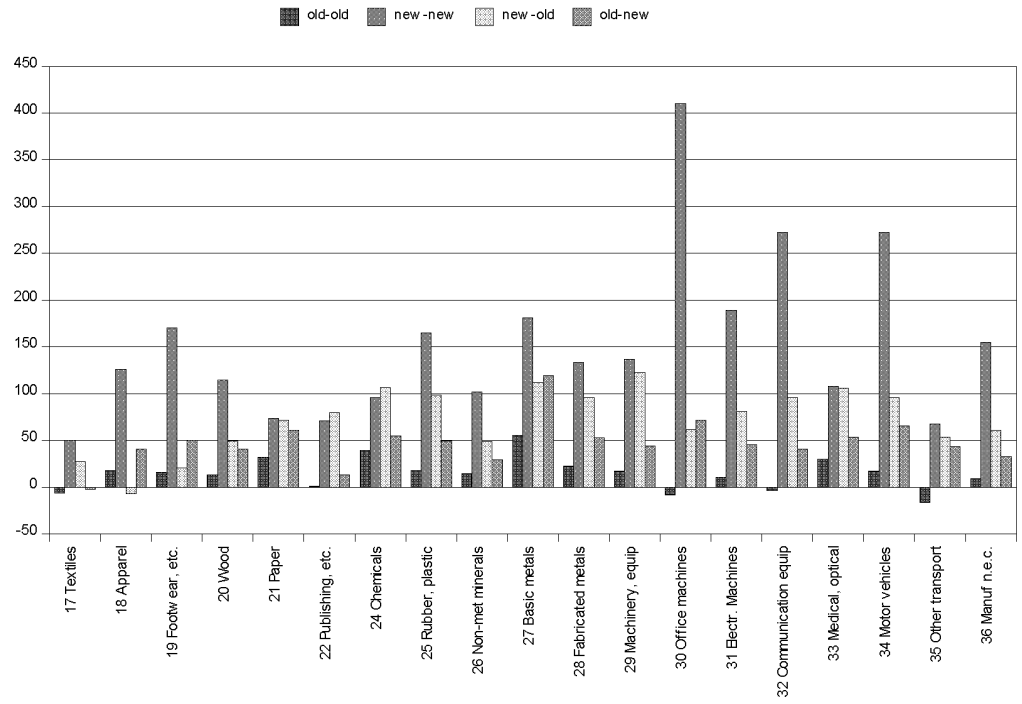
Figure 1: Export value flows in different relations (1999=100)



A first look at the aggregate export flows reveals strong trade creation on the part of new members following EU enlargement. Most apparently bilateral export flows among new members 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 new members.

At the same time, however, another explanation for the strong extra-EU growth lends itself directly: the parallel economic surge in Russia boosted exports from new members, and especially from the Baltic countries, 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 (see Table 8 in Appendix). 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.

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



The differences in the growth rates across country-pair groups is also evident for individual industries. Exports in trade directions that contain at least one new member, and especially trade among new members, grew considerably faster than trade among old members. The pattern is quite general across industries, although to a varying extent. The most remarkable increase occurred in the exports among new members of Office machinery (30), Communication equipment (32) and Motor vehicles (34), the export value of which in the four years of 2004-2007 was by 300-400% larger than in the four years of 2000-2003.

The large growth of exports in these typically high value/low volume goods needs a closer look, because they contain the products which are most prone to be subjects of VAT fraud. Robustness checks that exclude these items from the estimation therefore are highly recommended.

4 Measuring the effect of EU enlargement

I estimate the trade effect of EU enlargement by following a difference-in-difference estimation strategy. I define a treatment and a control group from the available country-pairs and take their exports for both the pre- and the post-accession years. The treatment group includes

country-pairs that become jointly EU members only in the post-accession period (new-new, new-old, old-new), while the control group includes old-old pairs. The treatment effect is derived from the change in exports for the treatment group from the pre- to the post-accession years relative to the similar change in exports for the control group. Formally,

$$x_{t=1}^{treat} - x_{t=0}^{treat} - \left(x_{t=1}^{control} - x_{t=0}^{control}\right) \tag{1}$$

where x is the logarithm of exports and $t = 0$ and $t = 1$ denote the pre- and post-accession period, respectively.

Taking the old-old country-pairs as the control group rests on the assumption that their export dynamics (the change from pre- to post-accession period) is not affected by the EU enlargement. This assumption may be justified by the raw data evidence that old-old exports were quite stable during the sample period. Also, for the difference-in-difference setup the treatment and the control groups should be sufficiently similar, or at least heterogeneity should be appropriately controlled for. Old and new countries are close to each other geographically and, at least by the time of my sample, have also got sufficiently close institutionally. Nevertheless, the two groups are far from being homogenous. Controlling for their differences - most notably the real convergence trend that characterises new countries - becomes a crucial issue in this analysis.[13]

In order to fully account for the factors that affect international trade I resort to the gravity theory, the workhorse model in international trade.

4.1 The gravity model

The basic idea of the gravity model 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. In its original form the gravity equation was not derived from solid theoretical foundations. Theoretical derivations appeared only later, starting with Anderson (1979) and followed by Bergstrand (1985), Deardoff (1998) and Anderson and VanWincoop (2003). The original idea of the gravity equation however proved to be quite robust in the face of different assumptions of different trade theories.[14] Recent developments in the estimation of gravity

[13] An ideal control group would include countries, which have gone through the same process of preparation for EU accession, but did not enter the EU in 2004. The closest examples are Bulgaria and Romania. Using them as a control group is however problematic not only because of the small number of observations, but also for the fact that their would-be accession in 2007 was decided in 2004, which could initiate some anticipatory trade effect early on.

[14] 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.

equations have been intiated by the increasing availability of large micro-level panel datasets.[15] Most recently, Helpman, Melitz and Rubinstein (2007) proposed a firm-level gravity theory and a corresponding estimation method, where zero trade observation (widespread in micro datasets) are also accounted for.

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 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

$$X_{ij} = \frac{Y_i Y_j}{Y^W} \left(\frac{T_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \tag{2}$$

subject to the constraints on the relationship between Π_i and P_j

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

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

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, Y^W is world income, T_{ij} is the bilateral trade barrier between the exporting and the importing countries, and σ is the elasticity of substitution between all goods. Π_i and P_j are the so-called multilateral trade barriers for the exporting and the importing country, respectively. More precisely, Π_i is a measure of trade barriers that country i's exports face in the rest of the world, while P_j is a measure of trade barriers that country j imposes on imports from the rest of the world.[16]

Introducing the multilateral trade barriers into the gravity equation is an important novelty of the model of Anderson and Van Wincoop relative to earlier models. Bilateral trade barriers

[15] Mátyás (1997) and Egger and Pfaffermayr (2003) suggested panel data gravity specifications, where individual country heterogeneity and time effects are more properly handled. De Benedictis *et al.* (2005) apply System GMM estimation in order to account for the dynamics of trade flows.

[16] Anderson and van Wincoop (2003) also makes the simplification that, under symmetrical bilateral trade costs ($T_{ij} = T_{ji}$), the two types of multilateral resistance 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.

matter for trade only in relative terms, i.e. in relation to the level of multilateral trade barriers. An increase in bilateral trade barriers *ceteris paribus* reduces bilateral trade, while an increase in the trade barriers with the rest of the world for either the exporter or the importer *ceteris paribus* increases it.

4.2 The estimating equation on panel data

The theoretical gravity model is set up for the steady state. Many of the recent applications - including this one - however use panel data sets with several years of observations. When applying the gravity theory to panel data I assume that the gravity equation holds for each time period. The analysis is therefore a comparative statics exercise. The gravity equation with time dimension (expressed in logarithms) is

$$x_{ijt} = y_{it} + y_{jt} - y_t^W + (1-\sigma)\, t_{ijt} - (1-\sigma)\, \pi_{it} - (1-\sigma)\, p_{jt} \tag{5}$$

where small letters are logarithms and t denotes time.

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

$$t_{ijt} = \delta_1 dist_{ij} + \delta_2 EU_{ijt} + \delta_3 Z_{ijt} + \varepsilon_{ijt} \tag{6}$$

The time-invariant $dist_{ij}$ denotes the log of the geographical distance between the exporting and importing countries. EU_{ijt} is a dummy variable for common EU membership. In the pre-accession period it takes value 1 for old-old country pairs and 0 otherwise, while in the post-accession years it is 1 for all country pairs.

$$\begin{aligned} EU_{ij,t\epsilon pre} &= \begin{cases} 1 & if\ old-old \\ 0 & if\ not\ old-old \end{cases} \\ EU_{ij,t\epsilon post} &= 1 \end{aligned}$$

The Z_{ijt} is a set of variables for proxying trade costs typically used in gravity studies: dummies for sharing a border, having a common language, common historical ties, or a common currency. Note that most elements of Z are time-invariant.[17] An error term ε_{ijt} enters the

[17] In other applications bilateral tariffs, as other important observable trade barriers, may also be part of the

expression, accounting for the fact that some bilateral trade barriers are not observed or are proxied by the above variables with an error.

After substituting for the trade cost term the gravity equation becomes

$$\begin{aligned} x_{ijt} &= y_{it} + y_{jt} - y_t^W + (1-\sigma)\,\delta_1 dist_{ij} + (1-\sigma)\,\delta_2 EU_{ijt} + \\ &\quad + (1-\sigma)\,\delta_3 Z_{ijt} - (1-\sigma)\,\pi_{it} - (1-\sigma)\,p_{jt} + (1-\sigma)\,\varepsilon_{ijt} \end{aligned} \tag{7}$$

Note that the effect of joint EU membership on trade is captured by the expression $(1-\sigma)\delta_2$. 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.

An important problem in estimating the above equation is that the two multilateral resistance terms (π_{it} and p_{jt}) are not observable. If they remain in the error term and are correlated with some of the right-hand-side variables, they may cause omitted variable bias in the estimates. Such fears are highly realistic, since the multilateral resistance terms, being functions of all the bilateral trade barriers with third countries, may indeed be correlated with some of the bilateral trade barriers between i and j, notably the EU dummy. An example for such a correlation 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.[18]

In a cross-section framework the unobservable multilateral resistance can be controlled for by including dummy variables for each country-pair in the estimation, i.e. a fixed effects estimation in the panel analogy. In a panel data setting this solution is sufficient only under the assumption that the unobservable multilateral resistance 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.

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.

[18] In particular, for all CEFTA countries third-country tariffs had to be lowered with accession (see Table 6 in Appendix), which corresponded to a fall in their multilateral resistance. 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.

Against this background I opt for an estimating equation with country-pair fixed effects and additional control variables that capture the time-varying part of the unobservable multilateral resistance. The estimating equation is

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

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.[19] I allow for non-unitary coefficients for the GDP variables (β_1 and β_2) for two reasons. First, GDP also captures income generated by the non-traded sector. Second, non-unitary coefficients can capture trade convergence trends, when trade growth systematically exceeds GDP growth.

The EU treatment dummy enters the equation in a way that allows for estimating both common and varying treatment effects. The term $EU_{ijt}D_{ij}$ is the interaction of the EU dummy and a set of dummy variables (D_{ij}) indicating which group (new-new, new-old, old-new, old-old) the country-pair belongs to. Estimating a common EU effect is the special case when $D_{ij} = 1$ for all country-pairs. The varying treatment effect gives separate EU effect estimates for every country-pair group, while the common treatment effect is an average across all treatment country-pairs. Note that the EU dummy for the old-old (control) group is time-invariant and drops out from the estimation; hence all estimated EU effects should be interpreted as relative to this group.

The two variables that are meant to control for the time-varying part of the multilateral resistance 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 resistance has been criticized in the literature, I also include them for another reason: they can control for differences in the real convergence trends of individual countries.

Year dummies (δ_t) control for common business cycle trends, and hence, capture the world output variable (y_t^W) in the theoretical equation. Country-pair fixed effects (γ_{ij}) control for any time-invariant factor, including the time-invariant multilateral resistance. They are

[19] I do not deflate 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 capture, among others, the conversion factor that converts year-t euros to base-year euros.

differentiated according to the direction of trade which allows for asymmetry in bilateral trade flows ($\gamma_{ij} \neq \gamma_{ji}$). Due to the inclusion of the fixed effects time-invariant variables in the gravity equation are not identified. In fact, apart from the EU dummy, the only time-varying element of bilateral trade barriers is the dummy for common currency (EA_{ijt}), which changes once for Slovenia's euroarea entry in year 2007.

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 resistance that is not captured by the tariff and real exchange rate variables. The assumption for unbiased EU effect estimates is therefore that these latter two unobservables are not correlated with the EU dummy.[20]

An issue that should be address when estimating on a panel with more than two time periods is serial correlation. As it was shown by Bertrand *et al.* (2004) and Kézdi (2004), the fact that the treatment dummy in panel data is usually strongly serially correlated leads to a downward bias on the standard error estimates under fixed-effects estimation. To fully overcome this problem I use the 'cluster' variance-covariance matrix estimator, with clustering on the direction-specific country-pair level, which provides unbiased estimates in the presence of either cross-sectional heteroskedasticity or serial correlation within each direction-specific country-pair.[21]

4.3 Timing issues

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 four considerations to the current analysis.

1. EU enlargement occurred in the middle of the year, as of 1 May 2004. Having annual frequency data, one needs to decide how to treat year 2004.

2. 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.

[20] The inclusion of exporter- and importer-specific year effects, as perfect controls for the time-varying part of multilateral resistance, is unfortunately not feasible in the present analysis due to their perfect collinearity with the $EU_{ijt}D_{ij}$ 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%).

[21] Kézdi (2004) shows that the 'cluster' estimator is unbiased even for a moderately large cross-sectional dimension ($N = 50$). Clearly, in the present case this condition is satisfied.

3. 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 acceding countries during the following year. Against this background one would expect that part of the accession effect has appeared already as early as 2003.

4. The fourth potentially important timing issue relates to the late 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.

I address the above timing issues in the following ways. In order to tackle the problem of the mid-year accession date I keep only the odd years in the sample. This way I can get rid of the 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 the presence of anticipatory EU effects. This can be done by leading the treatment dummy with two years as if accession occurred from 2001 to 2003. In a similar way, a 'placebo experiment' can also be carried out by leading the treatment with four years as if accession occurred from 1999 to 2001. A significant placebo effect would indicate that, having controlled for all the right-hand-side variables, something other than EU accession also characterizes 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.

The placebo experiment can therefore be a valid test for the forth issue above. An alternative - though theoretically less justified - way to test the possible late effects of earlier liberalization measures is to estimate the time-difference of the gravity equation. Differencing removes a deterministic trend from the equation, also eliminating a possible gradual trade effect of earlier liberalization measures. Moreover, if one accepts that the effect of these measures is front-loaded, i.e. it is stronger in the pre-accession than in the post-accession years, then the EU effect estimates in the time-differenced estimation may even be downward biased.

4.4 Results

The estimation is done on a panel of annual trade flows for the 5 odd years between 1999 and 2007. Bilateral exports are aggregated series from the detailed six-digit product-level

database. The number of direction-specific country pairs is $(22 \cdot 21=)$ 462, of which 182 is in the control group and 280 is in the treatment group.

4.4.1 Aggregate estimates

The main estimates for the EU effect are presented in Table 1 either with common treatment (columns 1-2) or varying treatment (columns 3-4). The two-year lead of the treatment, EU(+2), intends to capture an anticipatory accession effect. In this case the EU dummy for the treatment group takes value 1 already in 2003.

Table 1: Estimation results - level equation

Variable	Common treatment		Varying treatment	
EU	0.133***	0.071**		
	[0.041]	[0.035]		
EU_new_new			0.357***	0.298***
			[0.087]	[0.079]
EU_new_old			0.264***	0.165***
			[0.056]	[0.047]
EU_old_new			0.038	0.000
			[0.053]	[0.046]
EU(+2)		0.118***		
		[0.035]		
EU_new_new(+2)				0.167***
				[0.059]
EU_new_old(+2)				0.218***
				[0.051]
EU_old_new(+2)				0.066**
				[0.033]
Gravity variables	yes	yes	yes	yes
Country-pair fixed effects	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes
Observations	2310	2310	2310	2310
Number of groups	462	462	462	462
Within R^2	0.66	0.66	0.67	0.67

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 a 14% acceleration of trade for the treatment group, i.e. for all country-pairs that contained at least one new member.[22] When accounting for a possible anticipatory effect it turns out that a considerable part of this increase occurred in anticipation. The differences between the common and the varying treatments reveal a strong country group-specific nature of the accession effect. The relatively moderate common effect masks a large effect for exports of new-new country-pairs and, to a lesser extent, of new-old pairs, while no significant effect is detected for old-new ones. The coefficient for new-new relationships is around 0.35, i.e. it shows a more than 40% increase in bilateral exports following accession. Although this group also experienced a significant anticipatory effect, its magnitude is only half of the measured post-accession acceleration. The EU effect

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

for exports from new to old members is somewhat lower than for new-new pairs (30%) with an anticipatory effect of a similar magnitude.

According to equation (7), the estimate on the EU effect can be decomposed as $(1-\sigma)\,\delta_3$, i.e. the product of one minus the elasticity of substitution and the EU effect in ad valorem tariff equivalent terms. Knowing the value of σ one can give an estimate for the latter parameter. Anderson and Van Wincoop (2004) assesses the literature on empirical estimates of the elasticity of substitution and puts σ in the range of 5 to 10. Assuming that σ falls in this range, the estimated ad valorem tariff equivalent of not being jointly EU members ranges from 1.5% to 3.3% according to the common treatment estimate. For new-new country-pairs the same measure gets as large as 4% to 9%, which means that the joint EU accession of new countries acted like a hypothetical tariff reduction of the same magnitude.

Tables 11 and 12 in the Appendix give a more 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 above unity. The third-country tariff variables are mostly significant with the expected sign only in shorter sample estimations. In contrast, coefficients on the real exchange rate variables are strongly significant and negative in most of the regressions. This negative effect mainly 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.

4.4.2 Industry estimates

I carry out the estimation for each of the 19 manufacturing industries separately. The estimating equation (8) is modified as follows. Instead of the country GDPs I use industry gross output variables for both the exporter and the importer countries. In addition, however, the importer's total GDP is also added in order to account for the fact that products of an industry are also purchased by other sectors of the economy. Apart from these changes the estimation is the same as before. The estimated (common) treatment effects and their ad valorem tariff equivalents are reported for each industry in Table 2.[23] Tariff equivalents are calculated by either assuming $\sigma = 5$ or $\sigma = 10$ or by using the industry-specific σ estimates of Hummels (2001).[24]

Significant and large positive EU effects are found for most of the technology-intensive industries (NACE 30-34) such as Communication equipment, Electrical machinery, or Motor

[23] Estimates for the anticipatory effects are available on request.

[24] Hummels (2001) estimates the elasticity of substitution on 2-digit SITC product breakdown. Estimates are transformed to the 4-digit NACE industry classification by Chen and Novy (2008). Reported σ's at the 2-digit industry-level are weighted averages of the 4-digit figures, where weights are based on intra-EU25 export shares.

Table 2: Industry estimates

industry	coef.	s.e.	effect (σ_k)	effect ($\sigma = 5$)	effect ($\sigma = 10$)	σ_k
17 Textiles	0.082	[0.064]	-0.013	-0.021	-0.009	7.3
18 Wearing apparel	-0.098	[0.110]	0.019	0.023	0.010	5.7
19 Leather, luggage, footwear	0.052	[0.127]	-0.008	-0.013	-0.006	7.3
20 Wood, excl. furniture	-0.056	[0.094]	0.018	0.013	0.006	3.8
21 Pulp, paper products	0.144	[0.118]	-0.043	-0.036	-0.016	4.4
22 Publishing, printing	0.468***	[0.114]	-0.113	-0.117	-0.052	5.1
24 Chemical products	0.277***	[0.092]	-0.045	-0.069	-0.031	7.2
25 Rubber and plastic prods	0.133**	[0.068]	-0.032	-0.033	-0.015	5.2
26 Other non-metallic mineral	0.063	[0.082]	-0.032	-0.016	-0.007	3.0
27 Basic metals	0.621***	[0.116]	-0.245	-0.155	-0.069	3.5
28 Fabricated metal prods	0.069	[0.084]	-0.018	-0.017	-0.008	4.9
29 Machinery and equipment	0.124	[0.079]	-0.020	-0.031	-0.014	7.2
30 Office machinery and computers	0.325**	[0.161]	-0.033	-0.081	-0.036	10.9
31 Electrical machinery	0.564***	[0.086]	-0.112	-0.141	-0.063	6.0
32 Radio, tv, communication equip	0.630***	[0.150]	-0.129	-0.158	-0.070	5.9
33 Medical, precision, optical instr	0.401***	[0.087]	-0.072	-0.100	-0.045	6.6
34 Motor vehicles, trailers	0.519***	[0.177]	-0.083	-0.130	-0.058	7.3
35 Other transport equipment	-0.078	[0.199]	0.011	0.018	0.008	7.4
36 Furniture, manufacturing n.e.c.	-0.066	[0.117]	0.020	0.015	0.007	4.1

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%.

vehicles. Large effects are detected also for Basic metals (27), Publishing and printing (22), and Chemicals (24). In the case of motor vehicles, for instance, the estimated common treatment effect is around 0.5, consistent with a 65% growth in exports and an 8% hypothetical tariff reduction (if the industry σ is taken). The varying treatment estimates in Table 13 in Appendix reveal that this effect comes entirely from increased exports of new countries to both new and old members' markets.

4.4.3 Placebo experiment and robustness checks

I carry out a 'placebo experiment' in order to check as to what extent the estimates reflect the effect of accession alone. A placebo EU accession is defined to have taken place from 1999 to 2001, at a date before the Copenhagen Summit, and a placebo EU dummy is created as the four-year lead of the original EU dummy (EU(+4)). By including the placebo dummy into the baseline estimating equation one can test whether, having controlled for the right-hand-side variables, trade in the treatment group evolved significantly differently from trade in the control group even before EU enlargement (or before its announcement). The estimation strategy is reinforced if no significant differences are found, i.e. the coefficient estimate for the placebo dummy is statistically not different from zero.

Tables 11 and 12 in the Appendix (columns 3 and 5) report the placebo estimates. The estimation is done on both the whole sample and a sample until 2001. In general, 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. Some discrepancy appears however in the varying treatment case, where the placebo effect is significantly different from zero at 10% significance level for the new-old and old-new groups. No significant placebo effect is found though for new-new country pairs.

Robustness checks are presented in Table 16 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.[25] The results are basically unaltered. The analysis was also reproduced for export volumes 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 and a significant effect is detected also for old-new country pairs.

A robustness check was motivated by the evidence on the importance of the Russian market in extra-EU exports of some countries. 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 significant diversion of exports from Russian neighbour new countries to old ones and from Finland to new countries, i.e. countries neighboring Russia would have exported more to the EU without the strong gravitation force of the Russian market.

5 Margins of adjustment

There is a growing literature on the channels of adjustment in international trade to shocks. Does trade expands mainly through the introduction of new products to new markets and the entering of new firms to international trade (extensive margin) or through the intensification of already existing trade (intensive margin)? Many papers have emphasized the role of the extensive margin by showing that countries which trade a lot do so, because they trade a larger number of varieties with more partners and not because they trade more of the same good.[26] The extensive margin adjustment was found to be the dominant also in the trade effect of the euro adoption.[27]

[25] I exclude the 2-digit NACE categories 30 "Manufacturing of office machinery and computers", 32 "Manufacture of radio, television and communication equipment and apparatus", 33 "Manufacture of medical, precision and optical instruments, watches and clocks".

[26] See e.g. Hummels and Klenow (2005) or Kehoe and Ruhl (2009).

[27] See Flam and Nordström (2006) who find the product-level extensive margin more important than the product-level intensive margin, and two recent firm-level studies, which emphasize the role of the firm-level extensive margin in the euro's trade effect (De Nardis *et al.* (2008) on Italian and Berthou and Fontagné (2008) on French data).

In contrast, Besedes and Prusa (2007) takes the opposing stand and, by using a different definition for the margins, argue that in fact the extensive margin is only slightly responsible for export growth. An important difference between their measures for the margins and those applied in the other studies is that the former weights each trade observation with its own value share and not with average world trade shares. New trade is small in magnitude and often short-lived, which explains their finding.

Most recent papers attempt to reconcile such seemingly conflicting evidence. As Bernard *et al.* (2009) states "variation in imports and exports across trading partners is primarily due to extensive margins, while variation in trade across one-year intervals is dominated by the intensive margin. These seemingly divergent results can be reconciled by considering the small size of new entrants relative to incumbents, and their subsequent relatively strong growth conditional on survival. Across five- and ten-year time horizons, we find that the relative contribution of the extensive margins rises".[28]

5.1 Decomposition into the three margins

In the followings, I decompose the change in total export value into three margins: surviving, extensive and failure margins.[29] I opt for the Besedes and Prusa method of measuring the margins, because, as noted above, it also accounts for the magnitude of new trade. The decomposition is done on a country-pair and six-digit product level detail.

The change in total bilateral exports between two periods ($t-l$ and t) is a sum of all such changes for every product k.

$$X_{ijt} - X_{ijt-l} \equiv d_l X_{ijt} = \sum_k d_l X_{ijt,k} \tag{9}$$

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

[28] See also Ruhl and Willis (2009) or Eaton *et al.* (2008) on the gradual export expansion of new exporters.

[29] Besedes and Prusa (2007) define the growth on the intensive margin as the sum of the surviving and failure margins. I will however maintain the distinction among the three, since they inherently reflect different phenomena.

$$\begin{aligned}\sum_k d_l X_{ijt,k} \quad &\equiv SM_{ijt}^{(l)} + EM_{ijt}^{(l)} - FM_{ijt}^{(l)} = \\ &= \underbrace{\sum_k d_l X_{ijt,k}\Big|_{X_{ijt,k}>0, X_{ijt-l,k}>0}}_{surviving} + \\ &+ \underbrace{\sum_k X_{ijt,k}\Big|_{X_{ijt,k}>0, X_{ijt-l,k}=0}}_{extensive} - \\ &- \underbrace{\sum_k X_{ijt-l,k}\Big|_{X_{ijt,k}=0, X_{ijt-l,k}>0}}_{failure}\end{aligned} \tag{10}$$

Note that 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.

A decomposition of the total export growth rate in percentage terms is

$$\frac{d_l X_{ijt}}{X_{ijt-l}} = \frac{SM_{ijt}^{(l)} + EM_{ijt}^{(l)} - FM_{ijt}^{(l)}}{X_{ijt-l}} \tag{11}$$

Table 3 shows the decomposition of both annual ($l = 1$) and biannual ($l = 2$) bilateral trade growth rates, averaged across country-pair groups. The acceleration of exports from the pre- to the post-accession period seems to have happened dominantly on the surviving margin, i.e. through the deepening of already existing countrypair-product trade. For new-new country pairs, for instance, the average annual growth rate on the surviving margin was up to 28% from 16%. In sharp contrast, growth on the extensive margin even decelerated between the two periods for all country-pair groups, while the growth in failures slightly increased. The pattern is similar for annual and biannual growth rates.

All in all, the post-accession period is characterized by the negative balance of less new trade and more failures, which was more than offset by the strong acceleration on the surviving margin.[30]

[30] For a decomposition by NACE industries see Table 9 and 10 in the Appendix.

Table 3: Decomposition of annual export growth rates

$l=1$	Period	Surviving +	Extensive −	Failures =	Total
old-old	2000-2003	4.3	2.4	0.4	6.2
	2004-2007	6.5	0.6	2.9	4.2
new-new	2000-2003	16.1	5.6	2.5	19.2
	2004-2007	28.6	2.6	2.9	28.3
new-old	2000-2003	14.0	4.2	2.3	15.8
	2004-2007	17.1	1.7	3.0	15.8
old-new	2000-2003	10.8	3.3	1.2	12.9
	2004-2007	14.5	1.3	3.6	12.1
$l=2$	Period	Surviving +	Extensive −	Failures =	Total
old-old	2001-2003	7.2	5.0	0.6	11.6
	2004-2007	11.2	1.1	3.0	9.3
new-new	2001-2003	31.8	8.8	3.8	36.7
	2004-2007	60.8	8.1	3.8	65.2
new-old	2001-2003	24.6	6.8	2.9	28.5
	2004-2007	35.0	5.4	3.8	36.5
old-new	2001-2003	20.0	6.9	1.5	25.4
	2004-2007	27.8	2.5	4.3	26.0

Note: Period averages of annual ($l=1$) and bi-annual ($l=2$) growth rates in percentages.

5.2 Estimates on the margins

The EU effect is estimated for export growth on each margin separately. Since margins are defined on changes in trade, the estimating equation (8) has to be transformed into time-differences, i.e. two-year differences on the biannual sample. The estimating equation becomes

$$\begin{aligned} d_2 x_{ijt} &= \beta_1 d_2 gdp_{it} + \beta_2 d_2 gdp_{jt} + \boldsymbol{\beta}_3 d_2 EU_{ijt} D_{ij} + \beta_4 d_2 EA_{ijt} + \\ &\quad + \beta_5 d_2 tar_{it} + \beta_6 d_2 tar_{jt} + \beta_7 d_2 reer_{it} + \beta_8 d_2 reer_{jt} + \xi_t + d_2 u_{ijt} \end{aligned} \tag{12}$$

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. Note that in the time-differenced equation the EU dummy takes value 1 only in the first year of the treatment (year 2005). For inferring a more medium-run treatment effect (year 2007) one has to include lags of the EU dummy into the equation.

Estimation on the margins is done by replacing the dependent variable with $\frac{SM^{(2)}_{ijt}}{X_{ijt-2}}$, $\frac{EM^{(2)}_{ijt}}{X_{ijt-2}}$ or $\frac{FM^{(2)}_{ijt}}{X_{ijt-2}}$ in the case of the surviving, extensive and failure margins, respectively. Estimation is also done for total export growth, which serves as a cross-check for the individual margin estimates. Remember that margin growth rates add up to total export growth as $d_2 x_{ijt} \approx \frac{X_{ijt}}{X_{ijt-2}} - 1 = \frac{SM^{(2)}_{ijt} + EM^{(2)}_{ijt} - FM^{(2)}_{ijt}}{X_{ijt-2}}$. In addition, as discussed in Subsection 4.3, estimation on total export growth is also a robustness check for the baseline gravity estimates in levels.

The results presented in Table 4 and 5 are read as follows. Coefficients for the EU variables are the immediate EU effects, which appeared already in 2005, while coefficients for the lagged

EU variables are the medium-run effects appearing in 2007. The sum of these two are to be compared with the baseline estimates of Section 4. Coefficients corresponding to the lead of the EU dummy again show the anticipatory effect.

Table 4: Estimates on the margins - common treatment

Variable	Total	Surviving	Extensive	Failure
EU	0.055*	0.096**	-0.007	-0.006
	[0.034]	[0.045]	[0.043]	[0.033]
EU(-2)	0.173***	0.187***	-0.005	-0.100***
	[0.035]	[0.032]	[0.068]	[0.018]
EU(+2)	0.106***	0.150***	0.018	0.067***
	[0.031]	[0.040]	[0.048]	[0.018]
Gravity variables	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes
Observations	1848	1848	1848	1848
Adjusted R^2	0.16	0.14	0.05	0.11

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 5: Estimates on the margins - varying treatment

Variable	Total	Surviving	Extensive	Failure
EU_new_new	0.239***	0.300***	0.012	0.009
	[0.066]	[0.081]	[0.116]	[0.066]
EU_new_old	0.110**	0.147**	-0.014	-0.032
	[0.048]	[0.060]	[0.063]	[0.044]
EU_old_new	-0.027	0.012	-0.026	0.007
	[0.042]	[0.053]	[0.042]	[0.039]
EU_new_new(-2)	0.273***	0.307***	-0.193**	-0.166***
	[0.074]	[0.059]	[0.089]	[0.031]
EU_new_old(-2)	0.207***	0.181***	0.179	-0.118
	[0.051]	[0.046]	[0.162]	[0.027]
EU_old_new(-2)	0.141***	0.185***	-0.123***	-0.060***
	[0.036]	[0.040]	[0.044]	[0.014]
EU_new_new(+2)	0.162***	0.131**	0.057	0.056
	[0.056]	[0.064]	[0.110]	[0.048]
EU_new_old(+2)	0.186***	0.296***	0.069	0.073**
	[0.051]	[0.075]	[0.090]	[0.035]
EU_old_new(+2)	0.029	0.037	-0.058*	0.061***
	[0.030]	[0.033]	[0.034]	[0.016]
Gravity variables	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes
Observations	1848	1848	1848	1848
Adjusted R^2	0.17	0.16	0.05	0.11

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%.

The results are in general supportive for the earlier findings, though they also provide some interesting new insights.[31] First, estimates for the total export growth confirm the baseline estimates: the sum of the coefficients on the EU dummy and its lagged counterpart is in line with the effect found in the baseline estimation. An interesting piece of evidence is that the

[31] The VAT fraud sensitivity check was also done for estimates on the margins (Table 17 in Appendix). Most of the results are qualitatively unaffected, though there is stronger evidence for a post-accession decline on the extensive margin.

medium-run effect is found to be stronger than the immediate effect. In particular, in the longer run even old-new trade seems to be positively affected by EU accession.

Second, most of the estimated effects seem to have happened on the surviving margin, while the extensive margin has basically no role in the adjustment process. Common treatment estimates for the extensive margin are not only insignificant, but also small in magnitude.

Third, there is again a sizeable positive anticipatory effect, also occurring dominantly on the surviving margin. This happened however parellel to a significant increase of failures in the trade of new and old countries. In anticipation of EU accession exporters intensified some of their export channels, but at the same time shut down disproportionately more channels than before. Then, failures significantly decreased in the post-accession period. All this might suggest an early restructuring of trade between old and new countries immediately before accession, which was then followed by more stable trade patterns.

6 Conclusion

This paper provides empirical evidence on the magnitude of the trade effect of EU enlargement by taking the episode of the 2004 enlargement as a natural experiment. Since free trade was established for a large subset of manufactured goods already several years before the accession, the trade effect estimates can shed some light on the importance of (non-traditional) border-related barriers of trade. A difference-in-difference econometric strategy is built up, where the treatment group involves country-pairs with at least one new member and the control group contains old-old pairs.

The effect of EU enlargement on trade is found to be consistent with a hypothetical 1.5%-3.3% ad valorem tariff reduction. When allowing for varying treatment effects across country groups it turns out that exports among new members grew the fastest, while exports from old to new countries were affected only slightly, if at all. The effect is the strongest for more technology-intensive industries. A significant anticipatory effect is also identified for the immediate pre-accession year. Finally, the adjustment happened dominantly on the surviving margin, in line with the evidence that extensive margin growth tends to be small in short horizons.

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. Such an investigation is a topic of future research.

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Appendix 1: Data sources

Bilateral exports in euro value terms is from Eurostat's Comext database. Due to missing values for Poland and Slovakia before 2004 at a 6-digit product detail, data was complemented from the United Nation's Comtrade database for all country-pairs where Poland and Slovakia are the exporters.[32] Trade data at the 2-digit NACE classification is created with the help of the relevant concordance table.

Nominal GDP in euros are from Eurostat. Among the robustness checks, real GDP is calculated by deflating with the corresponding GDP deflator from the Eurostat database.

Real effective exchange rates are from Eurostat. They are calculated relative to 35 industrial countries with double export weights, and are based on unit labor costs. Their increase corresponds to appreciation.

Third-country tariffs 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.

Gross output by 2-digit NACE industries in euro value terms is from Eurostat.

Price index for deflating export flows (among robustness checks) is the national producer price indices (PPI) from the IMF's IFS database converted into euros with annual average exchange rates from Eurostat.

Appendix 2: Statistical considerations on trade data

When analysing the period of EU enlargement in 2004 one has to face some potentially serious statistical issues regarding trade data. Below the two most important of them is treated discussed.

Thresholds in Intrastat

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.[33]

[32] I thank the Vienna Institute for International Economic Studies (wiiw) for providing access to Comtrade.
[33] For a detailed description see Quality Report on International Trade Statistics, 2007 by Eurostat.

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

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 over-reporting their exporting activities. The most well documented case is that of the UK where such fraudulent practices caused a substantial bias in trade statistics.[34]

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.

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

Appendix 3: Tables

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

Table 7: 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 8: 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.

Table 9: Decomposition by industries

		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									
17	Textiles	0.9	-2.1	12.2	9.7	12.4	3.9	6.4	0.2
18	Wearing apparel	3.9	5.5	17.2	25.9	-0.6	-3.1	5.4	15.1
19	Leather, luggage, footwear, etc.	7.7	4.0	25.5	26.8	4.1	6.9	34.6	8.3
20	Wood, excl. furniture	5.5	-1.4	26.2	18.8	7.7	9.6	13.9	2.5
21	Pulp, paper products	25.8	2.0	15.4	16.5	25.8	13.7	32.8	8.6
22	Publishing, printing, reprod rec media	4.1	-1.6	10.3	15.3	21.3	13.1	9.7	2.4
24	Chemical products	11.8	8.1	10.7	22.9	13.5	24.0	11.8	13.7
25	Rubber and plastic prods	5.5	3.9	22.6	32.3	23.9	16.6	14.4	12.1
26	Other non-metallic mineral prods	3.8	4.1	17.9	20.8	8.9	10.5	8.9	9.4
27	Basic metals	5.5	18.3	14.5	35.3	10.1	25.7	15.3	28.2
28	Fabricated metal prods	3.3	8.4	20.2	24.5	14.7	20.4	11.8	14.5
29	Machinery and equipment	2.8	7.4	16.5	25.9	20.2	22.1	10.1	13.0
30	Office machinery and computers	0.3	-5.3	34.0	62.6	19.5	10.4	7.3	19.7
31	Electrical machinery and apparatus	2.9	4.5	25.2	32.0	16.4	15.7	9.2	12.1
32	Radio, tv, communication equip	13.5	-8.9	46.2	36.3	17.5	28.8	17.3	0.0
33	Medical, precision and optical instr	7.9	7.5	18.4	26.6	22.7	22.7	11.8	15.1
34	Motor vehicles, trailers, semi-trailers	4.5	4.7	19.8	47.4	13.4	23.6	16.1	16.7
35	Other transport equipment	8.1	-3.9	14.8	22.3	23.6	4.9	38.8	21.0
36	Furniture, manufacturing n.e.c.	3.7	3.9	29.3	24.5	15.8	10.5	7.2	11.2
Surviving									
17	Textiles	-0.9	-0.5	10.2	8.9	10.3	4.2	3.9	0.9
18	Wearing apparel	3.9	5.5	14.3	23.6	-0.8	-3.1	5.1	14.6
19	Leather, luggage, footwear, etc.	3.4	4.1	18.4	25.6	3.2	6.6	8.5	8.2
20	Wood, excl. furniture	3.1	6.7	20.9	23.8	7.2	11.8	8.9	14.3
21	Pulp, paper products	4.2	2.2	9.7	15.8	17.0	12.3	10.0	8.4
22	Publishing, printing, reprod rec media	3.3	0.7	10.6	16.2	21.0	13.9	9.9	3.0
24	Chemical products	10.3	8.5	10.0	22.2	12.1	21.2	11.2	14.9
25	Rubber and plastic prods	4.7	5.4	21.3	32.8	22.6	17.5	13.7	13.3
26	Other non-metallic mineral prods	2.0	5.3	15.6	20.7	8.1	11.8	7.2	10.6
27	Basic metals	5.4	18.9	13.4	33.1	9.5	24.1	14.2	28.0
28	Fabricated metal prods	3.3	8.4	18.4	23.7	13.7	20.1	11.6	14.4
29	Machinery and equipment	2.3	7.8	14.3	24.1	18.8	21.0	9.5	13.3
30	Office machinery and computers	-0.2	-3.9	34.9	61.6	15.9	10.4	6.9	20.1
31	Electrical machinery and apparatus	2.8	7.1	23.8	32.7	15.9	16.5	8.9	14.8
32	Radio, tv, communication equip	1.2	11.9	38.9	40.3	22.3	23.9	11.1	19.7
33	Medical, precision and optical instr	6.7	7.7	12.0	25.1	21.4	18.5	10.8	14.7
34	Motor vehicles, trailers, semi-trailers	4.5	4.8	20.5	42.5	12.4	21.1	16.1	16.4
35	Other transport equipment	7.3	-2.8	-6.8	20.6	13.2	20.2	21.3	14.2
36	Furniture, manufacturing n.e.c.	3.7	5.8	28.1	25.4	17.8	11.9	7.6	12.9

Note: Period averages of annual growth rates ($l = 1$) in percentages, weighted averages of bilateral flows within country group pairs.

Table 10: Decomposition by branches (cont.d)

		old-old		new-new		new-old		old-new	
		2000-2003	2004-2007	2000-2003	2004-2007	2000-2003	2004-2007	2000-2003	2004-2007
Extensive									
17	Textiles	2.2	0.6	6.4	3.9	4.4	2.3	3.7	1.4
18	Wearing apparel	0.1	0.1	7.2	4.2	1.0	0.8	1.5	1.0
19	Leather, luggage, footwear, etc.	4.3	0.0	9.5	2.5	3.6	1.7	26.7	0.9
20	Wood, excl. furniture	2.7	0.2	7.1	1.5	1.0	0.6	6.0	1.2
21	Pulp, paper products	21.8	0.3	7.7	1.5	10.8	2.4	23.7	1.0
22	Publishing, printing, reprod rec media	0.8	0.1	1.5	0.5	1.0	0.6	0.7	0.4
24	Chemical products	1.8	1.1	2.5	3.2	6.3	6.4	1.8	1.8
25	Rubber and plastic prods	0.8	0.1	2.4	1.0	1.9	0.7	0.9	0.2
26	Other non-metallic mineral prods	2.1	0.3	3.9	1.6	2.2	1.3	2.6	1.2
27	Basic metals	0.7	0.9	2.6	3.8	3.5	4.2	2.4	2.5
28	Fabricated metal prods	0.2	0.2	3.3	2.2	1.9	1.3	0.8	0.5
29	Machinery and equipment	1.1	0.7	8.0	5.8	4.5	3.3	3.0	2.3
30	Office machinery and computers	0.5	0.0	3.5	1.9	3.9	0.7	0.7	0.7
31	Electrical machinery and apparatus	0.3	0.5	3.4	4.1	1.4	2.3	1.2	0.5
32	Radio, tv, communication equip	12.5	0.5	11.3	8.5	4.0	15.3	6.5	0.9
33	Medical, precision and optical instr	1.5	0.5	10.4	5.7	3.4	9.5	2.6	1.4
34	Motor vehicles, trailers, semi-trailers	0.1	0.1	2.5	5.6	1.9	2.6	0.4	0.4
35	Other transport equipment	5.8	7.2	39.8	28.1	21.8	6.3	46.3	41.4
36	Furniture, manufacturing n.e.c.	0.2	0.2	2.4	1.1	0.6	0.4	1.0	0.6
Failures									
17	Textiles	0.3	2.2	4.5	3.1	2.3	2.6	1.2	2.2
18	Wearing apparel	0.1	0.1	4.4	1.9	0.9	0.8	1.2	0.5
19	Leather, luggage, footwear, etc.	0.0	0.1	2.5	1.2	2.6	1.5	0.6	0.8
20	Wood, excl. furniture	0.2	8.4	1.8	6.4	0.5	2.7	1.1	12.9
21	Pulp, paper products	0.2	0.6	1.9	0.8	1.8	1.1	0.9	0.7
22	Publishing, printing, reprod rec media	0.0	2.2	1.8	1.4	0.6	1.5	0.8	1.0
24	Chemical products	0.4	1.4	1.8	2.4	5.0	3.6	1.2	3.1
25	Rubber and plastic prods	0.1	1.6	1.1	1.5	0.6	1.4	0.3	1.4
26	Other non-metallic mineral prods	0.2	1.5	1.6	1.4	1.4	2.5	0.8	2.4
27	Basic metals	0.6	1.4	1.6	1.5	3.0	2.5	1.3	2.3
28	Fabricated metal prods	0.1	0.2	1.4	1.3	1.0	0.9	0.7	0.5
29	Machinery and equipment	0.7	1.1	5.8	4.1	3.1	2.3	2.4	2.5
30	Office machinery and computers	0.0	1.5	4.4	0.8	0.2	0.8	0.3	1.1
31	Electrical machinery and apparatus	0.2	3.1	2.0	4.8	0.9	3.2	0.8	3.2
32	Radio, tv, communication equip	0.1	21.3	3.9	12.6	8.8	10.5	0.3	20.6
33	Medical, precision and optical instr	0.3	0.7	4.0	4.2	1.9	5.3	1.6	1.0
34	Motor vehicles, trailers, semi-trailers	0.1	0.1	3.2	0.7	0.9	0.2	0.3	0.3
35	Other transport equipment	4.9	8.3	18.1	26.5	11.3	21.7	29.0	34.6
36	Furniture, manufacturing n.e.c.	0.1	2.1	1.2	2.0	2.6	1.6	1.2	2.3

Note: Period averages of annual growth rates ($l = 1$) in percentages, weighted averages of bilateral flows within country group pairs.

Table 11: Results - level equation, common treatment

Variable				sample until 2003	sample until 2001
EU	0.133***	0.071**	0.076**		
	[0.041]	[0.035]	[0.035]		
EU(+2)		0.122***	0.095***	0.159***	
		[0.032]	[0.031]	[0.031]	
EU(+4)			0.058		0.054
			[0.037]		[0.049]
gdp_i	1.722***	1.644***	1.629***	1.085***	0.773**
	[0.167]	[0.173]	[0.175]	[0.210]	[0.370]
gdp_j	1.209***	1.135***	1.120***	0.931***	1.306***
	[0.132]	[0.139]	[0.142]	[0.152]	[0.292]
EA	0.022	0.012	0.008		
	[0.059]	[0.058]	[0.059]		
tariff_i	-0.034***	-0.034***	-0.034***	0.014	0.005
	[0.010]	[0.010]	[0.010]	[0.011]	[0.025]
tariff_j	0.003	0.003	0.003	0.022***	0.034*
	[0.011]	[0.011]	[0.011]	[0.008]	[0.020]
reer_i	-1.237***	-1.176***	-1.182***	-0.778***	0.049
	[0.226]	[0.226]	[0.226]	[0.211]	[0.415]
reer_j	-0.328**	-0.273*	-0.280*	-0.097	-0.432
	[0.156]	[0.160]	[0.160]	[0.164]	[0.271]
Constant	-7.45***	-6.24***	-5.84**	-0.24	-3.22
	[2.248]	[2.365]	[2.468]	[2.818]	[5.324]
Country-pair fixed effects	yes	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes	yes
Observations	2310	2310	2310	1386	924
Number of groups	462	462	462	462	462
Within R^2	0.66	0.66	0.66	0.57	0.48

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%.

Table 12: Results - level equation, varying treatment

Variable				sample until 2003	sample until 2001
EU_new_new	0.357***	0.298***	0.311***		
	[0.087]	[0.079]	[0.079]		
EU_new_old	0.264***	0.165***	0.174***		
	[0.056]	[0.047]	[0.049]		
EU_old_new	0.038	0.000	0.005		
	[0.053]	[0.046]	[0.048]		
EU_new_new(+2)		0.167***	0.149***	0.195***	
		[0.059]	[0.054]	[0.058]	
EU_new_old(+2)		0.218***	0.171***	0.239***	
		[0.051]	[0.050]	[0.049]	
EU_old_new(+2)		0.066**	0.031	0.072**	
		[0.033]	[0.031]	[0.033]	
EU_new_new(+4)			0.048		-0.027
			[0.068]		[0.093]
EU_new_old(+4)			0.102*		0.059
			[0.053]		[0.063]
EU_old_new(+4)			0.073*		0.040
			[0.040]		[0.065]
gdp_i	1.358***	1.154***	1.121***	0.851***	0.850**
	[0.178]	[0.194]	[0.200]	[0.225]	[0.392]
gdp_j	1.253***	1.222***	1.209***	1.102***	1.464***
	[0.143]	[0.163]	[0.171]	[0.176]	[0.377]
EA	0.054	0.054	0.041		
	[0.057]	[0.056]	[0.056]		
tariff_i	-0.017	-0.016	-0.015	0.012	0.007
	[0.012]	[0.012]	[0.012]	[0.011]	[0.025]
tariff_j	0.001	0.001	0.002	0.023***	0.038*
	[0.011]	[0.011]	[0.011]	[0.008]	[0.020]
reer_i	-1.124***	-0.983***	-0.989***	-0.657***	0.072
	[0.213]	[0.213]	[0.214]	[0.218]	[0.425]
reer_j	-0.316**	-0.295*	-0.304*	-0.183	-0.413
	[0.153]	[0.163]	[0.163]	[0.175]	[0.274]
Constant	-4.32*	-2.34	-1.73	0.39	-6.165
	[2.443]	[2.616]	[2.813]	[2.867]	[6.088]
Country-pair fixed effects	yes	yes	yes	yes	yes
Common year effects	yes	yes	yes	yes	yes
Observations	2310	2310	2310	1386	924
Number of groups	462	462	462	462	462
Within R^2	0.67	0.67	0.67	0.57	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.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 13: Industry estimates, varying treatment

industry	coef.	s.e.	effect (σ_k)	effect ($\sigma = 5$)	effect ($\sigma = 10$)
new-new					
17 Textiles	0.165	[0.136]	-0.026	-0.041	-0.018
18 Wearing apparel	-0.236	[0.318]	0.049	0.058	0.026
19 Leather, luggage, footwear, etc.	0.628**	[0.252]	-0.100	-0.157	-0.070
20 Wood, excl. furniture	0.276*	[0.159]	-0.100	-0.069	-0.031
21 Pulp, paper products	-0.140	[0.227]	0.041	0.035	0.016
22 Publishing, printing, reprod rec media	0.277	[0.190]	-0.067	-0.069	-0.031
24 Chemical products	0.204	[0.165]	-0.033	-0.051	-0.023
25 Rubber and plastic prods	0.250**	[0.121]	-0.060	-0.063	-0.028
26 Other non-metallic mineral prods	0.092	[0.170]	-0.046	-0.023	-0.010
27 Basic metals	1.230***	[0.268]	-0.486	-0.308	-0.137
28 Fabricated metal prods	0.136	[0.250]	-0.035	-0.034	-0.015
29 Machinery and equipment	0.266*	[0.155]	-0.043	-0.067	-0.030
30 Office machinery and computers	1.376***	[0.296]	-0.138	-0.344	-0.153
31 Electrical machinery and apparatus	0.775***	[0.183]	-0.154	-0.194	-0.086
32 Radio, tv, communication equip	1.063***	[0.246]	-0.218	-0.266	-0.118
33 Medical, precision and optical instr	0.187	[0.173]	-0.034	-0.047	-0.021
34 Motor vehicles, trailers, semi-trailers	1.118***	[0.335]	-0.179	-0.280	-0.124
35 Other transport equipment	-0.548	[0.374]	0.084	0.135	0.060
36 Furniture, manufacturing n.e.c.	-0.017	[0.197]	0.003	0.003	0.001
new-old					
17 Textiles	0.250***	[0.079]	-0.039	-0.063	-0.028
18 Wearing apparel	-0.180	[0.132]	0.038	0.045	0.020
19 Leather, luggage, footwear, etc.	-0.041	[0.168]	0.006	0.010	0.004
20 Wood, excl. furniture	0.070	[0.114]	-0.025	-0.018	-0.008
21 Pulp, paper products	0.204	[0.163]	-0.060	-0.051	-0.023
22 Publishing, printing, reprod rec media	0.913***	[0.181]	-0.221	-0.228	-0.101
24 Chemical products	0.490***	[0.148]	-0.079	-0.123	-0.054
25 Rubber and plastic prods	0.416***	[0.098]	-0.099	-0.104	-0.046
26 Other non-metallic mineral prods	0.313***	[0.094]	-0.157	-0.078	-0.035
27 Basic metals	0.691***	[0.152]	-0.273	-0.173	-0.077
28 Fabricated metal prods	0.229*	[0.137]	-0.059	-0.057	-0.025
29 Machinery and equipment	0.385***	[0.123]	-0.062	-0.096	-0.043
30 Office machinery and computers	0.491**	[0.225]	-0.049	-0.123	-0.055
31 Electrical machinery and apparatus	0.751***	[0.125]	-0.149	-0.188	-0.083
32 Radio, tv, communication equip	0.787***	[0.179]	-0.161	-0.197	-0.087
33 Medical, precision and optical instr	0.640***	[0.123]	-0.115	-0.160	-0.071
34 Motor vehicles, trailers, semi-trailers	1.035***	[0.238]	-0.166	-0.259	-0.115
35 Other transport equipment	0.038	[0.255]	-0.006	-0.010	-0.004
36 Furniture, manufacturing n.e.c.	0.130	[0.133]	-0.042	-0.033	-0.014
old-new					
17 Textiles	-0.203**	[0.099]	0.032	0.050	0.022
18 Wearing apparel	0.042	[0.166]	-0.009	-0.011	-0.005
19 Leather, luggage, footwear, etc.	0.184	[0.152]	-0.029	-0.046	-0.020
20 Wood, excl. furniture	-0.181	[0.137]	0.065	0.045	0.020
21 Pulp, paper products	0.050	[0.170]	-0.015	-0.013	-0.006
22 Publishing, printing, reprod rec media	-0.097	[0.132]	0.022	0.023	0.010
24 Chemical products	-0.010	[0.095]	0.002	0.003	0.001
25 Rubber and plastic prods	-0.155*	[0.085]	0.036	0.038	0.017
26 Other non-metallic mineral prods	-0.190*	[0.110]	0.095	0.048	0.021
27 Basic metals	0.474***	[0.129]	-0.187	-0.119	-0.053
28 Fabricated metal prods	-0.088	[0.087]	0.021	0.020	0.009
29 Machinery and equipment	-0.127	[0.080]	0.019	0.030	0.013
30 Office machinery and computers	0.167	[0.193]	-0.017	-0.042	-0.019
31 Electrical machinery and apparatus	0.308***	[0.093]	-0.061	-0.077	-0.034
32 Radio, tv, communication equip	0.354	[0.223]	-0.073	-0.089	-0.039
33 Medical, precision and optical instr	0.052	[0.098]	-0.009	-0.013	-0.006
34 Motor vehicles, trailers, semi-trailers	-0.028	[0.200]	0.003	0.005	0.002
35 Other transport equipment	-0.259	[0.261]	0.039	0.063	0.028
36 Furniture, manufacturing n.e.c.	-0.316*	[0.165]	0.101	0.078	0.034

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%.

Table 14: Results - differenced equation

Variable	common treatment		varying treatment	
d2_EU	0.048	0.055*		
	[0.033]	[0.034]		
d2_EU_new_new			0.220***	0.239***
			[0.066]	[0.066]
d2_EU_new_old			0.093*	0.110**
			[0.048]	[0.048]
d2_EU_old_new			-0.028	-0.027
			[0.042]	[0.042]
d2_EU(-2)	0.164***	0.173***		
	[0.035]	[0.035]		
d2_EU_new_new(-2)			0.251***	0.273***
			[0.074]	[0.074]
d2_EU_new_old(-2)			0.186***	0.207***
			[0.051]	[0.051]
d2_EU_old_new(-2)			0.140***	0.141***
			[0.036]	[0.036]
d2_EU(+2)		0.106***		
		[0.031]		
d2_EU_new_new(+2)				0.162***
				[0.056]
d2_EU_new_old(+2)				0.186***
				[0.051]
d2_EU_old_new(+2)				0.029
				[0.030]
d2_gdp_i	1.375***	1.269***	1.170***	0.911***
	[0.166]	[0.173]	[0.177]	[0.192]
d2_gdp_j	1.213***	1.112***	1.200***	1.175***
	[0.120]	[0.124]	[0.134]	[0.149]
d2_EA	-0.091*	-0.092*	-0.082*	-0.083*
	[0.048]	[0.048]	[0.049]	[0.049]
d2_tariff_i	-0.012	-0.014	-0.004	-0.008
	[0.010]	[0.011]	[0.012]	[0.012]
d2_tariff_j	0.011	0.009	0.011	0.010
	[0.007]	[0.007]	[0.007]	[0.007]
d2_reer_i	-1.024***	-0.930***	-0.970***	-0.763***
	[0.215]	[0.216]	[0.205]	[0.202]
d2_reer_j	-0.465***	-0.380***	-0.451***	-0.425***
	[0.120]	[0.124]	[0.118]	[0.129]
Constant	0.028	-0.030	0.056*	-0.005
	[0.028]	[0.030]	[0.031]	[0.031]
Common year effects	yes	yes	yes	yes
Observations	1848	1848	1848	1848
Adjusted R^2	0.15	0.16	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 15: Results on the margins

Variable	Surviving		Extensive		Failure	
d2_EU	0.096**		-0.007		-0.006	
	[0.045]		[0.043]		[0.033]	
d2_EU_new_new		0.300***		0.012		0.009
		[0.081]		[0.116]		[0.066]
d2_EU_new_old		0.147**		-0.014		-0.032
		[0.060]		[0.063]		[0.044]
d2_EU_old_new		0.012		-0.026		0.007
		[0.053]		[0.042]		[0.039]
d2_EU(-2)	0.187***		-0.005		-0.100***	
	[0.032]		[0.068]		[0.018]	
d2_EU_new_new(-2)		0.307***		-0.193**		-0.166***
		[0.059]		[0.089]		[0.031]
d2_EU_new_old(-2)		0.181***		0.179		-0.118***
		[0.046]		[0.162]		[0.027]
d2_EU_old_new(-2)		0.185***		-0.123***		-0.060***
		[0.040]		[0.044]		[0.014]
d2_EU(+2)	0.150***		0.018		0.067***	
	[0.040]		[0.048]		[0.018]	
d2_EU_new_new(+2)		0.131**		0.057		0.056
		[0.064]		[0.110]		[0.048]
d2_EU_new_old(+2)		0.296***		0.069		0.073**
		[0.075]		[0.090]		[0.035]
d2_EU_old_new(+2)		0.037		-0.058*		0.061***
		[0.033]		[0.034]		[0.016]
d2_gdp_i	1.285***	0.927***	1.825***	1.607***	0.880***	0.955***
	[0.203]	[0.209]	[0.582]	[0.580]	[0.239]	[0.281]
d2_gdp_j	1.009***	1.103***	1.219***	1.509***	0.459***	0.431***
	[0.167]	[0.180]	[0.249]	[0.342]	[0.100]	[0.102]
d2_EA	-0.165***	-0.152***	-0.080	-0.114	0.054***	0.042***
	[0.054]	[0.055]	[0.082]	[0.105]	[0.012]	[0.010]
d2_tariff_i	0.019	0.025	-0.013	-0.016	0.013	0.013
	[0.016]	[0.017]	[0.024]	[0.027]	[0.009]	[0.009]
d2_tariff_j	0.020**	0.023**	-0.003	0.002	0.006	0.008
	[0.009]	[0.009]	[0.010]	[0.010]	[0.006]	[0.006]
d2_reer_i	-1.129***	-0.926***	-0.557	-0.495	-0.429**	-0.422**
	[0.245]	[0.220]	[0.456]	[0.497]	[0.198]	[0.212]
d2_reer_j	-0.251	-0.386**	-0.612***	-0.565**	-0.141*	-0.140
	[0.174]	[0.179]	[0.228]	[0.236]	[0.083]	[0.089]
Constant	-0.015	0.014	-0.063	-0.072	0.003	0.001
	[0.037]	[0.037]	[0.046]	[0.051]	[0.017]	[0.018]
Common year effects	yes	yes	yes	yes	yes	yes
Observations	1848	1848	1848	1848	1848	1848
Adjusted R^2	0.13	0.15	0.04	0.04	0.10	0.10

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 16: Robustness checks - level equation

Variable	No VAT fraud sensitive prods	Deflated flows	Russian neighbour
EU_new_new	0.328***	0.579***	0.358***
	[0.081]	[0.085]	[0.099]
EU_new_old	0.276***	0.372***	0.406***
	[0.050]	[0.059]	[0.073]
EU_old_new	-0.033	0.139***	0.065
	[0.048]	[0.053]	[0.054]
gdp_i	1.206***	0.808***	1.454***
	[0.169]	[0.229]	[0.177]
gdp_j	1.364***	1.158***	1.258***
	[0.134]	[0.201]	[0.143]
EA	-0.003	0.043	0.020
	[0.064]	[0.057]	[0.060]
tariff_i	-0.014	0.006	-0.004
	[0.012]	[0.012]	[0.012]
tariff_j	-0.008	0.004	0.002
	[0.012]	[0.011]	[0.011]
reer_i	-1.154***	-0.565***	-1.334***
	[0.198]	[0.178]	[0.215]
reer_j	-0.410***	0.413***	-0.331**
	[0.148]	[0.135]	[0.150]
EU_new_new*RU			0.022
			[0.122]
EU_new_old*RU			-0.256***
			[0.091]
EU_old_new*RU			-0.348***
			[0.109]
Constant	-3.41	1.59	-4.50*
	[2.220]	[2.380]	[2.437]
Country-pair fixed effects	yes	yes	yes
Common year effects	yes	yes	yes
Observations	2310	2310	2310
Number of groups	462	462	462
Within R^2	0.70	0.53	0.67

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%.

Table 17: Results on the margins - excluding VAT fraud sensitive products

Variable	Surviving	Extensive	Failure
d2_EU_new_new	0.208**	-0.176	-0.076
	[0.089]	[0.146]	[0.057]
d2_EU_new_old	0.109*	-0.155*	-0.054
	[0.065]	[0.085]	[0.043]
d2_EU_old_new	-0.046	-0.109*	-0.032*
	[0.041]	[0.059]	[0.020]
d2_EU_new_new(-2)	0.191**	-0.251**	-0.199***
	[0.092]	[0.114]	[0.038]
d2_EU_new_old(-2)	0.085	0.139	-0.144***
	[0.053]	[0.171]	[0.033]
d2_EU_old_new(-2)	0.110**	-0.105**	-0.069***
	[0.048]	[0.051]	[0.017]
d2_gdp_i	1.500***	2.511***	1.304***
	[0.462]	[0.754]	[0.332]
d2_gdp_j	1.454***	1.747***	0.569***
	[0.417]	[0.511]	[0.128]
d2_EA	-0.140**	-0.136	0.041***
	[0.060]	[0.107]	[0.012]
d2_tariff_i	0.025	-0.035	-0.001
	[0.017]	[0.028]	[0.013]
d2_tariff_j	0.033*	-0.008	0.001
	[0.018]	[0.035]	[0.008]
d2_reer_i	-1.482***	-1.227**	-0.729***
	[0.425]	[0.607]	[0.246]
d2_reer_j	-0.588*	-0.820**	-0.264**
	[0.315]	[0.366]	[0.107]
Constant	0.087	-0.129*	0.002
	[0.054]	[0.075]	[0.029]
Common year effects	yes	yes	yes
Observations	1848	1848	1848
Adjusted R^2	0.08	0.04	0.08

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%.