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ABSTRACT

REVISITING THE EURO'S TRADE COST AND WELFARE EFFECTS

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When, about twenty years ago, the Euro was created, one objective was to facilitate intra-European trade by reducing transaction costs. Has the Euro delivered? Using sectoral trade data from 1995 to 2014 and applying structural gravity modeling, we conduct an ***ex post*** evaluation of the European Monetary Union (EMU). In aggregate data, we find a significant average trade effect for goods of almost 8 percent, but a much smaller effect for services trade. Digging deeper, we detect substantial heterogeneity between sectors, as well as between and within country-pairs. Singling out Germany, and embedding the estimation results into a quantitative general equilibrium model of world trade, we find that EMU has increased real incomes in all EMU countries, albeit at different rates. E.g., incomes have increased by 0.3, 0.6, and 2.1 percent in Italy, Germany, and Luxembourg, respectively.

Keywords: Euro, Trade, General Equilibrium, Quantitative Trade Models, European Union

JEL classification: F15, F17, N74

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1 Introduction

The roots for the project 'European Monetary Union' (EMU) can at least be traced back to 1970, when the so-called Werner report recommended the introduction of a common European currency. From these beginnings, the objective was to foster intra-European economic exchange, in particular trade, by eliminating currency related transaction costs such as arising from the simple need of exchanging currencies, the insurance against exchange rate fluctuations, or reduced price transparency.

Both the academic and the political debates of the last years have mostly focused on the monetary aspects of EMU and on the macroeconomic consequences of its design. The transaction cost savings, or the 'real' effects of the common currency, have received much less attention, in particular concerning the role for this channel for macroeconomic variables; see Hartman and Smets (2018) for a recent survey. In this paper, we revisit the trade cost effects of introducing the Euro. To this end, we employ a structural gravity model and apply it to bilateral sectoral trade data for about 40 countries, 34 goods and services sectors, and the years 1995-2014. The estimates are used in a quantitative trade model to simulate a counterfactual equilibrium for the year 2014 in which the trade cost effects of the Euro are assumed to be undone. Next to general equilibrium consistent trade effects, we focus on welfare (real income) and sectoral value added.

In our estimates, we allow for trade cost effects to differ between sectors. We also allow for a certain degree of heterogeneity between and within country pairs. More specifically, we single out Germany and allow its effects to differ between imports and exports as well as between old and new members of EMU. Identification relies on geographical and chronological heterogeneity in countries' adoption of the Euro and is facilitated by the inclusion of intra-country trade flows. To deal with the uncertainty associated to our econometric estimates in the simulation, we construct confidence intervals for all the simulated variables.

Of course, we are not the first to study the trade effects of a currency union. In a famous paper, Rose (2000) uses a simple gravity model to show that sharing a common currency more than triples trade between the participating countries. Rose (2000) used a currency union dummy variable as a right-hand side regressor, which yields one coefficient for the assessment of the trade effect of currency unions. This paper was followed by a vast literature that addressed problems, such as omitted variables, self-selection, and other econometric issues (see also Baldwin (2006); Baldwin et al. (2008)). Generally, increased econometric sophistication and specifications with better theoretical underpinning have greatly reduced the estimated effects.

Recently, Chen and Novy (2018) apply a modern gravity analysis that avoids the econometric problems of the earlier literature. The authors argue theoretically and empirically that the trade effect of currency unions is heterogeneous across and within country pairs. The authors find that the trade effect of sharing the same currency depends on the size of the trade relationship. It is 30% for the 90th percentile of import shares but more than 90% at the 10th percentile. Other recent papers, such as the one by Glick and Rose (2016), emphasize the use of exporter and importer year-specific fixed effects. The authors find that currency unions increase trade on average by 40% and that the EMU increases trade even more.[1]

Building on Yotov et al. (2016), Larch et al. (2017) show how to structurally estimate the effects of currency unions on trade. To cope with issues such as heteroscedasticity or zero trade flows, they employ Pseudo-Maximum-Likelihood (PPML) estimation as advocated by Santos Silva and Tenreyro (2006). They control for exporter and importer year specific fixed effects to account for changes in multilateral resistance (Feenstra (2015); Baldwin and Taglioni (2007)), and time-invariant pair fixed effects that absorb the unobservable barriers to trade (Baier and Bergstrand, 2007).

We employ the same empirical strategy but add to the literature by specifically scrutinizing how and to what extent the formation of the EMU contributed to trade between Germany and its partners and across goods and services sectors. Our contribution relative to the literature is threefold: First, in the econometrics, we distinguish 30 sectors instead of looking at aggregate outcomes. Second, instead of estimating one single average treatment effect, we allow for Germany-specific asymmetric effects. And, third, from the econometrics, we back out the trade cost effects of the Euro and use a quantitative general equilibrium trade model to simulate the welfare effects of the EMU. We account for parameter uncertainty in our simulation exercise.

More specifically, our empirical gravity model is derived from the general equilibrium framework proposed by Caliendo and Parro (2015), a multi-sector input-output version of the Ricardian trade model by Eaton and Kortum (2002), extended to services and non-tariff barriers by Aichele et al. (2016). Crucially, the model features rich intra- and international input-output linkages. This allows us to account for trade diversion effects, competitiveness effects through changing prices of intermediate inputs, and effects on real GDP. Both the econometrics and the simulation draw on data from the World Input-Output Database (WIOD); see Timmer et al. (2015) for a description. On average, our econometric results are quite comparable to the ones in the literature (Micco et al. (2003); Baldwin and Taglioni (2007), Silva and Tenreyro (2010), Olivero and Yotov (2012)). However, we go beyond aggregates and report effects for detailed manufacturing and services sectors. Not all sectors

[1]Other important papers are Glick and Rose (2002), Glick and Rose (2016), and De Sousa (2012).

have benefitted from the Euro; in particular, the services sectors disappoint. Further, we find that outward trade costs of Germany have fallen quite substantially, but this is much weaker for inward trade costs. Our counterfactual analysis suggests, that German real GDP would have been by about 0.6% lower if the Euro had not existed in 2014. Among the large EMU members, this is the largest effect; small members such as Belgium or Luxembourg turn out to have benefitted more (1.4% and 2.1%, respectively). German gross trade is by about 1.1% to 1.5% higher with the Euro; within the other EMU members, the effect is even more pronounced.

In the following, we first explain our research design. In the third section, we present data and econometric results. In the fourth section, we discuss our counterfactual analysis. Section five concludes.

2 Research Design

We start by briefly introducing the theoretical model from which we derive the gravity equation and which will be used to conduct counterfactual analysis. Then we explain how the gravity equation is used to estimate the various EMU membership effects. Finally, we provide some outlook on the simulation exercise.

2.1 Setup

Our theoretical model follows Caliendo and Parro (2015), who provide a multi-sector version of Eaton and Kortum (2002) with input-output linkages. We briefly derive the gravity equation to be estimated and describe how we simulate counterfactual equilibria. Details are relegated to the Appendix.

There are N countries indexed by i and n, as well as J sectors indexed by j and k. Sectoral goods are either used as inputs in production or consumed, with the representative consumer having Cobb-Douglas preferences over consumption C_n^j of sectoral final goods with expenditure shares $\alpha_n^j \in (0,1)$ and $\sum_j \alpha_n^j = 1$.

Labor is the only production factor and labor markets clear. The labor force L_n is mobile across sectors such that $L_n = \sum_{j=1}^J L_n^j$, but not between countries. In each sector j, there is a continuum of intermediate goods producers indexed $\omega^j \in [0,1]$ who combine labor and composite intermediate input and who differ with respect to their productivity $z_i^j(\omega^j)$. Intermediate goods are aggregated into sectoral composites using CES production functions with elasticity η^j. In all markets, there is perfect competition.

A firm in country i can supply its output at price

$$p_{in}^j(\omega^j) = \kappa_{in}^j \frac{c_i^j}{z_i^j(\omega^j)} \text{ with } c_n^j = \Upsilon_n^j \, w_n{}^{\beta_n^j} \left[\prod_{k=1}^{J} p_n^k{}^{\gamma_n^{k,j}} \right]^{(1-\beta_n^j)} . \tag{1}$$

The minimum cost of an input bundle is c_n^j, where Υ_n^j is a constant, w_n is the wage rate in country n, p_n^k is the price of a composite intermediate good from sector k, $\beta_n^j \geq 0$ is the value added share in sector j in country n and $\gamma_n^{k,j}$ denotes the cost share of source sector k in sector j's intermediate costs, with $\sum_{k=1}^{J} \gamma_n^{k,j} = 1$. κ_{in}^j denotes trade costs of delivering sector j goods from country i to country n such that

$$\kappa_{in}^j = (1 + t_{in}^j) D_{in}^{\rho^j} e^{\delta^j \mathbf{Z}_{in}}, \tag{2}$$

where $t_{in}^j \geq 0$ denotes ad-valorem tariffs, D_{in} is bilateral distance, and $\mathbf{Z}_{in}$ is a vector collecting trade cost shifters (such as FTAs or other trade policies).

Productivity of intermediate goods producers follows a Fréchet distribution with a location parameter $\lambda_n^j \geq 0$ that varies by country and sector (a measure of absolute advantage) and shape parameter θ^j that varies by sector (and captures comparative advantage).[2]

Producers of sectoral composites in country n search for the supplier with the lowest cost such that

$$p_n^j = \min_i \left\{ p_{in}^j(\omega^j); i = 1, \ldots, N \right\}. \tag{3}$$

Caliendo and Parro (2015) show that it is possible to derive a closed form solution of composite intermediate goods price

$$p_n^j = A^j \left(\sum_{i=1}^{N} \lambda_i^j \left(c_i^j \kappa_{in}^j \right)^{\frac{-1}{\theta^j}} \right)^{-\theta^j}, \tag{4}$$

where $A^j = \Gamma\left[1 + \theta^j(1 - \eta^j)\right]^{\frac{1}{1-\eta^j}}$ is a constant.

[2] Convergence requires $1 + \theta^j > \eta^j$.

2.2 Gravity

Given this structure, one can show that a country n's expenditure share π_{in}^{j} for source country i's goods in sector j is

$$\pi_{in}^{j} = \frac{\lambda_i^j \left[c_i^j \kappa_{in}^j\right]^{\frac{-1}{\theta^j}}}{\sum_{i=1}^{N} \lambda_i^j \left[c_i^j \kappa_{in}^j\right]^{\frac{-1}{\theta^j}}}, \tag{5}$$

which forms the core of a gravity equation.

Log-linearizing equation (5) and making use of (2), one obtains the following gravity equation:

$$M_{in,t}^{j} = \exp\left[-\frac{1}{\theta^j}\ln(1+\tau_{in,t}^{j}) + \frac{\boldsymbol{\delta}_1^j}{\theta^j}\boldsymbol{€}_{in,t} + \frac{\boldsymbol{\delta}_2^j}{\theta^j}\mathbf{Z}_{in,t}^{j} + \nu_{in}^{j} + \nu_{i,t}^{j} + \nu_{n,t}^{j}\right] + \varepsilon_{in,t}^{j}. \tag{6}$$

$M_{in,t}^{j}$ is the value of imports of country n from partner country i in sector j at time t. The interesting parameters are the sectoral tariff elasticities θ and shifters of sectoral trade costs δ. The vector $\boldsymbol{€}_{in,t}$ takes the value of one if two countries i, n share the Euro at time t, and zero otherwise, where we allow for different parameters between different country groups and also with respect to directionality.

In the baseline gravity model, $€_{in,t}$ in equation (6) contains only one single binary variable which switches to one if two countries are both members of EMU. In further specifications the vector $€_{in,t}$ contains binary variables that specifically control for trade flows between Germany and the 'old' and 'new' EMU members.[3] In a symmetric gravity specification, the directional effects - whether Germany is the exporter or importer - are ignored, while this distinction is made in the asymmetric gravity specification. The following sub-chapters explain the vector $\boldsymbol{€}_{in,t}$ in more detail.

To identify causal treatment effects the panel nature of the data is exploited. Given the nature of the underlying theoretical model, these estimates can be translated into changes in ad valorem tariff equivalents of non-tariff trade costs. $1+\tau_{in,t}^{j}$ depicts the ad valorem tariff, with the trade elasticity $1/\theta^j > 0$. Since we can observe the data for these ad valorem tariffs for all bilateral pairs across sectors, the trade cost elasticity can be correctly identified and then later be used for the CGE simulations. Second, unbiased estimates of $\frac{\boldsymbol{\delta}_l^j}{\theta^j}$ are needed, where $l \equiv [1, 2]$.

Identifying variation stems from the membership accessions between 1995 and 2011, which

[3] Old EMU partner members: Austria, Belgium, Finland, France, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain. The new EMU partners of Germany: Greece, Slovenia, Malta, Cyprus, Slovakia, Estonia, Latvia, Lithuania.

is our available time frame. The Euro was officially launched on 1 January 1999 in 12 EU countries.[4] Between 2002 and 2015, the remaining members joined.[5] The vector $\boldsymbol{Z}_{in,t}$ contains dummy variables accounting for membership in the EU, the Schengen Area or other regional trade agreements.

In order to account for multilateral resistance, importer- and exporter-specific year fixed effects, $\nu^j_{i,t}$ and $\nu^j_{n,t}$, are included. These terms are generally unobserved and fully control for all exporter- and importer-specific time-varying determinants of trade (such as production or consumption). Effectively, they also control for nominal and real exchange rates movements relative to a third currency, and in combination (through triangle arbitrage) between countries i and n.

ν^j_{in} are bilateral country-pair fixed effects, which absorb all time-invariant bilateral trade frictions. The fixed effects may account for potential endogeneity issues of the EMU dummy if two countries that decide to join a currency union have traditionally traded a lot with each other (see e.g. Micco et al. (2003)). This fixed effect may also prevent potential selection bias. The selection of country pairs into plurilateral agreements may not be completely random, but is also not a purely bilateral decision. We further believe that reverse causality is not a major issue. Apart to potential endogeneity, this also addresses omitted variable bias in integration agreements (see, e.g., Baier and Bergstrand, 2007). $\varepsilon^j_{in,t}$ is the random error term. As recommended by Santos Silva and Tenreyro (2006), we estimate the model using Poisson Pseudo Maximum Likelihood (PPML) methods to address the OLS inconsistency and sample selection bias. We cluster standard errors at the country-pair level.

Following the common practice (see Baier and Bergstrand, 2007), we exploit variation within country-pairs and sectors over time to then identify the effects of policy changes. Thus, econometric identification relies on countries joining an agreement and the EMU in the period 1995-2011.

2.3 Comparative Statics

We wish to answer the question: How does welfare (real per capita income) in the observed baseline 2014 differ from a counterfactual situation in which the Euro did not exist. To answer this question, we need to close the model introduced in Section 2 above. We do this be requiring that in all countries, accounting for trade surpluses, income equals expenditure, and that for all sectors, goods markets clear. Appendix A.1 provides the essential equations.

[4]Initial states included Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.

[5]The 'new' wave of members include Slovenia, Cyprus, Malta, Slovakia, Estonia, Lithuania, and Latvia.

We are interested in the effects of the decrease in transaction costs due to the membership of the EMU on income, trade, and value added. As shown by Dekle et al. (2008), the model can be solved in changes. Let z denote the initial level of a variable and z' its counterfactual level. The Appendix A.2 provides more detail. The transaction cost shocks are then given by $\hat{\kappa}_{in}^{j} = \frac{1+t_{in}^{j'}}{1+t_{in}^{j}} e^{\delta^j (Z_{in}^{'} - Z_{in})}$ and the change in real income (our measure for welfare) is

$$\hat{W}_n = \frac{\hat{I}_n}{\prod_{j=1}^{J} \left(\hat{p}_n^j\right)^{\alpha_n^j}}. \tag{7}$$

Solving the model in changes has several important advantages. First, certain constant parameters which would be difficult to estimate such as the level of absolute advantage, the level of non-tariff trade barriers, or the elasticity of substitution drop out from the analysis. This should reduce measurement error. Second, the procedure has computational advantages as one does not need to solve for the baseline and the counterfactual equilibria separately.

2.4 Construction of Confidence Intervals

We simulate confidence intervals for all endogenous outcome variables. More specifically, we use the variance-covariance matrix of the sectoral gravity regressions and, assuming joint normality, we draw a thousand different parameter sets for each sector. We use these to calibrate a thousand simulation exercises, obtaining a distribution of changes in outcome variables. We report the 5th and the 95th percentiles of these distributions (the 90% confidence interval) together with the mean. This allows for a sound treatment of statistically insignificant gravity coefficients and for a proper quantification of parameter uncertainty.

3 Data and Econometric Results

3.1 Data

The main data base is the World Input-Output Database (WIOD). It is described in detail by Timmer et al. (2015). It provides information on the expenditure shares α, the cost shares β and γ, as well as data on bilateral trade shares π, bilateral trade in final and intermediate goods in producer and consumer prices detailed by sector, countries' total value added $w_n L_n$, values of production, and trade surpluses S.

There are two waves of WIOD data. The first wave includes data for 40 countries, 16 goods sectors and 19 services sectors for the years 1995 until 2011. The second wave, which was published in 2016 includes information about 43 countries, a rest-of-the-world aggregate and 56 sectors for the years 2000 to 2014. Unfortunately, no official concordance between the two waves exists, and any mapping of sectors is likely to contaminate the crucial time variance in the data required for proper estimation. For this paper, we use the first WIOD wave to be able to cover the first Euro accessions by Germany, Italy, Belgium, Finland, France, Ireland, Luxembourg, Netherlands, Portugal, and Spain in 1999. One disadvantage of the first WIOD wave is the fact that we cannot take account of the most recent Euro accessions of Lithuania and Latvia in 2014 and 2015. Single Market and Customs Union effects are identified through the enlargement of the EU between 1995 and 2011 and thus do not cover the most recent accessions by Croatia. We thus cover almost all Euro and EU accessions, which leaves us confident to correctly proxy the Euro effects.

However, to pin down the baseline, we have constructed a concordance between the two waves and work with the year 2014, the most recent one available. We use WIOD data on sectoral outputs, bilateral aggregated intermediate and final trade shares final expenditure and intermediate cost shares. Moreover, we match the cross-section of tariffs in 2014.[6] Data on bilateral preferential and MFN tariffs stem from Felbermayr et al. (2018b). Sectoral trade cost elasticities θ and the trade cost changes $\boldsymbol{\delta}$ are identified through structural state-of-the-art gravity estimation. Data on tariffs and on trade from WIOD are used to estimate trade elasticities for the 16 manufacturing and agricultural sectors – jointly with the ad-valorem equivalent changes in NTBs associated with the different steps of European and trade integration in general.[7] We use data on RTA membership from the WTO.[8] Data on membership in the EU, the Eurozone and the successive accession of countries to the Schengen Agreement stem from the European Commission. Information about the EU membership and RTA membership is taken the website of the European Commission.

3.2 Gravity Analysis of Average Effects

The first baseline gravity model estimates the average trade effect of bilateral country pairs being members of the EMU at time t. So, $€_{in,t}$ in equation (6) is not a vector, but rather

[6]We use the approach outlined in Aichele and Heiland (2016) to account for the fact that WIOD expenditure shares are valued in "basic" (or "producer") prices (net of tariffs), while expenditure shares in the model are defined in "market" prices (including tariffs). Further, we utilize their approach to account for changes in inventory as part of the accounting system of WIOD but do not feature in our model.

[7]For services sectors, we borrow an average estimate of the elasticity of services trade with respect to trade cost from Egger et al. (2012). We adapt their method to obtain a trade elasticity of services and apply it to our estimated goods elasticity from our aggregated gravity estimation. This is given by $\beta = \theta_{\text{Goods}} - \theta_{\text{Services}}$, which is $\theta_{\text{Services}} = 1.446 = 3.471 - 2.026(\hat{\beta})$ and a relative standard error of $0.144 = 0.924/6.404$ (t-value).

[8]The RTA gateway is accessible via `http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx`.

contains only one single binary variable which switches to one if two countries are both members of EMU. Further, control variables, such as being a member of the European Union, the Schengen Area, a customs union or a trade agreement are also included ($\mathbf{Z}^{j}_{in,t}$). We start with this simple specification to make our results comparable to earlier literature. The first line in Table 1 shows the estimates for aggregate goods and services trade.

On average, becoming a EMU member increased imports of goods by 7.8% and is statistically significant. This average result is in line with literature, (see e.g. Felbermayr et al. (2018a) and Larch et al. (2017)); the authors find rather small, but positive effects, although lacking significance in the latter example. Interestingly, the effect on services trade is small and statistically not significant.

The rest of Table 1 shows the gravity estimation results for all 16 goods sectors. The EMU has heterogeneous effects across the sectors, but with the only exception of the textiles sector, effects are positive. Many coefficients have large standard errors. As a consequence, we expect sizeable confidence intervals in our simulation exercise. In the area of services industries, sales and repair of vehicles, or accommodation (hotels) have strongly benefitted. Again, most estimated effects are positive but standard errors are large.

3.3 Singling Out Germany and Allowing For Directionality

Table 2 goes one step further and singles out Germany from the other EMU members. Moreover, it distinguishes between 'old' and 'new' EMU members.[9] However, effects are still symmetric in the sense that German exports and imports are affected similarly. Dropping time indices to avoid clutter, the vector €_{in} in equation 6 becomes

$$\text{€}_{in,t} = \{sym\text{€}_{old,DEU}; sym\text{€}_{new,DEU}; \text{€}_{Rest}\}, \tag{8}$$

Columns (1) and (2) show that especially trade between Germany and the other 'old' EMU members was enhanced due to EMU. On average trade in goods increased by 13.8% and trade in services by 7.2%, with both being statistically significant. Trade between Germany and the 'new' member states significantly decreased by 11.5% in manufacturing sectors, and by 10.5% in services sectors (Column (2) and (5)). Next, columns (3) and (4) (broad goods), and column six (broad services) differentiate between Germany being an exporter and an

[9]Old EMU partner members: Austria, Belgium, Finland, France, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain. The new EMU partners of Germany: Greece, Slovenia, Malta, Cyprus, Slovakia, Estonia, Latvia, Lithuania.

Table 1: The Impact of EMU on sectoral Bilateral Imports

Dep. var.:	Bilateral Imports				
ID	Goods	both Euro *b/se*	ID	Services	both Euro *b/se*
	Broad Goods	**0.0753*** (0.03)**		**Broad Services**	**0.0104 (0.03)**
1	Agriculture	0.08516*** (0.03)	17	Electricity	0.26883*** (0.06)
2	Mining	0.00194 (0.07)	18	Construction	0.00239 (0.02)
3	Food, Beverages	0.16106*** (0.03)	19	Sale, Repair Vehicles	0.11129*** (0.03)
4	Textiles	-0.15815*** (0.04)	20	Wholesale Trade	0.01043 (0.06)
5	Leather	0.04468 (0.06)	21	Retail Trade	0.02799 (0.03)
6	Wood	0.22584*** (0.03)	22	Hotels	0.13393*** (0.04)
7	Pulp, Paper	0.07960** (0.03)	23	Inland Transport	0.04196 (0.04)
8	Coke, Petroleum	0.85288*** (0.14)	24	Water Transport	-0.10906 (0.11)
9	Chemicals	0.08157** (0.04)	25	Ait Transport	0.02897 (0.07)
10	Rubber, Plastics	0.00675 (0.03)	26	Auxiliary Transport	0.01410 (0.06)
11	Other Minerals	0.06857** (0.03)	27	Telecommunications	-0.00197 (0.04)
12	Basic Metals	0.04256 (0.03)	28	Financial Interm.	-0.06000 (0.09)
13	Machinery	0.03305 (0.03)	29	Real Estate	0.00166 (0.07)
14	Electronics	0.00180 (0.04)	30	Business Activities	0.00839 (0.04)
15	Transport Equipment	0.01186 (0.03)	31	Public Admin	0.11808** (0.05)
16	Manufacturing	0.03578 (0.02)	32	Education	0.03826 (0.05)
			33	Health	0.07489** (0.03)
			34	Other	0.01217 (0.04)

Note: ***, **, * denote significance at the 1%, 5%, 10% levels, respectively. All models estimated use PPML methods. Robust standard errors (in parentheses) allow for clustering at the country-pair level. Pair as well as year specific importer and exporter fixed effects included but not reported. Further controls, such as membership of EU, RTA, FTA, Schengen and Tariffs are included in estimation but not reporte, but can be retrieved from the tables A1 and A2 in the Appendix. Number of observations: 27,200.

importer. So, we have

$$€_{in,t} = \{€_{old,DEU}; €_{DEU,old}; €_{new,DEU}; €_{DEU,new}; €_{Rest}\}, \quad (9)$$

which allows Germany's Euro-effects to be asymmetric. To save degrees of freedom, in this specification, we do not decompose the effect for the remaining Euro zone members.

Estimation results suggest that German exports of goods towards the old members increased by 18.2% (see column (4), line $asym.€_{DEU,old}$) and goods' imports from old EMU members increased by 7.5% (see column (4), line $asym.€_{old,DEU}$). German services exports towards old EMU members increased by 16.3% (see column (6)). But, as for imports, the effect is not distinguishable from zero. In contrast, exports and imports of goods from and to Germany to and from the new members even decreased by 11.2% (see column (4), line $asym.€_{DEU,new}$) and 11.8% (see column (4), line $asym.€_{new,DEU}$). The trade effects for the German service industry are even more pronounced: German exports in services to the new members decreased by 16.9%, which is also significant, whereas German services imports decreased by 4.7%. But this result is not significant.

Table 2: The Impact of EMU on German Bilateral Imports from Old and New EMU Members

Dep. var.:	Bilateral Imports					
	Goods				Services	
	(1)	(2)	(3)	(4)	(5)	(6)
sym. $€_{DEU,old}$	0.1291***	0.1367***			0.0698*	
	(0.03)	(0.03)			(0.04)	
sym. $€_{DEU,new}$	−0.1251***	−0.1227***			−0.1107***	
	(0.03)	(0.03)			(0.04)	
asym. $€_{DEU,new}$			−0.1135*	−0.1191*		−0.1851**
			(0.07)	(0.07)		(0.09)
asym. $€_{new,DEU}$			−0.1376**	−0.1263**		−0.0485
			(0.06)	(0.06)		(0.06)
asym. $€_{DEU,old}$			0.1876**	0.1922***		0.1734*
			(0.07)	(0.07)		(0.10)
asym. $€_{old,DEU}$			0.0719	0.0823		−0.0206
			(0.07)	(0.06)		(0.08)
Both $€_{Rest}$	0.0137	0.0211	0.0138	0.0212	−0.0332	−0.0333
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
Both EU	0.4444***	0.4493***	0.4447***	0.4496***	0.2277***	0.2275***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
RTA	0.2609***	0.2328***	0.2606***	0.2325***	0.1999***	0.1997***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)
Schengen	0.0345***	0.0336***	0.0345***	0.0336***	0.0200*	0.0202*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tariffs		−3.4704***		−3.4666***		
		(0.83)		(0.83)		

Note: ***, **, * denote significance at the 1%, 5%, 10% levels, respectively. All models estimated use PPML methods. Robust standard errors (in parentheses) allow for clustering at the country-pair level. Pair as well as year specific importer and exporter fixed effects included but not reported. Number of observations: 27,200.

To sum up, the effect on German exports and imports varies substantially. Further it also differs across the trading partners. Trade with old EMU members expanded, whereas, trade with the new members decreased, both across services and goods and for German exports and imports. Note that this is not due to a 'wrong' initial exchange rate between Germany and the new members, as initial conditions are accounted for by country-year fixed effects. The effects can also not be explained by different paths of prices (i.e., inflation) or even nominal exchange rates, which are effectively dealt with by fixed effects. Also, trade diversion cannot be blamed, because it is taken into account by the inclusion of fixed effects (which proxy for multilateral resistance terms). Note, that the welfare effects of the EMU do not depend on whether outward trade costs have gone down; of course, inward trade costs are at least of equal importance for welfare gains.

Tables 3 and 4 take the gravity specification, which accounts for directional trade between Germany and the new and old EMU members to a more disaggregated sectoral level. This specification informs the general equilibrium simulations. The respective tables solely show the results for the effects of the Euro between Germany, the old and new members, and the average effects for the remaining EMU members. Estimates of coefficients on additional control variables can be retrieved from the Table A3 and A4 in the Appendix.

Exports of German agricultural products to old EMU members went up, while the respective effect on imports is less pronounced. Trade between Germany and new EMU members did not experience a decrease in transaction costs. German trade with old members solely increased in the manufacturing industries, except for textile and leather products. German exports towards the new members decreased for almost all manufacturing products, except Coke, Refinery, Printing, Paper Services. Trade with new EMU members decreased through Euro membership. Only a few services sectors could profit.

Table 3: The Impact of EMU on sectoral Bilateral Imports of Goods

		$€_{Deu,old}$	$€_{old,DEU}$	$€_{Deu,new}$	$€_{new,DEU}$	$€_{Rest}$
1	Agriculture	0.1775*	0.0901	-0.3042***	0.0198	0.0552**
		(0.10)	(0.06)	(0.09)	(0.05)	(0.03)
2	Mining	0.3782***	-0.2119	-0.1306	-0.1870	-0.1081*
		(0.13)	(0.16)	(0.10)	(0.12)	(0.06)
3	Food, Beverages	0.3172***	0.1923***	0.0104	0.0652	0.0863**
		(0.09)	(0.07)	(0.19)	(0.07)	(0.04)
4	Textiles	-0.3612***	0.0389	-0.0467	-0.2175	-0.1600***
		(0.10)	(0.08)	(0.10)	(0.13)	(0.06)
5	Leather	-0.2373	0.1017	0.2037	-0.2390	0.1122
		(0.16)	(0.12)	(0.15)	(0.15)	(0.07)
6	Wood	0.3861***	0.3228***	-0.1535	-0.0450	0.1245***
		(0.10)	(0.08)	(0.17)	(0.10)	(0.03)
7	Pulp, Paper	0.2743**	0.0881	0.0731	0.0015	-0.0252
		(0.11)	(0.08)	(0.07)	(0.06)	(0.04)
8	Coke, Petroleum	1.0338***	0.4842	0.0986	0.2097	0.9409***
		(0.35)	(0.36)	(0.28)	(0.29)	(0.17)
9	Chemicals	0.1858*	0.1456**	-0.2245**	-0.1022	-0.0074
		(0.10)	(0.07)	(0.10)	(0.09)	(0.04)
10	Rubber, Plastics	0.0844	0.0963	-0.1444*	-0.1156	-0.0970***
		(0.08)	(0.06)	(0.09)	(0.09)	(0.03)
11	Other Minerals	0.2446**	0.1065	-0.0496	-0.0250	-0.0323
		(0.12)	(0.10)	(0.08)	(0.07)	(0.04)
12	Basic Metals	0.2572***	0.0297	-0.2437***	-0.1669**	-0.0628*
		(0.08)	(0.08)	(0.07)	(0.08)	(0.03)
13	Machinery	0.1325*	0.0325	-0.0178	-0.1023*	-0.0438
		(0.07)	(0.08)	(0.07)	(0.06)	(0.03)
14	Electronics	0.1293	0.0356	-0.0475	-0.1838**	-0.0843*
		(0.09)	(0.09)	(0.10)	(0.07)	(0.05)
15	Transport Equipment	0.0626	0.0566	-0.3067***	-0.2244**	-0.0127
		(0.06)	(0.08)	(0.09)	(0.09)	(0.04)
16	Manufacturing	0.0032	0.1389**	-0.1079	-0.1679***	0.0120

Note: ***, **, * denote significance at the 1%, 5%, 10% levels, respectively. All models estimated use PPML methods. Robust standard errors (in parentheses) allow for clustering at the country-pair level. Pair as well as year specific importer and exporter fixed effects included but not reported. Further controls, such as membership of EU, RTA, FTA, Schengen and Tariffs are included in estimation but not reported. The remaining control variables can be retrieved from the tables A3 and A4 of the Appendix. Number of observations: 27,200.

Table 4: The Impact of EMU on sectoral Bilateral Imports of Services

		$€_{Deu,old}$	$€_{old,DEU}$	$€_{Deu,new}$	$€_{new,DEU}$	$€_{Rest}$
		(0.07)	(0.06)	(0.10)	(0.04)	(0.03)
17	Electricity	0.5398***	0.2966**	-0.0388	0.1221	0.1798***
		(0.16)	(0.14)	(0.15)	(0.20)	(0.06)
18	Construction	0.1903**	-0.0125	-0.0224	-0.0991*	-0.0838***
		(0.08)	(0.08)	(0.07)	(0.06)	(0.02)
19	Sale, Repair Vehicles	0.1218	0.1427	-0.2197***	-0.2171**	0.1079***
		(0.10)	(0.11)	(0.07)	(0.10)	(0.04)
20	Wholesale Trade	0.3898***	0.0085	-0.1911	0.2126**	-0.1029
		(0.14)	(0.11)	(0.13)	(0.09)	(0.09)
21	Retail Trade	0.1761*	-0.0377	-0.0867	-0.1150	0.0060
		(0.10)	(0.09)	(0.12)	(0.11)	(0.04)
22	Hotels	0.2570**	0.1132	-0.1166	0.1267	0.1010*
		(0.12)	(0.12)	(0.20)	(0.09)	(0.05)
23	Inland Transport	0.2171**	-0.0628	-0.5063***	-0.2403	0.0362
		(0.11)	(0.09)	(0.16)	(0.23)	(0.05)
24	Water Transport	0.4966**	-0.5947***	-0.2404	-0.0083	-0.0690
		(0.22)	(0.20)	(0.26)	(0.29)	(0.12)
25	Ait Transport	0.3845**	-0.0456	-0.6180***	-0.0083	-0.0881
		(0.15)	(0.13)	(0.13)	(0.21)	(0.08)
26	Auxiliary Transport	-0.2000	0.1951**	-0.3187*	-0.1452	0.0417
		(0.18)	(0.10)	(0.18)	(0.28)	(0.06)
27	Telecommunications	0.0759	-0.0883	-0.0073	-0.2057	0.0093
		(0.13)	(0.12)	(0.15)	(0.13)	(0.05)
28	Financial Interm.	0.4427**	-0.3384**	-0.3628**	-0.1437	-0.0974
		(0.17)	(0.15)	(0.17)	(0.16)	(0.12)
29	Real Estate	0.1223	-0.0492	-0.0900	-0.0259	-0.0240
		(0.20)	(0.20)	(0.12)	(0.09)	(0.08)
30	Business Activities	0.1800	-0.1078	-0.1410	-0.1905**	0.0102
		(0.14)	(0.11)	(0.11)	(0.09)	(0.05)
31	Public Admin	0.3648***	0.0521	-0.1906	-0.1978***	0.0372
		(0.14)	(0.10)	(0.12)	(0.07)	(0.04)
32	Education	0.0611	-0.0088	-0.2806*	-0.1118	0.0600
		(0.15)	(0.14)	(0.15)	(0.07)	(0.05)
33	Health	0.2125**	0.1420**	-0.2594**	-0.0596	-0.0326
		(0.09)	(0.07)	(0.11)	(0.06)	(0.03)
34	Other	0.0273	0.1128	-0.1240	0.0116	-0.0327
		(0.15)	(0.13)	(0.25)	(0.16)	(0.04)

Note: ***, **, * denote significance at the 1%, 5%, 10% levels, respectively. All models estimated use PPML methods. Robust standard errors (in parentheses) allow for clustering at the country-pair level. Pair as well as year specific importer and exporter fixed effects included but not reported. Further controls, such as membership of EU, RTA, FTA, Schengen and Tariffs are included in estimation but not reported. The remaining control variables can be retrieved from the tables A3 and A4 of the Appendix. Number of observations: 27,200.

4 Counterfactual Analysis

In the next and final step, we use the econometric ex post evaluation of EMU in our general equilibrium model to conduct a counterfactual analysis: what, if, in 2014, the Euro had not existed? Our empirical exercise provides the needed estimates of the inverse trade elasticity so that we can back out the transaction cost effects of EMU membership; see equation (6).[10] This allows us to compute the shock $\hat{\kappa^j_{in}}$ associated to an end of EMU, which we use in our simulations. Essentially, these amount to solving the system of equations (12) to (16) in the Appendix. The econometric exercise also provides us with estimates of the variance-covariance matrices to simulate confidence intervals.[11]

4.1 Real Income Changes

Table 5 shows the changes in real income for all members of EMU and the remaining non-EMU members available in the data. Note that high levels of trade with the EMU member states prior to the introduction of the Euro magnify the positive effects because resource savings due to lower transaction costs are larger. Therefore, we do not expect that EMU has benefitted member states symmetrically. This is the reason why small and more central countries such as Luxembourg or the Netherlands belong to the countries that benefited the most in terms of real income gains. Similarly, the Baltic countries and particularly Estonia also experienced an increase in their real incomes through the lowering of transaction costs. The real income effect for Germany is comparable to the average effect across EMU members. Our simulations suggest that Italy and Greece benefited slightly less from the currency union than the other EMU members. One should keep in mind that, in principle, the model could also lead to negative welfare effects for countries inside and outside of the EMU. The reason for this is that terms of trade can move against countries and offset the direct transaction cost savings. However, the analysis suggests that this is not the case for any of the EMU members. All average real income changes are statistically significant at the 10%-level. Also, European Union members, which are not part of the EMU (such as the UK or Sweden), also indirectly profited from the Eurozone, often because they benefit from an increased level of economic activity in the Eurozone and the associated boost in demand for imported inputs. This is even true for some non-EU and non-EMU countries, such as Australia, who profited

[10]However, since we do not have trade cost shifters such as tariffs for the services industries, we take the trade cost elasticity from Egger et al. (2012).

[11]We draw 1000 realizations of parameter sets based on our gravity estimates and use them to simulate the model a 1000 times. The resulting distribution of endogenous variables is then characterized using the mean and the 5% and 95% percentiles.

from the creation of the Eurozone.

Table 5: Real Income Changes, in %

European Monetary Union Member States				**Non-EMU Countries**			
	Change in Real Income in %		Change in Real Income in %		Change in Real Income in %		Change in Real Income in %
Austria	**0.90**	Latvia	**1.34**	Australia	**0.01**	Mexico	**0.01**
	[0.90, 0.91]		[1.33, 1.35]		[0.01, 0.01]		[0.01, 0.01]
Belgium	**1.43**	Lithuania	**0.85**	Brasil	**0.00**	Norway	**0.01**
	[1.42, 1.44]		[0.84, 0.85]		[0.00, 0.00]		[0.01, 0.01]
Cyprus	**0.88**	Luxembourg	**2.05**	Bulgaria	**0.05**	Poland	**0.02**
	[0.87, 0.89]		[2.03, 2.07]		[0.05, 0.05]		[0.02, 0.02]
Estonia	**1.36**	Malta	**0.22**	Canada	**-0.00**	ROW	**0.01**
	[1.35, 1.37]		[0.20, 0.24]		[-0.00, -0.00]		[0.01, 0.01]
Finland	**0.43**	Netherlands	**1.16**	China	0.00	Romania	**0.05**
	[0.43, 0.43]		[1.16, 1.17]		[-0.00, 0.00]		[0.05, 0.05]
France	**0.45**	Portugal	**0.75**	Croatia	**0.04**	Russia	**-0.05**
	[0.44, 0.45]		[0.74, 0.75]		[0.04, 0.04]		[-0.05, -0.05]
Germany	**0.57**	Slovakia	**0.65**	Czech R.	**0.02**	Sweden	**0.01**
	[0.57, 0.57]		[0.64, 0.65]		[0.01, 0.02]		[0.01, 0.01]
Greece	**0.35**	Slovenia	**1.13**	Denmark	**-0.01**	Switzerland	**0.01**
	[0.35, 0.35]		[1.12, 1.13]		[-0.01, -0.01]		[0.01, 0.01]
Ireland	**0.61**	Spain	**0.42**	Hungary	0.00	Taiwan	**-0.01**
	[0.60, 0.62]		[0.42, 0.42]		[-0.00, 0.00]		[-0.01, -0.00]
Italy	**0.33**			India	**-0.00**	Turkey	**0.03**
	[0.33, 0.33]				[-0.00, -0.00]		[0.03, 0.03]
				Indonesia	**-0.00**	UK	**0.02**
					[-0.00, -0.00]		[0.02, 0.02]
				Japan	**0.01**	USA	**0.01**
					[0.01, 0.01]		[0.01, 0.01]
				Korea	**-0.01**		
					[-0.01, -0.01]		

Note: The baseline year is 2014. Mean effects and [p5,p95] intervals. Bold characters indicate significance at the 10%-level based on 1,000 bootstrap replications. Confidence intervals in square brackets.

4.2 Effects on International Trade

Table 6 shows the effects on overall trade, i.e., across all trade partners for Germany, the remaining EMU members and the non-EMU members across the three sector categories and an aggregate (total). Across all sector categories, Germany sees its overall exports and imports increase; compared to the change in real income, trade increases more, which indicates that the openness of the German economy, measured as total trade over GDP, increases substantially. The same is evident for the remaining EMU members. Non-EMU members, on the other hand, are confronted with overall decreases in exports and imports. Only exports of services expand (statistically significant at the 10%-level).[12]

The positive change in exports and imports of the EMU members, including Germany, can be explained through trade creation effects among the EMU members and, possibly, by trade

[12]Note that positive effects on openness do not necessarily imply positive welfare effects. The reason is that the latter are not driven by gross trade but by changes in domestic value added and in the aggregate price index.

Table 6: Change in Aggregate Trade, in %

	Germany		Rest of EMU		Non-EMU members	
	Change in %		Change in %		Change in %	
	Exports	Imports	Exports	Imports	Exports	Imports
Agriculture	**1.54**	0.23	**1.49**	**2.12**	0.04	**-0.17**
	[0.39, 2.69]	[-0.35, 0.82]	[0.04, 2.94]	[1.37, 2.87]	[-0.04, 0.12]	[-0.24, -0.11]
Manufacturing	**1.35**	**2.01**	**2.57**	**2.27**	**-0.18**	**-0.05**
	[0.93, 1.76]	[1.41, 2.60]	[1.78, 3.35]	[1.60, 2.94]	[-0.26, -0.11]	[-0.08, -0.02]
Services	0.27	0.49	0.30	0.97	**0.09**	**-0.09**
	[-0.45, 0.98]	[-0.52, 1.50]	[-0.63, 1.23]	[-0.12, 2.06]	[0.05, 0.13]	[-0.13, -0.06]
Total	1.13	**1.48**	1.69	**1.83**	-0.08	-0.08
	[-0.10, 2.36]	[0.13, 2.82]	[-0.07, 3.46]	[0.63, 3.03]	[-0.27, 0.11]	[-0.17, 0.02]

Note: The baseline year is 2014. Bold characters indicate significance at the 10%-level based on 1,000 bootstrap replications and an approximate normal distribution. Confidence intervals in square brackets. Domestic trade is not taken into account.

diversion effects with non-members. Table 7 reports the changes in bilateral trade flows for Germany, the remaining EMU members (Rest of EMU) and the rest of the world (ROW). Trade flows are disaggregated into broad categories (agriculture, manufacturing, services). The bold values denote the mean effects which are statistically different from zero at the 10% level. The trade flows change because of the trade shocks triggered by the formation of the EMU. They are influenced by changing trade costs and changes in total revenue and expenditure and by multilateral resistance forces.

Our simulations suggest that the introduction of the EMU has led to a significant increase in trade among EMU members. Especially agricultural and manufacturing trade could be expanded, while trade in services seems to be less affected. In relative terms, imports from the EMU members towards Germany increased to a higher extent than vice versa. Trade diversion effects are more pronounced in the agricultural and services sectors. EMU members substitute initial agricultural and services trade with non-EMU members with trade among each other, while manufacturing exports of EMU members towards non-EMU and among each other increased. The formation of EMU strengthened the region in terms of purchasing power, which led to an increase of imports from the non-EMU members. Former trade among non-EMU is now substituted with trade towards the Eurozone.

4.3 Effects on Value Added

Table 8 shows the changes in sectoral value added for Germany. Typically, comparative advantage sectors benefit while those with comparative disadvantage lose. The effects on sectoral value added are heavily influenced by inter- and intranational input-output linkages.

Table 7: Change in Bilateral Trade, in %

	Germany	Rest of EMU	ROW
Germany			
Agriculture		**3.97**	-0.10
		[6.63, 1.30]	[0.39, -0.60]
Manufacturing		**3.96**	0.04
		[5.30, 2.62]	[0.17, -0.10]
Services		1.27	**-0.11**
		[3.90, -1.35]	[-0.02, -0.19]
Total		**3.50**	0.00
		[4.88, 2.13]	[0.12, -0.11]
Rest of EMU			
Agriculture	1.00	**4.09**	-0.37
	[3.80, -1.81]	[6.52, 1.66]	[0.06, -0.79]
Manufacturing	**5.57**	**5.48**	**0.19**
	[7.40, 3.74]	[7.26, 3.70]	[0.36, 0.03]
Services	0.67	1.39	**-0.17**
	[3.03, -1.69]	[4.10, -1.31]	[-0.05, -0.29]
Total	**3.94**	**4.07**	0.03
	[5.46, 2.42]	[5.74, 2.41]	[0.15, -0.09]
Non-EMU members			
Agriculture	-0.18	**1.67**	**-0.17**
	[1.08, -1.43]	[2.49, 0.85]	[-0.11, -0.23]
Manufacturing	**-0.69**	**-0.60**	**-0.10**
	[-0.31, -1.07]	[-0.21, -0.99]	[-0.04, -0.15]
Services	**0.34**	**0.74**	**-0.07**
	[0.58, 0.10]	[0.98, 0.49]	[-0.03, -0.11]
Total	**-0.38**	**0.18**	**-0.10**
	[-0.08, -0.68]	[0.32, 0.04]	[-0.05, -0.15]

Note: The baseline year is 2014. Bold characters indicate significance at the 10%-level based on 1,000 bootstrap replications and an approximate normal distribution. Confidence intervals in square brackets. Domestic trade is not taken into account.

This way, while partial equilibrium estimates often fail to yield large positive direct effects for services, many sectors in this area still benefit from the Euro because of their important role in value added networks of manufacturing industries.

Effects are, however, relatively small. According to the estimates, the biggest winners are the chemicals and agri-food. Textiles tend to lose out.[13] Almost all services sectors win, with effects relatively similar to the aggregate GDP effects, implying that the allocation of production factors changes relatively little.

[13]The coke and petroleum sector appears to benefit strongly; this is driven by the econometric results which do not seem very plausible. The results should be taken with a grain of salt.

Table 8: German Sectoral Value Added Changes, in %

Agriculture and Manufacturing Goods					
	Initial Sectoral Value Added	Change of Sva in %		Initial Sectoral Value Added	Change of Sva in %
Agriculture	26199	**0.75**	Rubber and Plastics	38050	**0.71**
		[0.43, 1.08]			[0.31, 1.11]
Mining and Quarrying	6785	0.34	Other Non-Metallic Mineral	22719	**0.69**
		[-0.84, 1.51]			[0.40, 0.97]
Food, Beverages and Tobacco	59688	**1.10**	Basic Metals	104364	**0.57**
		[0.76, 1.45]			[0.35, 0.79]
Textiles	10552	**-1.90**	Machinery, Nec	149590	**0.51**
		[-3.11, -0.69]			[0.20, 0.83]
Wood Products	9030	**0.72**	Electrical Equipment	107097	0.10
		[0.49, 0.96]			[-0.44, 0.64]
Pulp, Paper, etc.	26606	**0.68**	Transport Equipment	17951	0.60
		[0.46, 0.91]			[-0.09, 1.30]
Coke, Petroleum, etc.	13264	**-1.64**	Manufacturing, Nec	31631	**0.59**
		[-3.09, -0.18]			[0.31, 0.88]
Chemicals	92288	**1.33**			
		[0.53, 2.12]			
Services					
	Initial Sectoral Value Added	Change of Sva in %		Initial Sectoral Value Added	Change of Sva in %
Electricity, Gas, etc.	76277	**0.63**	Auxiliary Transport Activities	65821	**0.52**
		[0.40, 0.86]			[0.34, 0.71]
Construction	164523	**0.54**	Telecommunications	98577	**0.52**
		[0.33, 0.76]			[0.32, 0.72]
Sale, Repair of Vehicles	200340	**0.50**	Financial Intermediation	155998	**0.52**
		[0.35, 0.64]			[0.35, 0.69]
Wholesale Trade, except vehicles	161246	**0.50**	Real Estate Activities	447330	**0.56**
		[0.34, 0.67]			[0.35, 0.76]
Retail Trade, except vehicles	114236	**0.55**	Other Business Activities	341557	**0.48**
		[0.35, 0.75]			[0.31, 0.65]
Hotels, Restaurants	85804	**0.52**	Public Admin, Defence, etc.	400351	**0.53**
		[0.32, 0.72]			[0.33, 0.74]
Inland Transport	67411	**0.45**	Education	190796	**0.56**
		[0.25, 0.65]			[0.35, 0.77]
Water Transport	10621	0.37	Health and Social Work	275879	**0.57**
		[-0.01, 0.75]			[0.35, 0.79]
Air Transport	8878	**0.76**	Other Social Services	30479	**0.60**
		[0.24, 1.29]			[0.35, 0.84]

Note:The baseline year is 2014. Bold characters indicate significance at the 10%-level based on 1,000 bootstrap replications and an approximate normal distribution. Confidence intervals in square brackets.

5 Conclusion

This paper conducts an ex-post analysis of the trade effects of the European Monetary Union and of the welfare effects that these effects entail. The economic consequences of the currency union are quantified allowing for asymmetries in the relation between Germany and the other EMU economies across sectors. The analysis is based on a quantitative trade theory framework, which gives rise to a structural gravity equation. The model's setup allows us to simulate confidence intervals for all endogenous variables, which is important since many of the Euro-related parameter estimates come with very substantial standard errors. Interestingly, though, we find that confidence intervals are quite narrow in most cases.

In the partial equilibrium gravity analysis, we find that the EMU has been successful in increasing trade between its members, but that effects differ quite a bit across sectors, country pairs, and direction. We exploit the heterogeneity identified at the sectoral level and of the structure of our quantitative general equilibrium model to back out the trade cost effects of EMU membership. We use these trade cost effects in the counterfactual analysis to simulate the real income, trade, and value added changes associated to the trade cost savings of introducing the Euro. We find that all EMU members could increase their real income and that non-EMU could generate small gains, too, despite the presence of trade diversion effects. Trade ties between the EMU members intensified, some trade relationships within the currency union substituted former trade with non-EMU members. Overall, we obtain very clear evidence for positive welfare effects from the transaction cost savings generated by the creation of the EMU.

We believe that highlighting those transaction cost savings and the benefits derived from them is crucial if one is to paint a balanced picture of the European Monetary Union. We are aware that our analysis is partial in that it ignores other effects of the common currency. However, much other work (e.g., as surveyed by Hartman and Smets, 2018) that focuses on the macroeconomic implications of the Euro is partial, too, as it ignores the transaction cost savings that we stress. Future work should try to integrate both strands of literature.

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A Appendix

A.1 Model Closure

Let Y_n^j denote the value of gross production of varieties in each sector j. For each country n and sector j, Y_n^j has to equal the value of demand for sectoral varieties from all countries $i = 1, \ldots, N$. The goods market clearing condition is given by

$$Y_n^j = \sum_{i=1}^{N} \frac{\pi_{ni}^j}{(1+t_{ni}^j)} X_i^j \qquad \text{with} \qquad X_i^j = \sum_{k=1}^{J} \gamma_i^{j,k}(1-\beta_i^k)Y_i^k + \alpha_i^j I_i, \tag{10}$$

National income consists of labor income, tariff rebates R_i and the trade surplus, which is exogenous S_i, i.e. $I_i = w_i L_i + R_i - S_i$ and X_i^j is country i's expenditure on sector j goods.-[14] Demand of sectors k in all countries i for intermediate usage of sector j varieties produced in country n is given in the first term on the right hand side. The second term denotes the final demand. Tariff rebates are $R_i = \sum_{j=1}^{J} X_i^j \left(1 - \sum_{n=1}^{N} \frac{\pi_{ni}^j}{(1+t_{ni}^j)}\right)$.[15]

The second equilibrium condition requires that, for each country n, the value of total imports, domestic demand and the trade surplus has to equal the value of total exports including domestic sales, which is equivalent to total output Y_n:

$$\sum_{j=1}^{J}\sum_{i=1}^{N} \frac{\pi_{in}^j}{(1+t_{in}^j)} X_n^j + S_n = \sum_{j=1}^{J}\sum_{i=1}^{N} \frac{\pi_{ni}^j}{(1+t_{ni}^j)} X_i^j = \sum_{j=1}^{J} Y_n^j \equiv Y_n \tag{11}$$

Conditions (10) and (11) close the model.

A.2 Comparative Statics in General Equilibrium

The following system of equations is required to solve the counterfactual changes. One advantage of solving the model in changes is that certain constant parameters such as the absolute advantage or the elasticity of substitution between input varieties ω drop out and need not be estimated.[16].

[14]Aggregate trade deficits in each country are exogenous in the model, which follows the theoretical framework of Caliendo and Parro (2015). All counterfactuals are calculated by holding the countries' aggregate trade deficits constant, as a share of world GDP.

[15]Instead of the goods market clearing condition, one can also use the expenditure equation $X_i^j = \left(\sum_{k=1}^{J} \gamma_i^{j,k}(1-\beta_i^k)(F_i^k X_i^k + S_i^k) + \alpha_i^j I_i\right)$ as in Caliendo and Parro (2015).

[16]See also Caliendo and Parro (2015)

$$\hat{c}_n^j = \hat{w}_n^{\beta_n^j} \left(\prod_{i=1}^{N} [\hat{p}_n^j]^{\gamma_n^{k,j}} \right)^{1-\beta_n^j}, \tag{12}$$

$$\hat{p}_n^j = \left(\sum_{i=1}^{N} \pi_{in}^j [\hat{\kappa}_{in}^j \hat{c}_i^j]^{-1/\theta^j} \right)^{-\theta^j}, \tag{13}$$

$$\hat{\pi}_{in}^j = \left(\frac{\hat{c}_i^j}{\hat{p}_n^j} \hat{\kappa}_{in}^j \right)^{-1/\theta^j}, \tag{14}$$

$$X_n^{j'} = \sum_{j=1}^{J} \gamma_n^{j,k} (1 - \beta_n^k) \left(\sum_{i=1}^{N} \frac{\pi_{ni}^{k'}}{1 + t_{ni}^{k'}} X_i^{k'} \right) + \alpha_n^j I_n', \tag{15}$$

$$\frac{1}{B} \sum_{j=1}^{J} F_n^{j'} X_n^{j'} + s_n = \frac{1}{B} \sum_{j=1}^{J} \sum_{i=1}^{N} \frac{\pi_{ni}^{j'}}{1 + t_{ni}^{j'}} X_i^{j'}, \tag{16}$$

with $\hat{w}_n$ depicting the wage changes. X_n^j are sectoral expenditure levels, $F_n^j \equiv \sum_{i=1}^{N} \frac{\pi_j^{in}}{(1+t_{in}^j)}$, $I_n' = \hat{w}_n w_n L_n + \sum_{j=1}^{J} X_n^{j'}(1 - F_n^{j'}) - S_n$, L_n are a country n's labor force, and S_n is the trade surplus, which is exogenous. $s_n \equiv S_n/B$, is fixed, with $B \equiv \sum_n w_n L_n$ denoting the global labor income. This ensures that the system is homogeneous of degree zero in prices. Equation (12) shows the shift in unit costs, which arise due to changes in input prices (i.e., wage and intermediate price changes).

These changes in unit costs have an indirect effect on the sectoral price index p_n^j, while trade cost changes directly affect it (see equation (13)). Trade shares change as a reaction to changes in trade costs, unit costs, and prices. The productivity dispersion θ^j indicates the intensity of the reaction. The higher θ^j, the bigger trade changes. Goods market clearing is ensured in equation (15). Equation (16) provides the new equilibrium and the counterfactual income-equals-expenditure, thus balanced trade condition. The framework of Caliendo and Parro (2015) is exploited to solve the system for multiple sectors, which is an extension of the single-sector solution algorithm proposed by Alvarez and Lucas (2007). The initial guess is made about a vector of wage changes. Using (12) and (13), it then computes changes in prices, trade shares, expenditure levels, evaluates the trade balance condition (16), and updates the change in wages based on deviations in the trade balance.

A.3 Detailed Gravity Results

Table A1: The Impact of EMU on Sectoral Bilateral Imports of Goods

Dep. var.: Bilateral Imports

	Broad Goods	Agriculture Fishing, etc. (1)	Mining and Quarrying (2)	Food, Beverages and Tobacco (3)	Textiles and Textile Products (4)	Leather, Leather and Footwear (5)
both Euro	**0.0753*****	0.08516***	0.00194	0.16106***	-0.15815***	0.04468
	(0.03)	(0.03)	(0.07)	(0.03)	(0.04)	(0.06)
both EU	**0.4416*****	0.45333***	0.35228***	0.45942***	0.35127***	0.35557***
	(0.02)	(0.03)	(0.08)	(0.03)	(0.04)	(0.05)
RTA	**0.2327*****	0.11932	0.06353	0.13315**	-0.13970	-0.07319
	(0.06)	(0.08)	(0.09)	(0.06)	(0.16)	(0.12)
Schengen	**0.0336*****	0.03247***	0.08363***	0.02642***	-0.04749***	0.01994
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
Tariffs	**-3.4673*****	-2.18310***	-3.03081**	-0.89716**$^{\alpha}$	-2.50476***	-0.84339$^{\alpha}$
	(0.83)	(0.50)	(1.25)	(0.44)	(0.49)	(0.63)

	Wood and Products of Wood and Cork (6)	Pulp and Paper , etc. (7)	Coke, Refined Petroleum and Nuclear Fuel (8)	Chemicals and Chemical Products (9)	Rubber and Plastics (10)	Other Non-Metallic Mineral (11)
both Euro	0.22584***	0.07960**	0.85288***	0.08157**	0.00675	0.06857**
	(0.03)	(0.03)	(0.14)	(0.04)	(0.03)	(0.03)
both EU	0.23180***	0.29140***	0.43283***	0.38557***	0.39130***	0.27754***
	(0.03)	(0.03)	(0.10)	(0.03)	(0.02)	(0.03)
RTA	-0.05563	0.05293	-0.14462	0.18313**	0.18302***	0.18548**
	(0.10)	(0.09)	(0.16)	(0.07)	(0.06)	(0.08)
Schengen	-0.01980**	0.00285	-0.05153	0.02213**	0.01722**	-0.00853
	(0.01)	(0.01)	(0.06)	(0.01)	(0.01)	(0.01)
Tariffs	-1.67668**	-1.43138*	-1.19203	-2.04158**	-2.37919***	0.14617$^{\alpha}$
	(0.74)	(0.79)	(1.67)	(0.83)	(0.72)	(0.78)

	Basic Metals and Fabricated Metal (12)	Machinery, Nec (13)	Electrical and Optical Equipment (14)	Transport Equipment (15)	Manufacturing Nec; Recycling (16)
both Euro	0.04256	0.03305	0.00180	0.01186	0.03578
	(0.03)	(0.03)	(0.04)	(0.03)	(0.02)
both EU	0.37835***	0.46156***	0.51414***	0.36217***	0.31368***
	(0.03)	(0.03)	(0.06)	(0.04)	(0.02)
RTA	0.27069**	0.32786***	0.36537***	0.17377*	0.39739**
	(0.12)	(0.09)	(0.11)	(0.09)	(0.19)
Schengen	0.06006***	0.01149	0.01727	0.03751***	0.00203
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tariffs	-1.39787*	-4.99101***	-4.67259***	-4.77642***	-2.2145
	(0.74)	(1.54)	(1.17)	(1.07)	(1.43)

Note: ***, **, * denote significance at the 1%, 5%, 10% levels, respectively. All models estimated use PPML methods. Robust standard errors (in parentheses) allow for clustering at the country-pair level. Pair as well as year specific importer and exporter fixed effects included but not reported. $^{\alpha}$ Theory inconsistent trade cost elasticites get replaced by the trade cost elasticity of the broad goods sector (-3.4673***); Number of observations: 27,200.

Table A2: The Impact of EMU on Sectoral Bilateral Imports of Services

Dep. var.: Bilateral Imports

	Broad Services	Electricity, Gas and Water Supply	Construction	Sale, Repair of Vehicles	Wholesale Trade Except of Vehicles	Retail Trade, Except of Vehicles	Hotels and Restaurants
	(17)	(18)	(19)	(20)	(21)	(22)	
both Euro	**0.0104**	0.26883***	0.00239	0.11129***	0.01043	0.02799	0.13393***
	(0.03)	(0.06)	(0.02)	(0.03)	(0.06)	(0.03)	(0.04)
both EU	**0.2241*** **	0.25402***	0.22359***	0.39919***	0.27699***	0.18707***	0.19428***
	(0.02)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
RTA	**0.1999*** **	0.07528	0.21308**	0.07640	0.12669	0.11608	0.19347***
	(0.07)	(0.13)	(0.09)	(0.05)	(0.09)	(0.09)	(0.07)
Schengen	**0.0195* **	0.02360	-0.02957***	0.01203	0.01752	-0.00859	0.00790
	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)

	Inland Transport	Water Transport	Air Transport	Auxiliary Transport Activities	Post and Telecom.	Financial Intermediation	Real Estate Activities
	(23)	(24)	(25)	(26)	(27)	(28)	(29)
both Euro	0.04196	-0.10906	0.02897	0.01410	-0.00197	-0.06000	0.00166
	(0.04)	(0.11)	(0.07)	(0.06)	(0.04)	(0.09)	(0.07)
both EU	0.28864***	0.08626	0.25163***	0.09940	0.29172***	0.04751	0.01792
	(0.05)	(0.09)	(0.05)	(0.06)	(0.06)	(0.07)	(0.06)
RTA	0.07877	0.36742**	0.01276	0.35035***	0.16693	0.02770	0.15499
	(0.07)	(0.18)	(0.10)	(0.11)	(0.11)	(0.09)	(0.11)
Schengen	0.06731***	0.00887	0.08209***	0.04689*	0.01641	-0.01054	0.07514***
	(0.02)	(0.04)	(0.02)	(0.02)	(0.01)	(0.03)	(0.03)

	Other Business Activities	Public Admin and Defence	Education	Health and Social Work	Community, Social and Personal Services
	(30)	(31)	(32)	(33)	(34)
both Euro	0.00839	0.11808**	0.03826	0.07489**	0.01217
	(0.04)	(0.05)	(0.05)	(0.03)	(0.04)
both EU	0.21323***	0.37947***	0.27733***	0.38639***	0.24880***
	(0.03)	(0.06)	(0.04)	(0.03)	(0.04)
RTA	0.20742***	0.08753	0.14450	0.21507***	0.16458
	(0.08)	(0.09)	(0.10)	(0.07)	(0.10)
Schengen	0.00568	0.01390	-0.01932*	0.02277**	0.01784
	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)

Note: ***, **, * denote significance at the 1%, 5%, 10% levels, respectively. All models estimated use PPML methods. Robust standard errors (in parentheses) allow for clustering at the country-pair level. Pair as well as year specific importer and exporter fixed effects included but not reported. Number of observations: 27,200.

Table A3: The Impact of EMU on sectoral Bilateral Imports of Goods

Dep. var.: Bilateral Imports

	Broad Goods	Agriculture Fishing, etc. (1)	Mining and Quarrying (2)	Food, Beverages and Tobacco (3)	Textiles and Textile Products (4)	Leather, Leather and Footwear (5)
$€_{Deu,old}$	0.1922***	0.1775*	0.3782***	0.3172***	-0.3612***	-0.2373
	(0.07)	(0.10)	(0.13)	(0.09)	(0.10)	(0.16)
$€_{old,DEU}$	-0.1191*	0.0901	-0.2119	0.1923***	0.0389	0.1017
	(0.07)	(0.06)	(0.16)	(0.07)	(0.08)	(0.12)
$€_{Deu,new}$	-0.1191*	-0.3042***	-0.1306	0.0104	-0.0467	0.2037
	(0.07)	(0.09)	(0.10)	(0.19)	(0.10)	(0.15)
$€_{new,DEU}$	-0.1263**	0.0198	-0.1870	0.0652	-0.2175	-0.2390
	(0.06)	(0.05)	(0.12)	(0.07)	(0.13)	(0.15)
$€_{Rest}$	0.0212	0.0552**	-0.1081*	0.0863**	-0.1600***	0.1122
	(0.03)	(0.03)	(0.06)	(0.04)	(0.06)	(0.07)
both EU	0.4496***	0.4560***	0.3559***	0.4605***	0.3541***	0.3536***
	(0.02)	(0.03)	(0.08)	(0.03)	(0.04)	(0.05)
RTA	0.2325***	0.1192	0.0639	0.1329**	-0.1394	-0.0725
	(0.06)	(0.08)	(0.09)	(0.06)	(0.16)	(0.12)
Schengen	0.0336***	0.0333***	0.0857***	0.0291***	-0.0487***	0.0196
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
Tariffs	-3.4666***	-2.1784***	-3.0051**	-0.8911**	-2.5149***	-0.8413
	(0.83)	(0.50)	(1.24)	(0.44)	(0.49)	(0.64)

	Wood and Products of Wood and Cork (6)	Pulp and Paper , etc. (7)	Coke, Refined Petroleum and Nuclear Fuel (8)	Chemical Products (9)	Rubber and Plastics (10)	Other Non-Metallic Mineral (11)
$€_{Deu,old}$	0.3861***	0.2743**	1.0338***	0.1858*	0.0844	0.2446**
	(0.10)	(0.11)	(0.35)	(0.10)	(0.08)	(0.12)
$€_{old,DEU}$	0.3228***	0.0881	0.4842	0.1456**	0.0963	0.1065
	(0.08)	(0.08)	(0.36)	(0.07)	(0.06)	(0.10)
$€_{Deu,new}$	-0.1535	0.0731	0.0986	-0.2245**	-0.1444*	-0.0496
	(0.17)	(0.07)	(0.28)	(0.10)	(0.09)	(0.08)
$€_{new,DEU}$	-0.0450	0.0015	0.2097	-0.1022	-0.1156	-0.0250
	(0.10)	(0.06)	(0.29)	(0.09)	(0.09)	(0.07)
$€_{Rest}$	0.1245***	-0.0252	0.9409***	-0.0074	-0.0970***	-0.0323
	(0.03)	(0.04)	(0.17)	(0.04)	(0.03)	(0.04)
both EU	0.2427***	0.2944***	0.4415***	0.3925***	0.3973***	0.2819***
	(0.03)	(0.03)	(0.10)	(0.03)	(0.02)	(0.03)
RTA	-0.0556	0.0529	-0.1460	0.1832**	0.1831***	0.1855**
	(0.10)	(0.09)	(0.16)	(0.07)	(0.06)	(0.08)
Schengen	-0.0193**	0.0053	-0.0550	0.0251**	0.0193**	-0.0065
	(0.01)	(0.01)	(0.06)	(0.01)	(0.01)	(0.01)
Tariffs	-1.6800**	-1.4059*	-1.2981	-2.0410**	-2.3817***	0.1448
(0.73)	(0.78)	(1.67)	(0.83)	(0.72)	(0.78)	

	Basic Metals and Fabricated Metal (12)	Machinery, Nec (13)	Electrical and Optical Equipment (14)	Transport Equipment (15)	Manufacturing Nec; Recycling (16)
$€_{Deu,old}$	0.2572***	0.1325*	0.1293	0.0626	0.0032
	(0.08)	(0.07)	(0.09)	(0.06)	(0.07)
$€_{old,DEU}$	0.0297	0.0325	0.0356	0.0566	0.1389**
	(0.08)	(0.08)	(0.09)	(0.08)	(0.06)
$€_{Deu,new}$	-0.2437***	-0.0178	-0.0475	-0.3067***	-0.1079
	(0.07)	(0.07)	(0.10)	(0.09)	(0.10)
$€_{new,DEU}$	-0.1669**	-0.1023*	-0.1838**	-0.2244**	-0.1679***
	(0.08)	(0.06)	(0.07)	(0.09)	(0.04)
$€_{Rest}$	-0.0628*	-0.0438	-0.0843*	-0.0127	0.0120
	(0.03)	(0.03)	(0.05)	(0.04)	(0.03)
both EU	0.3909***	0.4680***	0.5202***	0.3764***	0.3193***
	(0.03)	(0.03)	(0.06)	(0.04)	(0.02)
RTA	0.2709**	0.3279***	0.3652***	0.1738*	0.3978**
	(0.12)	(0.09)	(0.11)	(0.09)	(0.19)
Schengen	0.0608***	0.0122*	0.0175	0.0350***	0.0018
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tariffs	-1.3897*	-4.9916***	-4.6810***	-4.7859***	-2.2154
	(0.73)	(1.54)	(1.17)	(1.07)	(1.43)

Note: ***, **, * denote significance at the 1%, 5%, 10% levels, respectively. All models estimated use PPML methods. Robust standard errors (in parentheses) allow for clustering at the country-pair level. Pair as well as year specific importer and exporter fixed effects included but not reported. The gravity specification further controls for EU membership, RTAs, FTA, Schengen and also tariffs to retrieve the trade cost elasticities, but are also not reported here. Number of observations: 27,200.

Table A4: The Impact of EMU on German Sectoral Bilateral Trade of Services with Old and New EMU member states

Dep. var.: Bilateral Imports

	Broad Services (17)	Electricity, Gas and Water Supply (18)	Construction (19)	Sale, Repair of Vehicles (20)	Wholesale Trade Except of Vehicles (21)	Retail Trade, Except of Vehicles (22)	Hotels and Restaurants
$\text{€}_{Deu,old}$		0.5398***	0.1903**	0.1218	0.3898***	0.1761*	0.2570**
		(0.16)	(0.08)	(0.10)	(0.14)	(0.10)	(0.12)
$\text{€}_{old,DEU}$		0.2966**	-0.0125	0.1427	0.0085	-0.0377	0.1132
		(0.14)	(0.08)	(0.11)	(0.11)	(0.09)	(0.12)
$\text{€}_{Deu,new}$		-0.0388	-0.0224	-0.2197***	-0.1911	-0.0867	-0.1166
		(0.15)	(0.07)	(0.07)	(0.13)	(0.12)	(0.20)
$\text{€}_{new,DEU}$		0.1221	-0.0991*	-0.2171**	0.2126**	-0.1150	0.1267
		(0.20)	(0.06)	(0.10)	(0.09)	(0.11)	(0.09)
€_{Rest}		0.1798***	-0.0838***	0.1079***	-0.1029	0.0060	0.1010*
		(0.06)	(0.02)	(0.04)	(0.09)	(0.04)	(0.05)
both EU		0.2633***	0.2287***	0.4061***	0.2773***	0.1893***	0.1961***
		(0.05)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
RTA		0.0749	0.2129**	0.0768	0.1264	0.1157	0.1933***
		(0.13)	(0.09)	(0.05)	(0.09)	(0.09)	(0.07)
Schengen		0.0232	-0.0284***	0.0113	0.0200	-0.0082	0.0092

	Inland Transport (23)	Water Transport (24)	Air Transport (25)	Auxiliary Transport Activities (26)	Post and Telecom. (27)	Financial Intermediation (28)	Real Estate Activities (29)
$\text{€}_{Deu,old}$	0.2171**	0.4966**	0.3845**	-0.2000	0.0759	0.4427**	0.1223
	(0.11)	(0.22)	(0.15)	(0.18)	(0.13)	(0.17)	(0.20)
$\text{€}_{old,DEU}$	-0.0628	-0.5947***	-0.0456	0.1951**	-0.0883	-0.3384**	-0.0492
	(0.09)	(0.20)	(0.13)	(0.10)	(0.12)	(0.15)	(0.20)
$\text{€}_{Deu,new}$	-0.5063***	-0.2404	-0.6180***	-0.3187*	-0.0073	-0.3628**	-0.0900
	(0.16)	(0.26)	(0.13)	(0.18)	(0.15)	(0.17)	(0.12)
$\text{€}_{new,DEU}$	-0.2403	-0.0083	-0.0083	-0.1452	-0.2057	-0.1437	-0.0259
	(0.23)	(0.29)	(0.21)	(0.28)	(0.13)	(0.16)	(0.09)
€_{Rest}	0.0362	-0.0690	-0.0881	0.0417	0.0093	-0.0974	-0.0240
	(0.05)	(0.12)	(0.08)	(0.06)	(0.05)	(0.12)	(0.08)
both EU	0.2929***	0.0778	0.2600***	0.1043*	0.2923***	0.0478	0.0181
	(0.05)	(0.09)	(0.05)	(0.06)	(0.06)	(0.07)	(0.07)
RTA	0.0782	0.3671**	0.0123	0.3491***	0.1670	0.0263	0.1548
	(0.07)	(0.18)	(0.10)	(0.11)	(0.11)	(0.09)	(0.11)
Schengen	0.0673***	0.0124	0.0853***	0.0455*	0.0164	-0.0081	0.0759***

	Other Business Activities (30)	Public Admin and Defence (31)	Education (32)	Health and Social Work (33)	Community, Social and Personal Services (34)
$\text{€}_{Deu,old}$	0.1800	0.3648***	0.0611	0.2125**	0.0273
	(0.14)	(0.14)	(0.15)	(0.09)	(0.15)
$\text{€}_{old,DEU}$	-0.1078	0.0521	-0.0088	0.1420**	0.1128
	(0.11)	(0.10)	(0.14)	(0.07)	(0.13)
$\text{€}_{Deu,new}$	-0.1410	-0.1906	-0.2806*	-0.2594**	-0.1240
	(0.11)	(0.12)	(0.15)	(0.11)	(0.25)
$\text{€}_{new,DEU}$	-0.1905**	-0.1978***	-0.1118	-0.0596	0.0116
	(0.09)	(0.07)	(0.07)	(0.06)	(0.16)
€_{Rest}	0.0102	0.0372	0.0600	-0.0326	-0.0327
	(0.05)	(0.04)	(0.05)	(0.03)	(0.04)
both EU	0.2150***	0.3884***	0.2816***	0.3936***	0.2507***
	(0.03)	(0.05)	(0.04)	(0.03)	(0.04)
RTA	0.2070***	0.0877	0.1446	0.2151***	0.1646
	(0.08)	(0.09)	(0.10)	(0.07)	(0.10)
Schengen	0.0053	0.0151	-0.0198*	0.0253***	0.0184

Note: ***, **, * denote significance at the 1%, 5%, 10% levels, respectively. All models estimated use PPML methods. Robust standard errors (in parentheses) allow for clustering at the country-pair level. Pair as well as year specific importer and exporter fixed effects included but not reported. Number of observations: 27,200.