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Currency Unions, Export Margins, and Product Differentiation: An Empirical Assessment for European Monetary Union*

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Abstract
This paper reconsiders the trade effects of the euro, providing a decomposition into its effects on the extensive margin and intensive margin. Furthermore, it relates the more disaggregated estimates for 93 two-digit HS product groups to the elasticity of substitution, thereby testing a key hypothesis of recent trade theory. The estimates for the period 1996-2011 suggest a trade effect of the euro of some 28 percent, which has mainly materialized through the intensive margin. For several product groups, we find a negative net effect of the euro on the extensive margin, supporting anecdotal evidence that firms have consolidated their product varieties in response to the elimination of exchange rate variability. Finally, the disaggregated estimates are in line with recent trade theory, suggesting that a large elasticity of substitution dampens the effect of a trade cost reduction on the extensive margin and amplifies its effect on the intensive margin.

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1. Introduction

Empirical studies on the impact of currency unions on trade among its member states have mushroomed since the seminal paper by Rose (2000), who obtained a strikingly large effect of some 235 percent, using a gravity model for 186 countries. More recently, induced by the introduction of the euro in 11 European Union (EU) countries in 1999, the empirical literature on currency unions has shifted its focus towards the euro area, allowing a reassessment of the trade effects of common currencies with more recent, disaggregated and high quality data.

A large body of evidence suggests that the introduction of the euro has led to an increase in trade of the euro area member states, though the magnitude of the estimates varies considerable across studies. For instance, Bun and Klaassen (2002) estimate an increase of 38 percent in exports due to the euro. Micco, Stein, and Ordoez (2003) find that the impact of the euro on trade ranges from 4 to 16 percent, depending on the sample and estimation technique used. Results by Flam and Nordström (2006a) suggest that the introduction of the euro has increased trade between euro area countries by 15 percent on average for the period 1998-2002. More recently, Bun and Klaassen (2007), however, obtain a much smaller estimate of the euro's trade effects of around 3 percent. Chintrakarn (2008) shows that two countries sharing the euro trade somewhere between 9 and 14 percent more than other country-pairs. Baldwin (2006) surveys the literature and concludes that the effect is likely to lie somewhere between 5 and 20 percent.

From a theoretical perspective, new trade theory (Melitz, 2003) suggests two main channels through which the euro might have affected trade: i) a reduction in variable trade costs, causing an increase in both the *intensive margin*, i.e., the trade of goods that have already been traded before the introduction of the euro, and an increase in the *extensive margin*, i.e., the range of goods traded among euro area countries; ii) a reduction in fixed trade costs (and thus market entry costs), causing an increase in the *extensive margin* only. There is evidence on the relevance of both transmission

channels, though their relative importance differs across estimates and also depends on the measurement of the extensive and intensive margins. In a recent multi-country extension of the Melitz model, Chaney (2008) shows that the effects of a reduction in trade costs on the extensive and intensive margins of bilateral trade depends on the elasticity of substitution. This is an interesting implication that has not been tested so far in the empirical literature on the trade effects of the euro.[1]

The present paper reconsiders the trade effects of the euro and makes the following contributions. First, using highly disaggregated product-level data (around 5111 product categories, at the six-digit product level of Harmonized System (HS-6), we decompose the EU-15 countries' exports to 173 importing countries over the period 1996-2011 into extensive and intensive margins, following the decomposition approach by Hummels and Klenow (2005), which has – with the exception of Bergin and Lin (2012) – not been employed in the estimation of the trade effects of the euro so far.[2] Apart from its rigorous theoretical foundation, building on Feenstra (1994), an advantage of this approach is that it takes differences in the importance of product groups (in terms of market shares) into account. Moreover, it allows a log-linear decomposition of the trade effects of the euro into its effect on the aforementioned export margins.

Second, we estimate the effects of the euro on the euro area countries' extensive and intensive export margins using a standard gravity model, both for total trade, and at a more disaggregated level for trade in intermediate and final goods.

Third, going beyond previous studies and as a key contribution of the present paper, we also provide a more disaggregated analysis for 93 product categories (at the level of two-digit HS chapters, HS-2) in order to take up a key result from recent trade theory (Chaney, 2008), namely that the relative effect of a reduction in trade costs (due to the introduction of the euro) on the

extensive and the intensive margin of the euro area countries' exports depends on the elasticity of substitution. We consider an explicit test of this hypothesis, estimating the effects of the euro on extensive and intensive margins for the 93 HS-2 chapters and relating them to estimates of the elasticity of substitution for the euro area countries by Mohler and Seitz (2012). We argue that the introduction of the euro offers a particularly suitable case in point for a test of this hypothesis, since – in contrast to the case of multilateral trade agreements with industry-specific liberalization measures – it is plausible to assume that the (relative) effect of the euro on variable and fixed trade costs is the same over all product groups, allowing a clear test of the Chaney-hypothesis.

The major findings can be summarized as follows. The aggregate estimates suggest that the euro has lead to an increase in total trade by some 28 percent, most of which has materialized through the intensive margin. At the disaggregated level, the effect on the extensive margin is zero on average, leaving a smaller effect of some 17 percent that materialized exclusively through the intensive margin. Below the surface of aggregate data, there is considerable variation in the effects on the intensive and in particular the extensive margin across product groups, suggesting that the aggregate estimates may mask important differences at the micro/disaggregated level or micro dynamics. At the disaggregated level, the euro's effect on the extensive margin is even negative for several product groups, supporting anecdotal evidence that firms have consolidated their product varieties in response to the euro (Economist, 2001; Simbanegavi, 2009). Finally, we find that for more homogeneous product categories with a large elasticity of substitution, the euro's effect on the extensive margin is smaller and its effect on the intensive margin is larger, which is in line with recent trade theory (Chaney, 2008).

The remainder of the paper is organized as follows. Section 2 briefly discusses the theoretical background of our analysis and gives a succinct survey of previous studies. Section 3 outlines the Hummels and Klenow (2005) approach to decomposing exports into the extensive and intensive

margins and discusses some descriptive statistics on the evolution of the margins of the euro-11 countries' exports. Section 4 sets up an empirical gravity model for the EU-15 member states and 179 importing countries over the period 1996 to 2011, and reports the estimation results of the effects of the euro by margin, both for total, final, and intermediate goods trade as well as for 93 HS-2 chapters, and relates the effects of the disaggregated estimates on the extensive and intensive margin to the elasticity of substitution. Section 5 summarizes the main findings and concludes.

2. Theoretical background and results of previous studies

The introduction of the euro is expected to lead to an increase in trade of euro area countries due to declines in both fixed and variable costs of exports. By reducing the fixed and variable costs of exports, the euro enables existing exporters to export larger volumes (intensive margin of trade) and previously non-exporting firms to enter the export market (extensive margin of trade) or both. Recent trade theory, using heterogeneous firms models a la Melitz (2003), emphasizes that a firm exports to the foreign market only when its expected profits are sufficient to cover not only its variable costs (iceberg trade costs), but also its fixed trade costs (such as the costs of forming and maintaining distribution and servicing networks and establishing subsidiaries in export markets). According to this class of models, a decline in variable trade costs raises the volume of exports by existing exporters, but also allows some new firms, which are just below the productivity threshold, to enter the export market. On the other hand, a decline in fixed trade costs generates entry of new (less productive and smaller) firms into the export market, without affecting the export volume of existing exporters. Thus, according to recent trade theory, a decline in variable trade costs raises both the intensive margin (an increase in the volume of trade) and the extensive margin (an increase in the number of products exported), while a decline in the fixed trade costs raises only the extensive margin of trade.

In related work, Baldwin and Taglioni (2005) use a Melitz-type model to show that the adoption of the euro lowers variable and fixed trade costs, which in turn fosters trade between euro area countries via both the extensive and intensive margin, since the minimum size-class of firms that export falls as exchange rate uncertainty decreases. Bergin and Yi-Lin (2008) argue that currency unions boost bilateral trade via the extensive margin, while fixed exchange rate regimes increase trade via intensive margin. Their model is based on two key assumptions: firms incur fixed costs before entering the export market and a common currency is much more stable than exchange rate pegs, which results in lower exchange rate uncertainty. As a result, their model predicts that establishing a common currency encourages more entry relative to a fixed exchange rate regime.[3]

More recently, Chaney (2008) expands the Melitz model, considering a world with many asymmetric countries, which are separated by asymmetric trade barriers. For aggregate bilateral trade flows, Chaney (2008) shows that the extensive margin and the intensive margin are affected in opposite directions by the elasticity of substitution. That means, a higher elasticity of substitution i) makes the intensive margin more sensitive and the extensive margin less sensitive to changes in variable trade costs, and ii) makes the extensive margin less sensitive to changes in fixed trade costs. In this framework, the intensive margin is not affected by a change in fixed costs.

The intuition behind these results is as follows. When goods are highly differentiated and the elasticity of substitution is low, variable trade costs have little impact on the intensive margin because the demand for each differentiated product is relatively insensitive to changes in trade costs; moreover, firms' market shares are relatively insensitive to differences in productivity. A decline in trade costs also allows new, less productive, firms to enter the export market. With a low elasticity of substitution, new entrants are thus able to capture a relatively large market share and are relatively large compared with existing exporters. The bottom line is that the effect on the extensive and intensive margins of a reduction in trade costs, both variable and fixed, depends on

the elasticity of substitution, and that the effect on the intensive (extensive) margin increases (decreases) with the elasticity of substitution. We will spell out these hypotheses more precisely below in the specification of the empirical model.

Several empirical studies have attempted to identify the impact of the euro on the extensive margin and the intensive margin. Based on their data sources, these empirical studies can be divided into two groups. The first group has analyzed the impact of the euro on export margins using bilateral trade data at the product level. Examples include Baldwin and Di Nino (2006), Flam and Nordström (2006b), Di Nino (2009), and Bergin and Lin (2008, 2012). Using highly disaggregated trade data of 20 countries (EU-15, Switzerland, Norway, Iceland, US, Canada, and Japan) between 1994 and 2003, Baldwin and Di Nino (2006) provide supportive but not conclusive evidence for the new-goods hypothesis, i.e., that the euro lowers variable and fixed trade costs and fosters trade via both the extensive margin and the intensive margin.

Likewise, using product-level bilateral data of 20 OECD countries, including 10 euro area countries over the period 1995-2005, Flam and Nordström (2006b) find a positive effect of the euro on both the extensive and intensive margins of trade, with a relatively larger effect on the extensive margin. Furthermore, they have estimated the euro effects at different stages of processing and for different industries; they find significant and large effects for semi-finished and finished products but not for raw materials. In contrast, Di Nino (2009) estimates the impact of the euro on the extensive and intensive margins by employing six-digit level bilateral export data of twenty countries, including both euro area countries and non-euro area countries, for the period 1995-2006 and finds that both margins were positively affected by the introduction of the euro, but that a large share of the effect occurred via the intensive margin. Using a panel dataset of 15 European countries' exports (over the period 1973-2004), including 3 non-EU countries, Bergin and Lin

(2012) find that the majority of the trade effects of the EMU occurred at the extensive margin and that the extensive margin of trade responds ahead of the intensive margin.

The second group of empirical studies such as Berthou and Fontagne (2008), de Nardis, Pappalardo and Vicarelli (2008), Baldwin et al. (2008), Fontagne, Mayer, and Ottaviano (2009), and Esteve-Perez et al. (2011) considers the trade effects of the euro using firm-level trade data. Berthou and Fontagne (2008), based on a sample of French firms exports over the period from 1998-2003, find a positive effect of the euro on the extensive margin of French exports to the euro area, but no effect on the intensive margin. Using data on Italian manufacturing firms over the period 1999-2001, de Nardis, Pappalardo, and Vicarelli (2008) identifies a positive effect of the euro on both the extensive and intensive margins of the Italian firms' exports, although the impact on the extensive margins has been higher than that of the intensive margin. In contrast, using detailed product- and firm level export data for from Belgium, France, and Hungary over the period 1998-2003, Fontagne, Mayer, and Ottaviano (2009) find that the introduction of the euro on trade flows within the euro area has been positive and mainly channeled through an increase in the average value of exports per product (intensive margin).

Esteve-Perez et al. (2011) develop a simple extension of Baldwin and Taglioni's (2005) model in order to examine the effect of a reduction in exchange rate volatility on firms' decision to export and destination markets. Using data on Spanish manufacturing firms during the period 1994-2002, they find empirical support for the hypothesis that the reduction in exchange rate volatility increases both sales per exporting firm and the number of exporting firms to that market, leading to an increase in the proportion of exports to the euro area. Thus, their results suggest that the introduction of the euro has led to a reduction in the threshold size of firms that export to the euro area.

Overall, there is comprehensive evidence on trade effects of the euro, both on the extensive and intensive margin of trade, though there is substantial variation in the results both with respect to the magnitude of the effect and the relative role of the extensive and intensive margins. In the next section, we will take up these issues, considering the effects of the euro on (both total and disaggregated) exports and its margins, using the Hummels and Klenow (2005) decomposition method, and taking a closer look at the variation in the estimated effects on the extensive and intensive margin.

3. Export values and export margins of euro area exports

3.1. Decomposition methodology

In decomposing bilateral exports into the extensive and intensive margins between two countries, we follow Hummels and Klenow (2005), which is a cross-country analogue to Feenstra's (1994) approach to incorporate new varieties into a country's import price index.[4] Using x_{jmit} and p_{jmit} to denote the quantity and price of exports of product i from country j to country m in period t, respectively, the bilateral extensive margin of exports is defined as

$$EM_{jmt} = \frac{\sum_{i \in I_{jmt}} p_{kmit} x_{kmit}}{\sum_{i \in I_t} p_{kmit} x_{kmit}} \qquad (1a)$$

where I_{jmt} is the set of observable categories, in which country j has positive exports to country m in period t, *i.e.* $x_{jmit} > 0$. As a reference country, we use the rest of the world (k) throughout, such that I_t denotes all categories imported by country m. Hence, the extensive margin can be interpreted as refined measure of the fraction of categories in which country j exports to country m, where each category is weighted by the importance of rest-of-world exports to country m, or,

equivalently, by the importance of in country m's imports from the rest of the world. EM_{jmt} is positive and can take values between 0 and below 1. The calculation of EM_{jmt} is based on the six digit product level of the Harmonized System classification (HS), comprising data on 5111 product categories. A more detailed data description is given in the Appendix.

The bilateral intensive margin is defined as country j's nominal exports to country m, relative to exports from the rest of the world, summing over those categories in which j exports to m (I_{jmt}):

$$IM_{jmt} = \frac{\sum_{i \in I_{jmt}} p_{jmit} x_{jmit}}{\sum_{i \in I_{jmt}} p_{kmit} x_{kmit}} \qquad (1b)$$

Hence, the intensive margin calculates the export share of country j in the rest-of-world (k) exports to country m in those products in which j exports to m. Note that the extensive margin will be large if country j exports many different products i to country m while the intensive margin will be large if country j exports large amounts of a few categories i to m.

The overall market share of country j's exports relative to rest-of-world exports to country m is given as product of the extensive and the intensive margin:

$$OV_{jmt} = EM_{jmt} \times IM_{jmt} \qquad (1c)$$

Hence, with the specification of the margins as dependent variable in log-form, the sum of the euro's effect on the extensive and intensive margin corresponds to its (relative) effect on the overall margin, which is in turn (approximately) equal to its relative effect on trade.[5]

Using equations (1a) to (1c), we compute the extensive and intensive margins as well as the overall share of bilateral exports of each EU-15 countries' exports to 173 importing countries, using highly disaggregated 6-digit product level export data over the period 1996 to 2011. Moreover, the same calculations are done for the intermediate and final goods, as well as more detailed subcategories within these two groups. Trade data is taken from the UN's COMTRADE database, the classification into final and intermediate goods is based on the United Nations Broad Economic Categories (BEC) classification scheme as in Hummels, Ishii, and Yi (2001).

Finally, as an aggregate measure of a country's export margins and components, we follow Hummels and Klenow (2005) and calculate, for each exporter country j, weighted geometric average of the bilateral (intensive and extensive) margins over the set of the 173 importing countries. Referring to the set of importer countries, excluding exporter j, as M_{-j} we have the following aggregate country-specific measures of the intensive and extensive margin for period t:

$$IM_{jt} = \prod_{m \in M_{-j}} \left(IM_{jmt} \right)^{a_{jmt}} \tag{2a}$$

$$EM_{jt} = \prod_{m \in M_{-j}} \left(EM_{jmt} \right)^{a_{jmt}} \tag{2b}$$

The weight a_{jmt} is the logarithmic mean of the shares of importing country m in the overall exports of country j and rest-of the world k_{-j-m} in period t, respectively. (The weights are normalized such that they sum to 1 over the set M_{-j}.) As before, the variables defined in (2) are calculated for total trade, final products, intermediate products and more detailed subcategories.

3.2 Overview of the export values and export margins of the euro area countries

Before proceeding to the full econometric analyses, we present an overview of the euro area exports and export margins as whole and for the individual euro area countries over the period 1996 to 2011 for total trade. The descriptive analysis is based on exports data of the euro area countries to two destination regions, namely 1) exports to other euro area countries (intra-euro) and 2) exports to non-euro area countries (extra-euro). For the descriptive analyses, the intra-euro refers to 11 countries (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain) that adopted the euro as their common currency in 1999. (Belgium and Luxembourg are treated as single country due to limitations in data availability.) The chronology and status of European Community (EC)/European Union (EU) and the euro area membership as well as the list of exporting and importing countries used in the analysis are given in the Appendix Tables A1 and A2, respectively.

The evolution of total exports of the euro area exports to the two destination regions for each of the product categories over the period 1996-2011 is reported in Table 1. The regional composition of the euro area exports reveals several important empirical facts. First, both nominal intra- and extra euro area exports have grown strongly; however, extra-euro area exports have increased by a factor of 2.54 over the period 1996-2011, intra-euro area exports only by a factor of 2.10, resulting in a decline in the share of the intra-euro area exports from 52 percent in 1996 to 47 percent in 2011.

"INSERT Table 1 Here."

Corresponding results for the euro area's extensive and intensive export margins across both regions are reported in Table 1. While (average) intensive and extensive margins of intra-euro area exports have been roughly stable over the period under consideration, the average extensive margin

for extra-euro area exports has increased strongly; this is true to a smaller extent for the intensive margin for extra-euro area exports. This finding confirms the growing importance of emerging countries as a source of new export destinations for the euro member countries over the study period, and also highlights the role of the extensive margin in the increasing share of extra-euro area exports.

This initial look at the data might suggest that the introduction of the euro did not boost the trade between the core countries (the euro-11) as much as expected since these core countries already enjoyed a high degree of integration with the EU through membership in the European Union before the introduction the euro. Of course, one should not be tempted to infer causal effects of the euro on extensive and intensive margins from the simple descriptive statistics. The evolution of trade over the sample period has certainly been driven by many other (potentially more important) factors than the introduction of the euro. For example, cumulative real GDP growth over the period 1996-2011 amounted to some 47 percent in the extra-euro area, but only to some 26 percent in the euro area; the difference between nominal GDP growth turned out even larger, amounting to some 50 percent. Hence, by standard gravity equation parameters of GDP one would have expected an even larger difference in the growth of intra- and extra euro area exports than the one reported in Table 1. Hence, the growing export shares of the extra-euro area could result from the fact companies in the euro area directed their exports to emerging countries in Central Europe, Eastern Europe, Asia and South America to offset declining 'domestic' (euro area) demand in recent years. Of course, this does not necessarily point to a trade enhancing effect of the euro. Hence, we next turn to an econometric analysis in order to estimate the effects of the euro on exports and export margins.

4. Export margins and the euro: gravity estimates

4.1. Empirical model and data

In order to estimate the trade effects of the euro, we set up the following gravity-type panel data model:

$$\begin{aligned}\ln Y_{jmt} = \alpha_0 + \eta D^{€}_{jmt} + \alpha_1 DIST_{jm} + \alpha_2 CB_{jm} + \alpha_3 CL_{jm} \\ + \alpha_4 COL_{jm} + \alpha_5 COL45_{jm} + \alpha_6 FTA_{jmt} + \mu_{jt} + \kappa_{mt} + + \nu_{jmt}\end{aligned} \quad (3)$$

We consider alternative dependent variables (Y_{jmt}) in equation (3). As benchmark we estimate a standard gravity model, using real exports in US-$ from country j to country m.[6] In a next step, and as a key point of the paper, we use as dependent variable the bilateral extensive and intensive (and overall) margins of trade between country j and country m as defined in Hummels and Klenow (2005) (see section 3.1).

Regarding the explanatory variables, $D^{€}_{jmt}$ is a dummy variable, taking a value of 1 if both countries have introduced the euro and zero otherwise. We further include a set of control variables commonly used in gravity equations, namely (the log of) bilateral distance ($DIST_{jm}$), a common border dummy (CB_{jm}), a common language dummy (CL_{jm}), as well as dummies for colonial linkages (COL_{jm}) and colonial linkages after 1945 ($COL45_{jm}$), whose importance is emphasized in Head, Mayer, and Ries (2010). Data on geographical variables and colonial linkages is taken from the CEPII database.

A dummy for free trade agreements (FTA) is included dummy to avoid that the Euro dummy mistakenly captures effects of bi- and multilateral trade liberalization (see the discussion in de Nardis and Vicarelli, 2003). Specifically, FTA_{jmt} is a dummy variable assuming the value 1 if both countries have a free trade agreement in period *t* and 0 otherwise. Data source is the Economic Integration Agreements (EIA) data set constructed by Baier and Bergstrand (2007) and the Regional

Trade Agreements Information System (RTA-IS) from the World Trade Organization (WTO) web site.

Time-varying fixed effects for exporters μ_{jt} and importers κ_{mt}, i.e., importer and exporter fixed effects interacted with time dummies, are also included in the equation (3) in order to capture the fact that the multilateral resistance terms may change over time (see the discussion in Baldwin and Taglioni, 2006) as well as importer and exporter GDP. Finally, ν_{jmt} is a stochastic, idiosyncratic error term. A detailed description of the variables and the data sources is given in the Appendix.

Our sample comprises an unbalanced panel of $j = 1,..,14$ exporter countries, corresponding to the EU-15 member states[7], $m = 1,..,173$ importer countries, and the time period t ranges from 1996 to 2011. The choice of the EU-15 countries as reference group (all of which were EU members before and after the introduction of the Euro) ensures that the Euro Dummy does not mistakenly capture effects of deeper EU integration or the EU enlargement in 2004. Moreover, there was no substantial deepening of economic integration *within the* EU-15 (apart from the introduction of the Euro) during our sample period (The Single Market entered into force in 1993, the Services Directive in 2010, and the treaties of Amsterdam and Nice that came into force during our sample period were mainly concerned with institutional issues related to EU enlargement.) Regarding the time period, the starting year 1996 follows from the use of UN Comtrade Harmonized System's (HS, Revision 1996) six-digit level trade data, which yields the longest time series with a consistent definition of product groups. Our sample covers data up to the year 2011, the most recent year for which data are available. To ensure that our results are not driven by the slump of trade during the crisis we will explore the robustness of the results against using a shorter time period up to 2007.

4.2. Estimation results

In the following we present the estimation results for equation (3) for alternative levels of aggregation. We start with an analysis for total bilateral trade and then move on to more detailed product groups. The parameter of key interest in equation (3) is η, which reflects the effect of the euro on the dependent variable. Using obvious notation, the euro's effects on the extensive and intensive margin are referred to as η^{EM} and η^{IM}, respectively. By the construction of the margins and least squares algebra, the (estimated) effect on the overall margin is given by the sum of the (estimated) effects on the two margins: $\eta^{OV} = \eta^{EM} + \eta^{IM}$.

4.2.1. Results for overall trade.

Table 2 shows the estimation results of equation (3) for the EU-15 exporter countries and 173 trading partners over the period 1996-2011, where the dependent variables (bilateral exports, export margins) are based on total bilateral trade. Excluding observations where the dependent variable (which is specified in log form) takes a value of zero, we end up with a total of 26,832 observations; issues arising from the exclusion of these zero observations will be discussed below.

"INSERT Table 2 Here."

As can be observed from Table 2, there are two main results: First, the estimated effect of the euro on both real trade flows and the overall margins is significant and very similar in magnitude, amounting to some 28 percent. Second, the estimated effects on the extensive and intensive margins are significant at 1 percent, where some two third of the effect appear to have materialized through the intensive margin. We also experimented with shorter time periods, e.g., using data up to 2004 or

2007 (in order to exclude the financial and economic crisis) and we obtained qualitatively identical and quantitatively very similar results.[8]

In order to address the issue of zero observed trade flows, we also explored the robustness of the results using the Poisson quasi maximum likelihood (PQML) estimator suggested by Silva and Tenreyro (2006). Unfortunately, the use of the PQML approach turned out infeasible: Convergence could be achieved[9] in a small number of very parsimonious specifications only; moreover, the estimated effects often turned out to be highly implausible with huge swings in parameter estimates from slightly changing the specification. This problem is not unexpected in specifications with many zeros and a large number of explanatory (dummy) variables. Using Monte Carlo simulations, Martin and Pham (2008) show that the PPML estimator can be severely biased when the trade flows are frequently equal to zero.

On the other hand, to account for possible sample selection we applied the Heckman sample correction estimator as in Helpman, Melitz, and Rubinstein (2008). Again this route turned out to be a dead end, mainly for two reasons: First, of the two variables suggested for the selection equation (fixed start-up costs, common religion index), the fixed start up cost are only available for the year 1999, and the common religion index (which is available in principle in five year intervals as of 2000) turned out to be de facto time-invariant for our sample period; as a consequence, it is not too surprising that the use of the common religion index yielded either a negative or insignificant coefficient in the selection equation, calling into question the identifying assumptions and instrument quality of the Heckman sample correction estimator in the present application.

Hence, the panel data estimates given in Table 2 should be interpreted with due care. However, in light of the goal of the present study, we do not regard the exclusion of zero values or sample selection as a major issue for the following reasons. First, the estimates of the overall trade

effect are well in line with previous studies. Second, most of the trade flows that have been zero before the introduction of the euro, have remained so afterwards, such that - even if there were sample selection - there is no reason to believe that this systematically biases the estimated effects of the euro. This presumption is also supported by the results in the related paper by Dutt, Mihov, and Van Zandt (2011), whose standard panel and Heckit estimates of the effects of free trade agreements on international trade (and the extensive and intensive margin) are virtually identical. Finally, in assessing the *relative* importance of the effect of the euro on the extensive and the intensive margin, there is no strong reason to believe that possible sample selection or exclusion of zeros systematically biases the estimates of the *relative* effect of the euro on the extensive margin and the intensive margin.

4.2.2. Results for intermediate and final goods trade.

Having estimated and decomposed the effects of the euro on total trade, we turn to a more disaggregated analysis. As a first approach, we re-estimate equation (3) for two product groups: intermediate goods and final goods. The classification of the product categories into the two groups follows the United Nations Broad Economic Categories (BEC) classification scheme and is detailed in the Appendix. In terms of quantitative importance, intermediate and final goods make up some 50 and 21 percent of total exports, respectively.[10] Estimation results are reported in Tables 4 and 5.

"INSERT Table 3 Here."

"INSERT Table 4 Here."

First, observe that the estimated effect on the overall margin amounts to 20 percent for final goods and 25 percent for intermediate goods. This is roughly in line with the aggregate estimates and suggests that there are no strong differences in the effect of the euro on the two product goods. Again, the disaggregated estimates point to a much smaller role of the extensive margin, which is

insignificant at 10 percent for final goods and accounts for only one quarter of the total effect on intermediate goods. Again these results hold up the shorter time periods up to 2004 and 2007.

Compared with the results for the aggregate data, the effect of the Euro on the extensive margin turns out insignificant for final goods and smaller in magnitude for intermediate goods. In the following, we pursue this issue further and turn to a more disaggregated analysis of the euro effect on the extensive and intensive margins of trade.

4.2.3. Estimates at the 2-digit HS chapters level: a closer look.

In the subsequent analysis, we use 93 chapters at the 2-digit HS level to explore the effects of the euro on the extensive and intensive margin. The list of HS-2 chapters used in the analysis is provided in Table A4 in the Appendix. Export margins were then calculated for each country's exports in a specified chapter. Compared with the sample for the aggregate estimates, the number of observations is typically smaller and varies across the 93 HS-2 chapters, ranging from 2,189 to 18,477. Results for the estimated effects of the euro on the extensive and intensive margins are summarized in Table 5. Detailed results are given in Table A4 in the Appendix.

"INSERT Table 5 Here."

As expected there is considerable variation across HS-2 chapters. Considering the effects of the euro on the extensive margins first (second panel of Table 5), it is somewhat surprising that 63 out of 93 coefficients are negative (51, 49, and 43 of which are significant at 10, 5, and 1 percent, respectively.) This is supportive to the anecdotal evidence that the introduction of the euro has induced some firms to cut their number of product varieties (Economist, November 2001).[11] 30 of the coefficients are positive (23, 21, and 15 of which are significant at 10, 5, and 1 percent). The bottom of Table 5 gives the average effect over all HS-2 chapters (weighted by the share of the HS-

2 chapters in total euro-10 exports in 2008), which is close to and statistically not significantly different zero (assuming independence of the coefficients). This result is somewhat in contrast to the aggregate estimates in Table 2, and reinforces the results for final and intermediate goods in Tables 4 and 5, the effect of the euro on the extensive margin turned out weak and partly insignificant. It is in contrast with some previous studies (Flam and Nordström, 2006b; Berthou and Fontagne, 2008; Bergin and Yi-Lin, 2008, 2012), who find a large role for the extensive margin but no effect on the intensive margin, but in line with recent studies by Di Nino (2009) and Fontagne, Mayer, and Ottaviano (2009). The most likely explanation for this result is that i) the reduction in fixed trade costs by the euro has been relatively small[12] and ii) the positive effects of the reduced fixed costs on the extensive margin have been partly offset or even dominated by the firms' reduction in the number of product varieties after the introduction of the euro.

Turning to the effect on the intensive margin, a clearer picture that is consistent with the aggregate estimates emerges. Negative estimates are rarely obtained here: only 15 out of the 93 coefficients are negative and only 4 of them are significant at 10 percent. Of the 78 positive coefficients, 67, 65, and 60 are significant at 10, 5, and 1 percent respectively. Using the weighted average over all product groups, this points to a statistically significant positive effect of around 17 percent (see bottom of Table 5), which is very similar to the effect of 18 percent obtained from the aggregate estimates.

Figure 1 summarizes the distribution of the euro's effect on the extensive, intensive, and overall margin both for all 93 coefficients and those significant at 1 percent using box plots.

"INSERT Figure 1 Here."

The picture confirms the information provided by Table 5. There is a huge variation in the estimated effects on the extensive and intensive margin. The estimates of the effect on the extensive margin are centered around 0 and many of the estimated effects are negative and significant. The effect of the euro on the overall margin appears to be mainly driven by the effect on the intensive margin and is centered around some 17 percent, where only a few outlying coefficients turn out negative.

The large variation of the estimates is striking and deserves discussion. An interesting explanation suggested by recent heterogeneous firm trade theory is that the large differences in the estimates could be due to differences in the degree of product differentiation between product groups (in terms of the elasticity of substitution). In an extension of the Melitz model, considering a world with many asymmetric countries, which are separated by asymmetric trade barriers, Chaney (2008) derives the following hypotheses: i) A reduction in fixed trade costs (τ_{fix}) increases the extensive margin of trade, and the effect is smaller, the larger the elasticity of substitution (σ). ii) A reduction in variable trade costs (τ_{var}) increases both the extensive margin and the intensive margin of trade, and the effect on the extensive (intensive) margins is smaller (larger), the larger the elasticity of substitution. Hence, a large elasticity of substitution dampens the effect of a trade cost reduction on the extensive margin and increases its effect on the intensive margin.

Adopting the notation of the present paper, we have the following effect of a reduction in variable trade costs (τ_{var}) on the margins of trade (compare Chaney, 2008, p. 1716):

$$-\frac{d\ln OV}{d\ln \tau_{\text{var}}} = -[\frac{d\ln EM}{d\ln \tau_{\text{var}}} + \frac{d\ln IM}{d\ln \tau_{\text{var}}}] = [\gamma - (\sigma - 1)] + (\sigma - 1) = \gamma \text{ with} \qquad (4a)$$

$$-\frac{d\ln EM}{d\ln \tau_{\text{var}}} = [\gamma - (\sigma - 1)] \text{ and} \tag{4b}$$

$$-\frac{d\ln IM}{d\ln \tau_{\text{var}}} = (\sigma - 1)\,. \tag{4c}$$

The parameter γ is an inverse measure of firm heterogeneity: the higher γ, the more homogenous firms in the sense that output is concentrated among the smallest and least productive firms. For a reduction in fixed trade costs (τ_{var}) we get (compare Chaney, 2008, p. 1717):

$$-\frac{d\ln OV}{d\ln \tau_{\text{fix}}} = -[\frac{d\ln EM}{d\ln \tau_{\text{fix}}} + \frac{d\ln IM}{d\ln \tau_{\text{fix}}}] = \frac{\gamma}{\sigma - 1} - 1 \text{ with} \tag{5a}$$

$$-\frac{d\ln EM}{d\ln \tau_{\text{fix}}} = \frac{\gamma}{\sigma - 1} - 1 \text{ and} \tag{5b}$$

$$\frac{d\ln IM}{d\ln \tau_{\text{fix}}} = 0\,. \tag{5c}$$

Assuming that the introduction of the euro ($dD^{€} = 1$) had the same relative effect[13] on fixed and variable trade costs across HS-2 chapters h, i.e., $d\ln \tau_{\text{fix,h}} / dD^{€} = d\ln \tau_{\text{fix}}$ and $d\ln \tau_{\text{var},h} / dD^{€} = d\ln \tau_{\text{var}}$, its overall effect on the extensive and intensive margins (through the reduction both fixed and variable trade costs) is obtained by summing the corresponding expressions given in equations (4) and (5):

$$\eta^{EM} = d\ln EM = \frac{\gamma}{\sigma - 1} - 1 + [\gamma - (\sigma - 1)] = \frac{2[\gamma - (\sigma - 1)]}{\sigma - 1} \Rightarrow \frac{d\eta^{EM}}{d\sigma} < 0\,, \tag{6a}$$

$$\eta^{IM} = d\ln IM = (\sigma - 1) \Rightarrow \frac{d\eta^{IM}}{d\sigma} > 0\,, \tag{6b}$$

$$\eta^{OV} = d\ln OV = \frac{\gamma}{\sigma-1} - 1 + \gamma = \frac{\gamma\sigma}{\sigma-1} - 1 \Rightarrow \frac{d\eta^{OV}}{d\sigma} = \frac{-\gamma}{(\sigma-1)^2} < 0\,. \qquad (6c)$$

The implication is that we would expect the elasticity of substitution (σ) to have a positive effect on (the euro's effect on) the intensive margin and a negative effect on the extensive and overall margin. If there were only a reduction in variable trade costs (but not in fixed trade costs), there would be no effect of σ on the overall margin (since $-d\ln OV / d\ln \tau_{\text{var}} = \gamma$), but still a positive effect on the euro's effect on the intensive margin and a negative effect on the extensive margin (which cancel each other out).

In the following we test these hypotheses, using the following simple regression model:[14]

$$\hat{\eta}_h^{EM} = \pi_0 + \pi_1 \sigma_h + u_h\,, \qquad (7)$$

where $\hat{\eta}_h^{EM}$ is the estimated effect of the euro on the extensive margin of trade in product group h, as given in Table A4. The elasticities of substitution (σ_h) for HS-2 chapters h are calculated from country-specific HS-4-digit level estimates for the year 2008 by Mohler and Seitz (2012)[15], using averages over the euro-11 countries, matching the destination markets on which the trade effect of euro estimated in equation (3) should have materialized. We will also estimate equation (7) with the euro's effect on the intensive margin ($\hat{\eta}_h^{IM}$) and the overall margin ($\hat{\eta}_h^{OV}$) as dependent variable.

In the estimation of equation (7), there are several issues that deserve discussion. First, according to theory, the trade effects of the reduction in trade costs depend on the (inverse) firm heterogeneity parameter γ. Since firm distribution (number of firms and productivity of each firm) is unobserved for our sample of countries and HS-2 chapters, there might be an omitted variable

bias, unless γ is orthogonal to the elasticity of substitution. In Chaney (2008) and most other new trade theory models, γ is assumed exogenous and unrelated to σ. And while a large elasticity of substitution (low markups) may be associated with a smaller number of firms (Belenkiy, 2009), there is no strong theoretical reason to assume that there is a systematic relationship between the elasticity of substitution and the distribution of firms' productivity.

Second, the predictions of the model by Chaney (2008), in our setting the derivatives in equations (6a)-(6c), are conditional on the assumption that the euro had a positive effect on the margins of trade (through the reduction in variable and fixed trade costs). Only if the trade effect of the Euro has been positive, we can assume that the effect of a trade cost reduction dominates over other trade effects unrelated to elasticity of substitution, which might distort the estimation results of equation (7). Hence, we would not expect the hypotheses expressed in (6) to hold for a sample including HS-2 chapters, where the estimated effect of the euro is insignificant or even negative. As a consequence, in the estimation of equation (7), we will include only observations, where the estimates $\hat{\eta}_h^{EM}$ take a positive value. Moreover, will consider further subsamples, where $\hat{\eta}_h^{EM}$ takes a positive value and is additionally significant at the 20, 10, 5, and 1 percent level by a (one-sided) t-test.[16] Correspondingly, in the estimation of the equation (7) with the effect on the intensive margin as dependent variable, an analogous sample selection is made based on $\hat{\eta}_h^{IM}$. Finally, in the regression using the effect on the overall margin as dependent variable, we include observations, where the both $\hat{\eta}_h^{EM}$ and $\hat{\eta}_h^{IM}$ are positive (and significant).

Third, the (data used for the) right hand side explanatory variable (the elasticity of substitution σ) in equation (7) is an estimate of its true value and might thus be subject to classical measurement error. Given the absence of convincing instruments (or proxy variables), it has to be

borne in mind that the estimates of ρ are potentially biased towards zero (and thus more likely to be insignificant).

Fourth, the left hand side variable (the effect of the euro on trade margins $\hat{\eta}$) in equation (7) is an estimate as well, resulting in an increased variance of the error term and further increasing the likelihood to obtain insignificant estimates. This type of uncertainty is accounted for by (also) running weighted least squares regressions of equation (7), dividing each observation by the standard error of the estimated effect of the euro for product group h ($\hat{\eta}_h$) as given in Table A4. Hence, observations for which the effect of the euro is estimated less precisely are assigned a smaller weight in the regression, which should result in more efficient estimates.

Table 6 shows both the unweighted and weighted estimates of equation (7), using as dependent variable the estimated effect of the euro on the extensive margin ($\hat{\eta}_h^{EM}$), the intensive margin ($\hat{\eta}_h^{IM}$), and the overall margin ($\hat{\eta}_h^{OV}$), multiplied by 100 (in percent). The leftmost column (a) shows the results, where only observations with a positive effect of the euro on export margins ($\hat{\eta}_h > 0$) are used. Columns (b)-(e) show the results for subsamples of the regression in column (a), where the coefficient of the euro‘s effect on the trade margins turned out to be both positive and also statistically significant at 20, 10, and 1 percent, respectively (using a one-sided t-test).

"INSERT Table 6 Here."

The middle panel of Table 6 shows the estimates for the extensive margin. As already discussed above the number of positive coefficients with the extensive margin as dependent variable amounts to only 30 out of 93, and is reduced further to 15 if we consider only observations

where the coefficient of $\hat{\eta}_h^{EM}$ is significant at 1 percent. Given these rather small number of observations, the estimates for the extensive margins have to be interpreted with care and should not be overstressed. For the full sample of positive coefficients on $\hat{\eta}_h^{EM}$ in equation (7), the effect of the elasticity of substitution is zero in statistical terms in equation (7). It is suggestive, however, that the coefficient of σ becomes larger in magnitude, when moving from column (a) to column (e) where only positive coefficients on $\hat{\eta}_h^{EM}$, increasing in terms of statistical significance, are considered. The weighted estimates in columns (b)-(e) even point to a significant negative effect of σ on the euro's effect on the extensive margin.

The results of the effects on the intensive margin are given in the bottom panel of Table 6. The number of positive coefficients on $\hat{\eta}_h^{IM}$ in equation (1) amounts to 78 (out of 93), of which 67 (61) are also significant at the (10) 1 percent level. Here, the results are in line with the theoretical predictions: Both in the weighted and unweighted estimates of equation (7), we get a positive effect of the elasticity of substitution on the euro's effect on the intensive margin, which becomes statistically significant in the weighted regressions. The effect of the elasticity of substitution is also larger in magnitude compared with the extensive margin. Again, the unweighted and weighted coefficients are very close, and the standard errors of the latter are clearly lower.

Finally, the upper panel shows the results for the overall margin. Here the sample is further reduced, since we consider only observations where the euro's effect on both margins is positive (and significant), resulting in a sample size of 28 observations (12 for the 1 percent significance level). Overall, the hypothesis for the overall margin is confirmed. We find a negative (though insignificant) coefficient of the elasticity of substitution in the unweighted estimates, which increases in magnitude and becomes statistically significant in the weighted regressions. Of course, the results should not be overemphasized due to the small number of observations.

Taking all results on the euro's effect on the extensive, intensive, and overall margin together, we conclude that there is strong evidence that the effect of a reduction in trade costs depends on the elasticity of substitution. In particular, we find support for the predictions by Chaney (2008) that the elasticity of substitution amplifies the effects of (a reduction in trade costs due to) the euro on the intensive margin and dampens the effect on the extensive margin.

5. Conclusions

This paper reconsiders the effects of the euro on total, intermediate, and final goods trade, based on a panel of the EU-15 countries over the period 1996-2011. The effects of the euro are decomposed into its effects on the extensive and the intensive margin, which are calculated based on six-digit level data following Hummels and Klenow (2005).

Gravity estimates for total, intermediate and final goods trade suggest that the euro has lead to an increase in exports by some 28 percent. At the disaggregated level using 93 HS-2 product groups, the effect on the extensive margin is zero on average, leaving a smaller effect of some 17 percent that materialized exclusively through the intensive margin. Hence, below the surface of aggregate data, there is a strikingly large variation in the euro's effects on the extensive and intensive margin across product groups, suggesting that the aggregate estimates may mask important differences at the micro/disaggregated level or micro dynamics. For a number of product groups, the euro's effect on the extensive margin is even negative, supporting anecdotal evidence that firms have consolidated their product varieties due to the elimination of exchange rate variety. Finally, we find supportive for recent trade theory models, which predict that for more homogeneous product categories with a large elasticity of substitution, the effect of a reduction in trade costs on the extensive margin is smaller and the effect on the intensive margin is larger.

This suggests some interesting avenues for future research. From a theoretical perspective, a more general setting than in the trade model by Chaney (2008) appears interesting, allowing to identify more (observable) determinants of the effects of trade liberalization (trade cost reductions). From an empirical perspective, it would be interesting to disentangle the determinants of the effects of trade cost reductions, using more disaggregated data for single (or a small group of) countries, for which information on firm heterogeneity and possible further determinants of the effects of trade cost reductions are available.

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Appendix

Data

Trade data is taken from the UN's COMTRADE database (http://comtrade.un.org). We use data on exports of the EU-15 member states to 173 importing countries over the period 1996 to 2011, comprising 5111 items at the Harmonized System's (HS, Revision 1996) six-digit level (see Tables A1 and A2).[17] The database provides detailed annual bilateral trade data for commodity exports in value ($US at the current prices) and quantities at the 6-digit level of the HS, which allows us to calculate unit values for each product or item. In total, there are 14,147,248 annual bilateral export observations for each exporting country (5111 items, 173 importers, 16 years). Several export flows are zeros; moreover, for some items information on quantities is missing. As a consequence, the number of items used in the calculations varies across exporting countries and years.

To distinguish intermediate goods from final goods, we use the United Nations Broad Economic Categories (BEC) classification scheme as in Hummels, Ishii, and Yi (2001). As shown in Table A3, the BEC includes 19 basic categories, which are classified as capital goods (categories 41 and 521), consumption goods (categories 112,122, 522, and 6), intermediate goods (categories 111,121, 2, 31, 322, 42, and 53), and not classified (categories 321, 51 and 7). Categories, 321 (motor spirit) and 51 (passenger motor cars) could be consumed directly by consumers or used as intermediates; category 7 includes, among others, a range of military equipment, postal packages and special transactions and commodities not classified according to end-use classes. To address this issue, category 321, category 51, and category 7 are excluded from the calculations of the export margins for final goods and intermediate goods. In order to select the final and intermediate goods from the trade data, the correspondence table by the United Nations Statistics Division is

used to map the HS-6 (1996) codes to the BEC codes (http://unstats.un.org/unsd/default.htm). As a consequence, about 1238 items are considered as final goods and 3177 items are considered as intermediate goods out of 5111 items from the 6-digit level of the HS.

Data on real exporter and importer GDP, expressed in constant 2000 dollars, as well as their CPIs are taken from the World Bank's World Development Indicators (WDI). Finally, data on bilateral distance, contiguity, common languages, and colonial relationships are taken from the CEPII database (http://www.cepii.fr/anglaisgraph/bdd/distances.htm) and are defined as follows: $DIST_{jm}$: geographical distance (in km) between countries j and m , CB_{jm} : common border dummy, equal to one if countries j and m share a common border, CL_{jm} : common language dummy, equal to one countries j and m share a common official language, COL_{jm} : dummy variable, equal to one if countries j and m have ever had a colonial relationship, $COL45_{jm}$: dummy variable, equal to one if countries j and m have ever had a colonial relationship after 1945.

Finally, the FTA dummy was created using Economic Integration Agreements (EIA) data set constructed by Baier and Bergstrand (2007), which records the economic integration of bilateral country pairings for 195 countries annually from 1950 through 2005.[18] We have extended the EIA dataset on some additional agreements and years with the help of Regional Trade Agreements Information System (RTA-IS) from the World Trade Organization (WTO) web site.[19]

Endnotes

[1] Using a gravity model for a sample of 169 countries at the sectoral level for the period 1980-1997 with exports as dependent variable and distance, common border and language dummies as proxies for trade costs, Chaney (2006) finds support for the prediction of his theoretical model.

[2] A related paper by Dutt, Mihov, and Van Zandt (2011) uses the Hummels and Klenow (2005) approach to estimate and decompose the effect of FTAs and WTO membership on trade and its extensive and intensive margin. Similarly, Foster, Poeschl, and Stehrer (2011) examine the effect of Preferential Trade Agreements on the extensive and intensive export margins for a large sample of countries over the period 1962-2000.

[3] They also provide some supportive evidence of this hypothesis, using a panel of 148 countries' bilateral exports from 1973 to 2000.

[4] In the empirical trade literature, two types of methods have been used to calculate extensive and intensive margins. In the first method, extensive margins are calculated by simply counting the number of products or the number of trading partners to which a country exports, while intensive margins are calculated as average exports per product category (Baldwin and Di Nino, 2006; Flam and Nordström, 2006b; Berthou and Fontagne, 2008; Besedes and Prusa, 2010). As noted in Hummels and Klenow (2005), this approach gives equal weight to small and large products (markets), thereby assigning a large importance to product categories in which only a single country exports a lot. The approach by Hummels and Klenow (2005), which weights product categories according to their importance in international trade, has been employed by Bergin and Lin (2008,

2012), Van Hove (2009), Dutt, Mihov, and Van Zandt (2011), and Foster, Poeschl, and Stehrer (2011).

[5] The effect on overall margin and trade flows is not exactly the same for three reasons: i) aggregate bilateral trade data are typically not exactly equal to the sum of highly disaggregated bilateral trade data; ii) the rest-of-the world is the reference rather than the whole world; iii) if averages over time are considered, if there is time variation in the rest-of-world exports to country j. Below, we will see that the estimates of the relative effect of the euro using total bilateral trade as dependent variable are indeed quite close to the estimates of the models using the overall margin as dependent variable.

[6] Real exports are calculated using nominal exports, divided by the GDP deflator of the exporting country.

[7] For reasons of data availability, Belgium and Luxemburg are treated as single country throughout the paper.

[8] The estimated effect of the Euro on the overall margin amounts to 27.5 percent for the period 1996-2004 and to 28.0 percent for the period 1996-2007, compared with 28.5 percent for the full period 1996-2011, and the intensive margin accounts for some two third of the total effect in all three time periods.

[9] Even in these cases, the ppml routine in STATA drops many variables to ensure convergence, making the results hard to interpret.

[10] The figures do not sum up to 100 percent since there are several product groups that allow no clear classification (see the Appendix for more details).

[11] Simbanegavi (2009) provides a theoretical argument, why it might be optimal for firms to reduce the number of product varieties after the introduction of a common currency. This is due to the fact that changes in the exchange rate affect income dispersion and hence firms incentives to extract

consumer surplus. Higher income dispersion makes it harder for firms to extract surplus with a single variety. Therefore, variability in the exchange rate induces the firm to choose the two varieties strategy-a classic case of second-degree price discrimination-to extract more consumer surplus.

[12] Di Nino (2009) finds that the founders of the European Community were the ones to benefit the least from the introduction of the euro due to the fact that these countries had already achieved a very high degree of integration among them at the time when the euro was introduced. Similarly, Mohler and Seitz (2010) find that product variety gains are less significant for the largest four countries of the EU and more significant for the smaller and especially younger member states of the EU. Since the euro was first introduced mainly for relatively large countries that have been EU (EC) members for a relatively long time span and already fully participating in the Single Market Programme, the reduction in trade costs, fixed trade costs in particular, might have indeed been fairly small the sample of countries used in the present study. Regarding variable trade costs, Emerson et al. (1992) estimate that average trade-related transactions costs in the EU the early 1990s amounted to 0.5% of GDP, for small economies whose currencies have not been used widely internationally, even up to 1% of GDP.

[13] Reductions in variable trade costs (such as transaction costs, cost of insuring against exchange rate risk, which typically are a fraction of the trade volume), should not vary across product groups. As far as fixed trade costs are concerned, this is less clear. What will be required in the end is that the magnitude of the trade cost reduction is not related in a systematic way to the elasticity of substitution, and we argue that there is no strong reason to assume that this is the case, neither for variable nor for fixed trade costs.

[14] We also checked the robustness of the results using a specification with the elasticity of substitution in log-form and obtained qualitatively identical results.

[15] We wish to thank Lukas Mohler and Michael Seitz for providing their estimates of the elasticities of substitution in Mohler and Seitz (2010).

[16] We argue that this is a proper sample selection that does not bias the estimates, but in contrast removes a potential bias that stems from effects of the euro on trade margins operating through other channels than trade costs (and to which the Chaney (2008) hypotheses do not apply). These could be direct effects of the euro on trade margins (such as a negative effect on the extensive margin through a reduction of product variety) or indirect effects (through unobserved omitted variables in equation (7)). By excluding observations, where these "other effects" dominate (in the sense that they render the effects of the euro statistically insignificant or even negative), we obtain a more precise test of the hypothesis that the effects of trade cost changes depend on the elasticity of substitution.

[17] Note that starting year of the bilateral data at the HS-6 digit level from UN COMTRADE for Belgium and Luxembourg is 1999 because in the early years of the database from 1996-1998, Belgium and Luxembourg reported trade data as a single country. To ensure a balanced panel while including both of these countries, we aggregate Belgium and Luxembourg (Belg-Lux) together throughout the sample period.

[18] The database on Economic Integration Agreements (May 2012) can be found at http://www3.nd.edu/~jbergstr/.

[19]Information on existing regional trade agreements and the year of their entry into force can be found at http://rtais.wto.org/UI/Public MaintainRTAHome.aspx.

Table A1. The chronology of EC/EU and euro area membership

EC-6 (1957)	Belgium, France, Germany, Italy, Luxembourg, Netherlands
EC-9 (1973)	Denmark, Ireland, United Kingdom
EC-10 (1981)	Greece
EC-12 (1986)	Portugal, Spain
EU-15 (1995)	Austria, Finland, Sweden
EU-25 (2004)	Czech Republic, Cyprus, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia, Slovakia
EU-27 (2007)	Bulgaria, Romania
EURO-11(1999)	Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain
EURO-12 (2001)	Greece
EURO-13 (2007)	Slovenia
EURO-15 (2008)	Cyprus, Malta
EURO-16 (2009)	Slovakia
EURO-17 (2011)	Estonia

Notes: The 10 EU countries that are currently not using the euro are Bulgaria, Czech Republic, Denmark, Hungary, Latvia, Lithuania, Poland, Romania, Sweden, and United Kingdom. Data on dates of accession to the euro area from the European Central Bank website: http://www.ecb.int/Euro/html/index.en.html. Data on dates of accession to the European Union are from the European Union official website: http://Europa.eu/index_en.htm.

Table A2. *List of countries*

Afghanistan	Denmark[a]	Kyrgyzstan	Samoa
Albania	Djibouti	Latvia	Sao Tome and Principe
Algeria	Dominica	Lebanon	Saudi Arabia
Antigua&Barbuda	Dominican R.	Lesotho	Senegal
Argentina	Ecuador	Lithuania	Serbia
Armenia	Egypt	Madagascar	Seychelles
Aruba	El Salvador	Malawi	Singapore
Australia	Eritrea	Malaysia	Slovakia
Austria[a]	Estonia	Maldives	Slovenia
Azerbaijan	Ethiopia	Mali	Solomon Is.
Bahamas	Faeroe Is.	Malta	South Africa
Bahrain	Fiji	Mauritania	Spain[a]
Bangladesh	Finland[a]	Mauritius	Sri Lanka
Barbados	France[a]	Mexico	Sudan
Belarus	French Poly.	Mongolia	Suriname
Belg-Lux[a]	Gabon	Mozambique	Swaziland
Belize	Gambia	Myanmar	Sweden[a]
Benin	Georgia	Namibia	Switzerland
Bhutan	Germany[a]	Nepal	Syria
Bolivia	Ghana	Netherlands[a]	TFYR of Macedonia
Bosnia&Herzegovina	Greece[a]	New Caledonia	Thailand
Botswana	Greenland	New Zealand	Timor-Leste
Brazil	Grenada	Nicaragua	Togo
Brunei	Guatemala	Niger	Tonga
Bulgaria	Guinea	Nigeria	Trinidad and Tobago
Burkina Faso	Guinea-Bissau	Norway	Tunisia
Burundi	Guyana	Oman	Turkey
Cambodia	Honduras	Pakistan	Turkmenistan
Cameroon	Hungary	Papua New Guinea	Turks and Caicos Is.
Canada	Iceland	Paraguay	Tuvalu
Cape Verde Is.	India	Peru	Uganda
Central Afr. R.	Indonesia	Philippines	Ukraine
Chile	Iran	Poland	United Arab Emirates
China	Ireland[a]	Portugal[a]	United Kingdom[a]
China, Hong Kong	Israel	Qatar	U. Rep. of Tanzania
China, Macao	Italy[a]	Rep. of Korea	Uruguay
Colombia	Jamaica	Rep. of Moldova	USA
Congo	Japan	Romania	Vanuatu
Costa Rica	Jordan	Russia	Venezuela
Cote d'ivoire	Kazakhstan	Rwanda	Viet Nam
Croatia	Kenya	St. Kitts&Nevis.	Yemen
Cuba	Kiribati	St. Lucia	Zambia
Cyprus	Kuwait	St. Vincent&Grenadines	Zimbabwe
Czech R.			

Notes: [a] indicates the countries are classified as both exporters and importers in the current study.

Table A3. *The United Nations Broad Economic Categories classification scheme*

Commodity categories	End-Use classes
1. Food categories	
11. Primary	
111. Mainly for industry	Intermediate goods
112. Mainly for household consumption	Consumption goods
12. Processed	
121. Mainly for industry	Intermediate goods
122. Mainly for household consumption	Consumption goods
2. Industrial supplies not elsewhere specified	
21. Primary	Intermediate goods
22. Processed	Intermediate goods
3. Fuels and lubricants	
31. Primary	Intermediate goods
32. Processed	Intermediate goods
321. Motor Spirit	Not classified
322. Other	Intermediate goods
4. Capital goods (except transport equipment), parts, and accessories thereof	
41. Capital goods (except transport equipment)	Capital goods
42. Parts and accessories	Intermediate goods
5. Transport equipment, parts and accessories thereof	
51. Passenger motor cars	Not classified
52. Other	
521. Industrial	Capital goods
522. Non-industrial	Consumption goods
53. Parts and accessories	Intermediate goods
6. Consumer goods not elsewhere specified	
61. Durable	Consumption goods
62. Semi-durable	Consumption goods
63 Non-durable	Consumption goods
7. Goods not elsewhere specified	Not classified

Table A4. *Estimation results for the equation (3), EU-15, 1996-2011, HS-2 chapters*

HS-2	Description	Overall		EM		IM	
		η^{OV}	s.e.	η^{EM}	s.e.	η^{IM}	s.e.
1	Live animals	116.285***	(14.005)	107.629***	(10.546)	3.978	(13.185)
2	Meat and edible meat offal	82.926***	(10.113)	33.530***	(6.003)	49.055***	(8.566)
3	Fish, crustaceans & aquatic invertebrates	-83.263***	(9.009)	-6.644	(6.392)	-74.677***	(7.823)
4	Dairy prods; birds eggs; honey; ed animal pr n.e.s.	86.213***	(8.094)	22.611***	(5.104)	61.687***	(7.173)
5	Products of animal origin, n.e.s.	9.560	(12.576)	-6.153	(6.890)	20.512***	(11.159)
6	Live trees, plants, bulbs etc.; cut flowers etc.	40.712***	(12.649)	-65.678***	(7.316)	99.008***	(12.426)
7	Edible vegetables & certain roots & tubers	42.692***	(10.490)	-20.313***	(5.702)	64.798***	(9.283)
8	Edible fruit & nuts; citrus fruit or melon peel	66.799***	(11.371)	-56.449***	(7.957)	118.304***	(10.498)
9	Coffee, tea, mate, & spices	73.724***	(11.052)	16.722***	(7.300)	58.305***	(10.146)
10	Cereals	28.763***	(14.771)	20.328***	(9.124)	8.679	(13.628)
11	Milling products; malt; starch; inulin; wht gluten	75.139***	(13.188)	-5.901	(8.547)	72.230***	(12.151)
12	Oil seeds etc.; misc grain, seed, fruit, plant, etc	14.776	(9.380)	11.147***	(6.619)	6.690	(8.585)
13	Lac; gums, resins & other vegetable sap, & extract	-14.092	(10.607)	-8.842***	(5.225)	-6.509	(10.084)
14	Vegetable plaiting materials & products n.e.s.	93.587***	(16.424)	-6.515	(8.521)	95.376***	(15.397)
15	Animal or vegetable fats, oils, etc. & waxes	32.598***	(9.504)	-2.449	(6.450)	33.247***	(8.090)
16	Edible preparations of meat, fish, crustaceans etc	37.649***	(8.252)	3.749	(5.150)	33.799***	(7.599)
17	Sugars and sugar confectionery	-26.057***	(9.258)	-22.003***	(3.825)	-4.110	(8.916)
18	Cocoa and cocoa preparations	-10.533	(8.177)	-15.413***	(2.801)	5.561	(7.983)
19	Prep cereal, flour, starch or milk; bakers wares	-17.221***	(7.416)	-13.351***	(3.164)	-3.138	(6.812)
20	Prep vegetables, fruit, nuts or other plant parts	36.173***	(7.560)	-34.019***	(4.409)	68.857***	(6.845)
21	Miscellaneous edible preparations	-7.171	(6.315)	-6.745***	(2.445)	-1.612	(6.080)
22	Beverages, spirits and vinegar	-12.079	(7.965)	-39.482***	(4.075)	22.691***	(7.667)
23	Food industry residues & waste; prep animal feed	-0.499	(8.000)	-22.867***	(6.509)	22.569***	(8.086)
24	Tobacco and manufactured tobacco substitutes	44.310***	(13.278)	-17.755***	(9.094)	62.675***	(13.230)
25	Salt; sulfur; earth & stone; lime & cement plaster	34.881***	(9.155)	-21.154***	(5.874)	53.537***	(8.228)
26	Ores, slag, and ash	86.373***	(17.722)	29.246***	(12.857)	49.672***	(18.231)

Table A4 (continued). *Estimation results for the equation (3), EU-15, 1996-2011, HS-2 chapters*

HS-2	Description	Overall		EM		IM	
		η^{OV}	s.e.	η^{EM}	s.e.	η^{IM}	s.e.
27	Mineral fuel, oil etc.; bitumen subst; mineral wax	-135.471***	(12.877)	-19.873***	(6.610)	-114.094***	(12.462)
28	Inorg chem; prec & rare-earth met & radioact compd	18.737***	(7.302)	-34.063***	(5.117)	50.530***	(6.692)
29	Organic chemicals	30.756***	(7.349)	-20.829***	(4.945)	48.778***	(6.471)
31	Fertilizers	167.610***	(12.952)	37.215***	(8.011)	133.068***	(12.393)
32	Tanning or dyeing extracts etc.	-37.062***	(6.417)	-25.104***	(3.654)	-12.603***	(5.819)
33	Essential oils etc; perfumery, cosmetic etc preps	-31.496***	(7.255)	-25.647***	(3.099)	-4.164	(6.599)
34	Soap etc; waxes, polish etc; candles; dental preps.	-18.181***	(6.680)	-14.679***	(3.555)	-2.798	(6.076)
35	Albuminoidal subst; modified starch; glue; enzymes	-11.116	(7.052)	-14.881***	(2.308)	2.867	(6.818)
36	Explosives; pyrotechnics; matches; pyro alloys, etc.	21.436	(13.322)	1.290	(6.260)	22.695***	(12.688)
37	Photographic or cinematographic goods	29.471***	(10.719)	-11.191***	(5.429)	39.153***	(10.261)
38	Miscellaneous chemical products	23.031***	(5.767)	-4.870	(3.125)	27.731***	(4.770)
39	Plastics and articles thereof	18.548***	(4.273)	-13.686***	(2.612)	31.721***	(3.440)
40	Rubber and articles thereof	29.884***	(4.956)	-14.978***	(3.749)	43.793***	(5.025)
41	Raw hides and skins and leather	18.528***	(10.610)	-4.925	(5.407)	22.678***	(9.755)
42	Articles of leather, etc.	-17.931***	(6.081)	-23.673***	(3.003)	5.545	(5.596)
43	Furskins and artificial fur; manufactures thereof	44.194***	(11.360)	-0.295	(5.141)	43.862***	(10.269)
44	Wood and articles of wood, etc.	-7.405	(7.726)	-22.455***	(3.613)	14.422***	(6.882)
45	Cork and articles of cork	122.706***	(13.624)	13.892***	(6.605)	107.289***	(12.655)
46	Manuf. of straw, of esparto, etc.	76.927***	(10.717)	-9.227***	(4.281)	83.337***	(10.749)
47	Pulp of wood or of other fibrous cellulosic material	28.011***	(14.872)	18.532***	(8.780)	9.435	(12.981)
48	Paper and paper board, etc.	3.580	(5.458)	-16.766***	(3.053)	19.213***	(4.934)
49	Printed books, newspapers, etc.	63.841***	(6.364)	12.775***	(2.282)	51.646***	(6.017)
50	Silk, including yarns and woven fabric thereof	51.575***	(13.177)	42.093***	(8.164)	8.357	(12.738)
51	Wool; fine or coarse animal hair, etc.	10.682	(9.723)	6.334	(5.443)	6.409	(8.484)
52	Cotton, including yarn and woven fabric thereof	36.696***	(7.767)	-25.027***	(5.245)	60.550***	(6.570)

Table A4 (continued). *Estimation results for the equation (3), EU-15, 1996-2011, HS-2 chapters*

HS-2	Description	Overall		EM		IM	
		η^{OV}	s.e.	η^{EM}	s.e.	η^{IM}	s.e.
53	Other vegetable textile fibers	51.948***	(9.075)	-10.276***	(5.119)	62.077***	(8.642)
54	Man-made filaments	35.171***	(7.517)	-12.326***	(4.551)	45.962***	(6.827)
55	Man-made staple fibers	80.369***	(8.252)	17.564***	(4.829)	62.590***	(7.298)
56	Wadding, felt, etc.; sp yarn; twine, ropes etc.	16.372***	(7.299)	-13.530***	(3.677)	29.515***	(6.170)
57	Carpets; other textile floor coverings	-26.757***	(7.007)	-17.611***	(3.916)	-9.182	(6.435)
58	Special woven fabrics; lace, etc.	15.085***	(7.263)	-14.645***	(4.261)	31.702***	(6.623)
59	Impregnated etc. text fabrics; tex art for industry	17.580***	(6.491)	-18.715***	(3.304)	34.682***	(6.084)
60	Knitted or crocheted fabrics	21.230***	(8.771)	-25.443***	(4.968)	45.873***	(7.989)
61	Apparel articles and accessories, knit, or crochet	8.955	(6.611)	-10.515***	(3.582)	20.341***	(6.177)
62	Apparel articles and accessories, not knit etc.	-3.508	(6.777)	-8.337***	(4.138)	5.006	(6.113)
63	Textile art n.e.s.; needlecraft sets; worn text art	-12.800***	(6.280)	-3.155	(3.406)	-7.690	(5.685)
64	Footwear, gaiters, etc.	44.912***	(7.010)	-43.503***	(4.419)	88.318***	(6.834)
65	Headgear and parts thereof	19.454***	(6.932)	0.697	(2.360)	19.320***	(6.700)
66	Umbrellas, walking-sticks, etc.	51.519***	(9.114)	-23.324***	(3.898)	72.311***	(9.309)
67	Prepared feathers and down, etc.	0.983	(9.769)	-17.730***	(5.128)	21.008***	(9.858)
68	Articles of stone, plaster, etc.	-5.537	(6.278)	-29.348***	(3.677)	23.151***	(5.860)
69	Ceramic products	-7.988	(6.586)	-51.572***	(4.356)	39.940***	(6.353)
70	Glass and glassware	-4.067	(6.306)	-33.497***	(3.217)	28.629***	(5.523)
71	Nat etc pearls, prec etc stones, pr met, etc; coin	-8.892	(10.818)	0.239	(5.769)	-8.981	(9.383)
72	Iron and steel	-7.887	(7.205)	-32.850***	(5.260)	23.439***	(5.462)
73	Articles of iron or steel	5.570	(5.168)	-7.168***	(2.811)	12.706***	(4.334)
74	Copper and articles thereof	32.221***	(7.306)	-4.076	(4.289)	36.524***	(6.445)
75	Nickel and articles thereof	41.102***	(11.048)	8.352	(7.525)	32.419***	(10.572)
76	Aluminum and articles thereof	-1.947	(5.606)	-13.201***	(2.927)	10.372***	(4.949)
78	Lead and articles thereof	42.391***	(18.955)	5.940	(9.293)	33.749***	(15.844)

Table A4 (continued). *Estimation results for the equation (3), EU-15, 1996-2011, HS-2 chapters*

HS-2	Description	Overall		EM		IM	
		η^{OV}	s.e.	η^{EM}	s.e.	η^{IM}	s.e.
79	Zinc and articles thereof	99.912***	(11.606)	37.980***	(6.034)	65.124***	(11.197)
80	Tin and articles thereof	72.677***	(14.153)	32.932***	(7.695)	38.765***	(13.852)
81	Other base metals, etc.	64.789***	(10.698)	29.637***	(7.585)	38.264***	(10.437)
82	Tools, cutlery, etc. of base metal & parts thereof	33.465***	(6.447)	-15.027***	(3.459)	47.215***	(5.696)
83	Miscellaneous articles of base metal	5.427	(5.793)	-13.250***	(3.042)	19.677***	(5.000)
84	Nuclear reactors, boilers, machinery, etc.	43.620***	(3.983)	20.756***	(2.456)	23.358***	(3.911)
85	Electrical machinery and equipment, etc.	59.791***	(5.024)	33.504***	(2.902)	27.148***	(4.440)
86	Railway or tramway locomotives, etc.	-3.970	(10.821)	-12.638***	(6.081)	8.922	(10.190)
87	Vehicles, except railway or tramway, and parts etc.	25.169***	(6.062)	9.570***	(3.316)	16.165***	(6.025)
88	Aircraft, spacecraft, etc.	73.282***	(11.825)	30.460***	(5.990)	44.679***	(10.999)
89	Ships, boats, etc.	-22.329***	(12.362)	-6.061	(7.389)	-15.972	(10.976)
90	Optical, photographic, etc. apparatus	31.735***	(4.358)	5.866***	(2.987)	25.082***	(3.876)
92	Musical instruments, etc.	55.751***	(8.910)	8.648***	(5.093)	44.531***	(8.035)
93	Arms and ammunition, etc.	37.396***	(10.542)	36.573***	(6.514)	-0.231	(9.573)
94	Furniture, bedding, etc.	-37.514***	(4.986)	-15.118***	(2.457)	-21.733***	(4.425)
95	Toy, games, etc.	17.093***	(6.058)	-4.311	(3.465)	21.798***	(6.053)
96	Miscellaneous manufactured articles	16.781***	(6.162)	-20.293***	(3.467)	36.730***	(5.574)

Notes: Dependent variable is (the log of) the extensive, intensive, and overall margin, respectively. Estimates of model (1) for 93 HS-2 product chapters: There is no data on chapters 30 (Pharmaceutical products), 77 (reserved for future international use), 91 (Clocks and watches, etc.), and 97 (Works of art, antiques, etc.), *, **, *** indicate significance at 10, 5, and 1 percent.

Table 1. *Euro area exports by destination region, 1996-2011*

Year	Total trade *(bill. US-$)*		Extensive margin		Intensive margin	
	Intra-euro	Extra-euro	Intra-euro	Extra-euro	Intra-euro	Extra-euro
1996	802	736	0.688	0.100	0.076	0.013
1997	781	764	0.695	0.158	0.074	0.029
1998	823	776	0.712	0.180	0.074	0.031
1999	834	771	0.719	0.197	0.072	0.036
2000	827	822	0.706	0.237	0.068	0.035
2001	843	858	0.714	0.255	0.071	0.046
2002	895	932	0.732	0.267	0.071	0.095
2003	1,080	1,090	0.733	0.276	0.071	0.049
2004	1,286	1,301	0.739	0.281	0.070	0.040
2005	1,383	1,412	0.733	0.296	0.070	0.040
2006	1,521	1,617	0.723	0.303	0.069	0.041
2007	1,763	1,890	0.717	0.307	0.069	0.041
2008	1,899	2,094	0.708	0.307	0.066	0.047
2009	1,481	1,614	0.715	0.301	0.068	0.035
2010	1,617	1,849	0.716	0.302	0.065	0.030
2011	1,737	2,091	0.633	0.246	0.056	0.023

Notes: Destination regions: Intra-euro: exports within euro area (the euro-10), Extra-euro: exports from euro area to the world excluding euro area countries. Extensive and intensive margins (see equations (1a) and (1b)) is defined as percent/100 and calculated as arithmetic average of euro area countries' extensive margins across destination regions.

*Source***:** UN's COMTRADE database, authors' own calculations.

Table 2. *Estimates of the equation (3), EU-15, 1996-2011, total trade*

Variables	Exports	Overall	EM	IM
D^{ϵ}_{jmt}	0.272***	0.285***	0.097***	0.188***
	(0.031)	(0.032)	(0.023)	(0.029)
$\ln DIST_{jm}$	-1.149***	-1.204***	-0.391***	-0.814***
	(0.020)	(0.020)	(0.017)	(0.015)
CB_{jm}	0.087*	0.119**	-0.401***	0.520***
	(0.051)	(0.051)	(0.038)	(0.031)
CL_{jm}	0.652***	0.722***	0.370***	0.353***
	(0.027)	(0.029)	(0.023)	(0.024)
COL_{jm}	0.402***	0.367***	0.266***	0.102***
	(0.034)	(0.035)	(0.028)	(0.033)
$COL45_{jm}$	0.901***	0.991***	0.478***	0.513***
	(0.051)	(0.053)	(0.039)	(0.040)
FTA_{jmt}	0.218	-0.872	-0.378	-0.494
	(0.921)	(0.886)	(0.773)	(0.724)
R^2	0.926	0.813	0.753	0.633
RMSE	0.868	0.880	0.762	0.761
Observations	26,832	26,832	26,832	26,832

Notes: Estimates based on unbalanced panel of bilateral exports from EU14 countries to 173 trading patterns over the period 1996-2011. All models include time-varying fixed effects for importers and exporters. Robust standard errors in parenthesis. *, **, *** indicate significance at 10, 5, and 1 percent.

Table 3. *Estimates of the equation (3), EU-15, 1996-2011, final goods trade*

Variables	Exports	Overall	EM	IM
D^{ϵ}_{jmt}	0.263**	0.204***	0.023	0.180***
	(0.040)	(0.042)	(0.028)	(0.033)
$\ln DIST_{jm}$	-1.244***	-1.280***	-0.427***	-0.854***
	(0.027)	(0.027)	(0.019)	(0.020)
CB_{jm}	0.083	0.095	-0.453***	0.548***
	(0.059)	(0.058)	(0.039)	(0.037)
CL_{jm}	0.763***	0.804***	0.355***	0.449***
	(0.035)	(0.037)	(0.027)	(0.031)
COL_{jm}	0.532***	0.535***	0.291***	0.243***
	(0.044)	(0.045)	(0.032)	(0.041)
$COL45_{jm}$	1.122***	1.162***	0.586***	0.577***
	(0.060)	(0.061)	(0.042)	(0.049)
FTA_{jmt}	0.410	0.144	0.149	-0.024
	(7.946)	(4.320)	(4. 861)	(5. 96ß)
R^2	0.893	0.769	0.684	0.598
RMSE	1.102	1.127	0.884	0.988
Observations	26,175	26,175	26,175	26,175

Notes: Estimates based on unbalanced panel of bilateral exports from EU14 countries to 173 trading patterns over the period 1996-2011. All models include time-varying fixed effects for importers and exporters. Robust standard errors in parenthesis. *, **, *** indicate significance at 10, 5, and 1 percent.

Table 4. *Estimates of the equation (3), EU-15, 1996-2011, intermediate goods trade*

Variables	Exports	Overall	EM	IM
D_{jmt}^{ϵ}	0.269***	0.253***	0.064***	0.188***
	(0.033)	(0.033)	(0.022)	(0.030)
$\ln DIST_{jm}$	-1.197***	-1.240***	-0.416***	-0.824***
	(0.021)	(0.021)	(0.016)	(0.016)
CB_{jm}	0.130**	0.160***	-0.337***	0.496***
	(0.054)	(0.055)	(0.041)	(0.030)
CL_{jm}	0.643***	0.660***	0.361***	0.299***
	(0.030)	(0.033)	(0.023)	(0.026)
COL_{jm}	0.428***	0.405***	0.255***	0.150***
	(0.037)	(0.038)	(0.027)	(0.031)
$COL45_{jm}$	0.953***	1.060***	0.539***	0.521***
	(0.054)	(0.058)	(0.037)	(0.042)
FTA_{jmt}	2.661*	0.252	-1.116	1.368
	(1.615)	(1.361)	(1.129)	(1.023)
R^2	0.923	0.797	0.775	0.641
RMSE	0.886	0.907	0.694	0.754
Observations	25,983	25,983	25,983	25,983

Notes: Estimates based on unbalanced panel of bilateral exports from EU14 countries to 173 trading patterns over the period 1996-2011. All models include time-varying fixed effects for importers and exporters. Robust standard errors in parentheses. *, **, *** indicate significance at 10, 5, and 1 percent.

Table 5. *Summary of estimation results for the equation (3), EU-15, 1996-2011, HS-2 chapters*

	Overall		EM		IM	
	η^{OV}	s.e.	η^{EM}	s.e.	η^{IM}	s.e.
Weighted average[1)] of estimated effect of euro (in percent)						
All [a)]	17.353***	(1.403)	0.443	(0.805)	16.849***	(1.333)
10% [b)]	17.843***	(1.347)	0.635	(0.798)	16.946***	(1.319)
5%[c)]	17.738***	(1.344)	0.671	(0.797)	16.933***	(1.319)
1%[d)]	17.659***	(1.342)	0.630	(0.785)	16.723***	(1.316)
Number of coefficients (of 93 HS-2 chapters)						
	(+)	(-)	(+)	(-)	(+)	(-)
All	66	27	30	63	78	15
10%	57	12	23	51	67	4
5%	54	11	21	49	65	4
1%	49	9	15	43	60	3

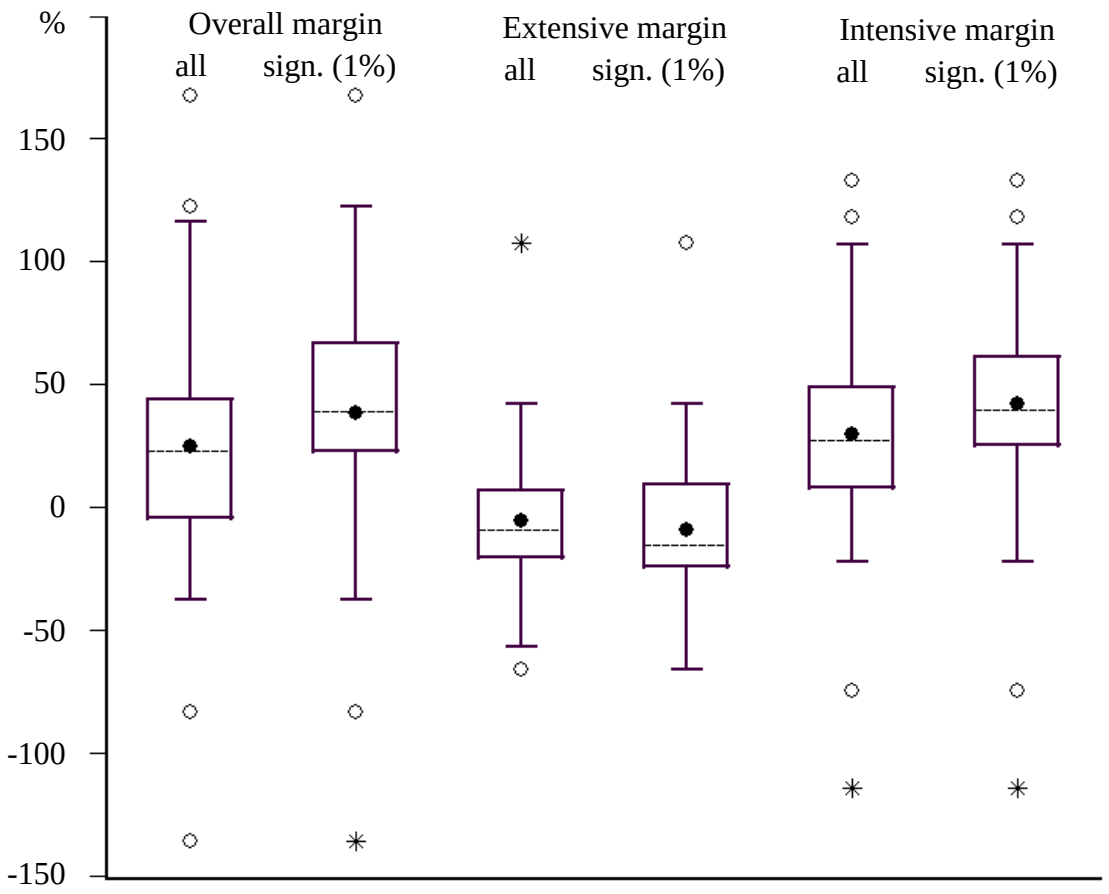
*, **, *** indicate significance at 10, 5, and 1 percent. [1)] weighted average over all product groups (a), over all product groups, where estimated effect of the euro is significant at 10 (b), 5 (c), and 1 percent (d). Standard errors calculated assuming that the coefficients are uncorrelated across product groups.

Table 6. *Estimation results for equation (7) for alternative samples*

	(a)	(b)	(c)	(d)
	Overall margin (unweighted)			
Constant	61.145***	77.602***	82.543***	98.357***
	(16.049)	(16.816)	(17.420)	(19.253)
σ	-0.037	-0.380	-0.678	-2.351
	(1.580)	(1.542)	(1.564)	(1.801)
R^2	0.000	0.004	0.012	0.146
RMSE	37.357	34.513	34.412	33.733
Observations	28	18	17	12
	Overall margin (weighted[1])			
Constant	60.317***	68.113***	69.691**	77.867***
	(3.738)	(3.982)	(4.065)	(4.331)
σ	-0.914***	-1.114***	-1.215***	-1.697***
	(0.344)	(0.354)	(0.357)	(0.376)
	Extensive margin (unweighted)			
Constant	28.921***	34.342***	37.688***	42.588***
	(8.336)	(8.608)	(8.855)	(11.435)
σ	-0.801	-0.962	-1.133	-1.048
	(0.843)	(0.850)	(0.855)	(1.150)
R^2	0.031	0.053	0.077	0.060
RMSE	20.635	20.302	20.181	22.775
Observations	30	25	23	15
	Extensive margin (weighted[1])			
Constant	19.355***	24.573***	25.814***	28.037***
	(1.886)	(1.987)	(2.026)	(2.143)
σ	-0.359**	-0.511***	-0.570***	-0.509***
	(0.180)	(0.183)	(0.185)	(0.197)
	Intensive margin (unweighted)			
Constant	36.372***	40.253***	41.645***	44.296***
	(4.176)	(4.131)	(4.142)	(4.302)
σ	0.313	0.362	0.327	0.297
	(0.276)	(0.68)	(0.265)	(0.266)
R^2	0.017	0.027	0.023	0.021
RMSE	27.630	26.344	26.009	26.004
Observations	78	69	67	61
	Intensive margin (weighted[1])			
Constant	31.459***	31.928***	33.050***	34.653***
	(1.164)	(1.180)	(1.196)	(1.225)
σ	0.208**	0.414***	0.375***	0.346***
	(0.097)	(0.101)	(0.102)	(0.102)
Sample[2)]	$\hat{\eta}_h > 0$	p < 0.20	p < 0.10	p < 0.01

Notes: Dependent variable is $\hat{\eta}_h$, multiplied by 100 (in percent). [1)] Weighted least squares, using the inverse of the standard deviation of the estimated effect of the euro as weight. [2)] Samples restricted to observations, where the estimated effect of the Euro ($\hat{\eta}_h$) is positive (a), or positive and significant with a p-value of 0.2 (b), 10 (c), and 1 percent (d). RMSE and R^2 refer to unweighted regression.

Figure 1. *Estimates of Euro Effect on Export Margins, EU-15, 1996-2001, HS2 chapters - Boxplot*



Notes: Box plot: the box illustrates the interquartile range (*IQR*, middle 50% of the coefficients), the staples the first and third quartile ± 1.5*IQR*; • is the mean, the dashed line is the median, o are near outliers (outside the staples), * are far outliers (outside the first and third quartile ± 3*IQR*).