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The Euro and the Intensive and Extensive Margins of Trade: Evidence from French Firm Level Data

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**THE EURO AND THE INTENSIVE AND EXTENSIVE MARGINS OF TRADE: EVIDENCE
FROM FRENCH FIRM LEVEL DATA**

NON-TECHNICAL SUMMARY

Past literature on Currency Unions has found a positive but low effect of the adoption of a common currency on trade flows within the Monetary Union. Beyond the macro perspective however, very little has been done to investigate the effect of euro adoption at the micro-level.

On a theoretical perspective, previous literature suggests that the effect of a reduction in firm-level uncertainty related to nominal exchange rate volatility should lead to an increase in the average value of exports by each firm, and promote the entry of new exporters. The adoption of the euro has also been motivated by the elimination of trade costs related to economic exchanges in different currencies, and by a greater price transparency within the eurozone. In a framework *a la* Melitz with heterogeneous firms, the decrease in variable trade costs would lead to an increase in the value of exports by firm in the foreign market, and to the entry of new firms on the export market. A decrease in the fixed cost of export however would only have a positive effect on the number of exporting firms. More recently, models of trade with multi-product firms have emphasized that a variation of trade costs may lead to a within-firm adjustment through the number of goods exported by each firm. Finally, one would expect from a greater price transparency that competition increases, thus contributing to firm selection on the export market. Hence, theory tells us that the effect of the euro on trade can both translates into a variation in the number of exporting firms or product exported by firm, and a variation in the value of exports by firm or by product.

We contribute to the literature on the micro effects of Currency Unions, by making use of a unique database on French firm-level exports. Previous empirical studies on the micro effects of the euro have been using product-level trade data at the HS6 level - with around 5,000 product categories. However, the level of disaggregation of these data does not enable to control for the entry or exit behavior of firms within a product category. In contrast, we rely on the use of French data on firm-level exports provided by the French customs. Importantly, our data provide information on firm exports with detailed information on the nature of the products that are shipped (HS8 categories). We can therefore identify an additional pattern related to the fact that several firms can export within a single product category, and we define a *variety* as a product category exported by a single firm. Note that we restrict our analysis to manufactured products, including agro-food. Our data cover the 1998-2003 period.

Since we are interested in measuring the effect of the euro on trade, we identify a "treatment group", i.e. destination countries located within the eurozone (EZ13: eurozone 13 less

Greece and Slovenia), and a "control group" in which we identify three destination regions: the rest of the EU15 less Greece (nonEZeU); the rest of Europe including the 12 enlargement countries (less Malta and Cyprus) plus Switzerland and Norway (nonEZEurope); the rest of the world (nonEZworld).

We define the *extensive margin* as the number of varieties that are exported to each destination country, and the *intensive margin* as the average value of exports by variety. These export margins have a *bilateral dimension*, and are used in the econometric part of the paper. In the descriptive statistics, we further identify the intensive and extensive margins by destination region, which requires to account for the geographical component of the extensive margin, i.e. the number of destination countries for each variety within a destination region. This second decomposition of the export margins has therefore a multilateral dimension.

Relying on the latter definition, our descriptive statistics indicate that overall, the variation of exports to eurozone partners over the period is proportionally more driven by the extensive margin. This is the result of different changes. The number of French exporters has declined in the eurozone, contributing negatively to the extensive margin of trade. In contrast, the average number of varieties exported by firm, and the average number of destination markets by variety - within the EZ destination region - have both positively contributed to the extensive margin. Finally, the intensive margin shows a positive trend over the period. We record a similar increase in the number of products exported by firm to the eurozone and to nonEZeU destinations; however the reduction in the number of exporters is more pronounced in the eurozone than in nonEZeU, which dampens the increase in the extensive margin. Exports towards the rest of Europe are characterized by a decrease in the number of varieties exported by firm, a slight increase in the number of exporting firms and destination markets by variety, and a very large increase in the intensive margin. This pattern is similar and even amplified for exports to the rest of the world, with a very large decrease in the number of varieties exported to nonEZworld partners. Overall, the descriptive statistics indicate that if any, the euro had a differentiated impact on the two margins of trade.

As a second step we use the decomposition of the intensive and the extensive margins using the *bilateral dimension*: the extensive margin is therefore defined as the number of varieties exported to each partner, and does not include the geographical component as in the descriptive statistics. We proceed to econometric estimates that aim at identifying the effect of the euro on French exports to EZ partners, as compared to French exports to nonEZ partners. We estimate two gravity equations with the intensive and extensive margins of French exports as the dependent variables. In our empirical methodology, we introduce a measure of the nominal exchange rate volatility, in order to control for the reduction in the related uncertainty at the firm level. We also introduce eurozone dummies to control for additional effects that

the adoption of the euro may have generated on French exports, as suggested by the literature.

Estimation results point to a strong negative effect of the nominal exchange rate volatility on both the intensive and extensive margins of trade, which suggests a large - positive - effect of the euro related to the reduction of firm-level uncertainty. Volatility indeed reduces the number of varieties that are shipped to trade partners, as well as the value of exports by variety.

The coefficients on the euro dummies also indicate an additional positive effect of the euro on the extensive margin, which is not related to the reduction in nominal exchange rate volatility. We find that the difference between the number of varieties exported to EZ partners and non-EZ partners, has increased by 19.4% between 1998 and 2003. We also find a positive effect specific to the introduction of the banknotes, that can be estimated at 7.8%. Robustness checks indicate however that the positive effect of the euro introduction on the extensive margin of French exports is responsive to the size of the control group.

Overall, this paper contributes to the literature on the micro effects of Currency Unions, and provides new evidence of a positive effect on trade that is not related to the elimination of nominal exchange rate volatility. This effect can be attributed to reduced trade costs or increased price transparency, which has increased the number of varieties exported by French firms.

ABSTRACT

We improve the study of the effects of a Currency Union on trade. Using data on French exports at the firm level, we compute an intensive and extensive margins of French exports - with a variety dimension - over the period 1998-2003. Estimation results indicate that nominal exchange rate volatility has a negative effect, which translates into the intensive and extensive margins. We also provide some evidence that the euro had an additional positive effect on the extensive margin; this effect is not related to the reduced nominal exchange rate volatility. This suggests a *new varieties effect* of the euro.

JEL Classification: F15

Keywords: trade, export margins, euro.

**EFFET DE L'EURO SUR LES MARGES INTENSIVE ET EXTENSIVE DU COMMERCE :
APPROCHE PAR L'UTILISATION DE DONNÉES DE FIRMES FRANÇAISES**

RESUME NON TECHNIQUE

La littérature sur les Unions monétaires fait généralement état d'un effet macro-économique positif mais limité de l'adoption d'une monnaie commune sur les échanges commerciaux au sein de ces Unions. La question des effets micro-économiques de l'adoption d'une monnaie unique sur les échanges a néanmoins reçu jusqu'ici une attention limitée.

Théoriquement, la réduction de l'incertitude au niveau de la firme liée à la volatilité du taux de change peut entraîner une augmentation des exportations de chaque firme, mais aussi favoriser l'entrée de nouveaux exportateurs. L'adoption de l'euro a également été motivée par une élimination des coûts de commerce liés à l'existence d'échanges dans des monnaies différentes, et par une hausse de la transparence des prix. Dans un contexte de firmes hétérogènes *a la Melitz*, la réduction des coûts de commerce variables doit entraîner à la fois une hausse des ventes par firme à l'étranger ainsi qu'une augmentation du nombre de firmes exportatrices, alors qu'une baisse du coût fixe ne joue positivement que sur le nombre de firmes exportatrices. Plus récemment, les modèles avec firmes multi-produits ont mis en évidence le fait que l'ajustement consécutif à une libéralisation commerciale peut se faire au sein de la firme, par le nombre de biens produits et exportés. Enfin, on peut attendre d'une hausse de la transparence sur les prix, une hausse de la concurrence au sein de l'Union Monétaire, contribuant à la sélection des firmes sur le marché d'exportation. Par conséquent, les effets de l'euro sur le commerce peuvent se traduire à la fois par une hausse du nombre de firmes exportatrices ou par le nombre de produits exportés par firme, ainsi que par une hausse du volume d'exportation par firme ou par produit.

Nous nous proposons ici d'analyser, à l'aide de données individuelles de firmes, la manière dont l'introduction de la monnaie unique a affecté le nombre de firmes exportatrices, le nombre de variétés exportées, ainsi que le volume d'exportation par variété. Les études empiriques des impacts micro-économiques de l'euro ont jusqu'ici utilisé des données d'échanges commerciaux au niveau de la nomenclature HS6 (comprenant 5 000 produits environ). Toutefois, même à ce niveau de désagrégation, il est impossible de contrôler pour l'entrée ou la sortie de firmes exportatrices au sein de chaque catégorie de produit. A cette fin, nous mobilisons des données individuelles de firmes françaises, mises à notre disposition par la Direction des Douanes.

Nous disposons pour chaque année sur la période 1998-2003 du montant des exportations pour chaque firme présente sur le marché d'exportation, détaillé par catégorie de produit au niveau HS8. Ce détail dans les données nous permet ainsi d'observer le nombre de firmes exportant au sein d'une même catégorie de produits, ce qui n'est bien entendu possible que si l'on dispose de données de firmes. Nous considérons ici que deux firmes exportant un même produit exportent en réalité deux variétés différentes. Nous limitons notre analyse aux produits manufacturés, incluant l'agro-alimentaire.

Afin d'identifier les effets de l'adoption de l'euro sur les échanges commerciaux, nous définissons un "groupe de traitement", à savoir les pays de la zone euro (EZ13 : la zone euro moins la Grèce et la Slovénie), ainsi qu'un "groupe de contrôle" distinguant trois régions de destination : le reste de l'UE15 à l'exception de la Grèce (nonEZeu), le reste de l'Europe incluant les 12 pays de l'élargissement (moins Chypre et Malte) ainsi que la Suisse et la Norvège (nonEZeuropa) ; enfin le reste du monde (nonEZworld).

Nous définissons la *marge extensive* du commerce comme le nombre de variétés qui sont exportées vers chaque destination, et la *marge intensive* comme la valeur moyenne des exportations par variété. Ces marges d'exportation ont une *dimension bilatérale*, qui est mobilisée dans la section économétrique de cet article. Dans la section proposant des statistiques descriptives, nous ajoutons une composante géographique à la marge extensive, en prenant en compte la diversité des marchés d'exportation au sein d'une région de destination, pour chaque variété.

Nos statistiques descriptives mettent en évidence que globalement, la croissance de la valeur des exportations manufacturières totales de la France à destination des partenaires de la zone euro sur la période considérée s'explique davantage par la marge extensive du commerce que par la marge intensive. Concernant la marge extensive, ce résultat s'explique par la combinaison de plusieurs évolutions : le nombre d'exportateurs français vers la zone euro a décliné, contribuant à réduire la marge extensive ; mais le nombre moyen de produits exportés par chaque firme a augmenté, et donc joué en sens opposé ; enfin, le nombre de destinations pour chaque variété a lui aussi augmenté. Nous notons également une contribution positive de la marge intensive sur la période. Comparant les régions de destination entre elles, nous observons une augmentation similaire du nombre de produits exportés par firme vers la zone euro et vers les destinations nonEZeu. Toutefois, le recul du nombre d'exportateurs est plus prononcé au sein de la zone euro qu'au sein de la destination nonEZeu, ce qui limite la contribution de la marge extensive au sein de la zone euro. Les exportations à destination du reste de l'Europe se caractérisent par une baisse du nombre de produits exportés par firme, une légère augmentation du nombre de firmes exportatrices et du nombre de marchés de destination par variété. Enfin la croissance de la marge intensive y est très prononcée. Nous observons des évolutions similaires, mais encore plus marquées, dans le cas des exportations françaises vers le reste de monde, notamment un recul très net du nombre de produits exportés par firme. Ainsi, ces statistiques descriptives suggèrent-elles que si l'euro a joué un rôle, son impact a été très différent sur les deux marges du commerce.

Dans une seconde étape, nous utilisons la décomposition des marges intensive et extensive en exploitant la dimension bilatérale de celles-ci, comme indiqué plus haut. La marge extensive est alors définie comme le nombre de variétés exportées vers chaque destination, et ne prend pas en compte la composante géographique utilisée dans les statistiques descriptives. Nous proposons une estimation économétrique visant à identifier les effets de l'introduction de la monnaie unique sur les exportations françaises vers les destinations de la zone euro, par comparaison avec les exportations vers les autres destinations. Nous estimons deux équations de

gravité utilisant comme variable dépendante chacune des deux marges du commerce. Nous utilisons notamment comme variable explicative la volatilité du taux de change nominal, afin d'identifier l'effet d'une réduction de l'incertitude au niveau de la firme. Nous introduisons également dans les variables explicatives des variables indicatrices zone euro, pour mesurer les effets additionnels de l'introduction de l'euro sur les exportations françaises, comme suggéré par la littérature.

Les résultats d'estimation indiquent que la volatilité du taux de change nominal a un effet négatif, à la fois sur les marges intensive et extensive du commerce, ce qui suggère un effet positif de l'euro lié à la réduction de l'incertitude au niveau de la firme. La volatilité du taux de change nominal réduit en effet à la fois le nombre de variétés exportées, ainsi que le volume moyen d'export par variété.

Les coefficients sur les variables indicatrices zone euro indiquent également un effet additionnel positif de l'euro sur la marge extensive, qui n'est pas lié à la réduction de la volatilité du taux de change. La différence entre le nombre de variétés exportées vers des partenaires zones euro et hors zone euro s'est accrue de 19,4% sur la période. L'effet spécifique de l'introduction des billets en euro sur les exportations françaises n'est pas négligeable. La différence entre le nombre de variétés exportées vers les partenaires de la zone euro et vers les autres pays a augmenté d'environ 8,7% suite à l'introduction des billets. Les tests de robustesse effectués soulignent néanmoins que l'impact positif de l'introduction de l'euro sur la marge extensive des exportations françaises est sensible à la taille du groupe de contrôle.

Plus généralement, cet article contribue à la littérature sur les effets micro-économiques des unions monétaires, et confirme l'existence d'un effet positif sur le commerce, au-delà de l'élimination de la volatilité du taux de change. Cet effet, qui peut être interprété comme la conséquence d'une baisse des coûts de commerce ou encore à une hausse de la transparence sur les prix, a contribué à accroître le nombre de produits ou variétés exportés par chaque firme.

RESUME COURT

Cet article contribue à l'étude des effets de l'établissement d'une Union Monétaire sur le commerce. Nous utilisons des données d'exportation au niveau de la firme pour construire les marges intensive et extensive des exportations françaises sur la période 1998-2003. Les résultats d'estimation indiquent que la volatilité du taux de change nominal a un effet négatif sur les deux marges du commerce. Au-delà de l'élimination de la volatilité du taux de change nominal, nous trouvons que l'adoption de l'euro a eu un effet supplémentaire positif sur la marge extensive. Ces résultats suggèrent donc un effet positif de l'euro sur le nombre de variétés exportées par les firmes françaises.

Classification JEL : F15

Mots clés : Commerce, marges du commerce, euro.

THE EURO AND THE INTENSIVE AND EXTENSIVE MARGINS OF TRADE

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1. INTRODUCTION

Past literature on Currency Unions has found a positive effect of the adoption of a common currency on trade flows within the Monetary Union. [Rose \(2000\)](#) finds that common currency raises trade by 235%. Estimates on the effect of the euro on trade are however typically lower. [Baldwin \(2006\)](#) reviews the literature and acknowledges that the effect should actually be between 5% and 10%. Beyond the macro perspective however, very little has been done to investigate the effect of euro adoption at the micro-level.

In a theoretical perspective, [Baldwin and Taglioni \(2004\)](#) develop a Melitz-like trade model where each firm exports a single good, and find that reduced uncertainty related to nominal exchange rate volatility enables exporters to export larger volumes, as well as the entry of new - smaller - exporters. Beyond reduced volatility, the euro has also been motivated by the elimination of trade costs related to currency exchange and related transaction costs. In a [Melitz \(2003\)](#) framework with heterogenous firms, a decrease in the fixed entry cost would lead to the entry of new - less productive and smaller - firms into the export market. In a similar framework, a decrease in the variable trade cost contributes to firm selection, but also increases the value of exports by variety. We may therefore expect that the adoption of the euro has contributed at the aggregate level to the export of new varieties to each eurozone partner, and to some extent to the increase in the value of exports by firm, depending on how the euro may have affected trade costs. More recently, [Bernard et al. \(2006\)](#) have developed a model of multi-product firms. In their model, a decrease in the variable trade cost induced by trade liberalization leads to firm selection into the export market, but also increases the number of goods that are exported by each firm³.

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²Paris School of Economics, Université Paris I and CEPII. Email: lionel.fontagne@univ-paris1.fr . We are indebted to participants to the HEI workshop "Trade and the Euro" held on January 12th 2008 in Geneva, for their helpful comments on a preliminary version of this paper. We also thank Matthieu Crozet for his advises on the database and his suggestions, and Agnès Bénassy-Quéré for her comments.

³The range of goods produced by each firm decreases while the proportion of goods that are exported is larger.

Potentially, the adoption of the euro may have generated a positive effect on French exports *via* a reduction in the volatility of the nominal exchange rate, but also *via* reduced fixed *or* variable trade costs, associated to the elimination of the cost of exchanging currencies. The adoption of the euro may have also increased price transparency, leading to greater competition and enhanced firm or product selection.

Testing those micro mechanisms requires to use highly disaggregated data. Using product-level trade data at the HS6 level - with around 5,000 product categories, [Baldwin and Nino \(2006\)](#) find some support for a New Goods hypothesis of the euro, while [Flam and Nordstrom \(2007\)](#) find some evidence that most of the effect of the euro goes through the extensive margin of trade, defined as the value of exports in products that are not continuously traded over time. However, the level of disaggregation of these data does not enable to investigate the effect of the euro on firms behavior.

In this paper, we use a unique database on French exports at the firm level, provided by the French customs. In our approach, we define a variety as a product category exported by a single firm. Using the French data, we build an intensive and extensive margins of French exports, that correspond respectively to the value of exports by variety, and the number of varieties exported to each destination country. For the descriptive statistics section of the paper, we also compute a multilateral extensive margin, that integrates a geographical dimension⁴. Our data cover the 1998-2003 period for French exports. The descriptive statistics indicate that overall, the variation of exports to eurozone partners over the period is proportionally more driven by the extensive margin. The empirical part of the paper also provides some support to the *New Variety* hypothesis of the euro. We find strong evidence that a reduced volatility of nominal exchange rate contributes to the increase in the number of varieties exported and to an increase in the value of exports by variety. Results also suggest that the euro had a positive effect on the number of varieties that are exported by French firms, consistent with a decrease in the fixed entry cost and enhanced competition leading to further firm and product selection on the export market.

The remaining of the paper proceeds as follows: Section 2 describes the data and provides a first piece of evidence using descriptive statistics; we develop our empirical strategy in Section 3; estimation results are provided in Section 4; finally, Section 5 concludes.

⁴Working with destination regions requires to take into account the number of destinations for each variety within a region.

2. A FIRST GLANCE AT THE DATA

2.1. Data sources and construction

We use individual data on French firms provided by the French Customs. Our dataset comprises all custom records at the firm, product and destination country level for the period 1998-2003. Hence we have only one year before the introduction of the euro. However, the dataset is large enough to study the dynamics of the euro introduction on trade flows over the recent period. Most importantly, the database enables to distinguish between the number of varieties that are exported to each destination market - the *extensive margin*, from the value of exports by variety - the *intensive margin*. It is worth noticing that the use of firm level data has the great advantage to enable the construction of export margins with a variety dimension, which is not the case with product level databases.⁵ *Within country pairs*, we define the extensive margin with a variety - product \times firm - dimension rather than with a simple firm dimension, since firms are likely to export several goods or product categories, as emphasized in Bernard et al. (2007). We therefore fully exploit the dimension of the database provided by the French customs. We come back later in this section on the construction of the intensive and extensive margins, and give some details on the construction of our database.

The database provided by the French customs classifies export flows at the firm level within the product categories of the Combined - 8 digit - nomenclature (CN8). We restrict our analysis to manufactured products, including agro-food. Accordingly, we drop all product categories that do not match ISIC-rev2 headings 311 to 390.⁶ This leaves us with all export flow data within 28 manufacturing industries.

Using the French data, we provide two methodologies to decompose the intensive and extensive margins of French exports, (i) within country pairs - export margins with a *bilateral dimension* - and (ii) within destination regions - export margins with a *multilateral dimension*. Note that the multilateral decomposition will be used in the descriptive statistics, while the bilateral decomposition will be used in the econometric part of the paper.

⁵For instance, the BACI (CEPII) or COMTRADE (UN) databases provide bilateral trade flow data with HS 6-digit classification; these databases therefore only enable a count of product categories that are exported at the bilateral level.

⁶We rely on the classification of HS6 positions - the first 6 digits of the CN8 - in ISIC headings, which is provided by the CEPII and is available on the CEPII website.

2.1.1. A decomposition of export margins within country pairs

We first detail how we compute the intensive and extensive margins of French exports for each destination country and industry. For this exercise, we use shipments from France to each destination market for each one of the 28 ISIC rev.2 manufacturing industries. We define the extensive margin of French exports to country j within industry k , as the number of product varieties exported to each destination country. We compute the extensive margin as follows:

$$E_{kjt} = N_{kjt} \times Z_{kjt}; \text{ with } Z_{kjt} = \frac{\sum_{n=1}^{N_{kjt}} m_{nkjt}}{N_{kjt}}$$

E_{kjt} is the extensive margin of exports to country j , in industry k , at time t ; N_{kjt} is the number of exporting firms indexed $n = 1 \dots N_{kjt}$ that export to country j ; Z_{kjt} is the average number of product categories exported by firm to country j and m_{nkjt} is the actual number of product categories exported by each individual firm indexed n to the same destination.

We define the intensive margin of French exports as the average value of shipments by variety to each destination country. We compute the intensive margin as follows:

$$I_{kjt} = \frac{\sum_{i=1}^{E_{kjt}} x_{ikjt}}{E_{kjt}}$$

I_{kjt} is the intensive margin of French exports to destination j , in industry k , at time t ; x_{ikjt} is the value of shipment for variety i . This decomposition of the value of French exports at the bilateral level is used in the econometric part of this paper.

2.1.2. A decomposition of export margins by destination region

Since we are interested in measuring the effect of the euro on trade, we identify a "treatment group", i.e. destination countries located inside the eurozone, and a control group in which we identify three destination regions. For the descriptive statistics part of the analysis, we rely on the definition of four destination region categories:

- The eurozone 13 less Greece and Slovenia (EZ thereafter: Belgium and Luxembourg⁷, Germany, Ireland, Spain, Italy, the Netherlands, Austria, Portugal, Finland);

⁷Belgium and Luxembourg are treated as a single country in our investigations, because of data restrictions at the beginning of the period.

- The rest of the EU15 less Greece (nonEZeU)⁸;
- The rest of Europe including the 12 enlargement countries, less Cyprus and Malta, plus Switzerland and Norway (nonEZeurope)⁹;
- The rest of the world (nonEZworld).

We also compute the intensive and extensive margins of French exports to each one of the four destination regions defined above, in order to build our descriptive statistics.¹⁰ Since we have several countries within each destination region, we need to refine the construction of the extensive margin to account for the fact that a single variety can be exported to several countries. We now use all the available information in order to better identify all the components of the extensive margin (E): the extensive margin can be defined as the product of the number of firms (N), the average number of products exported by firm (Z), and the average number of destination markets for each exported variety (G). As in the previous sub-section, the intensive margin (I) is defined as the average value of exports for each variety exported to a given destination j . The total value of exports (V) at time t can therefore be decomposed as follows for each destination region $R \in \{EZ; \text{nonEZeU}; \text{nonEZeurope}; \text{nonEZworld}\}$:

$$V_t^R = E_t^R \times I_t^R = N_t^R \times Z_t^R \times G_t^R \times I_t^R$$

Our decomposition includes all the dimensions of the multilateral extensive margin. In particular, we can isolate the geographical component (G) within our multilateral extensive margin.

2.2. What the Data Say

Before turning to the econometric part of the paper, we use the multilateral decomposition of the French export margins within destination regions, as defined above, to shed light on the effect of the euro on French export margins.

We start with the overall sample of sectors and destinations and decompose the total value of exports into a number of exporting firms and an average value of exports

⁸Note that the Danish Krona is linked to the euro *via* the ERM II mechanism, with +/- 2.25% fluctuations possibilities.

⁹Estonian currency was pegged to the DM until 1999, and is now pegged to the euro.

¹⁰Mauro Pisu and Laszlo Halpern, have replicated this methodology with Belgian and Hungarian firm-level data respectively; their results have been used for the forthcoming 2008 EFIM report.

Table 1: Descriptive Statistics, all destinations and industries

	1998	1999	2000	2001	2002	2003
Total value of exports (billions euros)	225	236	272	280	268	264
Market shares (10% largest exporters)	0.94	0.94	0.95	0.95	0.95	0.95
Nb of exporters	92,908	94,497	95,227	95,162	94,270	91,425
Average value by exporter (millions euros)	2.431	2.495	2.854	2.939	2.846	2.884
Average nb of shipments by exporter	18.03	18.21	18.68	18.75	18.47	18.39
Average value by shipment	134,827	137,020	152,732	156,756	154,091	156,843

by firm. We also compute the average number of shipments by firm¹¹, as well as the average value of export by shipment. Finally, we report the market share of the 10% largest exporters¹². All these statistics are provided in Table 1 for the period 1998-2003. The first striking fact is the extreme concentration of exports. Only few firms export. The 10 percent 'champions' concentrate 94 percent of the total value of French exports in 1998 and even 95 percent in 2003. This reproduces the stylized fact stressed by Mayer and Ottaviano (2007). The total number of firms rather tends to decrease over the period. One percent and a half of the total number of exporters have disappeared over the considered period; this tendency can be explained by mergers that occurred during the period¹³. We then compute the average number of shipments by each exporting firms. This number varies over time in a range of 18 to 19 shipments. Finally, results indicate that the average value of exports by firm, as well as the average value of exports by shipment, increases over time. Overall, French exports seem to have been driven both by the intensive and extensive margins over the period, with less firms exporting more product categories to more destinations, together with a larger value of exports by shipment.

In Table 2, we replicate the same exercise for each of the four destination regions defined in the previous section. Not surprisingly, *EZ* is the first destination of exports for French firms, with some 50 percent of the value of the shipments throughout the considered period. The concentration of exports is larger for *nonEZworld*; this feature can be related to higher fixed and variable costs of exports outside Europe, which only enable larger and more productive firms to enter. No clear difference in terms of concentration is observed within Europe across our three groups of destination. The value of exports by firm is much larger for the eurozone, and has been increasing quickly over the period that we consider. The number of shipments by firm is indeed larger within the eurozone, and even dominates the number of shipments by firm to the rest of the world. The value of exports by shipment is also large for exports to the *EZ*, but is dominated by the value of exports by shipment to the *nonEZeu* destination region.

In Table 3, we specifically use a decomposition of the total value of export flows into an extensive and an intensive margins, while still reporting all the components of the

¹¹ Which can also be considered as the number of varieties exported by firm if one considers a product exported to a single destination country as a variety.

¹² In terms of export sales.

¹³ Observing mergers however requires to have information on the financial linkages of firms. This question goes beyond the scope of our study.

Table 2: Descriptive statistics (cont'd) - all industries, by destination

	Total value of exports (billions)			Market shares (10% largest exporters)		
	EZ	nonEZeU	nonEZworld	EZ	nonEZeU	nonEZworld
1998	114	28.5	14.5	0.90	0.90	0.94
1999	121	30.3	15.8	0.91	0.90	0.94
2000	137	33.8	17.3	0.91	0.91	0.95
2001	137	34.7	18.6	0.90	0.90	0.95
2002	132	34.4	18.5	0.90	0.90	0.94
2003	133	31.8	18.8	0.91	0.90	0.95

	Nb Exporters			Value of exports by exporter (millions)		
	EZ	nonEZeU	nonEZworld	EZ	nonEZeU	nonEZworld
1998	45,388	22,272	36,156	2,511	1,277	0,402
1999	46,390	22,923	36,824	2,611	1,323	0,429
2000	46,571	23,127	37,642	2,939	1,462	0,459
2001	43,317	22,259	38,413	3,168	1,56	0,485
2002	41,749	21,582	38,489	3,166	1,594	0,48
2003	41,561	21,375	36,988	3,202	1,487	0,508

	Nb of shipments by exporter			Value of exports by shipment		
	EZ	nonEZeU	nonEZworld	EZ	nonEZeU	nonEZworld
1998	14.92	6.63	4.72	168,247	192,593	85,141
1999	15.43	6.95	4.79	169,190	190,415	89,422
2000	15.63	7.05	4.9	188,095	207,441	93,653
2001	16.57	7.26	4.92	191,251	214,961	98,652
2002	16.91	7.24	4.87	187,214	220,273	98,595
2003	17.33	7.31	4.72	184,773	203,499	107,525

extensive margin. In 1998, we have 316,354 varieties - $N \times Z$ - that are exported within the *EZ* region to 2.14 partners on average. This translates into an extensive margin of 677,272 shipments within the region, with an average individual value of 168,247 euros by shipment - i.e. the intensive margin. Overall, the product of the intensive and extensive margins gives a total value of exports by French firms within the *EZ* region of 113,95 billions euros that has been mentioned in the previous Table. Maybe the most important feature to highlight is that the data reveal that French exporters are typically multi-product firms, as suggested by Bernard et al. (2006) and Bernard et al. (2007); each firm however exports its products to very few partners on average¹⁴.

We also report the 1998-2003 percentage changes in the components of the extensive margin, as well as the percentage change in the intensive margin, in Table 3 and summarize the results in Figure 1¹⁵. We observe that the number of French exporters has declined in the eurozone, contributing negatively to the extensive margin of trade¹⁶. In contrast, the average number of varieties exported by firm, and the average number of destination markets by variety - within the *EZ* destination region - have both positively contributed to the extensive margin. Finally, the intensive margin shows a positive trend over the period. Turning to the nonEZeU partners, the descriptive statistics indicate that the pattern is similar, with slight differences. While the decrease in the number of exporting firms is smaller than for the *EZ* destination region, there has been no variation over the period in the average number of destination markets by variety. This can potentially be explained by the fact that the number of destination countries in nonEZeU is lower, which limits the potential for exporting existing varieties to new partners. The size of the destination region can therefore have an influence on our results. Overall, we notice a similar increase in the number of products exported to the eurozone and to nonEZeU; however the reduction in the number of exporters is more pronounced in the eurozone than in nonEZeU, which negatively impacts the extensive margin.

Exports towards the rest of Europe are characterized by a decrease in the number of varieties exported by firm, a slight increase in the number of exporting firms and

¹⁴Note that this result may be due to the fact that many - small - firms only export to one partner, while few large firms, the "happy few", export large amounts to a number of foreign partners.

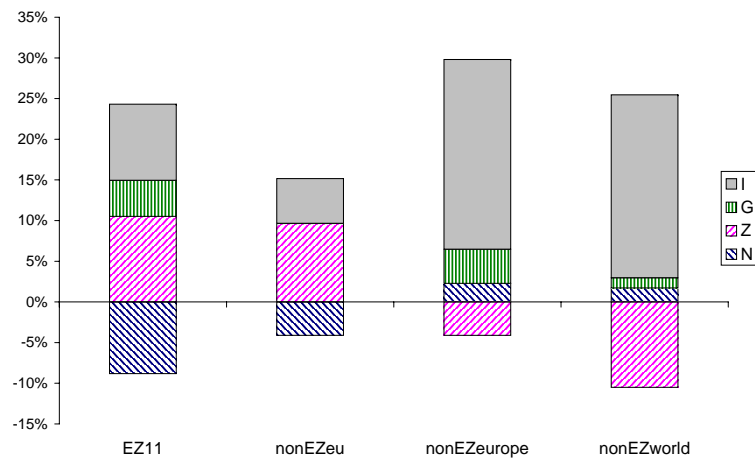
¹⁵Note that the negative variation in the number of firms over the period may be overestimated for the EU: the declaration threshold to the customs has indeed increased in 2001 and 2002, therefore leading to artificial exits of firms exporting small amounts.

¹⁶Note again that this tendency may be associated to mergers that occurred intensively within the EU during the period that we consider.

Table 3: Extensive and Intensive Margins of Trade - All manufacturing industries, all firms, by destination

	Levels in 1998					
	Nb exporters N	Nb products by firm Z	Nb destinations by variety G	Extensive E	Intensive I	
EZ	45,388	6.97	2.14	677,272	168,247	
nonEZeU	22,272	4.69	1.42	147,727	192,593	
nonEZeUrope	36,156	3.68	1.28	170,617	85,141	
nonEZworld	62,854	5.76	1.88	679,562	101,437	
Variation 1998-2003 (% variation)						
	N	Z	G	E	I	
EZ	-0.088	0.105	0.044	0.061	0.094	
nonEZeU	-0.041	0.096	0	0.055	0.055	
nonEZeUrope	0.023	-0.041	0.042	0.023	0.233	
nonEZworld	0.017	-0.105	0.013	-0.076	0.225	

Figure 1: Intensive margin and the components of the extensive margins: percent change 1998-2003

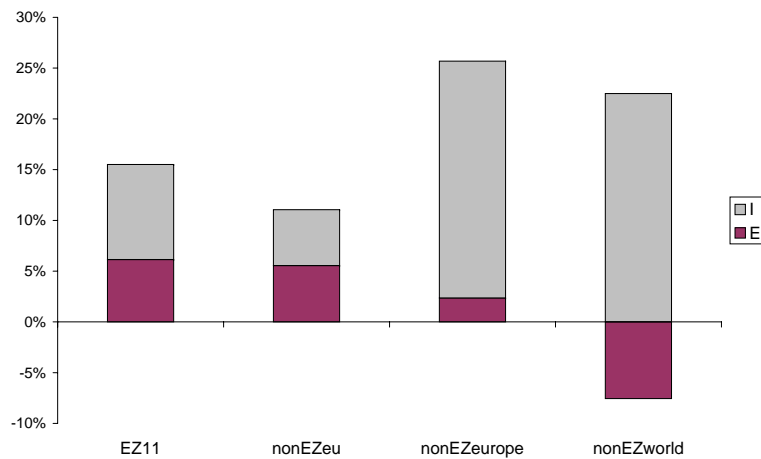


destination markets by variety, and a very large increase in the intensive margin. This pattern is similar and even amplified for exports to the rest of the world, with a very large decrease in the number of varieties exported to nonEZworld partners.

We summarize the variations in the extensive and intensive margins in Figure 2. From these descriptive statistics, it is obvious that the evaluation of the effect of the euro on the intensive and extensive margins of French exports margins highly depends on the choice of the control group. Considering all destination regions, the data indicate that French exports to EZ destinations have been proportionally more driven by an increase in the number of varieties exported, which tends to confirm a *new varieties effect* of the euro. If we restrict however the control group to the nonEZeU destination region, the picture is obviously less clear.

In the empirical part of the paper, our econometric methodology enables to isolate the effect of the euro on the two margins of French exports, by controlling in particular for factors such as EU membership that may generate endogeneity issues.

Figure 2: Extensive and Intensive Margins of trade: percent change 1998-2003



3. DATA AND EMPIRICAL STRATEGY

The descriptive statistics above suggest that if any, the euro has had a differentiated impact on the two margins of trade. We use the decomposition of the intensive and the extensive margins with the *bilateral dimension* - as defined above - in our empirical approach¹⁷. Note that our analysis is constrained though by the fact that we only have one year before the introduction of the euro. Our dataset also only contains export flows from France. Our estimates therefore refer to the effect of the euro on French exports to EZ partners, as compared to French exports to nonEZ partners. In our estimations, the effect of the euro may therefore be under-estimated, since we never refer to export flows from nonEZ to nonEZ countries in our control group¹⁸.

¹⁷We therefore have no geographical component in the extensive margin of exports to each destination country. The extensive margin is therefore defined as the number of varieties exported to each partner.

¹⁸Flam and Nordstrom (2003) indeed find some evidence of an effect of the euro on aggregate trade when the destination or the exporter is located outside the eurozone.

3.1. Empirical Strategy

We estimate two gravity equations with the intensive and extensive margins of French exports as the dependent variable. We follow Flam and Nordstrom (2003) and first investigate whether (i) there is an effect of euro on French exports beyond the elimination of the nominal exchange rate volatility, and (ii) this effect is changing over time. We estimate the following two equations:

$$\begin{aligned} \log(E_{kjt}) = & \alpha_1 EZ_{99} + \alpha_2 EZ_{00} + \alpha_3 EZ_{01} + \alpha_4 EZ_{02} + \alpha_5 EZ_{03} + \alpha_6 Vol_{jt} \\ & + \alpha_7 \log(rer_{jt}) + \alpha_8 \log(rgdp_{jt}) + \alpha_9 \log(dist_j) + \alpha_{10} contig_j + \alpha_{11} CL_j + \kappa_k + \kappa_t + \epsilon_{kjt} \end{aligned} \quad (1)$$

$$\begin{aligned} \log(I_{kjt}) = & \beta_1 EZ_{99} + \beta_2 EZ_{00} + \beta_3 EZ_{01} + \beta_4 EZ_{02} + \beta_5 EZ_{03} + \beta_6 Vol_{jt} \\ & + \beta_7 \log(rer_{jt}) + \beta_8 \log(rgdp_{jt}) + \beta_9 \log(dist_j) + \beta_{10} contig_j + \beta_{11} CL_j + \kappa_k + \kappa_t + \mu_{kjt} \end{aligned} \quad (2)$$

Where the EZ_{year} dummies are interaction terms between an EZ dummy variable - indicating whether the destination country belongs to the eurozone, and the 1999 to 2003 time dummies. Thus, for instance, EZ_{00} is equal to unity in 2000, if the destination country is a member of the euro area, and zero otherwise. Vol_{jt} is a measure of the nominal exchange rate volatility between the two currencies¹⁹. rer_{jt} is the real exchange rate between France and the destination country j , at time t ²⁰; $rgdp_{jt}$ is the real GDP in country j at time t ; $dist_j$ is the bilateral distance; $contig_j$ is a dummy variable equal to unity if the two countries are contiguous; CL_j is a dummy variable equal to one if the destination market is French speaking. Finally, κ_k and κ_t are respectively the industry and year fixed effects; ϵ_{kjt} and μ_{kjt} are the error terms.

We then complete our analysis by testing whether the introduction of the banknotes in 2002 had a positive effect on French export margins. The introduction of the banknotes may have indeed improved competition within the eurozone by promoting price transparency, which may have in turn resulted in further firms or products selection on the export market. We test this effect with a simple difference-in-difference

¹⁹We come back to the construction of this variable in the data section. Since the euro dummies and the volatility variable may be highly correlated, we also report estimation results without controlling for volatility in the Table 9 in the Appendix Section.

²⁰Thus, a higher rer_{jt} means a real appreciation of the French currency against partner's j currency.

approach, by introducing a dummy variable for exports to EZ countries over the 2002-2003 period. We then estimate two gravity equations over the 1999-2003 period. Each year is thus treated by the initial effect of the euro, and we can isolate the effect which is specific to the introduction in the banknotes.

$$\begin{aligned} \log(E_{kjt}) = & \alpha_1 EZ_{02-03} + \alpha_2 Vol_{jt} + \alpha_3 \log(rer_{jt}) + \alpha_4 \log(rgdp_{jt}) + \alpha_5 \log(dist_j) \\ & + \alpha_6 contig_j + \alpha_7 CL_j + \alpha_8 EZ + \kappa_k + \kappa_t + \epsilon_{kjt} \end{aligned} \quad (3)$$

$$\begin{aligned} \log(I_{kjt}) = & \beta_1 EZ_{02-03} + \beta_2 Vol_{jt} + \beta_3 \log(rer_{jt}) + \beta_4 \log(rgdp_{jt}) + \beta_5 \log(dist_j) \\ & + \beta_6 contig_j + \beta_7 CL_j + \beta_8 EZ + \kappa_k + \kappa_t + \mu_{kjt} \end{aligned} \quad (4)$$

Where EZ_{02-03} is a dummy variable which is equal unity for the period 2002-2003, if the trade partner is a member of the euro area - EZ, and zero otherwise. A positive coefficient on the EZ_{02-03} dummy variable would mean that there has been a positive effect of the introduction of the banknotes in 2002.

For each test related to the changing effect of the euro over time, or alternatively the effect of the banknotes, we complete the empirical investigation by introducing an EU15 dummy variable - $EU15_j$, in order to control for the fact that the effect of the euro on French exports is not driven by the belonging of the destination country to the European Union. We also use a within fixed effect estimator that controls for industry x country pair fixed effects in the estimation; this enables to control for reverse causality. Indeed, countries that intensively trade together have an incentive to reduce transaction costs and uncertainty related to the nominal exchange rate volatility. Consequently, part of the effect of the euro on trade may be due to this feature; controlling for country-pair fixed effects enables to treat this potential source of endogeneity²¹.

Finally, we propose some robustness checks at the end of the empirical section, by successively dropping the nonEZworld and nonEZeurope groups from the control group, as suggested by Baldwin (2006) and Flam and Nordstrom (2007). While there

²¹We report the estimation results with and without including the country pair fixed effects, since it dramatically reduces the number of degrees of freedom.

has been no further enlargement of the EU during the 1998-2003 period, EU policies that aim at driving a deeper integration within the EU may have led to a positive effect on intra-EU15 trade flows, that may be captured by the EZ dummies and lead to a biased estimate of the effect of the euro on French exports. Restricting the size of the control group to countries that have benefited from those policies should therefore enable to better capture the true effect of the euro.

3.2. Data

We use the trade data for individual French firms²² provided by the customs database for the period 1998-2003, and compute the French export margins - with a bilateral dimension - as described above. The data for bilateral distance, common language, and contiguity come from the CEPII. Data for real GDP come from the Penn World Tables.

We compute the volatility of the exchange rate as [Tenreyro \(2007\)](#), by taking, for each year in our sample, the standard deviation of the monthly variation of the nominal exchange rate:

$$Vol_{jt} = Std.Dev. \left(\frac{e_{jt,m} - e_{jt,m-1}}{e_{jt,m-1}} \right)$$

With $m = 1...12$. Vol_{jt} is the yearly volatility of the monthly nominal exchange rate of the French currency against the foreign currency.

We compute our bilateral real exchange rate variable using the producer prices of the exporter - France - and importer countries, in the domestic currencies. The data for producer price indices come from the International Financial Statistics (IMF) and the OECD. Note that the producer price index for China is not available from these sources; we use instead the PPI provided by the China Statistical Yearbook 2006 (National Bureau of Statistics China). We also use bilateral nominal exchange rates to compute our bilateral real exchange rate. All data related to nominal exchange rate come from the International Financial Statistics (IFS), and from the European Central Bank.

After having introduced all these controls into the equations to be estimated, we obtain a balanced panel that consists of 50 partner countries for 6 years. Controlling for

²²Within the EU, French customs collect information on the product (NC8 categories) exported by firms when the annual cumulated value of all shipments of a firm (in the previous year) is above 100,000 euros from 2001 onwards. This threshold was 99,100 euros in 2000 and 38,100 euros before. As regards extra-eu exports, all shipments above 1,000 euros are reported.

the bilateral real exchange rate considerably reduces the number of importing countries, due to data availability for the producer price indexes. However, we roughly cover 90 percent of the value of French exports throughout the considered period. We also have 25 ISIC industries in the final sample. We drop 3 industries - 314, 331 and 354 - in order to obtain a balanced panel; the actual number of observations for these three industries is indeed much reduced in the data. This leaves us with 7,500 observations. We provide a list of all destination countries in Table 8²³.

4. ESTIMATION RESULTS

4.1. Main Results

We first estimate equations (1) and (2) to investigate the time-variant effect of the euro, and report the results in Table 4. Using panel data with heterogeneous individuals requires to implement maximum likelihood techniques. In the first four columns of Table 4, we implement a random effects GLS, and control for industry and time fixed effects. Columns III and IV additionally includes an EU15 membership dummy variable, to control for the fact that a number of EU members may have adopted the euro because they actually intensively trade together. Finally, results reported in columns V and VI are obtained using a *a - within - fixed effect* estimator, which implies the use of industry x country-pair fixed effects, and additionally control for time fixed effects. This last methodology dramatically reduces the number of degrees of freedom, but enables to control for any source of reverse causality and auto-selection into the monetary union, as discussed in the previous section²⁴.

Results first indicate that the variables that are traditionally used in the gravity equation have the expected sign: bilateral distance has a negative effect on the number of varieties that are shipped to each industry, as well as on the average value of exports by shipment. Contiguity has a positive effect on the two margins. French exporters export a larger number of varieties to destination countries that share the same official language, but export a lower value of each variety to those countries. A possible interpretation is that sharing the same culture reduces the fixed cost to export, which

²³The restriction to 50 destination countries may introduce some bias in the results since we remove a large proportion of zeros from our dataset. Nevertheless, Helpman et al. (2007) show that most of the bias in estimating gravity equation comes from the absence of differentiation between the intensive and extensive margins, rather by the existence of zeros in bilateral trade matrices.

²⁴Since volatility is close to zero for the eurozone, we control in a robustness check reported in Appendix Section, Table 9, that the coefficients on the EZ dummies remain unaffected when volatility is excluded from the estimated equation.

Table 4: Trade effect of the euro, effect by year

Dep. var.	I	II	III	IV	V	VI
	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin
<i>EZ</i> ₁₉₉₉	0.102*** (0.017)	-0.035 (0.029)	0.060*** (0.016)	0.002 (0.03)	0.051*** (0.015)	0.018 (0.03)
<i>EZ</i> ₂₀₀₀	0.061*** (0.017)	-0.042 (0.031)	0.019 (0.016)	-0.005 (0.032)	0.033** (0.015)	0.037 (0.031)
<i>EZ</i> ₂₀₀₁	0.049*** (0.017)	-0.064** (0.029)	0.007 (0.016)	-0.027 (0.03)	0.011 (0.015)	0.003 (0.029)
<i>EZ</i> ₂₀₀₂	0.075*** (0.021)	-0.016 (0.035)	0.034* (0.02)	0.02 (0.037)	0.043** (0.02)	0.055 (0.036)
<i>EZ</i> ₂₀₀₃	0.221*** (0.022)	-0.076** (0.038)	0.178*** (0.021)	-0.039 (0.039)	0.189*** (0.022)	-0.004 (0.04)
<i>Volatility</i> _{jt}	-2.055*** (0.152)	-1.376*** (0.418)	-2.013*** (0.153)	-1.434*** (0.424)	-1.324*** (0.168)	-0.708 (0.439)
<i>RER</i> _{jt}	-0.088*** (0.012)	-0.018 (0.013)	-0.083*** (0.012)	-0.019 (0.013)	-0.351*** (0.065)	-0.340** (0.155)
<i>RGDP</i> _{jt}	0.587*** (0.017)	0.355*** (0.02)	0.537*** (0.017)	0.363*** (0.021)	1.328*** (0.086)	1.191*** (0.266)
<i>DIST</i> _j	-0.716*** (0.022)	-0.217*** (0.023)	-0.513*** (0.027)	-0.248*** (0.029)		
<i>Contig</i> _j	0.588*** (0.069)	-0.09 (0.065)	0.307*** (0.067)	0.125** (0.061)		
<i>CL</i> _j	0.598*** (0.062)	-0.04 (0.05)	0.938*** (0.066)	-0.090* (0.052)		
<i>EU15</i> _j			0.928*** -0.058	-0.160*** -0.054		
Nb observations	7350	7350	7350	7350	7350	7350
Estimation Method	RE	RE	RE	RE	FE	FE
Fixed effects	Industry & year	Industry & year	Industry & year	Industry & year	Ind x pair & year	Ind x pair & year

Note: Significance levels: *10%, **5%, ***1%. All variables - with the exception of dummy variables - are in logarithms. Robust standard errors in parentheses. RE stands for random effects GLS, FE stands for within fixed effect estimation.

enables to export new varieties but reduces the average value by shipment, by making smaller exporters to enter. For these three variables, the marginal effect is larger on the extensive margin, which may imply that bilateral distance, contiguity and the existence of a common language affect the fixed entry cost, and therefore the productivity cutoff that enables a firm to export a new variety. Finally, a real appreciation of the domestic currency in France has always a negative effect, at least on the extensive margin, while the real GDP of the destination country positively influences the two margins. Note that all results related to gravity variables are very consistent with the estimation results presented in Mayer and Ottaviano (2007), that use the same database.

Estimation results reported in column I point to a positive effect of the euro on the extensive margin of French exports, for each year consecutive to 1998. The positive effect however decreases until 2001 and then increases again until 2003. The Wald test on coefficients, reported in Table 10 in the Appendix Section, cannot reject the equality of coefficients on EZ_{2000} , EZ_{2001} and EZ_{2002} variables for the first column. While this effect may be associated to the evolution of the euro parity with regards to other major currencies over the period - with a weak euro in 2001 generating a trade diversion effect, results remain unchanged when we control for real exchange rate movements²⁵. The introduction of the EU15 dummy variable in column III does not qualitatively modify the results, even though it severely reduces the positive impact of the euro on the extensive margin. Finally, results from the estimation introducing industry x country-pair fixed effects reported in column V are consistent with those in columns I and III, suggesting a positive and exogenous effect of the euro on the extensive margin. Results on the intensive margin are also very clear: all coefficients on the euro time dummies are non-significant, or even negative in 2001 and 2003, in column II.

Results related to the volatility of the nominal exchange rate suggest a negative effect on both the intensive and extensive margins, with the exception of estimations using a within estimator in columns V and VI. We report estimation results without controlling for volatility in Table 9 of the Appendix Section. Results indicate that the coefficients on the euro dummies remain unaffected.

Overall, results suggest that Currency Unions may benefit to exports through the elimination of nominal exchange rate volatility, but also through reduced trade costs

²⁵Note that, as suggested previously, the evolution in the reporting thresholds imposed to exporting firms by the French customs may have an influence on our results, by statistically restricting the number of exporting firms to the EU15, especially by 2000.

and increased price transparency. While the effect related to nominal exchange rate volatility translates both into the number of varieties and the average value of shipments by variety, as suggested by Baldwin and Taglioni (2004), we find some evidence of an additional effect of the euro on trade that fully translates into the number of varieties that are traded. This result is consistent with a decrease in the fixed cost of trading across borders. It is also consistent with an increased competition within the euro area related to price transparency, generating new entries into the export market, with the form of new varieties. Note that the descriptive statistics suggest that the effect should be related to existing firms exporting more products to more partners, contributing positively to the extensive margin, while some exporting firms disappear during the period. Our findings can therefore also be related to the model developed by Bernard et al. (2006), who find that part of the adjustment consecutive to trade liberalization and a variation in trade costs operate on the number of goods exported by each firm.

We take the coefficients on the EZ_{2003} variable in the estimation of the two equations with the EU15 control - in column III - for our quantification exercise. We find that the difference between the number of varieties exported to EZ partners and non-EZ partners, has increased by 19.4% between 1998 and 2003.²⁶

We then test the impact of the introduction of the banknotes in 2002, and estimate equations (3) and (4) for the period 1999-2003 and report the results in Table 5. The results indicate that the coefficients on contiguity and common language are positive for the extensive margin, while the common language variable has a negative effect on the intensive margin. These results therefore remain extremely consistent with those presented in Table 4, with a larger effect of distance, contiguity and common language on the extensive margin. The coefficient on distance is always negative, as well as the coefficient on the real exchange rate - but only for the extensive margin, while the effect of the real GDP in the destination country is always positive.

Most importantly, the coefficient on the $EZ_{2002-2003}$ dummy variable in the Table is positive and highly significant for the extensive margin, and not significant for the intensive margin. This suggests that the increase in the price transparency related to the introduction of the banknotes has led to further firm or product selection on the export market. Results remain extremely stable when we introduce the EU15 control, and when we introduce the industry x country-pair fixed effects in columns V and VI of Table 5. This implies that the difference between the number of varieties

²⁶The marginal effect is computed as follows: $e^{0.178} - 1 = 0.194$

The Euro and the Intensive and Extensive Margins of Trade

Table 5: Trade effect of the euro, period 2002-2003.

Dep. var.	I	II	III	IV	V	VI
	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin
<i>Banknotes</i>	0.076*** (-0.013)	-0.004 (-0.024)	0.075*** (-0.013)	-0.004 (-0.024)	0.067*** (-0.014)	0.011 (-0.027)
<i>Volatility_{jt}</i>	-2.167*** (-0.179)	-1.947*** (-0.569)	-2.179*** (-0.18)	-1.951*** (-0.571)	-1.405*** (-0.195)	-2.211*** (-0.564)
<i>RER_{jt}</i>	-0.098*** (-0.012)	-0.018 (-0.013)	-0.089*** (-0.012)	-0.019 (-0.013)	-0.662*** (-0.078)	-0.03 (-0.02)
<i>RGDP_{jt}</i>	0.554*** (-0.017)	0.360*** (-0.02)	0.522*** (-0.018)	0.361*** (-0.022)	1.184*** (-0.108)	0.332*** (-0.026)
<i>DIST_j</i>	-0.596*** (-0.025)	-0.245*** (-0.026)	-0.513*** (-0.027)	-0.250*** (-0.031)		
<i>Contig_j</i>	0.231*** (-0.075)	0.166** (-0.067)	0.304*** (-0.074)	0.162** (-0.069)		
<i>CL_j</i>	0.824*** (-0.067)	-0.076 (-0.053)	0.928*** (-0.067)	-0.082 (-0.054)		
<i>EZ_j</i>	0.835*** (-0.059)	-0.225*** (-0.049)	0.133 (-0.088)	-0.188*** (-0.07)		
<i>EU15_j</i>			0.848*** (-0.091)	-0.045 (-0.08)		
Nb observations	6125	6125	6125	6125	6125	6125
Estimation Method	RE	RE	RE	RE	FE	FE
Fixed effects	Industry & year	Industry & year	Industry & year	Industry & year	Ind x pair & year	Ind x pair & year

Note: Significance levels: *10%, **5%, ***1%. All variables - with the exception of dummy variables - are in logarithms. Robust standard errors in parentheses. RE stands for random effects GLS, FE stands for within fixed effect estimation.

exported to EZ partners and nonEZ partners has increased by about 7.8% between the 1999-2001 and 2002-2003 periods²⁷. This effect should be interpreted as the effect of the euro on French exports, that is specifically related to the introduction of the banknotes. As in the previous Table, this result is independent of the effect of reduced volatility, but also independent from the initial effect of the euro on French exports in 1999, since we only keep the 1999-2002 period for the above estimations.

²⁷We take the coefficient on the banknotes dummy in column III: $\exp(0.075)-1=0.078$

4.2. Robustness

In this last exercise, we refine the analysis by restricting the size of the control group. This methodology enables to implicitly control for the fact that some time variant effect may affect the EZ countries as well as neighboring countries in the same way. In particular, EU policies that aimed at promoting the integration within Europe may introduce some bias in our results. We therefore successively drop from the control group the nonEZworld and nonEZeurope destination regions. Note that for this exercise, we keep the simplest form of the equation to be estimated, and only keep the real GDP of the destination country as well as bilateral distance as controls²⁸. We first provide the results of the robustness checks for the time effect of the euro in Table 6. Results indicate that most of the effect of the euro on the extensive margin disappears when we remove nonEZworld from the control group - only the 1999 and 2003 time dummies of the euro have a positive and significant coefficient, while the euro does not seem to have had a significant differentiated effect on the extensive margin when we only keep nonEZeU as the control group. These results are very consistent with [Flam and Nordstrom \(2007\)](#)²⁹, that indeed find that the effect of the euro on the extensive margin - defined by the number of product categories exported to a given partner - indeed disappears, when one restricts the sample of importing countries to EZ and nonEZeU countries. The effect of the euro on the intensive margin remains unaffected though.

We then test whether our result related to the introduction of the banknotes is stable to the restriction of the sample size. We report the results of estimations in Table 7. Results indicate that removing nonEZworld or nonEZworld and nonEZeurope from the control group leads to a non-significant differentiated effect of the introduction of the banknotes on the extensive margin.

All these results therefore indicate that the positive effect of the euro introduction on the extensive margin of French exports is influenced by the size of the control group. While we indeed find a positive effect of the euro introduction on exports to EZ partners, as compared to nonEZworld partners, the effect is ambiguous when we estimate the effect by only keeping European countries in the control group. These results could first be interpreted by the fact that the estimated positive effect of the

²⁸The real exchange rate, volatility, common language and contiguity variables are indeed extremely affected by the size of the sample of destination countries, since we only have France as the exporter. Keeping those controls for our robustness exercise would therefore lead to biased results.

²⁹See Table 2 of their paper.

Table 6: Time effect of the euro, restricting the control group

Control group Dep. var.	I all nonEZ		III nonEZeU, nonEZeurope		V nonEZeU	
	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin
EZ_{1999}	0.075*** (0.017)	-0.033 (0.029)	0.061*** (0.022)	-0.032 (0.038)	0.021 (0.026)	-0.034** (0.017)
EZ_{2000}	0.036** (0.016)	-0.036 (0.031)	0.01 (0.022)	-0.029 (0.039)	0.016 (0.024)	0.031 (0.02)
EZ_{2001}	0.02 (0.017)	-0.064** (0.029)	-0.026 (0.022)	-0.082** (0.039)	0.011 (0.027)	0.032 (0.02)
EZ_{2002}	0.071*** (0.021)	-0.001 (0.033)	-0.035 (0.027)	-0.07 (0.044)	0.021 (0.038)	-0.045** (0.022)
EZ_{2003}	0.208*** (0.023)	-0.068* (0.036)	0.054* (0.03)	-0.130** (0.054)	0.039 (0.042)	-0.110*** (0.025)
$RGDP_{jt}$	0.670*** (0.017)	0.369*** (0.019)	0.770*** (0.023)	0.354*** (0.022)	0.372*** (0.03)	0.376*** (0.065)
$DIST_j$	-0.883*** (0.02)	-0.248*** (0.019)	-1.054*** (0.069)	-0.364*** (0.057)	-1.000*** (0.084)	-0.373* (0.212)
Nb Observations	7350	7350	3000	3000	1650	1650
Estimation Method	RE	RE	RE	RE	RE	RE
Fixed effects	Industry & year	Industry & year	Industry & year	Industry & year	Industry & year	Industry & year

Note: Significance levels: *10%, **5%, ***1%. All variables - with the exception of dummy variables - are in logarithms. Robust standard errors in parentheses. RE stands for random effects GLS.

euro actually captures the positive effect of an overall European integration. Indeed, even if there has been no further enlargement during the 1998-2003 period, policies that aimed at promoting a deeper integration within the EU may have led to a positive effect on the extensive margin of French exports, which would lead to a biased estimated effect of the euro on trade.

Flam and Nordstrom (2007) and Baldwin (2006) also suggest that there is a positive effect of the euro for trade from EZ to nonEZ countries. This effect can therefore potentially explain why the effect of the euro on the extensive margin progressively disappears when we restrict the size of the control group. Indeed, if the euro had a positive effect on exports between EZ and nonEZ countries, this may especially have affected exports to nonEZ neighboring countries. Baldwin (2006) indeed suggests that the effect of the euro on exports should be the highest when trade costs are also lower.

Table 7: Effect of the banknotes, restricting the control group

Control group Dep. Var.	I all nonEZ		III nonEZeU, nonEZeurope		V nonEZeU	
	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin
<i>Banknotes</i>	0.095*** (-0.013)	0.01 (-0.025)	-0.01 (-0.017)	-0.051* (-0.031)	0.014 (-0.024)	0.026 (-0.039)
<i>RGDP_{jt}</i>	0.611*** (-0.018)	0.379*** (-0.02)	0.651*** (-0.023)	0.379*** (-0.021)	0.385*** (-0.031)	0.463*** (-0.025)
<i>DIST_j</i>	-0.742*** (-0.025)	-0.273*** (-0.025)	-1.014*** (-0.069)	-0.359*** (-0.06)	-0.956*** (-0.087)	-0.267*** (-0.069)
<i>EZ_j</i>	0.763*** (-0.057)	-0.141*** (-0.044)	0.671*** (-0.049)	-0.143*** (-0.04)	0.184*** (-0.067)	-0.085 (-0.066)
Nb observations	6250	6250	2625	2625	1375	1375
Estimation Method	RE	RE	RE	RE	RE	RE
Fixed effects	Industry & year	Industry & year	Industry & year	Industry & year	Industry & year	Industry & year

Note: Significance levels: *10%, **5%, ***1%. All variables - with the exception of dummy variables - are in logarithms. Robust standard errors in parentheses. RE stands for random effects GLS.

Two last limitations are associated with the peculiar nature of our database. Firstly, we only have one year before the introduction of the euro. Secondly, we cannot control for export flows between nonEZ to nonEZ countries, since we only have France as the exporter. This may therefore reduce our estimated effect of the euro on the intensive and extensive margins. Nevertheless, our results clearly suggest that the effect of the euro on French exports, if any, translates into the extensive margin.

5. CONCLUSION

This paper contributes to the recent literature that aims at measuring the effect of the adoption of the euro on trade. Using French firm-level data, we show that the effect of the euro mainly translates into the extensive margin, i.e. the number of varieties that are exported to euro area members, while the intensive margin, i.e. the average value of shipments by variety, does not seem to be affected. According to our estimations, the difference between the number of varieties exported to EZ partners and non-EZ partners, has increased by 19.4% between 1998 and 2003; we also estimate the effect specific to the introduction of the banknotes at 7.8%.

Those results are very consistent with the view that reduced fixed costs enables to export new varieties, as suggested by [Melitz \(2003\)](#), while increased transparency may have generated a larger competition within the eurozone, therefore contributing to the selection of firms. Nevertheless, the descriptive statistics suggest that the effect translated into more products exported by each firm rather than by an increase in the number of exporting firms. Our contribution can therefore be related to the model of multi-product firms proposed by [Bernard et al. \(2006\)](#). We also find that nominal exchange rate volatility has a negative effect on both the extensive and intensive margins, which is also consistent with the theoretical approach proposed by [Baldwin and Taglioni \(2004\)](#). Finally we find that results are conditioned to the choice of the control group, the effect of the euro indeed disappears when we restrict the control group to EU15 non-eurozone member countries. A pessimistic interpretation of this last result would conclude that the effect captured by the euro dummies actually reflect other reduction of trade costs related to European integration as a whole. An optimistic view would conclude to a "spillover effect" of the euro on neighboring countries, as suggested by [Baldwin \(2006\)](#).

Overall, this paper considerably improves the estimation of the micro effects of euro adoption on trade, by making use of a unique database on firm-level exports.

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APPENDIX

Table 8: List of Destination Countries

Argentina	Japan
Australia	Korea
Austria	Lithuania
Belgium and Luxembourg	Latvia
Brazil	Mexico
Canada	Malaysia
Switzerland	Netherlands
Chile	Norway
China	New Zealand
Columbia	Peru
Czech Republic	Philippines
Germany	Poland
Algeria	Portugal
Egypt	Singapore
Spain	El Salvador
Estonia	Slovakia
Finland	Slovenia
United Kingdom	Sweden
Hong Kong	Thailand
Croatia	Tunisia
Hungary	Turkey
Indonesia	Uruguay
India	United States
Ireland	Venezuela
Italy	South Africa

Table 9: Trade effect of the euro, effect by year. No control for volatility

Dep. var.	I	II	III	IV	V	VI
	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin	Extensive Margin	Intensive Margin
<i>EZ</i> ₁₉₉₉	0.084*** (0.017)	-0.042 (0.029)	0.040** (0.016)	-0.009 (0.03)	0.040*** (0.015)	0.012 (0.03)
<i>EZ</i> ₂₀₀₀	0.048*** (0.017)	-0.044 (0.031)	0.002 (0.016)	-0.011 (0.032)	0.033** (0.015)	0.039 (0.03)
<i>EZ</i> ₂₀₀₁	0.031* (0.017)	-0.072** (0.029)	-0.013 (0.016)	-0.039 (0.03)	0.004 (0.015)	-0.002 (0.029)
<i>EZ</i> ₂₀₀₂	0.079*** (0.022)	-0.01 (0.035)	0.034* (0.02)	0.023 (0.037)	0.046** (0.02)	0.055 (0.036)
<i>EZ</i> ₂₀₀₃	0.209*** (0.023)	-0.078** (0.037)	0.163*** (0.022)	-0.046 (0.038)	0.172*** (0.022)	-0.013 (0.04)
<i>RER</i> _{<i>jt</i>}	-0.119*** (0.013)	-0.022* (0.012)	-0.110*** (0.012)	-0.023* (0.012)	-0.634*** (0.059)	-0.493*** (0.133)
<i>RGDP</i> _{<i>jt</i>}	0.629*** (0.018)	0.364*** (0.021)	0.569*** (0.018)	0.372*** (0.022)	1.460*** (0.085)	1.261*** (0.275)
<i>DIST</i> _{<i>j</i>}	-0.728*** (0.023)	-0.239*** (0.024)	-0.517*** (0.028)	-0.266*** (0.03)		
<i>Contig</i> _{<i>j</i>}	0.665*** (0.071)	0.108* (0.063)	0.348*** (0.068)	0.142** (0.06)		
<i>CL</i> _{<i>j</i>}	0.552*** (0.062)	-0.085* (0.048)	0.908*** (0.065)	-0.129** (0.051)		
<i>EU15</i> _{<i>j</i>}			0.996*** (0.058)	-0.140*** (0.051)		
Nb observations	7350	7350	7350	7350	7350	7350
Estimation Method	RE	RE	RE	RE	FE	FE
Fixed effects	Industry & year	Industry & year	Industry & year	Industry & year	Ind x pair & year	Ind x pair & year

Note: Significance levels: *10%, **5%, ***1%. All variables - with the exception of dummy variables - are in logarithms. Robust standard errors in parentheses. RE stands for random effects GLS, FE stands for within fixed effect estimation.

Table 10: Wald test for equality of parameters on EZ time dummies

Test on parameters from Table 4, column I			
Variables	<i>Chi2</i>	<i>Prob > chi2</i>	<i>Equality</i>
<i>EZ</i> ₂₀₀₁ & <i>EZ</i> ₁₉₉₉	11.53	0.001	No
<i>EZ</i> ₂₀₀₁ & <i>EZ</i> ₂₀₀₀	0.60	0.438	Yes
<i>EZ</i> ₂₀₀₁ & <i>EZ</i> ₂₀₀₂	1.82	0.177	Yes
<i>EZ</i> ₂₀₀₁ & <i>EZ</i> ₂₀₀₃	66.24	0.000	No

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