The Euro Effect on Bystanders

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Abstract
This paper investigates trade effects of the euro focusing on the impact on bystanders. A common currency is expected to lower both variable and fixed trade costs, inducing increased trade flows between currency-union members on both intensive and extensive margins of trade. While this trade-creating effect has gained attention in recent work using firm-level data, few studies have looked on the possible trade-diverting effect for firms remaining outside. In this paper, we use data for Swedish manufacturing firms covering the 1997-2006 period in order to assess the trade-diverting effects of the euro on Swedish exports. We consider variations in the impact of the euro taking both firm, industry and export-market characteristics into account. Our preliminary results suggest that there are trade-diverting effects on the intensive margin and that the negative effects of the euro on trade flows are stronger for exports to less remote countries within the Eurozone.

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1. Introduction

The aim of the euro was to achieve deeper European integration and, as a single currency will reduce transaction costs and exchange rate volatility, economic benefits on trade and also investment was expected. There is a large number of studies that have tried to assess the impact of the euro on trade flows (and investment) among the eurozone countries. The results from these studies tend to confirm a positive effect on trade although the magnitude of this effect varies widely across studies (reference). From an European integration perspective, it is particularly interesting that not all EU member countries have adopted the euro. The effects of the euro on these bystanders have, however, gained much less attention in the literature.

The purpose of this paper is to fill this gap and study the euro’s effect on bystander firms’ exports to the Eurozone countries. The paper follows the, by now, standard heterogeneous-firm model of the micro patterns of international trade and investigates the impact on both firms’ intensive (the volume of export sales by existing exporters) and extensive (non-export firms becoming exporters) margins (reference). In a theoretical setting based on Chaney (2008), we start by identifying the asymmetric effects on outside firms’ exports to the deeper integration area consisting of the Eurozone countries. We then try to assess these effects empirically making use of firm-level data for Swedish manufacturing firms covering the period 1997-2006.

Contrary to the few existing studies on the subject, we find evidence of trade diversion for Swedish firms exporting to the Eurozone. This trade diversion effect is only found on the intensive margin suggesting that….. In line with the theoretical setting we also find that the negative effect of the euro on trade flows is stronger for exports to less remote countries within the Eurozone.

The paper contributes to the existing literature by

The paper is organized as follows. Section 2 discusses how a single currency is expected to affect trade flows and reviews related studies. Section 3 provides the theoretical setting by demonstrating the firm’s export decision and the effects on bystanders. The empirical
methodology and data are described in section 4 while section 5 presents the empirical results. Section 6 concludes.

2. The euro and trade effects

One main channel through which a currency union such as the euro is expected to affect trade is by a reduction in trade costs among the Eurozone countries. Removing trade costs associated with trading in different currencies and exchange rate uncertainty is likely to have an overall positive impact on trade within the union. In the framework by Melitz (2003), this trade creating effect may be observed on two margins: the intensive margin where trade volumes increase by existing firms as product prices decrease, and the extensive margin where the number of trading firms increases as the productivity threshold to enter the export market is lowered.

With a common currency leading to a fall in trade costs among the Eurozone countries, trade diversion effects are also possible. A fall in trade (fixed and/or variable) costs between the countries implementing the euro decreases the perceived price on these countries’ markets. This will have a negative impact on firms located outside, but exporting to, the Eurozone. If the costs for outsiders to reach the Eurozone remain unchanged after the euro’s implementation, outsiders’ exports will become relatively more costly on the euro markets suggesting trade diversion effects on the intensive margin of trade. This effect may be further strengthened on the aggregated level by a fall in the extensive margin of trade as well. In particular, a fall in the perceived price within the Eurozone increases the productivity threshold of outside exporters as they will meet more competition. The probability of exporting to the Eurozone therefore falls and we would expect fewer outside firms exporting to the Eurozone.\(^1\)

\(^1\) It could be questioned whether trade costs facing outside firms exporting to the euro zone are unchanged by a deeper integration. After all, the same currency can be used on a larger market inducing trade costs with the euro zone to fall which may counterbalance the expected trade diversion. This effect, however, should be secondary compared to the fall in trade costs within the euro zone and expected to be minor since outside firms still face costs of exchange and option values (!).
3. Firms’ export decision

Our point of departure when it comes to firms’ export decision is the model of heterogeneous firms in international trade, which extends the new trade theory (see Helpman and Krugman, 1985) by introducing heterogeneity in firm costs or productivity and sunk cost of exporting (see Melitz, 2003; Helpman et al., 2008; Chaney, 2008). Heterogeneity implies that the price of a firm falls with productivity so that the demand for its unique variety increases. In addition, a domestic firm may serve a foreign market as long as it covers the fixed cost of exporting, which implies that it will only serve a market as long as exporting is profitable. Firms’ therefore select themselves into export activities, and whether a firm choose to export to market \( j \) depends both on its productivity level and the costs of exporting to that particular market. If we use the approach and the notation of Chaney (2008), then we could base each firm’s export decision on three equations. The first one shows country \( j \)'s demand of a variety produced by a firm \( \phi \) located in country \( i \):

\[
x_j(\phi) = p_j(\phi)q_j(\phi) = \mu Y_j \left( \frac{p_j(\phi)}{P_j} \right)^{\gamma - \sigma},
\]

where \( \phi \) is the randomly drawn (Pareto distribution with the shape parameter \( \gamma \)) labour productivity of the firm (this also defines the firm since it is firm specific), \( \mu \) stems from the utility function and tells us the share of income devoted to manufactures, \( p \) is the price of the firm’s variety in country \( j \) (including production and transport costs), \( P \) is the ideal price index in the importing country \( j \), and \( \sigma \) is the elasticity of substitution between varieties of manufactures. The ideal price index is in turn a function of the price of all the goods consumed in \( j \) and hence it will be affected by the cost of supplying its consumers with the varieties produces around the world. Hence it is represented by the following equation:

\[
P_j = \left[ \sum_{k \neq i} N_k \int_{\phi_i}^{\infty} \left( \frac{\sigma}{\sigma - 1} \frac{w_k T_{kij}}{\phi} \right) G(\phi) \right]^{\gamma/(1-\sigma)},
\]
where $w_k$ is the wage level (or the productivity level) of country $k$, $L$ is the country size (i.e. the number of workers), $\tau$ is the variable trade cost between $j$ and $k$, $G(\varphi)$ is the distribution of productivity in manufactures, and $\overline{\varphi}_{ij}$ is the productivity threshold for exporting firms. The threshold for exporting is in turn defined by:

$$\overline{\varphi}_{ij} = \left[ \left( \frac{\sigma}{\mu} \right)^{1/(\sigma-1)} \left( \frac{\sigma}{\sigma - 1} \right) \left( \frac{w_{ij}}{Y_j} \right)^{1/(\sigma-1)} \right],$$

where $f$ is the fixed costs of establishing oneself on the foreign market. Chaney (2008) uses the productivity threshold in order to establish the equilibrium price index, which is then plugged into the demand equation in order to find the equilibrium export of one firm located in $i$ to country $j$. The expression becomes:

$$x_{ij}(\varphi) = \begin{cases} \lambda \left( \frac{Y}{Y_j} \right)^{(\sigma-1)/\nu} \left( w_{ij} \tau_{ij} \right)^{1-\sigma} \left( \theta_j \right)^{(\sigma-1)} \varphi^{(\sigma-1)}, & \text{if } \varphi > \overline{\varphi}_{ij}, \\ 0 & \text{otherwise} \end{cases}$$

$$\overline{\varphi}_{ij} = \nu \left( \frac{Y}{Y_j} \right)^{1/\nu} \left( \frac{w_{ij} \tau_{ij}}{\theta_j} \right)^{1/(\sigma-1)}$$

$$\left( \theta_j \right)^{-\gamma} = \sum_{k=1}^{N} \left( \frac{Y_k}{Y} \right) \left( w_{kj} \tau_{kj} \right)^{-\gamma} \left( f_{kj} \right)^{-\left(\gamma/(\sigma-1)\right)}$$

where $\lambda$ and $\nu$ are constants (see Chaney, 2008, for details), $Y$ is the income of $j$ or the world (indicated by the lack of a subscript), and $\theta$ is an aggregated index of importer $j$’s remoteness (see also Anderson and van Wincoop, 2003) in relation to the rest of the world (the more costly it is to reach $j$, the more remote is $j$).\(^2\)

The implication of equation (4) is that the exports of firm $\varphi$ to country $j$ depends on whether the firm actually could establish itself on that market due to both the irreversible fixed costs and the variable trade costs of exporting. If the firm establish itself on market $j$, then it has to

\(^2\) Note that $\gamma$ is assumed to be larger than $(\sigma-1)$, and it is an inverse measure of heterogeneity.
decide how much it will export. Both these trade margins (the extensive and the intensive respectively) are not only affected by the bilateral trade costs between the exporter and the importer since the demand for a particular variety produced in country $i$ depends on the general openness of the importing country, which is captured by $\theta$.

### 3.1 The bystander effect

In our analysis, the relationship between the exporting country $i$ (Sweden) and the importer $j$ (other European countries) is unchanged so that both $dt_{ij}$ and $df_{ij}$ equal zero. If, however, some of the importing countries $j$ initiate a deeper integration (e.g. by the euro), then Swedish firms will face a trade shock even if the bilateral trade costs between Sweden and these countries are unchanged. The reason for this is that the integration process makes these countries less remote from a Swedish perspective and hence the demand for Swedish exports falls. First, the intensive margin of an exporting firm in $i$ falls since consumers divert their demand towards relatively cheaper import from members of the same integration area. Secondly, the increased competition from a shrinking foreign market implies that some relatively unproductive firms face a loss and hence exit market $j$ and the threshold level of productivity increases. These effects may be traced by focusing on the impact of a change in trade costs between $k$ and $j$ while the relationship between $i$ and $j$ is unchanged:

\[
\frac{\partial x_{ij}}{\partial \tau_{kj}} x_{ij} = (\sigma - 1) \frac{\tau_{kj}}{\theta_j} \frac{\partial \theta_j}{\partial \tau_{kj}} > 0, \quad \frac{\partial x_{ij}}{\partial f_{kj}} x_{ij} = (\sigma - 1) \frac{f_{kj}}{\theta_j} \frac{\partial \theta_j}{\partial f_{kj}} > 0
\]

\[
\frac{\partial \bar{\theta}_j}{\partial \tau_{kj}} = \frac{\tau_{kj}}{\theta_j} \frac{\partial \theta_j}{\partial \tau_{kj}} < 0, \quad \frac{\partial \bar{\theta}_j}{\partial f_{kj}} = \frac{f_{kj}}{\theta_j} < 0
\]

which shows different elasticities of $j$'s import demand from $i$ as costs between another exporter $k$ and $j$ changes. This change in demand of $i$'s export may be miniscule if only $k$'s trade costs changes, but if we allow a larger set of countries to integrate, then the full effect on $i$'s exports ($E$) and on the threshold ($D$) to $j$ becomes:

\[
E_j = (\sigma - 1)\theta_j^{-1} \sum_{k \in EMU} z_{kj} \frac{\partial \theta_j}{\partial z_{kj}} > 0, \quad D_j = \theta_j^{-1} \sum_{k \in EMU} z_{kj} \frac{\partial \theta_j}{\partial z_{kj}} < 0
\]
where $z$ is either $\tau$ or $f$, and Eurozone is the set of countries forming a deeper integration area. If we assume that the initial level of trade costs between $k$ and $j$ and that the sum of the marginal effects of $z$ on $j$’s remoteness are the same for all countries in the deeper integration area, then the impact on the bystander only varies across trade partners due to a variation in the remoteness of $j$. Hence we expect an asymmetric effect so that the negative impact on a bystander (lower intensity in exports and a higher productivity threshold leading to a lower propensity for exporting) is reduced by the remoteness of the importer.

4. Empirical specifications

Our benchmark specification of the gravity equation is based on equation (4):

$$
\ln x_{jt} = \left(\frac{\sigma - 1}{\gamma}\right) \ln GDP_{jt} + (\sigma - 1) \ln \theta_j + \\
+ (\sigma - 1) \ln TFP + E_{jt} + \mu_j + \tau + \lambda \Phi_{jt} + \varepsilon_{jt}, 
$$

(7)

where $x_{jt}$ is the export volume of firm $f$ to importer $j$ at time $t$, GDP is the Gross Domestic Product of the importer, $\theta_j$ is the remoteness variable (calculated as $\theta_j = \sum_i d_{lj} / Y_i$, where $d_{lj}$ is the distance between country $l$ and $j$ and $Y$ is the GDP), TFP is the Total Factor Productivity (measured as in Olley and Pakes, 1997), $E_{jt}$ is an indicator of Eurozone membership (1 after 1999 if $j$ is a Eurozone member, 0 otherwise), $\mu$ and $\tau$ are fixed effects capturing firm-importer and time invariant trade costs and omitted variables or measurement errors, $\Phi_{jt}$ is the correction term in order to control for the selection bias. $^3$

The estimation of equation (7) is based on the approach of Wooldrige (1995, 2002) for linear panel data with sample selection using a Probit form selection equation. That is, we use a Mundlak approach in order to capture fixed effects and hence run a Probit regression of $z_{jt}(1$ if $x_{jt}>0)$ on $\ln z_{jt}$ and $\ln z_{jt}$ (i.e. the mean of $z_{jt}$) for each year. $^4$ The mills ratio ($\Phi_{jt}$) is then used as the correction term in equation (7).

$^3$ See Table A1 for variable definitions and sources.

$^4$ The variables in $z$ are the same as in equation (7) plus....
The next step is to investigate the extensive margin of trade and whether the euro have an impact on the probability of export participation, which we expect should be the case since a less remote importer (due to Eurozone country) implies that the threshold productivity level increases. Our approach is, as in Bastos and Silva (2012), to examine the probability of a firm to export to a particular country based on the conditions in equation (4):

\[
P[x_{ijt} > 0] = P\left(\ln \frac{\varphi}{\gamma} + \ln Y_j + \ln \theta_j - \ln(w_jT) - \frac{1}{(\rho - 1)} \ln f_{j} > 0\right),
\]

\[
P[x_{ijt} > 0] = P\left(\beta_1 \ln TFP + \beta_2 \ln GDP_j + \beta_3 \ln \theta_j + \mu_j + \tau_i + \eta_{jft}\right)
\]  

(8)

where \(\eta_{jft}\) is the error term and the other variables are defined as above. The export participation equation (8) is estimated using a Linear-Probability Model (LPM) fixed effect model as in Bastos and Silva (2012) since it allows us to capture unobserved firm-importer effects without facing the problems of incidental parameters problem, which may be a problem in a probit. In addition, the LMP gives a “good estimates of the partial effects on the response probability near the centre of the distribution” of the independent variables (Wooldridge, 2002, p. 455), which is our purpose.

4.1 Data

Our firm-level data is provided by Statistics Sweden and consists of an unbalanced panel of 3,601 firms in the manufacturing sector covering the period 1997 until 2006. For all years we have detailed information for each firm on its output, choice of factor inputs, details of its ownership structure and most importantly on export volumes to each export destinations. When it comes to the number of export destinations, then we limit our sample to 31 high-income OECD countries in order to have a relevant group of comparison. Hence the balanced panel of potential export activities for each year is over 100,000 but only 28 per cent of these are actually activated. A detailed definition of variables used can be found in Table 1.  

The stylised facts of firm export behaviour match those in other countries and industry

\(^5\) Note that we only consider firms that exist for at least two sequential years and firms that have at least 20 employees.
settings. For example, we find that exporters are more productive and larger than non-exporters. We do also find a positive correlation between the export volumes of exporters and the gravity of the importer (GDP/distance), the productivity of the firm and the size of the firm measured as the number of employees.

[Table 1 about here.]

[Table 2 about here.]

5. Empirical results

[Table 3 about here.]
[Table 4 about here.]

6. Conclusions

To be written

References
Tables

Table 1: Definitions and sources

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td><strong>Firm level</strong></td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td>Total factor productivity defined and calculated as in Olley and Pakes (1996).</td>
</tr>
<tr>
<td>Employees</td>
<td>Number of employees in full-year-equivalents.</td>
</tr>
<tr>
<td>Capital stock</td>
<td>The capital stock is calculated by the perpetual method using book value the first year. Depreciation rate for equipment and for buildings are 0.1 and 0.05 respectively.</td>
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<tr>
<td>Physical capital intensity</td>
<td>Capital stock (see above) per employee.</td>
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<tr>
<td>Human capital intensity</td>
<td>The share of employees with university degree.</td>
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<td><strong>Destination level</strong></td>
<td></td>
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<tr>
<td>GDP</td>
<td>Gross domestic product (constant prices) from CEPII</td>
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<tr>
<td>Population</td>
<td>The population stem from CEPII</td>
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<tr>
<td>Distance</td>
<td>The distance is calculated as ... and stem from CEPII.</td>
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Table 2: Descriptive figures (all firm-time-export destination observations)

Table 3: The intensive margin

Table 4: The extensive margin
Appendix