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# Does the Common Currency Increase Exports? Evidence from Firm-Level Data

## Abstract

The main goal of this paper is to investigate empirically whether the adoption of the common currency increases the export activity of individual firms using the probit model. There are many studies that seek to estimate the aggregate trade effects of the adoption of the euro by the "old" EU countries, which are based on the gravity model. In contrast to the existing literature we use an alternative micro-econometric approach based on firm-level data compiled by the EBRD and the World Bank. We demonstrate that the propensity to export of individual firms from Slovenia and Slovakia increased after the accession of those countries to the Eurozone.

**Keywords:** Export, Eurozone, firm-level data
**JEL:** F12, F14, F33

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## Introduction

The accession to the Eurozone should have important consequences for the trade flows of accessing countries. The standard argument is that a reduction in transaction costs due to the elimination of exchange rate risk should stimulate the exports of existing firms and encourage non-exporters that previously operated only in their domestic markets to start exporting. It is argued that the reduction of transaction costs is important for countries that are characterized by the concentration of their trade with one large trading partner or a group of countries using the same currency. This is exactly the case for new EU member states (NMS) from Central and Eastern Europe (CEE) for which Germany is the main trading partner, and more than 50 per cent of their trade takes place with the members of the Eurozone.

The NMS must eventually join the Eurozone, however the majority of them have not yet introduced the common currency. Accession to the Eurozone requires fulfillment of the Maastricht convergence criteria. One of those criteria (related to accession) is the exchange rate mechanism (ERM II). Estonia, Lithuania and Slovenia joined the ERM II at the time of their accession to the EU in June 2004, Cyprus, Latvia and Malta did so in May 2005, while Slovakia did so in November 2005. Larger NMS, such as Bulgaria, the Czech Republic, Hungary, Poland and Romania, despite their declarations to adopt the, euro have not joined the ERM II thus far.[1]

Slovenia was the first country to join the Eurozone in January 2007. Cyprus and Malta joined the Eurozone in January 2008, Slovakia in January 2009, Estonia in January 2011, and Latvia in January 2014. Lithuania is expected to do so in 2015. Therefore, it is possible to analyze ex post the direct effects of the euro adoption for trade flows for two NMS for which data is available: Slovenia and Slovakia.

According to the empirical studies based on aggregate data the trade flows among the old members of the EMU have grown on average by 10–15% due to the use of a common currency [Baldwin *et al*., 2005; Rose and Stanley, 2005]. However, evidence for the NMS is much less robust [Cieślik *et al.,* 2012a, b, c]. The empirical evidence based on the firm-level data on the trade consequences of the euro adoption is still rather scarce and, in particular, evidence for the NMS is still missing.

The primary goal of this paper is to evaluate the *ex post* effects of the accession of new EU member countries to the European Economic and Monetary Union (EMU) on the export performance of their firms. In our study we focus on two Central European countries: Slovakia and Slovenia, which are the new EU member countries that have so far adopted the euro. Unfortunately, we cannot extend our analysis to include Estonia due to the lack of data covering the period after the Eurozone accession.

To evaluate these effects we use a probit estimation, based on the Melitz [2003] model and firm-level data. In addition to the use of firm-level data we also control for country

characteristics such as size and the level of development that may affect the firms' propensity to export. This study will help in understanding whether and by how much the adoption of the euro contributed to firms' export performance. In particular two different effects can be distinguished and analyzed. First, there is the extensive margin; that is, a small positive differential effect on trade through an increase in the number of products exported. Second, there is an intensive margin which means a larger positive differential effect on the average value of exports per firm and/or per product.[2]

The structure of this paper is as follows. In the next section we survey the literature on the impact of the euro adoption with a special focus on Central and European countries. We then describe the analytical framework and discuss data sources. Finally, we present our estimation results on the *ex post* impact of the euro adoption on firms' export performance in the CEE countries that have already adopted the common currency. The last section summarizes and concludes.

## Literature Review

The trade effects of the adoption of a common currency can be studied in a number of ways. Traditionally, trade economists used to empirically study aggregate trade flows on the basis of augmented gravity equations derived from neoclassical and new trade theories. In this approach binary variables, describing participation in the exchange rate stabilization regimes and membership in the monetary union, are usually used. Additionally, some measures of exchange rate volatility can be included in the estimating equations. The alternative approach is derived from the latest strand in the new trade theory, based on the Melitz [2003] model, in which export performance of heterogeneous firms depends on labor productivity and the costs of exporting. The empirical implementation of this model requires firm-level data. The trade implications of this model can be studied either on the basis of simulation models or using the micro-econometric analysis. In this section we present a brief review of both strands in the literature.

The first attempts to study the trade implications of the adoption of the common currency were based on the gravity models estimated for the aggregate trade flows. The widely cited studies by Rose [2000, 2001] identified two main effects of the adoption of a common currency: the effects associated with the elimination of exchange rate volatility and the pure monetary effect associated with the use of a single currency. His early studies yielded very surprising results, suggesting that participation in the monetary union may increase trade between its member countries even threefold. Since then a number of studies on the potential trade effects of participation in the monetary union have emerged. Many authors have suggested various reasons for the overestimation of trade effects associated with the

adoption of a common currency, such as a sample selection bias or the endogeneity of the monetary union.[3]

For example, Barr *et al.* [2003] studied the potential effects of the EMU for EU and EFTA countries trying to solve the endogeneity problem by instrumental variables estimation. A similar study was done by Micco *et al.* [2003] who analyzed a sample of OECD countries. In these studies the predicted trade effects of joining the monetary union were much lower, and especially in the latter amounted only to a 6 per cent increase in trade. An interesting study was also done by Flam and Nordstrom [2002], who studied the trade effects of a monetary union separately for various SITC product groups. It turned out that the strongest effects of the monetary union were reported for trade in processed manufactured products, and in particular SITC groups 6–8.[4]

In the context of Central and Eastern European countries some attempts were also made to estimate, *ex ante*, the trade effects of euro adoption by these countries using the gravity model. The first such an attempt was made by Maliszewska [2004] who studied bilateral trade flows between the EU and the Central European countries during the period 1992–2002. She estimated a simple gravity model by OLS to find that the parameter estimate on the EMU dummy variable was positive and statistically significant. In particular, she found that as a result of the euro adoption trade would increase on average by 23 per cent. She then used this estimate to make a forecast for the CEE countries assuming that these countries will reach the same level of trade openness as EMU members. According to her forecast, the euro adoption by such less open countries such as Poland, Latvia and Lithuania will result in a significant increase in trade, while already open countries such as the Czech Republic, Estonia, and Slovakia will experience a decrease in trade.

However, another study by Belke and Spies [2008] reached a completely different conclusion. The authors included in their analysis all OECD and CEE countries during the period 1992–2004. They estimated a gravity model based on the assumption of complete specialization using the Hausman-Taylor approach that allowed them to endogenize the EMU variable. In their study the estimated parameter on the EMU variable also turned out to be positive and statistically significant. However, in contrast to Maliszewska [2004], their forecast showed that relatively closed economies such as Poland, Latvia and Lithuania would experience a decrease in their exports while more open economies such as the Czech Republic, Estonia, and Slovakia would experience an increase in their exports.

Finally, in a related contribution on the effects of the EMU enlargement by Brouwer *et al.* [2008], the authors studied the impact of the exchange rate volatility on trade and FDI using the fixed effects estimator and unbalanced panel data for 29 countries (the EMU members, the new EU countries, the rest of EU and the four other OECD countries: Canada, Japan, Switzerland and the US) during the period 1980–2005. Although their main results focused on FDI they report that the direct export effect of joining the EMU for all countries is positive and varied depending on the level of volatility and trade balance from 0.84 per cent for Lithuania to 13.3 per cent for Malta.

Other attempts to study the *ex ante* trade effects of CEE countries joining the Eurozone using a gravity model were made by Cieślik *et al.*[2009, 2012a]. They employed panel data for the present Eurozone members and almost 100 other countries trading with the Eurozone countries. Their forecasts consisted of two elements. First, the authors estimated the effect of exchange rate stabilization against the euro, making use of data for the group of Central and Eastern European countries that pegged their currency to the euro. The second component of the forecast was based on the analysis of the impact of joining the Eurozone. It involved the elimination of exchange rate fluctuations effects and the impact of trade policy changes related to joining the Eurozone. Their results suggested that just after joining the Eurozone, Polish exports would increase by about 12 per cent, but the positive effect would gradually disappear over time.

The literature dealing with the *ex post* evaluation of the aggregate trade effects of euro adoption in the Central European countries is much less abundant. The existing literature for the new EMU members concentrated so far on fulfillment of the Maastricht criteria for the euro adoption, growth, and business cycle synchronization. Examples include studies by Fidrmuc and Korhonen [2006], De Grauwe and Schnabl [2008], Frankel [2008], Feuerstein and Grimm [2007], and Sivak [2011]. However, the formal *ex post* econometric evidence on the consequences of euro adoption in the new EU members states for their aggregate trade flows is still scarce.

In particular, Aristovnik and Meze [2009] used a time series approach to study the *ex post* effect of EMU creation for Slovenian trade. They argued that the trade benefits of the entry of new countries into the EMU would thus not be the same as the benefits of the initial formation of the EMU in the nineties. They validated their claim using case-study evidence for Slovenia. Their regression analysis of time series showed that there had been a positive effect on Slovenia's exports into, and a negative effect on its imports from, the Eurozone precisely at the time of the creation of the EMU in 1999. However, in their study they did not investigate the *ex post* effects themselves of Slovenia's 2006 accession to the Eurozone.

This issue was taken up in the empirical study by Cieślik *et al.* [2012b,c], who studied the implications of accession of two new Central European countries: Slovenia and Slovakia to the already existing and functioning EMU. The authors employed a gravity model that controlled for an extended set of trade theory and policy variables. Trade theory variables included both country size and factor proportion variables. Trade policy variables included membership in GATT/WTO, CEFTA, OECD, EU and Europe Agreements. The gravity model was estimated using the panel data approach on a sample of CEE countries trading with the rest of the world during the period 1992–2009 using the fixed effects, random effects and Hausman-Taylor estimators. According to their results elimination of exchange rate volatility resulted in trade expansion for the CEE countries but accession to the Eurozone did not have any significant effects on exports of Slovakia and Slovenia.[5]

Hence, a wide array of empirical studies show that introduction of the euro had a modest but positive impact on the value of aggregate trade flows inside the euro area for the old EU member states. However, the trade effects of the accession to the Eurozone for new EU member states are much less evident. These results are based on the gravity model and aggregate trade data. However, in the more recent literature it is argued that the aggregate data masks important microeconomic gains.

In particular, two types of microeconomic gains are distinguished that may arise even though aggregate trade flows do not change. First, the euro may increase the availability of differentiated varieties of both final and intermediate products. In addition to this it may also help existing exporters increase the number of products exported and the number of destinations served. The aggregate exports may not change if richer product variety coincides with an offsetting reduction in average shipments per product. Second, the value of aggregate exports may be affected by the increased competition resulting in the compression of prices. Enhanced transparency and lower transaction costs associated with the introduction of the euro may lead to a fall in markups and prices across the euro area. With no major change in relative prices, aggregate trade flows should not change much either.

The new approach to studying the trade effects of the euro is based on the latest strand in trade theory literature. This new strand stresses the role of firm heterogeneity and has become popular in the last few years. In contrast to the previous literature, i.e. Krugman [1980] model, which assumed that firms are symmetric, this new literature focuses on firms' heterogeneity in terms of productivity and export performance. Empirical studies reveal that only a small fraction of the most productive firms account for the majority of exports; most firms do not export and concentrate their activities on domestic markets only.

This latest strand of the new trade theory was initiated by Melitz [2003]. He relaxed the key assumption of firms' symmetry in Krugman's [1980] monopolistic competition model and introduced firms' heterogeneity in terms of labour productivity. The Melitz [2003] model implies important microeconomic effects of reduction in transaction costs. Namely, this reduction should lead to significant changes within sectors: growth of the most efficient firms, a richer variety of goods, tougher competition (i.e., smaller mark-ups), and, consequently, exit of the least efficient firms.

Testing for the microeconomic effects of the euro requires highly disaggregated data. Two possible approaches can be considered. The first approach is to use trade data at the product level. However, using such data, it is not possible to assess whether an increase in the value of bilateral exports in one product category can be explained by incumbent firms increasing the value of their shipments, or new firms exporting to the same trade partner within the same product category. The second approach is to use firm-level trade data which permits a description of the micro-level adjustment.

There are only few empirical studies that investigate the microeconomic trade effects of the accession to the Eurozone for old EU member states (EU-15) and the empirical

evidence for the new EU member states is virtually non-existent. In particular, Fontagne *et al.* [2009] analyze the implications of the euro adoption for Belgium and France using the second approach in the period of 1998–2003. They exploit firm-level export databases at the product level. For each exporter, they have information on the value of exports detailed by product CN8 category (10,000 product categories) which allows them to identify the destination market. On this basis, they compute the number of exporters on each market, the average number of products exported by firm on each market, and the average value of exports by product.

Their analysis tackles a difficult counterfactual question: what would have happened to European firms if the euro had not been introduced? This implies identifying an appropriate benchmark. Their approach, was to compare the behavior of firms in countries that have adopted the euro with those that have not. They called the firms in the former countries the 'treated group' and firms in the latter countries the 'control group'. The main idea was to compare the dynamics of two different subsets of exports: trade flows that are 'treated' by the effects of the euro, and trade flows that are not 'treated'. This allows distinguishing among four groups of trade flows:

- Flows between euro-area countries;
- Flows between a euro-area and a non-euro area country;
- Flows between a non-euro area and a euro-area country;
- Flows from non-euro area countries.

They compute the intensive and extensive margins of exports, distinguishing different types of destination: euro area, non-euro area EU, non-euro area Europe and non-euro area world.[6] The extensive margin is defined as the number of varieties exported, while the intensive margin is defined as the average value of exports per variety. Specifically, they compare the evolution of trade margins to euro-area destinations with the evolution of trade margins to non-euro area destinations for Belgium and France. According to their findings the introduction of the euro resulted in changes in the total value of euro-area exports that were driven mostly by the extensive margin (the number of exporting firms, products exported and countries served) in the case of euro-area destinations.

Moreover, the introduction of the euro reduced price volatility and price-discrimination among markets in the Eurozone compared to markets outside the Eurozone. Given the size of the integrated market and the level of competition, price discrimination by European exporters was smaller towards Eurozone countries than to non-euro area EU countries and even smaller than to the rest of the OECD. After introduction of the euro, euro-area exporters reduced the dispersion of their export prices in the euro area relative to markets outside the Eurozone. This was not the case for exporters belonging to countries outside the Eurozone.

In the context of Central and Eastern European countries according to the best of our knowledge it seems that there are no formal empirical studies based on firm-level data. Therefore, our study aims at filling at least a part of the existing gap in the literature.

## Empirical Methodology and Data Description

In our study we consider only one of microeconomic effects of the common currency. Namely, we focus on the effect of increased participation of non-exporters in international markets, which is an equivalent of studying the extensive margin effects. This approach refers to the Melitz [2003] model, which is a useful tool for analyzing trade performance at the firm- level in response to reduced transaction costs. In particular, it can be used to analyze the effects of adopting the common currency on firms' export performance. In the light of this model it might be argued that the adoption of the common currency lowers trade costs and can positively affect a firm's export performance.

In the Melitz [2003] model, productivity differences among firms are the key variable explaining the firm's ability to enter export markets. In this model firm productivity is exogenously given and each firm has to pay a fixed cost when entering the domestic and foreign markets. The model predicts that the most productive firms with the lowest marginal costs can pay the fixed cost of entry and become an exporter.

The importance of firm productivity for exporting has been confirmed by the EFIGE [2010] report. In this report it has been demonstrated that firm export performance in seven EU countries depends on labour productivity and other firm characteristics. This analysis showed that the productivity of the labour force was positively related to the probability of exporting. In addition, in their empirical studies, other factors such as spending on R&D, size of the firm, internationalization of the firm, and the stock of the human capital may affect export business decisions were examined. Unfortunately, these studies did not include the countries of Central and Eastern Europe with the exception of Hungary.[7] Moreover, in the aforementioned studies, the authors did not control for participation in the Eurozone.

Therefore, in this paper we study the relationship between exporting and the common currency using the simple probit model. In our study we control for firms' characteristics and the EU membership. We use the empirical model to investigate how the reduction in transaction costs associated with entering markets in other countries that share the common currency affects the probability of exporting. This probability is modeled as a linear function of firm and country characteristics.

Let $Y_i^*$ be our dependent variable indicating the export status of firm i. This variable is a latent variable. This means that instead of observing the volume of exports, we observe only a binary variable $Y_i$ indicating the sign of $Y_i^*$. Our dependent variable follows a binary distribution and takes the value 1 when the firm exports and 0 otherwise:

$$Y_t = \begin{cases} 1 \ \ if \ \ Y_i^* > 0 \\ 0 \ \ if \ \ Y_i^* = 0 \end{cases}$$

Moreover, we assume that $Y_i^*=X_i\theta+\varepsilon_i$, where $X_i$ is a vector of explanatory variables affecting exports, $\theta$ is the vector of parameters on these variables that needs to be estimated and $\varepsilon_i$ is an error term which is assumed to be normally distributed with a zero mean. Hence, the probability that a firm exports can be written as:

$$Pr(Y_i = 1 \mid X_i) = \Phi(\beta + X_i\theta)$$

Our analysis is based on the EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS) data collected by the World Bank and the European Bank for Reconstruction and Development for post-communist countries located in Europe and Central Asia (*ECA*) and Turkey. The surveys covered the manufacturing and services sectors and are representative of the variety of firms according to sector and location within each country. The data was collected for the years 2002, 2005, and 2009. In all countries where a reliable sample frame was available (except Albania), the sample was selected using stratified random sampling.[8] However, only a small proportion of firms was sampled every year.[9]

Our study focuses on the Central and Eastern European countries and Turkey. We assume that export activity occurs when at least one percent of sales revenue comes from sales made abroad.

The probability of exporting for analyzed CEE firms is dependent on individual firm and country characteristics. Firm characteristics are based on survey questions regarding the individual characteristics of the firm, sector of activity, legal and economic status, characteristics of managers and the size of the firm, economic performance and key characteristics of the reviewed firms, as well as stakeholders.

Regarding the key explanatory variables stressed by the Melitz [2003] model – labor productivity is expressed as the total amount of annual sales per full time employee (*lprod*). Other factors that may affect export activity include the level of innovation proxied by the R&D spending (lRaD), and the stock of human capital proxied by the percentage of employees with university degrees (*luniv*). In addition, we control for foreign ownership (*foreign_cap*), the use of foreign technology (*foreign_tech*), age (*firm_age*), and the size of the firm (*firm_size*).

The sample used in our econometric analysis includes cross-section data for almost six thousand observations for firms located in the CEE countries for which explanatory variables were available in all analyzed years. In Table 1 we present the exact definitions of firm characteristics used in our study.

**TABLE 1. Explanatory variables: Firm characteristics**

| Variable Name | BEEP input Name | Description |
|---|---|---|
| Lprod | lprod=log(lprod)<br>prod=exchange rate*(d2/l1) | Logarithm of productivity expressed as the total amount of annual sales per full time employee. Annual sales are converted from local currencies to USD. |
| Firm_age | | Logarithm of number of years since the start of operations |
| Luniv | luniv=log(ECAq69) | Logarithm of % employees at the end of the fiscal year with a university degree. |
| lRaD | RaD=(ECAo4/d2)*100<br>lRaD=log(RaD) | Logarithm of % of total annual sales spent on research and development. |
| foreign_cap | b2b | Shares in the capital of private foreign individuals, companies or organizations. |
| foreign_tech | e6 | The use of technology licensed from a foreign--owned company |
| Firm_size | l1 | Logarithm of the no. permanent, full-time employees of this firm at end of last fiscal year |

In addition to firm characteristics we also included country characteristics such as the EMU and EU membership. The EMU membership variable is a dummy variable that takes value 1 when the country is the member of the Eurozone and zero otherwise. In a similar manner, EU membership was defined. EU membership is an indicator variable that takes value 1 when the country is a member of the European Union. Finally, we also control for individual time and industry effects.

## Estimation Results

Our estimation results are presented in Table 2. In column (1) we show the baseline results obtained without controlling for individual year and industry effects. In column (2) we check the robustness of our results by controlling for time effects. In column (3) we show the results obtained by controlling for individual industry effects but not for time effects. Finally, in column (4) we present the results obtained by controlling for both individual industry effects and for time effects.

**TABLE 2: Estimation Results (standard errors in parentheses)**

| VARIABLES | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| lprod | 0.0128*** | 0.0167*** | 0.0133*** | 0.0166*** |
| | (0.00463) | (0.00476) | (0.00471) | (0.00477) |
| firm_size | 0.285*** | 0.248*** | 0.250*** | 0.250*** |
| | (0.0136) | (0.0140) | (0.0140) | (0.0140) |
| Firm_age | 0.00304*** | 0.00423*** | 0.00408*** | 0.00416*** |
| | (0.00105) | (0.00107) | (0.00107) | (0.00107) |
| foreign_cap | 0.00734*** | 0.00822*** | 0.00816*** | 0.00821*** |
| | (0.000733) | (0.000742) | (0.000743) | (0.000743) |
| foreign_tech | 0.674*** | 0.100 | 0.158 | 0.153 |
| | (0.0838) | (0.0950) | (0.0960) | (0.0967) |
| lRaD | 0.0701*** | 0.0705*** | 0.0565** | 0.0630*** |
| | (0.0216) | (0.0219) | (0.0220) | (0.0221) |
| luniv | 0.0498*** | 0.0557*** | 0.0548*** | 0.0555*** |
| | (0.00760) | (0.00774) | (0.00775) | (0.00776) |
| EU | 0.492*** | 0.587*** | 0.567*** | 0.585*** |
| | (0.0405) | (0.0417) | (0.0416) | (0.0418) |
| EMU | 1.234*** | 0.749*** | 0.635** | 0.785*** |
| | (0.245) | (0.253) | (0.257) | (0.259) |
| Constant | –2.132*** | –1.590*** | –2.189*** | –3.149*** |
| | (0.0884) | (0.115) | (0.0902) | (0.817) |
| time effects | no | Yes | No | yes |
| sector effects | no | No | Yes | yes |
| Observations | 5,932 | 5,932 | 5,932 | 5,932 |
| Log likelihood | –2961 | –2860 | –2862 | –2851 |
| Pseudo R2 | 0.179 | 0.207 | 0.207 | 0.210 |

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

First, we describe the benchmark results presented in column (1) obtained from the specification in which we did not control for the individual time and industry effects. Our benchmark estimation results reveal that all the explanatory variables are statistically significant at the 1 percent level and display the expected signs. The estimated parameter on the key explanatory variable – the EMU membership displays a positive sign. This means that firms from Eurozone member countries face lower transaction costs when

entering the foreign markets in other Eurozone countries and reveal a higher propensity to export.

The estimated parameter on the EU membership also displays a positive sign. However, the magnitude of the estimated parameter on the EMU variable is almost three times as large as the one on the EU variable. This means that from the perspective of the Central and East European countries accession to the EU increases the propensity to export of their firms but accession to the Eurozone generates an additional increase in the extensive margin of exports.

The signs of the estimated parameters for all other explanatory variables are also in line with expectations. In particular, the level of labor productivity is positively related to the probability of exporting, which is in line with the predictions of the Melitz [2003] model. Moreover, the level of R&D spending and the proportion of workers with university degrees are positively related to the probability of exporting. Finally, the probability of exporting increases with a firm's size, age, foreign ownership and the use of foreign technology.

In column (2) we present the estimation results obtained from the specification in which we controlled for individual time effects. In this case, the estimated parameter on the EMU variable remains positive and statistically significant at the 1 percent level but its magnitude drops by almost half as compared to the baseline estimation from column (1). The estimated parameters on the other explanatory variables remain statistically significant at the 1 per cent level and display the expected signs with the exception of the variable describing the use of foreign technology, which completely loses its previous statistical significance.

In column (3) we report estimation results obtained from the specification in which we controlled for individual industry effects. In this case, the estimated parameter on the EMU variable remains positive and is statistically significant but only at the 5 percent level. Moreover, its magnitude is smaller compared to both the baseline estimation from column (1) and the estimate reported in column (2). The estimated parameters on the remaining explanatory variables display the expected signs but the levels of their significance drop in several cases. In particular, the estimated parameter on the use of foreign technology variable loses completely its statistical significance while the statistical significance of the R&D variable drops to the 5 percent level.

Finally, in column (4) we show the estimation results obtained from the specification in which we controlled for both individual time and industry effects. In this case, the estimated parameter on the EMU variable remains positive and again becomes statistically significant at the 1 percent level. The estimated parameters on the other explanatory variables become statistically significant at the 1 per cent level and display the expected signs with the exception of the variable describing the use of foreign technology, which remains statistically not significant. Thus, it seems that our estimation results are robust with respect to time, and industry specific, effects.

## Conclusions

In this paper, we studied the *ex post* effects of accession to the Eurozone by two new EU member states that have so far adopted the euro: Slovenia and Slovakia, and the export activity of their firms. In contrast to earlier studies that were based on the gravity model and the aggregate trade flows we used the Melitz [2003] theoretical framework and firm-level data for the period 2002–2009. This framework predicts a positive relationship between the level of firm productivity and export performance. In addition to the level of productivity we also included other factors that may affect export performance. These included the level of innovation, the stock of human capital, the foreign ownership, the use of foreign technology, the age and the size of the firm.

Our estimation results confirmed the hypothesis that EMU membership is positively related the probability of exporting, i.e., firms from Slovenia and Slovakia increased their propensity to export after accession to the Eurozone. Thus, accession to the Eurozone generated an additional increase in the extensive margin of exports in addition to EU membership. The estimated parameters on the remaining variables such as productivity, the age and the size of the firm, the stock of human capital and the foreign ownership, were in line with the results of previous empirical studies based on the Melitz [2003] theoretical framework.

The results of our analysis may suggest important policy recommendations concerning the development of a general long-term export strategy for the governments of Central and Eastern European countries. In particular, the international competitiveness of firms from the CEE countries can be improved through the development of high quality educational systems allowing them to increase their stock of human capital. Financial support for research and development should also have a positive impact on the export performance of firms from the CEE countries. Finally, export performance can be improved by attracting export-oriented FDI.

The empirical finding concerning the significance of the EMU membership is different from the results of our previous studies based on aggregate trade flows, which do not properly reflect the export behavior of individual firms. Therefore, these two sets of empirical results do not have to be mutually exclusive. The results based on the aggregate data may not properly reflect microeconomic gains as the value of aggregate exports may be affected by increased competition, resulting in the compression of prices. In addition, estimations based on the aggregate data can mask gains resulting from changes in extensive and intensive margins. However, our results should also be treated with caution as we were unable to use panel data and we estimated only the equivalent of extensive margin effects.

**Notes**

[1] Bulgaria, although it did not officially enter the ERM II, pegged its currency to the euro since its creation in 1999 (before the Bulgarian lev was pegged to the German mark).

[2] Fontagne et al., [2009].

[3] For example, endogeneity can be associated with central bank policies and colonial ties. In particular, exchange rate volatility may not be exogenous if central banks want to decrease the range of exchange rate fluctuations with respect to the currencies of their main trading partners. The main trading partners for developing countries are often former colonizers with respect to which former colonies stabilize their exchange rates.

[4] The comprehensive survey of the early literature on the trade consequences of joining the monetary union has been compiled by Baldwin [2006], who suggested the need to control for individual country effects as well as multilateral resistance terms.

[5] These results do not seem surprising given the fact that some of the studies for old EU member states do not find any positive trade effect of the Eurozone creation. For example, [Berger and Nitsch, 2008] argued that the euro's impact on trade disappears if the positive trend in the institutional integration is controlled for.

[6] The euro area (the treated group) includes: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain. The non-euro area EU countries include: Denmark, Sweden, and the UK. The non-euro area Europe countries include: Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Norway, Poland, Slovakia, Slovenia, and Switzerland.

[7] A similar study for the Visegrad countries (i.e. the Czech Republic, Slovakia, Hungary, and Poland) was conducted by Cieślik, Michałek and Michałek [2012].

[8] The sampling methodology is explained in the Sampling Manual (available at http://www.enterprisesurveys.org/Methodology/).

[9] This means that application of a panel data analysis is not possible. Therefore, we used the standard probit procedure on the pooled dataset without controlling for individual firm effects.

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