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The Impact of the Euro Adoption on inside and outside Eurozone Trade

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ABSTRACT
This study focuses on the differential trade effect between the Euro countries and non-euro countries within the 28 European Union (EU) countries. The study period is from 1999 to 2015. We use the panel data models to assess the differential trade effects of these two groups of countries. Our results show that compared to the non-euro-adopting EU countries, the euro-adopting EU countries will export 17.4 % more to the Eurozone. Besides, the euro-adopting countries export 11.6 % more to the non-Eurozone countries than the non-euro adopting EU countries do. In addition, we find that compared to the non-euro adopting EU countries, the euro-adopting EU countries would have a more stable exports, regardless inside or outside Eurozone trade. Our conclusion is that compared to those EU countries not adopting the euro, the euro adopting countries could have more exports, especially the exports to the common currency adoption area. In addition, compared to those non-euro adoption countries, the euro adopting countries can have more stabilized exports inside Eurozone. However, the differential export stabilizing effects do not different from alternative export destinations.

Keywords: Euro, Eurozone; Export volume; Export Volatility; Panel Data Method; non-Eurozone
JEL Classification: O43, O52

INTRODUCTION

Considering the provisions of the Treaty of Maastricht, the European Union (EU) was established in 1993. A common currency system was established January 1, 1999. After several EU enlargements and consolidations, there are now 28 member countries. The EU is the second-largest economy in the world, and their GDP was estimated to be €15 trillion (nominal) in 2015. 19 of 28 members adopted the euro after 1999, thus becoming the “euro countries.” The other 9 members retained their national currencies, thus becoming “non-euro countries.” Since its adoption, the euro has become the second most important foreign exchange asset, behind the U.S. dollar. With its expansion, Eurozone trade has also increased. This leads to our research question: “how does the trade differential between the ‘euro’ and ‘non-euro’ EU countries affect exports inside and outside the Eurozone?”

According to the optimum currency area theory, proposed by Mundell [1] , establishing an optimum currency can eliminate the risks associated with volatile exchange rates and promote specialization of production, international trade, and investment among member countries. The Commission of the European Communities Report [2] said that a monetary union could ballast exchange rate uncertainty to stimulate trade and investment. Adopting a common currency is equivalent to permanently fixing the exchange rates among member countries, which can help stabilize the price level in the common currency area and allow for a more efficient allocation of resources, reflected by increased trade and investment flows. The argument was supported by Micco et al. [3]

Several studies debate Eurozone trade. Dell'Ariccia [4] used the gravity model to assess the effects of exchange rate volatility on the bilateral trade with EU15 countries. Additionally, Rose [5] estimated bilateral trade flows using the gravity model to determine trade effects of common currencies and exchange rate uncertainty between 186 country pairs from 1970 to 1990. He claimed that a common currency could improve international trade. Thus, scholars called his result, "the Rose effect." Moreover, most empirical studies assessing the economic effects of adopting the euro focused on bilateral trade. For instance, the majority concluded that the euro would exert a positive effect. This effect has been widely studied by Rose and Stanley [6], Flam and Nordström [7], Faruqee [8], Chintrakarn [9], Eichengreen and Boltho [10], Nardis et al. [11], Sadeh [12], and Glick and Rose [13].

The euro introduced only a few positive effects per year. Several studies claimed that the adoption of a common currency would greatly increase trade volume. However, they were based on a small amount of data (since the euro adoption). After 17 years, however, researchers have begun thinking that the increase in trade after adoption of the euro was not as dramatic as the previous study suggested. They have found only a small increase and a smaller euro effect, e.g., Bun and Klaassen [14], , and Kunroo et al. [15]. Beside, the result of Camarero et al. [16] showed that the euro had a positive though small effect on trade. In fact, EMU countries seem to have increased their trade with non-EMU countries, as well as with fellow EMU members." However, there are other studies, such as Santos Silva and Tenreyro [17] and Figueiredo et al. [18], that stated that the euro had no significant effect on bilateral trade.

To learn more about euro versus the EU trade, we reinvestigate the impact of euro countries' and non-euro countries' trade effects inside the Eurozone and outside the Eurozone using a panel data model. We also collect more economic datasets to assess the effect of euro and non-euro countries. Owing to most studies using the gravity model to estimate the trade-euro nexus, we choose to use panel data to estimate differential trade before and after adoption the euro. This allows us to determine whether adopting the euro has affected the exporting volumes for the two groups. It also allows us to understand the effects of exports on euro and non-euro trading partners after adopting the euro. Nevertheless, thus far, the literature has not paid much attention to the impact of export volumes and magnitude of EU countries based on adoption or non-adoption of the euro. Thus, this paper aims to contribute to the field by using more economic data to assess the impacts of the euro on the pattern of exports.

We apply the panel data model to assess the trade volumes and volatility to show that the impact of euro countries on the trade volumes of exports inside the Eurozone were statistically significant, compared to non-euro countries. Regarding exports outside the Eurozone, euro countries are also statistically significant, but the effect is smaller. Furthermore, the stabilization of trade indicates that euro countries experience less volatile trade inside the Eurozone than non-euro countries. Thus, euro countries exporting inside the Eurozone are more stable than non-euro countries exporting inside the Eurozone. However, when exporting outside the Eurozone, the euro countries' trade stabilizing impacts are insignificantly different than non-euro countries. This reveals that EU countries exporting to non-euro countries are affected by the different currency and exchange rate risks, regardless of euro.

The remainder of this study is organized as follows: Section 2 briefly explains our methodology to assess trade volumes and trade volatility by employing the panel data model. Section 3 describes the data sources and the construction of the relevant variables. Section 4 presents the empirical results, Section 5 has a discussion, and Section 6 provides concluding remarks.

METHODOLOGY

To investigate the impact of euro adoption on inside and outside Eurozone trade, we apply the following panel data model to EU countries from 1999–2015. First, we explore the differential export effects of euro adoption among EU countries to the euro area. Our empirical model is designed as follows:

$$Exeuro_{iJt} = \alpha_0 + \alpha_i + \delta_t + \alpha_1 Euro_{it} + \alpha_2 gdppc_{Jt} + \alpha_3 FDI_{it} + \alpha_4 RD_{it} + \alpha_5 FC_{it} + \varepsilon_{it} \qquad (1)$$

where i indicates the EU countries, t is the indicator for time, and J represents the group of euro countries. α_i and δ_t respectively capture the individual country and time-specific effects. The dependent variable, $Exeuro_{iJt}$, is the log of total real exports from EU country i to the euro country group J in year t. $Euro_{it}$ is a dummy variable that takes value of 1 if country i adopts the euro at period t, otherwise it takes the value, 0. $gdppc_{Jt}$ gives the log of the GDP per capita of euro-zone country group J during year t. Following Muratoğlu [19], we also consider the following variables as our additional control variables: FDI_{it} (% of GDP), the foreign direct investment received by country i in period t; RD_{it} (% of GDP), the research and development expenditure of country i in year t; and FC_{it} (% of GDP), the gross fixed capital formation of country i in year t. Lastly, ε_{it} is the error terms of the model.

Next, we examine the differential export effects of euro adoption among the EU countries to the non-euro zone. Our empirical model is as follows:

$$Exnoneuro_{iKt} = \beta_0 + \beta_i + \delta_t + \beta_1 Euro_{it} + \beta_2 nongdppc_{Kt} + \beta_3 FDI_{it} + \beta_4 RD_{it} + \beta_5 FC_{it} + \varepsilon_{it} \qquad (2)$$

where subscripts i and t respectively indicate country and time, and K represents the group of countries that do not use the euro as their national currency. The dependent variable, $Exnoneuro_{ikt}$, is the log of the total real export from EU country i to the non-euro zone country group K in year t. $nongdppc_{kt}$ is the log of the GDP per capita in non-euro zone group K in year t. All other variables are as previously defined.

After testing the differential trade effects of euro adoption among EU countries, we go one step further to test the export stability effects of euro adoption in those EU countries. Thus, we build the following empirical model to assess the differential export stability effect of euro adoption among EU countries to the euro zone:

$$Veuro_{iJt} = \gamma_0 + \gamma_i + \delta_t + \gamma_1 Euro_{it} + \gamma_2 gdppc_{Jt} + \gamma_3 FDI_{it} + \gamma_4 RD_{it} + \gamma_5 FC_{it} + \varepsilon_{it}, \qquad (3)$$

where all subscripts, i, t, and J, are defined as in Equation (1). The dependent variable, $Veuro_{iJt}$, measures the degree of export volatility of EU country i to Eurozone country group J in time t. The remaining variables are defined as in Equation (1).

Lastly, we examine the differential export stability effect of euro adoption among the EU countries to non-euro area. The empirical model is specified as follows:

$$Vnoneuro_{iKt} = \theta_0 + \theta_i + \delta_t + \theta_1 Euro_{it} + \theta_2 nongdppc_{Kt} + \theta_3 FDI_{it} + \theta_4 RD_{it} + \theta_5 FC_{it} + \varepsilon_{it}, \qquad (4)$$

where the subscripts, i, t, and K, are defined as in Equation (2). The dependent variable, $Vnoneuro_{iKt}$, is the degree of export volatility of EU country i to non-euro zone country group K in time t. The remaining variables are defined as in Equation (1).

DATA

There are 28 member countries in the EU. 19 introduced the euro before 2015, the remaining nine countries still use their own national currency. Table 1 shows the time frame of euro adoption of these 19 countries. If a country adopts the euro as its official currency in a certain year, we give it a value of 1. For the non-euro years, we give the country a value of 0. In Table 1, we capture the dynamic of currency system adoption in all EU countries during the study period (1999–2015). Additionally, we can use the information provided in Table 1 to construct the dummy variable, $Euro_{it}$, which equals 1 if country i adopts euro in year t. Otherwise, it is 0.

The dependent variable, the log of real exports from EU country to the euro area, $Exeuro_{iJt}$, is constructed by summing the real exports of country i to the group of euro countries, J, at time t. Because EU countries adopting the euro changes over time, the composition of the euro-adopting countries varies over time. For example, in 1999 there were 11 countries in the Eurozone. For the euro EU country that exports to the Eurozone, we sum its exports to the remaining 10. However, for the non-euro countries, we sum their real exports with the entire 11. In 2001, Greece joined the Eurozone, providing 12 euro countries for our sample pool. We repeat the same treatment of data with the augmented group. The dependent variable of Equation (2), $Exnoneuro_{iKt}$, is the log of real exports from EU country i to the group of non-euro countries, K, at time t. Because each EU country has many trading partners, it is tedious to sum the exports of each EU country to all its trading partners. To make our research workable, we sum the exports of each EU country's top ten trading partners outside the Eurozone after 1999 as a proxy of exporting to non-euro countries. The dependent variable of Equation (3), $Veuro_{iJt}$, is the volatility of real exports from EU country i to the group of euro countries, J, at time t, constructed by calculating the standard deviation of the dependent variable in Equation (1) using the moving window method[1]. The dependent variable, $Vnoneuro_{iKt}$, in Equation (4) is the volatility of real exports from EU country i to non-euro country group K at time t. Again, we apply the moving window method to measure the degree of export volatility. These export data are taken from Direction of Trade Statistics of International Monetary Fund. Because these data are nominal, we use the export deflator obtained from World Development Indicators (WDI) of the World Bank to deflate them into real terms.

Because a country's exports are affected by the GDP per capita of its trading partners, we define the explanatory variable, $gdppc_{Jt}$, in Equations (1) and (3) as GDP per capita, a logarithm of euro country group J, which is calculated by dividing the total GDP of the euro country group by its total population. Because the composition of the euro country group varies over time, using Table 1, we carefully compute the GDP per capita variable on a yearly basis. Alternatively, for the explanatory variable, $nongdppc_{Kt}$, in Equations (2) and (4), we compute each EU country's top ten trading partners' GDP per capita outside the Eurozone as country group K by dividing the total GDP of the top ten trading partners by their total populations. All the GDP and population data are downloaded from the WDI of the World Bank for the period of 1999–2015.

Lastly, FDI_{it} is foreign direct investment received by country i at year t, defined as net flows (% of GDP); RD_{it} measures the research and development activity of country i at time t, defined as the R&D expenditure (% of GDP); and $FCit$ is the physical capital accumulated in country i at

[1] The moving-window method is a descriptive statistic for a time series variable calculated for each time series within the panel data by rolling a certain window width. In our model, we used a 5-yrs width for the rolling window to compute the standard deviation. For Example, there were 17 years of observations in each sample country, and with a 5-yr. rolling window, we obtained one standard deviation by rolling every 5 yrs. Thus, we will have a total of 13 standard deviation observations, which is our measurement of export volatility.

period *t*, proxied by gross fixed capital formation (% of GDP). All three variables are taken from WDI of the World Bank for the period of 1999–2015.

RESULTS

Before running the regular regressions, we first test for the existence of cross-correlation. For that research purpose, we performed the Friedman's test and found that the test statistics are not statistically significant. The test result indicates that issue of cross-correlation may not be a concern in this study. As such, the following results are based on the regular panel data regressions without considering cross-sectional correlation.

Export to Eurozone

Table 2 displays the differential export effects between euro and non-euro EU countries to the Eurozone countries. Thus, the sign, estimated magnitude, and statistical inference of the coefficient before the dummy variable, "euro," becomes our major concern. By focusing on column (1) of Table 2, the estimated coefficient of "euro" is 0.204 and is statistically significant at the 1 % level. This result provides preliminary evidence that, compared to their EU counterparts, the euro-adopting countries export more to the Eurozone country group. Next, we add other control variables, including GDP per capita of the Eurozone country group, gdppc, foreign direct investment received (FDI), R&D expenditure (RD), and physical capital formation (FC), to the simple benchmark model. The results are presented in columns (2) through (5) of Table 2. The four control variables do not exert statistically significant effects on the trade activity between the EU countries and the Eurozone country group. Nevertheless, the differential export effects between the EU countries that do and do not adopt the euro are still statistically significant. Focusing on the results of column (5), where all control variables are considered, the coefficient before the dummy variable "euro" is positive with a value of 0.174, meaning that euro-adopting countries will export 17.4 % more to the euro zone country group than non-euro adopting EU countries will.

For the table 2, the fixed effect is used in our first model. In order to check the robustness prudentially, one implements the random effect for our first model and shows the result in table 3. We can clearly find the column (5) of the Table 3 that the coefficient of the dummy variable "euro" is 0.176, which doesn't display much difference of the result from the table 2. Furthermore, we also perform the Hausman's test to compare the fitness of these two models and get the p-value of the Hausman test is 0.04 which is smaller than the 5% significance level. As such, one can reject H_0, which implies that the fixed effect model is the better model to interpret our empirical results. Generally speaking, the euro-adopting countries will export 17.4% more to the Eurozone country group than non-euro adopting EU countries.

Export to non-Eurozone

Table 4 reports the differential export effect between euro and non-euro EU countries to non-Eurozone country group. As shown in column (1) of Table 4, the estimated coefficient before the dummy variable, "euro," is 0.093, which is also statistically significant at the 10 % level. Again, we add the relevant control variables one by one to the simple benchmark model, and the results are presented in columns (2) to (5) of Table 4. With these control variables considered, the differential export effect represented by the estimated coefficient before the dummy variable, "euro," are mostly positive and statistically significant. Based on the results shown in column (5), from the most complete model, one can see that the euro-adopting EU countries generally export 11.6 % more to the non-euro country group than the non-euro adopting EU countries do. Compared to the results presented in column (5) of Table 2, this differential export effect between the EU countries that do and do not adopt the euro is lower.

Again, we carry out the random effect exercise for further robustness check and the results are presented in table 5. In column (5) of Table 5, the coefficient of the dummy variable “euro” is 0.115, which is very close to that reported in column (5) of table 4. In addition, the p-value of the Hausman test is 0.058 which is marginally greater than the 5% significance level. This result indicates that there is no big difference between fixed effect and random effect models. For comparable purpose, we still focus on the results based on the fixed effect model and it shows that the euro-adopting countries will export 11.6% more to the non-Eurozone country group than non-euro adopting EU countries.

Stability of Exporting to Eurozone

We next check the stabilizing trade effect of adopting the euro. For that purpose, we change our dependent variable to the volatility of export. Table 6 presents the differential trade stabilization effect between the EU countries that do and do not adopt the euro to the Eurozone countries. Focusing on the results of the simple model presented in column (1) of Table 6, one can see that the coefficient before the dummy variable, “euro,” is statistically significant and negative with a value of −0.027. This implies that euro countries of EU would have a more stable trade relationship with the Eurozone country group than non-euro countries.

As a further robustness check, we apply the random effect model to the same data and the results are reported in table 7. It can be seen that the results estimated in the random effect model generally have larger negative effects. For instance, the coefficient of the dummy variable “euro” reported in column (5) of table 7 is -0.041, which is more negative than that reported in column (5) of Table 6. The result of Hausman test get the p-value is 0.002, which is smaller than the 1% significance level. As such, we reject H_0, and pick the results from the fixed effect model as our primary outcome.

Stability of Exporting to non-Eurozone

Table 8 presents the differential trade stabilization effect between the EU countries that do and do not adopt the euro to the non-Eurozone country group. In column (1) of Table 8, the export volatility is statistically significant at a 5 % level, with a negative value of −0.038. Moreover, for further sensitivity analyses, we add other control variables one-by-one to the simple benchmark model, and the outcomes are reported in columns (2) through (5). With these additional control variables added, the coefficient before the dummy variable, “euro,” is still negative and statistically significant at a 5 % level.

Once again, we perform the random effect model to the same data and the results are reported in table 9. By and large, the estimate coefficients before the “euro” variable are negative more than those reported in Table 8. The p-value the Hausman test is 0.008, which is less than the 1% significance level, hence indicating that the fixed effect is the better model to interpret our empirical results.

DISCUSSION

In summary, our previous results show that the euro-adopting countries will export 17.4% more to the Eurozone country group than their non-euro adopting EU counterparts will. Moreover, for those euro-adopting countries, their exports to Eurozone are more stable than their non-euro adopting counterparts to Eurozone. This outcome is consistent with the proposition of Mundell [1] and Baldwin et al. [20]. They claim that the establishment of the common currency can eliminate the risks associated with volatile exchange rates, and hence can promote international trade. The common currency is equivalent to permanently fixing the exchange rates among members, and which can help to stabilize the price level in the Eurozone. As the price level is stabilized, compared to their non-euro adopting EU counterparts, the uncertainty is reduced, and the trade volumes will increase and be less volatile between euro members.

Alternatively, the exports of euro-adopting EU countries to non-Eurozone are 11.6% more than that of their non-euro adopting EU counterparts to non-Eurozone. In addition, for those euro-adopting countries, their exports to non-Eurozone are more stable than their non-euro adopting counterparts to non-Eurozone. It can be seen that even without the advantage of reduced price volatility caused by using the common currency, the euro-adoption countries in general still enjoy the benefit of more and stable exports to non-Eurozone than their non-euro adopting EU counterparts. It is possibly that as the euro is the second largest reserve and most traded currency in the world, most international enterprises will deposit the euro as their paying instrument. By so doing, international enterprises can reduce the transaction cost when they run international business with the world. Therefore, euro adopting countries can have more export volumes to the non-Eurozone group than non-euro adopting counterparts have. As to the trade stabilization effect, Döhring [21] and Schmittmann [22] have claimed that the currency exposure can be reduced by currency hedging. Generally speaking, as international enterprises deposit the euro as their main paying instrument, for standard financial operation, they can hedge the currency to against the exchange risk to reduce the risk and uncertainty in trade transactions. Therefore, compared to their non-euro adopting EU counterparts, the euro adopting countries can have more stable exports to non-euro zone.

CONCLUSION

This study investigated the impact of common currency adoption on inside and outside Eurozone trade. We classify the EU countries into two groups over the period of 1999–2015. One comprises euro countries, and the other non-euro countries. By employing the panel data model, we find that the euro adopting countries will export 17.4 % more to the Eurozone country group than non-euro-adopting EU countries. However, the euro-adopting EU countries will export 11.6 % more to the non-Eurozone country group than the non-euro adopting EU countries do. Compared to the differential trade effects between the EU countries that do and do not adopt the euro to Eurozone, this differential export effect is lower.

With respect to export stabilization, the euro adopting EU countries would have a more stable trade relationship with the Eurozone than non-euro adopting EU countries do, regardless. Nevertheless, the differential export-stabilizing effects between the EU countries that do and do not adopt the euro, either exporting inside or outside the Eurozone, are not very different from each other.

Therefore, this study suggested that, compared to non-euro EU countries, the euro countries had more exports, especially to the common currency adoption area. Additionally, compared to non-euro countries, euro countries can have more stabilized exports. However, the differential export stabilizing effects do not different from alternative export destinations..

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References

Mundell, R. (1961), “A Theory of Optimal Currency Areas.” *American Economic Review*, 51: 657-65

Commission of the European Communities (1990). “European Economy.” http://ec.europa.eu/economy_finance/publications/pages/publication7454_en.pdf

Micco, A., Stein, E. and Ordonez, G. (2003), "The Currency Union Effect on Trade: Early Evidence from EMU." *Economic Policy*, 37: 315-356

Dell'Ariccia, G. (1999), "Exchange rate fluctuations and trade flows: evidence from the European Union." IMF Staff Papers, Vol. 46, No. 3, pp. 315–334.

Rose, A.K. (2000), "One money, one market: the effect of common currencies on trade." *Economic. Policy*, 15:7-46

Rose, A.K. and Stanley, T.D. (2005), "A Meta-Analysis of the Effect of Common Currencies on International Trade." *Journal of Economic Surveys*, 19:341-365

Flam, H. and Nordström, H. (2003), "Trade Volume Effects of the Euro: Aggregate and Sector Estimates." Institute for International Economic Studies, Stockholm University

Faruqee, H. (2004), "Measuring the Trade Effects of EMU." International Monetary Fund, WP No. 04/154

Chintrakarn, P. (2008), "Estimating the Euro Effects on Trade with Propensity Score Matching,: *Review of International Economics,* 16(1), 186-198

Eichengreen, B. and Boltho, A. (2008), "The Economic Impact of European Integration." Centre for Economic Policy Research, DP No. 6820

Nardis, S., Santis, R. and Vicarelli, C. (2008), " The Euro's Effects on Trade in a Dnamic Setting," *The European Journal of Comparative Economics*, Vol. 5, 1: 73-85

Sadeh, T. (2013), "The Euro's Effect on Trade," *European Union Politics*, Vol. 15(2) 215-234

Glick, R. and Rose, A. K. (2016), "Currency unions and trade: A post-EMU reassessment." *European Economic Review*, 87: 78-91

Bun, M. and Klaassen, F. (2007), "The Euro Effect on Trade is not as Large as Commonly Thought." *Oxford Bulletin of Economics and Statistics*, 69: 473-496

Kunroo, M. H., Sofi, I. A., Khurana, M. and Mogha, S. K. (2017), "Re-visiting the Impact of the Euro on Trade Flows: New Evidence Using Gravity Equation with Poisson Count-Data Technique." *Proceedings of Sixth International Conference on Soft Computing for Problem Solving*, DOI 10.1007/978-981-10-3325-4_23

Camarero, M., Gomez, E. and Tamarit, C. (2013), "EMU and Trade Revisited: Long-Run Evidence Using Gravity Equations." *The World Economy*, 36: 1146-1164

Santos Silva, J.M.C. and Tenreyro, S. (2010), "Currency Unions in Prospect and Retrospect." *The Annual Review of Economics*, 2: 51-74

Figueiredo, E., Lima, L.R. and Schaur, G. (2016), "The Effect of the Euro on the Bilateral Trade Distribution." *Empirical Economics*, 50:17-29

Muratoğlu, G. and Muratoğlu, Y. (2016), "Determinants of Export Competitiveness: Evidence from OECD Manufacturing," *Journal of Economics and Political Economy*," Vol. 3(1): 111-118

Baldwin, R., Skudelny, F. and Taglioni, D. (2005), "Trade Effects of The Euro-Evidence from Sectoral Data," *European Central Bank*, WP No. 446

Döhring, B. (2008), "Hedging and invoicing strategies to reduce exchange rate exposure: a euro-area perspective." *European Commission*, Economic papers 299

Schmittmann, J. M. (2010), "Currency Hedging for International Portfolios," *International Monetary Fund***,** WP/10/151

Table 1: The dummy variable of the EU countries join in the Eurozone

Country/year	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Austria	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Belgium	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Finland	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
France	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Germany	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ireland	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Italy	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Luxembourg	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Netherlands	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Portugal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Spain	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Greece	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Slovenia	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
Cyprus	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Malta	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Slovakia	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Lithuania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Romania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

"Official Launch of the Euro" is the year of the implementation of the single monetary policy by the European System of Central Banks between year 1999 and 2015.
"1" indicates the country adopt the euro after certain year.
"0" represent the country is still using its national currency at that year.

Table 2: Export to Eurozone (Fixed Effect)

	(1)	(2)	(3)	(4)	(5)
	Exeuro	Exeuro	Exeuro	Exeuro	Exeuro
euro	0.204***	0.205***	0.199***	0.174***	0.174***
	(0.040)	(0.041)	(0.041)	(0.044)	(0.044)
gdppc		-0.266	-0.290	-0.446	-0.390
		(2.271)	(2.277)	(2.398)	(2.446)
FDI			-0.00007	0.00004	0.00004
			(0.0003)	(0.0003)	(0.0003)
RD				-0.006	-0.006
				(0.049)	(0.050)
FC					0.0004
					(0.004)
Constant	9.697***	12.470	12.710	14.380	13.780
	(0.039)	(23.712)	(23.777)	(25.045)	(25.560)
R^2	0.606	0.606	0.607	0.615	0.615
F	38.94	36.69	34.24	32.48	30.78

Standard errors in parentheses *** $p < 0.01$

Table 3: Export to Eurozone (Random Effect)

	(1)	(2)	(3)	(4)	(5)
	Exeuro	Exeuro	Exeuro	Exeuro	Exeuro
euro	0.208***	0.210***	0.204***	0.176***	0.176***
	(0.041)	(0.041)	(0.042)	(0.045)	(0.045)
gdppc		-0.473	-0.506	-0.576	-0.515
		(2.282)	(2.292)	(2.422)	(2.471)
FDI			-0.00008	0.00003	0.00003
			(0.0003)	(0.0003)	(0.0003)
RD				0.015	0.016
				(0.049)	(0.050)
FC					0.0005
					(0.004)
Constant	9.688***	14.620	14.970	15.690	15.040
	(0.305)	(23.832)	(23.934)	(25.300)	(25.821)
R^2	0.606	0.606	0.607	0.615	0.615
Wald Chi2	655.37	653.00	641.28	604.03	602.26

Standard errors in parentheses *** $p < 0.01$

Table 4: Export to Non-Eurozone (Fixed Effect)

	(1)	(2)	(3)	(4)	(5)
	Exnoneuro	Exnoneuro	Exnoneuro	Exnoneuro	Exnoneuro
euro	0.093*	0.085*	0.080	0.119**	0.116**
	(0.051)	(0.049)	(0.050)	(0.053)	(0.054)
nongdppc		-1.306***	-1.286***	-1.459***	-1.448***
		(0.229)	(0.231)	(0.249)	(0.249)
FDI			-0.0001	0.0002	0.0002
			(0.0003)	(0.0003)	(0.0003)
RD				0.075	0.070
				(0.060)	(0.061)
FC					-0.003
					(0.004)
Constant	9.265***	21.890***	21.700***	23.280***	23.250***
	(0.049)	(2.212)	(2.238)	(2.397)	(2.399)
R^2	0.615	0.642	0.640	0.660	0.661
F	40.39	42.76	39.43	39.47	37.48

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Export to Non-Eurozone (Random Effect)

	(1)	(2)	(3)	(4)	(5)
	Exnoneuro	Exnoneuro	Exnoneuro	Exnoneuro	Exnoneuro
euro	0.100**	0.0893*	0.0849*	0.119**	0.115**
	(0.051)	(0.049)	(0.050)	(0.054)	(0.054)
nongdppc		-1.333***	-1.318***	-1.479***	-1.470***
		(0.221)	(0.223)	(0.236)	(0.237)
FDI			-0.0001	0.0002	0.0002
			(0.0003)	(0.0003)	(0.0003)
RD				0.107*	0.104*
				(0.060)	(0.060)
FC					-0.003
					(0.004)
Constant	9.257***	22.140***	22.000***	23.400***	23.400***
	(0.295)	(2.153)	(2.173)	(2.297)	(2.297)
R^2	0.615	0.642	0.640	0.660	0.660
Wald Chi2	681.03	771.26	745.75	743.96	742.47

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Volatility of Export to Eurozone (Fixed Effect)

	(1)	(2)	(3)	(4)	(5)
	Veuro	Veuro	Veuro	Veuro	Veuro
euro	-0.027*	-0.033**	-0.033**	-0.040**	-0.039**
	(0.014)	(0.015)	(0.015)	(0.016)	(0.015)
gdppc		2.021	1.972	2.181*	1.547
		(1.241)	(1.248)	(1.267)	(1.252)
FDI			0.00007	0.00001	0.00003
			(0.0001)	(0.0001)	(0.0001)
RD				0.036*	0.026
				(0.018)	(0.018)
FC					-0.004***
					(0.001)
Constant	0.138***	-20.970	-20.450	-22.680*	-15.950
	(0.011)	(12.957)	(13.029)	(13.232)	(13.081)
R^2	0.108	0.116	0.113	0.121	0.160
F	3.006	2.996	2.678	2.630	3.410

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Volatility of Export to Eurozone (Random Effect)

	(1)	(2)	(3)	(4)	(5)
	Veuro	Veuro	Veuro	Veuro	Veuro
euro	-0.039***	-0.040***	-0.041***	-0.039***	-0.041***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)
gdppc		1.118	1.158	0.383	0.437
		(0.854)	(0.871)	(0.817)	(0.807)
FDI			0.00006	0.00002	0.000009
			(0.0001)	(0.0001)	(0.0001)
RD				-0.016**	-0.018**
				(0.007)	(0.007)
FC					-0.003***
					(0.001)
Constant	0.142***	-11.540	-11.950	-3.839	-4.331
	(0.012)	(8.914)	(9.096)	(8.535)	(8.433)
R^2	0.107	0.113	0.111	0.095	0.136
Wald Chi2	49.44	50.93	49.19	56.86	68.31

Standard errors in parentheses ** $p < 0.05$, *** $p < 0.01$

Table 8: Volatility of Export to Non-Eurozone (Fixed Effect)

	(1)	(2)	(3)	(4)	(5)
	Vnoneuro	Vnoneuro	Vnoneuro	Vnoneuro	Vnoneuro
euro	-0.038**	-0.037**	-0.034**	-0.036**	-0.036**
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)
nongdppc		0.296***	0.305***	0.347***	0.349***
		(0.088)	(0.088)	(0.090)	(0.090)
FDI			0.0003***	0.0003***	0.0003***
			(0.0001)	(0.0001)	(0.0001)
RD				-0.021	-0.024
				(0.020)	(0.020)
FC					-0.001
					(0.001)
Constant	0.165***	-2.695***	-2.797***	-3.171***	-3.154***
	(0.0120)	(0.850)	(0.853)	(0.870)	(0.870)
R^2	0.204	0.231	0.249	0.261	0.264
F	6.346	6.891	6.942	6.724	6.403

Standard errors in parentheses ** $p < 0.05$, *** $p < 0.01$

Table 9: Volatility of Export to Non Eurozone (Random Effect)

	(1)	(2)	(3)	(4)	(5)
	Vnoneuro	Vnoneuro	Vnoneuro	Vnoneuro	Vnoneuro
euro	-0.049***	-0.043***	-0.040***	-0.041***	-0.041***
	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)
nongdppc		0.049*	0.056**	0.029	0.029
		(0.027)	(0.027)	(0.023)	(0.024)
FDI			0.0002**	0.0002**	0.0002**
			(0.0001)	(0.0001)	(0.0001)
RD				-0.026***	-0.026***
				(0.009)	(0.009)
FC					-0.0006
					(0.001)
Constant	0.170***	-0.309	-0.377	-0.0857	-0.0781
	(0.015)	(0.258)	(0.265)	(0.231)	(0.234)
R^2	0.203	0.212	0.230	0.228	0.231
Wald Chi2	92.51	96.41	102.82	114.47	114.18

Standard errors in parentheses ** $p < 0.05$, *** $p < 0.01$