8. EXPORT COMPOSITION AND THE EUROZONE TRADE BALANCE IN MANUFACTURING GOODS

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Abstract

Some Eurozone countries have been characterised by a persistently increasing trend in the external imbalances, involving potential risks. This research is pioneering in analysing the effects of export composition on the trade balance in manufacturing goods using bilateral trade flows among the EA-12 countries and their EU-15 partners. Based on dynamic panel data regression models, the results indicated a robust association between the share of high-technology export goods and the trade balance. This association is robust during the period of growing imbalances (1999-2007) and for an expanded time span (1999-2015). In contrast to previous studies, traditional explanatory variables such as income elasticity and price elasticity did not show significant associations. Therefore, the policy makers need to be aware that the economic specializations of their countries, especially their export structures, play key roles in explaining and managing the external imbalances.

Keywords: European trade balance; manufacturing goods; export composition
JEL Classification: F15, F14, F32

1. Introduction

The outbreak of the global financial crisis and the subsequent European sovereign debt crisis increased the attention paid to the (relatively) large external imbalances of some Eurozone countries. Two reasons explain these increasing concerns. First, a potential link between these imbalances and the beginning of the crisis (Carrasco and Serrano, 2015) and, second, the risk that these imbalances signifies for the stability of the Eurozone (Arghyrou and Chortareas, 2008; Campa and Gavilan, 2011; Schmitz and von Hagen, 2011; Belke and Dreger, 2013; Chen, Milesi-Ferretti and Tressel, 2013; Alessandrini *et al.*, 2014; Moro, 2014; Gehringer, 2015).

Several hypotheses were tested to explain the European external imbalances. However, only a few studies have focused on non-price competitiveness, which is now highly relevant

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among the Eurozone countries because of the Euro, removing the exchange rate risk. In this line, the literature has recently claimed that export composition, in particular exports consisting of high technology products, is positively associated with export performance. This suggests that export composition may also impact balance in both the trade account and the current account (Athanasoglou, Backinezos and Georgiou, 2010; Wierts, Van Kerkhoff and De Haan, 2014; Carrasco and Peinado, 2015). Given this, the main goal of this study is to examine the bilateral trade of manufacturing goods among the EA-12 countries (the first 12 countries in adopting the single currency) and its relationship with the export composition.

It is worth noticing that the goods balance is the main component of the current account balance in the cases of Finland, Germany, the Netherlands, Greece, Portugal, and Spain (six of the EA-12 countries). These countries presented the largest imbalances within the EA-12 group during the growing imbalances period (1999-2007). Therefore, to be able to address the Eurozone external imbalances, it is necessary to identify the determinants of their goods balances. In addition, for the EA-12 countries, exports and imports of manufacturing goods are the main component of the total merchandise exports and imports during the period 1999-2007. Subsequently, the analysis of determinants of the trade balance of manufacturing goods is fundamental for the analysis of external imbalances in the Eurozone.

Until recently, the economic literature has studied the determinants of bilateral trade balance and the effects of export composition, separately. In the first batch of the literature, as highlighted by Khan and Hossain (2012), the determinants of the bilateral trade balance are not necessarily those determining the overall trade balance. Previous studies included explanatory variables such as bilateral real exchange rate, the ratio of external-to-domestic income, import-weighted distance, bilateral foreign direct investment, and relative labor costs (Çelik and Kaya, 2010; Khan and Hossain, 2010, 2012; Gu, Zhou and Beg, 2014; Bineau, 2016). Nevertheless, the explanatory variables should contemplate the bilateral nature of the relationship: that is, at least some relative factors should be taken into account to investigate the determinants of bilateral trade (Khan and Hossain, 2010).

On the other hand, the economic literature has explored the relationship between export composition, export performance, productivity, and economic growth. This literature has highlighted the role of export composition and export diversification in the economic growth (Ghatak, Milner and Utkulu, 1997; Aditya and Acharyya, 2013), through its effects on productivity growth when the composition of exports is dominated by manufacturing exports rather than primary exports (Fosu, 1990; Ghatak, Milner and Utkulu, 1997; Herzer, Nowak-Lehmann and Siliverstovs, 2006).

This paper aims to add pieces to the puzzle by analysing the relationship between bilateral manufacturing trade balance and export composition. Accordingly, it contributes to the empirical literature in several ways. First, following the model developed by Khan and Hossain (2010), we analyse the determinants of the Eurozone manufacturing trade balance highlighting the role of export composition in explaining non-price competitive differences among the Eurozone countries. Second, we build a panel of panels (as in Wierts *et al.*, 2014) with each of the EA-12 countries (country *i*) and their EU-15 trade partners (partner country *j*). Third, we analyse how relative factors (as suggested by Khan and Hossain 2010) are strategic in determining the bilateral manufacturing trade balance in the Eurozone. Fourth, we include a key variable representing the effect of Euro adoption on the interest rates. Fifth, we focus on the period of growing imbalance, *i.e.*, after Euro adoption and before the last global financial crisis and, thereafter, we make robustness checking exercises increasing

the period of analysis. Finally, our empirical approach includes several static and dynamic panel methods and specifications to provide robust and consistent results.

The rest of the paper is structured as follows. Section 2 presents some facts on the European external imbalances and their relationship with export composition. Section 3 describes the data set and the methodology to be implemented. Section 4 presents and discusses the main results. Finally, we conclude and give some policy recommendations.

2. European External Imbalances and the Composition of Exports

The characteristics of the Eurozone imbalances differ from other imbalances of global importance, which have been observed since the eighties (Belke and Dreger, 2013). A first characteristic of the European imbalances is the one that the countries with the highest level of income, in relative terms, tended to detect the presence of surpluses in their current accounts, while the countries with the lower levels of income showed deficits (Carrasco and Serrano, 2015).

Additionally, Eurozone imbalances were detected before the adoption of the Euro and increased after the introduction of the single currency (Berger and Nitsch, 2010; Carrasco, 2015).[3] How could the adoption of the single currency be connected to persistently increasing deficits in the current account of relatively low-income countries? The most supported hypothesis is based on the expected catching-up process that would make these (relatively less developed) countries converge with the core Eurozone countries (Campa and Gavilan, 2011; Belke and Dreger, 2013; Gehringer, 2015; Carrasco and Hernandez-del-Valle, 2017). Within this hypothesis, lower transaction costs and the elimination of exchange rate risk due to the adoption of the Euro encouraged the capital flows from the core Eurozone countries to peripheral countries. That is, capital flows sought higher returns because of the expected economic convergence among the Eurozone members within the economic integration process, where shelter was provided to the foreign investors by having common European institutions, ensuring the return of investments.

Figure 1 shows the balance of the current transactions of the EA-12 countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain) with the rest of the world (BCTRW) over the period 1960-2015.[4] As show in Figure 1, from Euro adoption up to the outbreak of the global financial crisis in 2008 (light grey area), Greece, Ireland, Italy, Portugal and Spain showed a significant increase in their deficits with the rest of the world. Conversely, Austria, Germany, and the Netherlands presented an increasingly persistent surplus. Thus, the period 1999-2007 was characterised by the rise in external imbalances.

However, since the outbreak of the global financial crisis and the subsequent sovereign debt crisis (dark grey area in Figure 1), the observed external imbalances of the 1999-2007 period

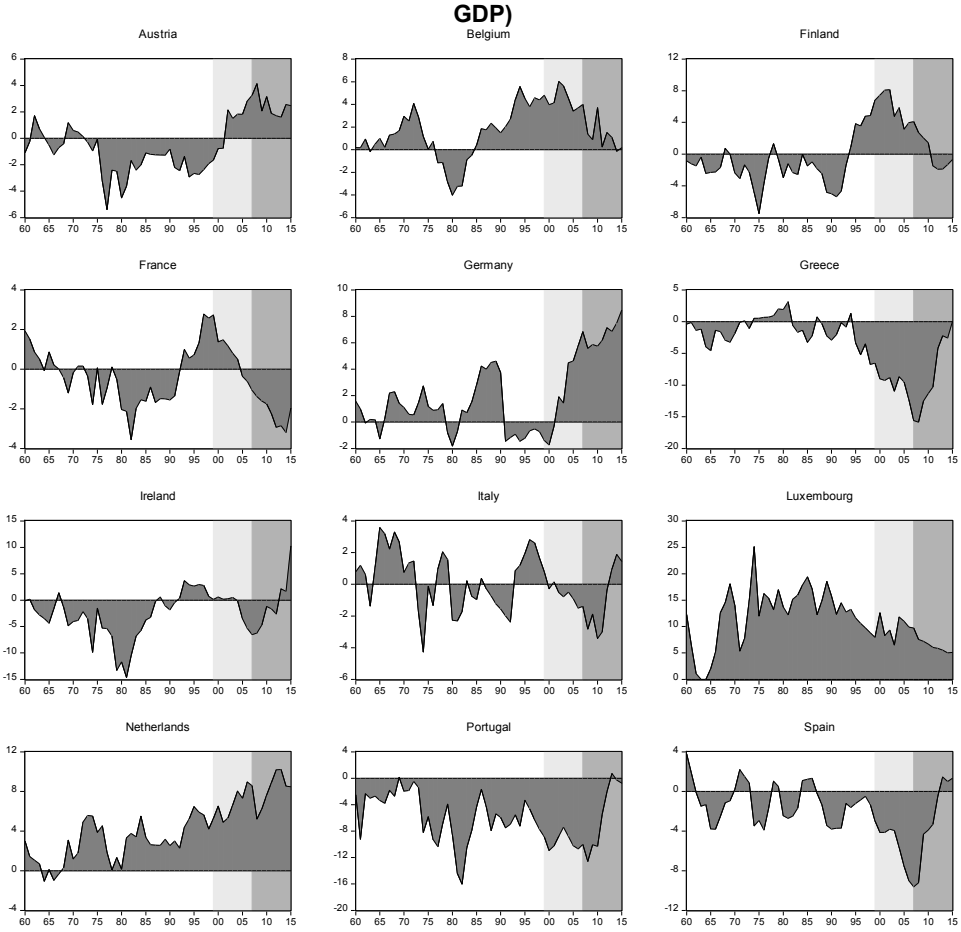
[3] Moreover, the adoption of the single currency was reflected in a significant increase in the trade among the Eurozone member countries and in the trade of these countries with third parties (Sadeh, 2014).

[4] BCTRW series is a proxy for the current account balance with the advantage of a long-span availability.

decreased in the cases of Austria, Belgium, Finland, France, Greece, Ireland, Italy, Portugal and Spain.[5]

Figure 1

Balance of EA-12 Countries Current Transactions with the Rest of the World (% GDP)



Source: AMECO.

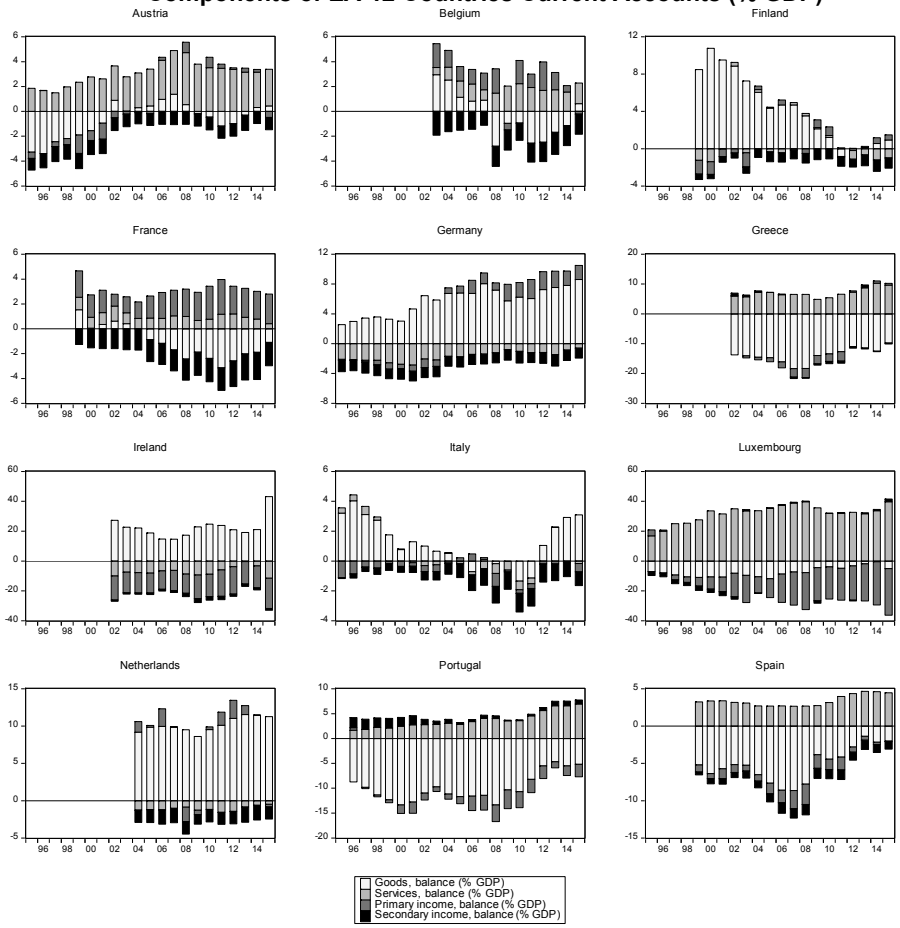
Another important characteristic of the European external imbalances is the wide variation of composition of the current account among the Eurozone members, so that the

[5] *In this regard, a question remained unanswered: the decrease in the deficits of peripheral countries during the recent period is explained by a structural change after the forced adjustments in the aftermath of the global financial crisis or the decline in those imbalances is just a cyclical factor. That is, are they a consequence of the temporary reduction in the GDP, and, once an economy recovers, are they likely to reappear?*

determinants may be different as well. Figure 2 shows the components of the current account balance (goods balance, services balance, primary income, secondary income) of the EA-12 countries as share of the GDP. Over the 1999-2007 period, the goods balance was the larger component of the current account balance in the case of Finland, Germany, Greece, the Netherlands, Portugal and Spain. In addition, the current account presented a persistent surplus in the case of Finland, Germany and the Netherlands, while in the case of Greece, Portugal and Spain the current account was persistently in deficit. In the case of Austria and Luxembourg, the main current account component was the services balance. These two countries are characterised by a persistent and relatively large current account surplus. Thus, except for Austria and Luxembourg, the countries with the largest external imbalances in the EA-12 group are those for whom the goods balance is the main component of the current account balance.

Figure 2

Components of EA-12 Countries Current Accounts (% GDP)



Source: OECD Stats.

Additionally, for the EA-12 countries, exports and imports of manufacturing goods were the main component of the total merchandise exports and imports during the 1999-2007 period. On the one hand, with data from the World Development Indicators, the share of manufactured exports to merchandise exports accounted a 1999-2007 period average of 81.5% for Austria, 79.1% for Belgium, 83.8% for Finland, 80.7% for France, 85% for Germany, 53.9% for Greece, 86% for Ireland, 86.7% for Italy, 83% for Luxembourg, 60.4% for the Netherlands, 81.7% for Portugal and 77.1% for Spain. On the other hand, in the same period the share of manufactured imports to merchandise imports accounted an average of 78.7% for Austria, 76.2% for Belgium, 70.6% for Finland, 76.3% for France, 70.3% for Germany, 69.4% for Greece, 78.7% for Ireland, 68.3% for Italy, 70.8% for Luxembourg, 64.6% for the Netherlands, 70.4% for Portugal and 72.9% for Spain. Consequently, if the aim is to analyse the determinants of the European external imbalances, we should analyse the determinants of the manufacturing goods balance.

According to empirical evidence from outside the Eurozone, relative income and exchange rate are the key determinants of the manufacturing goods balance (Çelik and Kaya, 2010; Khan and Hossain, 2012; Gu, Zhou and Beg, 2014; Bineau, 2016). However, dynamics of these two variables should be different for the Eurozone countries: they have a single currency and they are high-income economies. Thus, non-price competitiveness should play a key role. Consequently, we focus on the role of high-tech manufacturing exports. One should notice that export composition is a signal of specialisation in the economy and of non-price competitiveness (Carrasco and Peinado, 2015; Carrasco and Hernandez-del-Valle, 2017). An economy specialised in goods with higher-added value, in relative terms, is located above or close to the technological frontier. Consequently, the goods that this economy exports are hard to be substituted when prices change. In other words, the price elasticity of demand for exported goods should be low. Otherwise, an economy specialised in relatively non-high-tech exports should be more sensitive to the changes in prices and income. Therefore, if the composition of exports is a key determinant of the balance of goods, then the adjustment of external imbalances may require a structural change in the productive structure.

The economic literature has analysed the relationship between export composition, export performance, productivity, and economic growth, but not the role of export composition in the bilateral manufacturing balance. For instance, it was revealed that export diversification and export composition were key factors in determining the economic growth (Ghatak, Milner and Utkulu, 1997; Aditya and Acharyya, 2013). Furthermore, the positive effects of exports on productivity and economic growth are higher when it comes from manufacturing goods exports rather than form primary sector exports (Fosu, 1990; Ghatak, Milner and Utkulu, 1997; Herzer, Nowak-Lehmann and Siliverstovs, 2006).

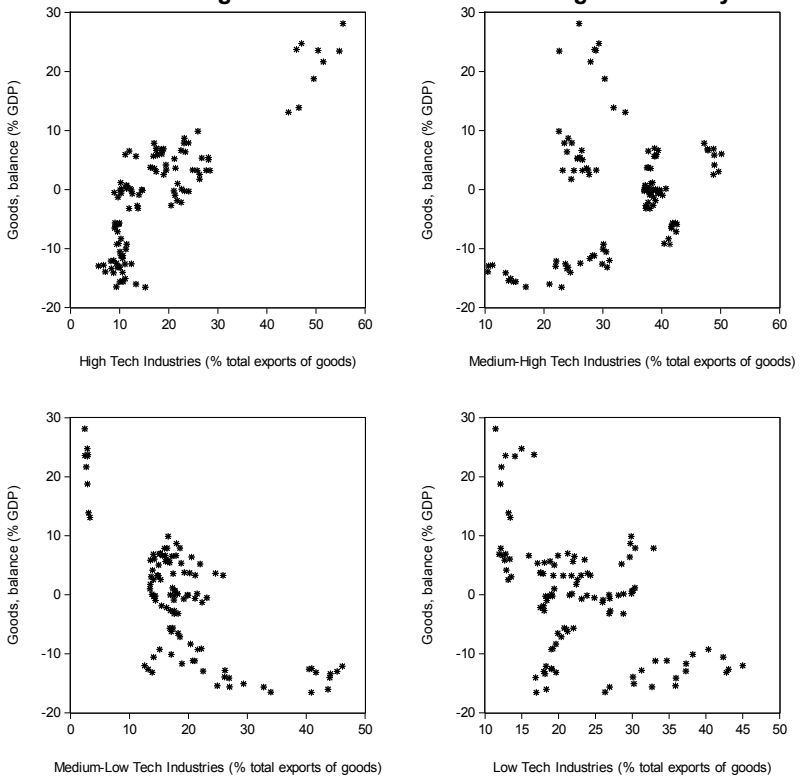
However, the evidence suggests that, despite the fact that increasing manufacturing exports is important for sustained growth, this relationship is only met once an economic development threshold has been reached. This is due to the minimum requirement of human capital before having benefited of a transition toward manufacturing goods (Sheridan, 2014). When exports are composed of high-technology goods, the effects on production are significant and positive, especially in the countries of whose manufacturing exports as shares of total exports are higher than the world average (Aditya and Acharyya, 2013). Hence, those firms investing more on research and development (R&D) tend to export more, where the combination of exports and R&D have joint positive effects on productivity growth (Bravo-Ortega, Benavente and González, 2014). Moreover, growth in skill-intensive exports improves the average educational attainment and increases schooling, which implies that

some kind of sectorial development is more beneficial to capital accumulation and long-term growth (Blanchard and Olney, 2017). Finally, export specialisation in high technology industries have positive effects on total export performance (Wierts, Van Kerkhoff and De Haan, 2014).

Figure 3 shows the relationship between manufacturing goods balance and the technological intensity of exports in the EA-12 countries. It is possible to identify a positive relationship between high-tech exports and the manufacturing goods balance. In contrast, there is no clear pattern between the manufacturing goods balance and the medium-high, medium-low or low technology industries. Therefore, in what follows, we examine the role of high technology products in export composition, in a bilateral framework among the EA-12 countries and their EU-15 partners (*i.e.*, EA-12 plus Denmark, Sweden and United Kingdom) over the periods 1999-2007 and 1999-2015.

Figure 3

Manufacturing Goods Balance and Technological Intensity



Source: OECD STAN Bilateral Trade Database.

3. Data and Methodology

As mentioned above, the period 1999-2007 was characterised by the increase and persistence of European external imbalances. In 1999 and 2007 two major structural breaks

were observed. First, in 1999 the Euro was adopted as an accounting currency in the world financial markets, and second, the outbreak and contagion of the global financial crisis started in 2007. Both facts could have implied a change in the determinants of the European external imbalances. Consequently, to avoid biased results from a structural change, in a first approach we study the 1999-2007 period. The empirical tests are focused on the bilateral trade among the EA-12 countries and their EU-15 partner countries. We selected the EU-15 countries as the trade partner group for two main reasons: the EU-15 countries have a similar level of development and they belong to the single market.

The core data is taken from the STAN bilateral trade database, sponsored by the Organisation for Economic Co-operation and Development (STAN-OECD). Likewise, we follow the STAN-OECD definition for high technology manufacturing industries. Data on manufacturing exports, manufacturing imports and exports composition are taken from OECD Stats; Harmonised Index of Consumer Prices and convergence criterion interest rates from Eurostat; real unit labour costs from AMECO macro-economic database; and GDP per capita, total GDP and GDP growth from World Development Indicators.

Thus, we examine the determinants of the bilateral manufacturing goods balance in a panel data framework where the baseline model is given by Equation (1):

$$lnB_{ij,t} = \beta_{0ij} + \beta_1 lnB_{ij,t-1} + \beta_2 lnP_{ij,t} + \beta_4 lnY_{ij,t} + \beta_5 lnC_{ij,t} + \beta_6 lnRULC_{ij,t} + \beta_7 IR_{ij,t} + \beta_8 EA-6_{ij,t} + YEAR_t{}'\delta + e_{ij} + v_{ij,t} \quad (1)$$

where: $B_{ij,t}$ is the manufacturing goods balance, measure as the ratio of exports to imports of manufacturing goods of country *i* with partner country *j*. $P_{ij,t}$ is the ratio of the Harmonised Index of Consumer Prices (HICP) in partner country *j* to country *i* (proxy of price elasticity). $Y_{ij,t}$ is the ratio of per capita GDP in partner country *j* to country *i* (proxy of income's elasticity). $C_{ij,t}$ represents the high-technology exports of manufacturing goods as share of the total exports of manufacturing goods of country *i* with partner country *j* (proxy of export composition). $RULC_{ij,t}$ is the ratio of the Real Unit Labour Cost in partner country *j* to country *i* (proxy of competitiveness' elasticity). $IR_{ij,t}$ account for the euro effect on interest rate differential.

To compute $IR_{ij,t}$ let $a_{i,t}$ and $a_{j,t}$ be the difference between the interest rate in time *t* and the interest rate average in the 1994-1998 period for countries *i* and *j*, respectively. Then, $IR_{ij,t}$ is obtained as the difference between $a_{j,t}$ and $a_{i,t}$. One should notice that all variables are transformed into logarithms, excluding *IR* because it can take negative values.

YEAR is a time effect (dummy for each year) controlling effects of unspecified market conditions. We also include a dummy variable coded 1 for Finland, Germany, the Netherlands, Greece, Portugal, and Spain (*EA-6*), because these countries presented a persistent surplus or deficit in their current account balances (mainly composed by the goods balance).

Cross-sectional dependence was rejected by three tests: Pesaran, Friedman, and Frees (Pesaran, 2004; De Hoyos and Sarafidis, 2006) and the Pesaran-Yamagata test rejected cross-country heterogeneity (Pesaran and Yamagata, 2008; Ditzen and Bersvendsen, 2019). Following the previous literature (Çelik and Kaya, 2010; Khan and Hossain, 2012; Gu, Zhou and Beg, 2014; Bineau, 2016), we tested stationarity in our variables. We used several panel unit root tests, namely, Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS), Harris-

Tzavalis, Breitung, Fisher-type, and Hadri. Some of these tests assume a common autoregressive parameter and others assume an individual (panel-specific) one. The tests also included combinations of non-constant, constant, and trend. Unexpectedly, most of the tests suggest that only the ratio of per capita GDP has unit root (these results are not reported in tables to save space). Consequently, a panel cointegration analysis (as in the previous literature) is not suitable in our case.

It is worth noticing that the lagged dependent variable is included as regressor because of the autoregressive nature of manufacturing goods balance. Given this, and because cointegration analysis is not an option, in order to estimate the baseline model the econometric literature suggests the use of dynamic panel data models using the generalized method of moments, explicitly the SYS GMM method (Blundell and Bond, 1998) or the DIF GMM method (Arellano and Bond, 1991).[6] The variables under study may reveal autoregressive characteristics, biasing the estimation of DIF GMM (Blundell, Bond and Windmeijer, 2001). In addition, in our case, the number of cross-sectional observations is relatively large as compared to the time-series observations (158 x 9). Consequently, the SYS GMM method is the preferable option (Bun and Windmeijer, 2010). The method ensures efficiency and consistency once the internal instruments are validated and in the absence of autocorrelation of second order (Baltagi, 2005).

4. The Results

4.1 The Period of Growing Imbalances (1999-2007)

The main results of the panel data dynamic model (Equation 1) and other specifications for the period of growing imbalances (1999-2007) are presented in Table 1. Column (1) shows the estimated coefficients using the SYS GMM method in two steps and including a maximum of 2 lags of dependent and independent variables as instruments.[7] First, one may notice that the dynamic model is well justified, the lagged dependent variable as regressor is statistically significant at the 1% level. The Sargan test validates the instruments and the serial correlation of second order is rejected.

Table 1

Regression Results (EA-12 Sample)

Dependent variable: bilateral manufacturing goods balance

	(1) SYS GMM	(2) SSY GMM	(3) SYS GMM	(4) DIF GMM	(5) Random Effects	(6) Fixed Effects	(7) Fixed Effects Corrected
Lagged Dependent	0.65***	0.48***	0.61***	0.30***	0.92***	0.49***	0.64***
Harmonised Index of Consumer Prices	-0.04		-0.03	-0.33	-0.24**	-0.26	-0.21
GDP per capita	0.20		0.25	0.73***	-0.03**	0.47**	0.39***
High-technology exports	0.16***		0.13***	0.12***	0.02*	0.11***	0.11***
Real Unit Labour Cost	0.13		0.22	0.61***	-0.01	0.53**	0.40***
Interest rate	-0.07***		-0.0004	-0.01	-0.01***	-0.04	-0.03

[6] The potential relevance of these methods in explaining trade balance has been already noticed in the literature (Khan and Hossain, 2012). However, their use was limited because of concerns about the assumptions required by the methods for efficient and consistent estimations.

[7] In this manner, we keep the number of instruments low, accounting for the potential problem of too many instruments (Roodman, 2009).

	(1) SYS GMM	(2) SSY GMM	(3) SYS GMM	(4) DIF GMM	(5) Random Effects	(6) Fixed Effects	(7) Fixed Effects Corrected
Lagged Harmonised Index of Consumer Prices		-0.41	-0.28				
Lagged GDP per capita		0.20	0.04				
Lagged High-technology exports		0.02	0.01				
Lagged Real Unit Labour Cost		-0.43*	-0.27				
Lagged Interest rate		-0.11***	-0.08***				
EA-6	-0.07	-0.05	-0.11		-0.001		
Year 2001	-0.02	-0.03**	-0.03**	-0.03**	-0.02	-0.02	
Year 2002	-0.02	-0.04*	-0.03*	-0.03**	-0.01	-0.02	
Year 2003	-0.003	-0.02	-0.01	-0.01	0.003	-0.01	
Year 2004	0.00004	-0.01	-0.003	-0.01	0.01	-0.004	
Year 2005	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	
Year 2006	-0.02	-0.02	-0.01	-0.03	-0.02	-0.04*	
Year 2007	-0.005	-0.03	-0.01	-0.02	-0.01	-0.03	
Constant	-0.37***	0.02	-0.32**	-0.28***	-0.04	-0.24***	
Observations	1264	1264	1264	1106	1264	1264	1106
r-squared (over all)	n.a.	n.a.	n.a.	n.a.	0.95	0.77	n.a.
N x T	158 x 8	158 x 8	158 x 8	158 x 7	158 x 8	158 x 8	158 x 7
Sargan test (p-value)	25.27 (0.12)	16.00 (0.59)	25.12 (0.12)	21.37 (0.04)			
First order serial correlation test (p-value)	-4.11 (0.00)	-3.46 (0.00)	-3.67 (0.00)	-3.06 (0.00)			
Second order serial correlation test (p-value)	-0.33 (0.74)	-0.30 (0.75)	-0.23 (0.81)	-0.93 (0.35)			

(*) [**] and {***} indicate statistical significance at the (10%) [5%] and {1%} levels.

The coefficients of Harmonised Index of Consumer Prices (proxy of price elasticity) and GDP per capita (proxy of income elasticity) are not statistically significant. These results differ from the majority of previous findings, where income and real exchange rate are key determinants of trade balance, suggesting or not a J-curve (Çelik and Kaya, 2010; Khan and Hossain, 2012; Gu, Zhou and Beg, 2014; Bineau, 2016). The insignificant effects of these variables could respond to a relatively homogenous income level (the Eurozone members are high-income countries). In addition, the differences in prices are especially relevant in the case of countries whose comparative advantages are mainly in price-competitive industries; this is not the case for most of the Eurozone countries.

Most important for the main goal of this research, the coefficient of high-technology exports has a positive sign, and is statistically significant at the 1% level. Thus, the key explanatory variable of trade balance among the European countries is the export composition, where countries mainly exporting high technology goods will see positive impacts on their balance. This effect should be a result of the inelastic demand of these goods and the high value added in their production process.

In addition, our results indicate that the Real Unit Labour Cost (proxy of price-competitiveness) does not show statistical significance. This result disagrees with previous findings in China, where RULC is the most relevant explanatory variable (Gu, Zhou and Beg, 2014). This makes sense in China, because the low costs of labour in this country are well known. On the contrary, in the European countries, the importance of price-competitive industries is relatively low, and it is not generalised for all the Eurozone member countries.

Moreover, the interest rate variable, accounting for the effects of Euro introduction, shows a negative sign and statistical significance, which agrees with previous findings in China, where foreign direct investment is associated with trade balance (Gu, Zhou and Beg, 2014). This variable captures the effect of Euro adoption on the interest rate. When the single currency was introduced, and the exchange rate risk disappeared, the trade and financial flows increased, especially when considering the expected process of real convergence. Capital flows exerted downward pressure on the interest rate, stimulating consumption and investment by increasing private and public debt, which was reflected in the external balance.

We do not expect reverse causality among our variables. Moreover, the SYS GMM is already controlling for endogeneity because it uses lags of the dependent and independent variables as instrumental variables. Nevertheless, as additional measures controlling for possible endogeneity concerns, we replicated the regression analysis including only lagged independent variables (column 2 in Table 1) and in combination, current and lagged independent variables (column 3 in Table 1). The results suggest that the lagged interest rate and the current share of high-technology exports explain the current manufacturing goods balance. This supports the results in the main specification (column 1), where the ratio of high-technology exports to total exports is positively linked to the manufacturing goods balance.

In order to check robustness to changes in the method, we replicated the analysis using the DIF GMM estimator (column 4), assuming random effects (columns 5), fixed effects (columns 6) and fixed effects corrected as proposed by Bruno (2005) (column 7). Although these methods are biased, the main finding on the relevance of export composition is robust. The coefficients of high-technology exports are positive and statistically significant in all specifications. These other regressions also support the use of the dynamic model, because the dependent variable (trade balance) as regressor is statistically significant at the 1% level in all regressions. The rest of independent variables show mixed results, so that it is not possible to identify any clear and robust association with the manufacturing goods balance.

Table 2

Regression Results (EA-6 Subsample)

Dependent variable: bilateral manufacturing goods balance

	(1) SYS GMM	(2) SSY GMM	(3) SYS GMM	(4) DIF GMM	(5) Random Effects	(6) Fixed Effects	(7) Fixed Effects Corrected
Lagged Dependent	0.55***	0.54***	0.55***	0.31***	0.91***	0.49***	0.62***
Harmonised Index of Consumer Prices	-0.30		-1.69***	-0.42	-0.37**	-0.45	-0.26
GDP per capita	0.34***		0.72*	0.45*	-0.06**	0.27	0.32
High-technology exports	0.07***		0.06***	0.07***	0.01	0.05**	0.04*
Real Unit Labour Cost	0.54***		0.60**	0.73***	-0.03	0.63***	0.17
Interest rate	-0.10***		-0.01	-0.05	-0.01***	-0.10***	-0.11***
Lagged Harmonised Index of Consumer Prices		0.40*	1.88***				
Lagged GDP per capita		0.09	-0.42				
Lagged High-technology exports		-0.004	0.03				
Lagged Real Unit Labour Cost		-0.51***	-0.47**				
Lagged Interest rate		-0.08***	-0.08***				
Year 2001	-0.04***	-0.03**	-0.05***	-0.04***	-0.05*	-0.04*	
Year 2002	-0.04**	-0.03**	-0.05***	-0.05***	-0.07**	-0.06***	
Year 2003	-0.001	0.01	-0.002	-0.03	-0.01	-0.02	

	(1) SYS GMM	(2) SSY GMM	(3) SYS GMM	(4) DIF GMM	(5) Random Effects	(6) Fixed Effects	(7) Fixed Effects Corrected
Year 2004	-0.03	-0.0003	-0.02	-0.05**	-0.05**	-0.04*	
Year 2005	-0.02	0.02	-0.001	-0.04*	-0.04	-0.04	
Year 2006	-0.05**	-0.01	-0.04	-0.08***	-0.06**	-0.08**	
Year 2007	-0.06***	-0.01	-0.04**	-0.09***	-0.07***	-0.09***	
Constant	-0.19***	-0.003	-0.25***	-0.27**	0.03	-0.13	
Observations	624	624	624	546	624	624	546
r-squared (over all)	n.a.	n.a.	n.a.	n.a.	0.96	0.90	n.a.
N x T	78 x 8	78 x 8	78 x 8	78 x 7	78 x 8	78 x 8	78 x 7
Sargan test (p-value)	19.45 (0.42)	23.48 (0.21)	23.19 (0.22)	18.55 (0.10)			
First order serial correlation test (p-value)	-4.27 (0.00)	-4.33 (0.00)	-4.26 (0.00)	-2.93 (0.00)			
Second order serial correlation test (p-value)	-0.32 (0.74)	-0.24 (0.80)	-0.34 (0.73)	-0.42 (0.66)			

(*) [**] and {***} indicate statistical significance at the (10%) [5%] and {1%} levels.

The EA-6 (Finland, Germany, the Netherlands, Greece, Portugal, and Spain) dummy variable does not show statistical significance. That is, the main findings should not be affected by the peculiarities of these countries. Nevertheless, we replicated the analysis using a subsample including only these countries. The main findings are reported in Table 2 and they are similar to those reported in Table 1. Specifically, the coefficients of export composition are positive and statistically significant. That is, the results again support the positive association between high-technology exports and manufacturing goods balance. In addition, the coefficients of GDP per capita, Real Unit Labour Cost, and Interest Rate presents several statistically significant coefficients with the expected sign.

4.2 The Robust Effect of Export Composition in an Expanded Period (1999-2015)

The main objective of this research is to examine the determinants of bilateral manufacturing trade balance of the EA-12 countries during the period of growing imbalances (1999-2007), associated with the burst and depth of the Eurozone crisis (Duman, 2018). However, it is worth noticing that the previous analysis left unanswered some key questions: is the association between export composition and external imbalances only a characteristic of the period of growing imbalances? How the results change when including the recovery years of the Eurozone economy, in an expanded time span (1999-2015)?

We may assume that the association between external balance and export composition remains unchanged after the period of growing imbalances. The main reason is related to the export specialization of the economies; its transformation requires a longer period to really allow for a change in the productive structure. However, it is also true that since the European economic crisis a readjustment process has been carried out, seeking, among other goals, to address the structural factors determining the external imbalances of the deficit economies.

Consequently, we extend the regression analysis to the 1999-2015 period. Table 3 shows the corresponding results of the regression analysis. Similar to the previous sub-section, the lagged dependent variable is significant in all specifications, so that the use of a dynamic

model is well justified. Now, the significance of traditional variables has changed, but they are not robust across all specifications. Moreover, the interest rate variable, accounting for the effects of Euro adoption, is still significant with the expected sign. Relative labour costs are only significant in regressions 3 and 4. More important, the variable accounting for export composition is significant and the magnitude of the parameter is similar to the previous estimations. Summarising, these results show the relevance of export specialization in determining the external trade imbalances in the EA-12 countries, during the period of growing imbalances and the recovery period of the Eurozone economy.

Table 3

Regression Results (EA-12 Sample, 1999-2015)

Dependent variable: bilateral manufacturing goods balance

	(1) SYS GMM	(2) SSY GMM	(3) SYS GMM	(4) DIF GMM	(5) Random Effects	(6) Fixed Effects	(7) Fixed Effects Corrected
Lagged Dependent	0.78***	0.80***	0.76***	0.51***	0.93***	0.62***	0.62***
Harmonised Index of Consumer Prices	-0.37***		-0.94***	-0.68***	-0.39***	-0.06	-0.04
GDP per capita	-0.08**		0.85***	0.76***	-0.01	0.45***	0.46***
High-technology exports	0.12***		0.12***	0.15***	0.01**	0.09***	0.09***
Real Unit Labour Cost	-0.15		0.34*	0.31**	-0.10	0.23	0.23***
Interest rate	-0.01***		-0.01***	-0.01***	-0.01***	-0.01***	-0.01***
Lagged Harmonised Index of Consumer Prices		-0.42***	0.92***				
Lagged GDP per capita		-0.19***	-1.02***				
Lagged High-technology exports		-0.04***	-0.01				
Lagged Real Unit Labour Cost		-0.37***	-0.55***				
Lagged Interest rate		-0.01***	-0.01***				
EA-6	0.09	0.14***	0.16***		0.005		
Year Dummies	yes	Yes	yes	Yes	yes	yes	n.a.
Constant	-0.35***	0.07	-0.35***	-0.36***	-0.03	-0.19***	
Observations	2520	2520	2520	2362	2520	2520	2362
r-squared (over all)	n.a.	n.a.	n.a.	n.a.	0.95	0.78	n.a.
N x T	158x16	158x16	158x16	158x15	158x16	158x16	158x15
Sargan test (p-value)	55.57 (0.08)	71.87 (0.003)	64.74 (0.01)	57.41 (0.00)			
First order serial correlation test (p-value)	-5.84 (0.00)	-5.77 (0.00)	-5.76 (0.00)	-6.38 (0.00)			
Second order serial correlation test (p-value)	0.28 (0.77)	-0.22 (0.82)	0.31 (0.75)	0.03 (0.97)			

(*) [**] and {***} indicate statistical significance at the (10%) [5%] and {1%} levels.

5. Conclusions and Implications

This paper contributes to the empirical literature by analysing the determinants of the Eurozone manufacturing trade balance, highlighting the role of non-price competitive differences among the Eurozone countries in a panel framework among the EA-12 countries and their EU-15 trade partners. In addition, our estimations account for the effects of the Euro adoption on the interest rates in an empirical approach that includes several static and dynamic panel methods and specifications to provide robust and consistent results.

For the EA-12 countries, the evidence suggests that traditional explanatory variables of bilateral trade balance are irrelevant for both the period of growing imbalances (1999-2007) and an expanded period (1999-2015). The coefficients of relative income and relative price levels (income and price elasticities) lack statistical significance. Consequently, traditional policy tools to manage the external imbalances will not work for and among the Eurozone countries. For its part, the coefficients of export composition presented statistical significance and robust results. That is, countries whose exports significantly consist of high-tech goods show positive impacts on their bilateral trade balances. Thus, increasing the share of high-tech exports may be expected to improve external trade balance in the deficit countries.

The results show that export composition is a key determinant of external imbalances. Thinking about the potential risks that external imbalances involve and about the policies to reduce them in the Eurozone, policy makers need to be aware that the economic specialization of countries, especially their export structure, plays a key role. In other words, if reducing external imbalances is a policy objective, the productive structure should be modified. To this aim, the discussion and implementation of industrial policies are necessary (Botta, 2014; Mazzucato *et al.*, 2015), that incentivise the establishment of new industries with higher value added in the Eurozone peripheral countries with potential spill-over effects on the rest of the economy. This requires at least a small amount of human capital able to be absorbed by these new industries. Thus, while the problem of external imbalances will be solved, the problem of underemployment that has been common in recent generations in the peripheral countries should be also addressed.

It is a fact that, since the global financial crisis, external imbalances in some Eurozone countries have been decreasing (see Figure 1). In this regard, there is evidence that the rebalances of peripheral countries resulted from the effect of domestic demand - in a context of relative low growth - and inflation on imports where productivity has played a key role in the core countries (Esposito and Messori, 2019). In addition, over the past 10 years many peripheral countries implemented a series of reforms (Greer, 2014) aimed at reorganizing their productive structures, mainly reducing the state's participation in the economy (Heimberger, 2017) and increasing labour market flexibility (Blanchard, Jaumotte and Loungani, 2014). Both strategies require more time and high efforts to modify the productive structure, and their capacity to modify the economic specialisation of some Eurozone countries is not clear. Additionally, recent research showed the relevance of regional-specific macro prudential policies in reducing the build-up of external imbalances (Bielecki *et al*., 2019). These findings agree with our results in the analysis of the expanded period. Therefore, without a deep process of reforming the economic structure of the deficit countries, we may expect that the differentials in export specialization will continue to cause differences in the external sector performance.

Our results are robust both for the period of growing imbalances (1999-2007) and for an expanded time span (1999-2015). However, future research should keep monitoring the evolution of the determinants of Eurozone external imbalances. The decrease in external trade imbalances will only be temporary if the economic structure of the deficit economies is not substantially modified.

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