The Euro effect on the Euro Zone Exports
Meriem Bouchoucha*

Abstract:
In this article, we examine the impact of the real effective exchange rate for several countries in the Euro area over the period before and after the introduction of the Euro on exports. Based on ARDL modeling techniques, we estimate the long-run and short-run relationships between exports volumes and a number of key variables, namely Real Effective Exchange Rate, weighted GDP and Output Gap. This article is particularly oriented towards the study of long-term relationships between the exchange rate and global exports performance on the one hand, and between exchange rates and intra-European exports performance, on the other. Two measures of exchange rate are considered: a global real exchange rate to investigate the impact of exchange rates on overall exports and an intra European real exchange rate calculated to detect its effect on intra-European trade. The study shows that there is a big difference between the impact of exchange rates on exports before and after the establishment of the European Monetary Union on the one hand, and between the impacts of exchange rates on intra-European global exports on the other hand.

JEL Classification: C22, F15, F36, F41.
Key words: Exports, Real Effective Exchange Rate, Euro Zone, ARDL model.

Dans cet article, nous examinons l'impact du taux de change effectif réel de plusieurs pays de la zone euro sur la période avant et après l'introduction de l'euro. En se basant sur des techniques de modélisation ARDL, nous estimons les relations de long terme et de court terme entre le volume des exportations et un certain nombre de variables clés, à savoir taux de change effectif réel, le PIB pondéré et l'Output Gap. Cet article est particulièrement orienté vers l'étude des relations de long terme entre le taux de change et les performances globales à l'exportation d'une part, et entre le taux de change et les performances intra-européennes à l'exportation d'autre part. Deux mesures de taux de change sont prises en compte: un taux de change réel global pour étudier l'impact des taux de change sur l'ensemble des exportations et un taux de change réel intra-européen calculé dans le but de détecter ses effets sur le commerce intra-européen. L'étude montre qu'il existe une grande différence entre l'impact des taux de change sur les exportations avant et après la création de l'Union monétaire européenne, d'un côté, et entre les effets des taux de change sur les exportations globales et intra-européens de l'autre.

Classification JEL: C22, F15, F36, F41.
Mots de passe : Exportations, Taux de Change Réel Effectif, Zone Euro, modèle ARDL.

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Introduction

There is an extensive literature on the relationship between exchange rate and trade (Glick and Rose, 2000), (Bun and Klassen, 2007), (Baldwin et al, 2005), (Campbell, 2012). However, there is relatively little empirical work that addresses the influence of intra European exchange rate on the trade. This article focuses on this aspect and shows that, contrary to expectations, the impact of exchange rate on the intra European trade is much more important than the impact of exchange rate on global trade of the euro zone countries. With using different real effective exchange rate indicators for the euro area, we demonstrated that measures of real effective exchange rate play a key role in the determination of price competitiveness impact.

In a context of rigid wages and prices, the exchange rate is an efficient instrument of economic policy to manage the macroeconomic consequences of problems of international competitiveness. Belonging to a country that is part of a monetary union implies renouncing the use of this instrument. If the monetary union is not an optimal currency area, it is important that members can experience a real convergence process particularly leading to a convergence of international competitiveness.

This concept is close to Kenen’s criterion definition (1969) of an optimal currency area that it is important for members to share production facilities and diversified exports. One approach to this problem is to assume that the criteria of optimum currency area are endogenous. In other words, they should be able to be achieved progressively so that economic agents use the single currency. Thereby, sharing a single currency would boost trade between member countries and accelerate trade integration (Rose, 2000) while increased trade integration is likely to promote a process of convergence of production structures and exports (Baldwin and Forster, 2008).

Since the crisis in the Euro area, the exchange rate of the Euro and the single currency that does not allow devaluation are accused of playing a role in the deterioration of the competitiveness of Euro zone countries, save for the competitiveness of Germany which was not affected by the appreciation of the exchange rate that refocuses the debate on the role of exchange rates in the improvement or the deterioration in competitiveness, specially in the European case.

This issue is particularly important in the actual situation of the Euro Zone given its important level of heterogeneity. Furthermore, if the current account of the Euro Zone is balanced on average, intra-European balance is not achieved. Actually, since the mid-1990s, southern European countries have been experiencing a sharp deterioration in their current accounts with deficits reaching 10% of the GDP on average. On the other hand, northern countries have accumulated surpluses (Graph 1).

It is well known that the volume of exports depends negatively on the exchange rate (when they decrease the rate increases; in other words, the currency depreciates). And, if the exchange rate increases, the volume of imports tends to increase as domestic goods are less competitive compared to foreign production. Thus, the effect on the two components, called volume effect, plays for the deterioration in the trade balance. However, the increase in the exchange rate tends to reduce the relative price (in national currency) of foreign imported goods.

In effect, the real exchange rate is the price of goods and services related to the price in other countries. Hence rises in European real exchange rate means that Euro Zone products are more expensive compared to those sold overseas, and are therefore less competitive. An appreciation of
the Euro, with other details remaining the same, will lift our real exchange rate, thereby lowering competitiveness and eventually affecting export volumes. A rise in the exchange rate will also affect exporters’ returns, making exporting from Euro Zone less profitable.

Graph 1: Current Account % GDP: Germany, France, Spain and Italy [1980-2012]

Source: IMF

Action to reduce a substantial current account deficit usually involves increasing exports (goods going out of a country and entering foreign countries) or decreasing imports (goods coming from a foreign country into a country). Firstly, this is generally accomplished directly through import restrictions, quotas, or duties (though these may indirectly limit exports as well), or by promoting exports (through subsidies, custom duty exemptions, etc.). Influencing the exchange rate to make exports cheaper for foreign buyers will indirectly increase the balance of payments.

In fact, the introduction of the Euro is supposed to promote trade significantly, as stated by the theory of optimal Euro Zone (Mundell, 1961), (McKinnon, 1963), (Kenen, 1969), (Fleming, 1971), (Rose, 2000). The consensus estimate suggests that the Euro has already boosted intra-Euro area trade by five to ten percent (Baldwin, 2006).

In this paper, in order to study the impact of exchange rates on Exports for European countries, we estimate the sensitivity of exports to exchange rate fluctuations before and after the introduction of the single currency. In order to achieve this objective, two models are studied to detect the trade effects of currency union, looking at both relations with Euro Zone and non-Euro Zone countries.

This paper is organized as follows. The first section discusses the relationship between exchange rate, competitiveness and the Euro Zone trade. In section two we present the determinants of exports. The third section deals with the econometric methodology. Section four deals with the estimation results. The final section is a conclusion.
Exchange rate volatility and multiple currencies may cause the depression of trade. In this sense, Mundell (1960) argues that for two nations forming a currency union, microeconomic gain grows with the development of trade.

An extensive literature has been developed to measure the effect of the single currency. Thus, Frankel and Rose (1998) confirm that monetary union promotes trade integration among member countries, and reduce in the future the risk of asymmetric shocks.

Rose (2000) finds that both exchange rate stability and a common currency were powerful stimulants to trade. He shows that countries in a currency union traded 3 times more with each other than one would expect. Rose (2000) suggested in this article that a currency union would increase trade by 200%, on top of the large and positive effect of eliminating exchange rate volatility. However, other studies showed that Rose’s result (2000) was entirely due to an econometric mistake (Pakko and Wall 2001), (Persson 2001). Micco et al. (2003) find that the trade effects of currency unions induced 6% more trade among member countries, and reduce in the future the risk of asymmetric shocks. Bun and Klaassen (2002) find quite similar results. In another study, Baldwin et al. (2008) confirm that the Euro zone’s exports to non-Euro zone nations seem to be unaffected by the new currency.

De Souza (2002) estimates the basic gravity model for the European Union countries with the addition of a time trend. He finds no evidence for a significant trade effect of the Euro unless he removes the trend. Barr et al. (2003) note that the trade effects of currency unions is positive and significant. Pakko and Wall (2001) refute the finding in Rose (2000). The findings of Flam and Nordstrom (2003) suggest that the trade effects of currency unions are 8%. Moreover, the estimate for the exports of non-Euro zone nations to Euro zone nations is almost identical to the intra-Euro zone effect, however, the Euro zone’s exports to non-Euro zone nations seem to be unaffected by the new currency.

Following its introduction in 1999, the Euro experienced four main phases: First, strong depreciation until 2001, then appreciation until 2004, afterward a period of variability within a relatively narrow range up to end 2005, and lastly a prolonged appreciation (Graph2).

Graph 2: Exchange rate Euro/US Dollar [1999-2012]

In this sense, the loss of price competitiveness experienced by the Euro area since the early 1990s was relatively modest, due partly to the large depreciation of the Euro’s exchange rate up to
2001. This could show a limited effect of the real effective exchange rate if the study of the evolution of exports covers a relatively long period. The effect of the appreciation of the euro would be absorbed.

Such exchange rate movements are broadly reflected, though to a less volatile extent, in Euro area related export prices. Measured in this way, price competitiveness deteriorated by around 10% between 1999 (Q1) and 2008 (Q1) (Di Mauro et al. 2008).

The heterogeneity of the Euro area must also be taken into consideration. Therefore, the impact of the exchange rate appreciation depends on the sensitivity of exports to changes in price competitiveness. An increase in the effective exchange rate of the national currency, all things being equal, causes the increase in export prices on the international market. The result is a decrease in price competitiveness in the export country, which could lessen export volumes.

Relatively bad export performance of French companies, coinciding with the rise of the Euro against the U.S. dollar from 2001, revived fears of an overvalued Euro that would penalize trade balance. Paradoxically, at the same time, Germany showed remarkable performance in terms of foreign trade.

As a matter of fact, German exports are generally considered less sensitive to changes in relative prices than French exports: it is estimated that a 1% decrease in price competitiveness in the exportation of German products leads to a long-term decline of 0.3 points in the volume of exports, against 0.7 in the French case, when performing modeling exports of these two countries with reference to their traditional determinants, global demand and real effective exchange rate (Cachia, 2008).

These differences can be explained particularly by differences in non-price competitiveness: German products have a better brand image than French products. This allows them to more easily support an increase in their export prices. Exporters Manufacturers seem to pay particular attention to the non-price competitiveness of export. But this does not only concern the French case since Italy and Spain have recorded losses in price competitiveness compared to France (Gaulier and Vicard, 2012).

The situation seems to be more difficult in the southern Euro Area and even France is sometimes included in this group of countries (Bennett et al. 2008). The common pattern of real appreciation observed during recent years in Greece, Italy, Portugal, and Spain was in the center of many studies (Meyer, 2004), (Papademos, 2007). It is argued that this real appreciation is associated with a loss of international competitiveness and could lead to a persistent period of slow growth, which has already materialized in the case of Italy and Portugal (Blanchard, 2006).

In fact, faced with growing surpluses in Germany (in addition to the Netherlands and Austria), crisis countries have experienced growing current account deficits. Countries with a structural current account deficit (Spain, Greece and Portugal) have seen it getting worse, reaching more than 10% of GDP in 2007, while France and Italy went from a surplus to a deficit (respectively – 1.0% and – 2.4% in 2007), these sustainable current account imbalances have played a key role in the current crisis in the euro zone (Lane and Milesi-Ferretti, 2011). The reason for this divergence is the considerable increase in export prices for Spain and Italy, while German and Dutch export prices grew marginally and French prices were virtually flat.

Spain and Italy experienced an improvement in their price competitiveness in the early 1990s due to the depreciation of the Peseta and the Lira over this period which pushed up competitors’ export prices (in Euro) for these two countries. However, the improvement in competitiveness for Italy did not last a long time due to rapidly increasing export prices. Indeed, Italy is losing in market shares as a result of the product and of the market specialization of its exports, as well as due to poor
price and non-price competitiveness since its exports suffered from competition from the new Euro
Union Member States and Asia, combined with low technological competitiveness.

Spanish exports have been favorably affected by the integration effects related to Spain’s
accession to the European Union as well as relatively low levels of export prices and labor costs
compared with competitors. Despite the fact that Spanish export prices grow their growth rate was
not as fast as that of their competitors (Di Mauro et al. 2005), which the improved performance of its
exports.

More generally, the sensitivity to the price competitiveness in the Euro area is uneven
between different countries, but remains important. In a comparative perspective with the developed
countries, these countries specialize in labor intensive categories of goods. For example, concerning
technological competitiveness, the intensity of Research and Development in manufacturing in the
United States and Japan is about 50% higher than in the euro area.
Section 2: Determinants of Exports and Data

There are many factors influencing exports volume. Determinants of exports can be actually classified into two groups (Smith, 2004): (1) supply side determinants: i) capacity (Inputs, Productivity, Weather, Stocks, Expected profitability, World export rates, Exchange rate). ii) Alternative uses: Domestic market and (2) demand side determinants: i) Foreign demand (Market size, Foreign income, Population, Preferences, World export prices, Exchange rate) ii) Trade barriers (Tariffs, Quotas, Regulatory constraints) iii) Competitiveness (Input costs, Productivity, Exchange rate, Transport costs).

Trade intensity depends not only on these factors. Two competing forces determine the intensity of trade between countries: their income and size that are attractive forces and the distance and the various barriers to trade that are resistance forces (Fontagné et al, 2002). In this article, three variables are retained and are often considered in the literature as fundamental, namely: the exchange rate, the output gap for each country and the foreign demand trade partners.

Exports are modeled primarily as a function of foreign demand and some measure of price competitiveness (Capet and Gudin De Vallerin, 1993), (Di Mauro et al. 2005), (Bayoumi et al. 2011). These variables can in fact explain in a considerable extent the export developments, that’s the growth of world demand is the most important determinant of export growth in the Euro zone over the sample period 1992-2003 (Di Mauro et al, 2005). In the same time, Price competitiveness is a major determinant of export market shares.

For our study, the price competitiveness measured by real effective exchange rate, is the key determinant. First of all, the high relevance of the real effective exchange rate as a measure of competitiveness is reflected by its inclusion in the scoreboard of the European Union Macroeconomic Imbalance Procedure that was adopted in December 2011 (Schmitz et al. 2012). Secondly, the deterioration of the Euro zone competitiveness because of the single currency is in the center of the debate. Thirdly, In the short term, physical constraints (such as inputs of capital and labor) and pre-arranged contractual obligations affect the ability of exporters to respond to price changes and changes in demand conditions (Smith, 2004) by cons prices operate immediately. Finally, the role played by exchange rate in a monetary union is unique due to the fact that the fixity of the European exchange rate regime is irrevocable and very rigid.

And that’s the whole point of our study. Indeed, the European Union is supposed to present a frame in which all tariff and non-tariff barriers to trade are abolished and the exchange rate is fixed without any possibility of devaluation. So what would be the impact of that situation on trade performances? The conventional wisdom predicts, as relatively large shares of exports of European countries are sold in Europe and particularly in the Euro Zone, that the evolution of the exchange rate of the Euro does not automatically affect the demand for exports because Euro Zone countries depend only partially on the parity of Euro-foreign currencies.

To verify this assumption, two exchange rate measurements are considered: intra-European exchange real exchange rate and global real exchange rate. Otherwise, we use the trade weighted GDP as a measure of foreign demand and the output gap as a measure of supply conditions.

It should be noted that there are two types of output gaps: positive and negative. A positive output gap occurs when actual output is more than the full-capacity output. Economic theory suggests that positive output gap will lead to inflation as production and labor costs rise.

Negative output gap occurs when actual output is less than full-capacity output. Indeed, this situation reflects the inability to respond to an increase in foreign demand and pressure on the unable to follow the dictates of the market.
As mentioned above, our paper focuses on a study of the relationship between exports and real effective exchange rate. In order to do so, we consider quarterly data for the period 1980-2012 for 4 countries of the Euro zone. We divide the period [1980-2012] into two sub-periods: i) The period from 1980 to 1998, characterized by a floating exchange rate system for various European countries and ii) the period from 1999 to 2012 in order to capture the effects of the European Monetary Union on the Exports for each country.

Exports correspond to the volume of exports of goods and services (2005=100) obtained from OCDE EOL. Regarding the Real Effective Exchange Rate, it corresponds to the nominal exchange rate index (2005 = 100) deflated by the consumer prices index (CPI) or the unit labor cost (ULC) and adjusted by the trade-weight of each country against its trading partners. The impact of foreign demand has been seized through the trade-weighted GDP which is trading partners GDP in volume adjusted by the trade weights, data were collected from the IMF databases.

In order to study the impact of exchange rate on intra European trade as well as its effect on global trade, we consider the export ratio of each country to its partners in the Euro area relative to its total exports to developed countries. We also calculated intra Effective Exchange rate which corresponds to the nominal exchange rate index (2005=100) of each country against the Deutsche Mark, deflated by the consumer prices index (CPI) or the unit labor cost (ULC) and adjusted by the trade-weight of each country against its Euro Zone trading partners. The trade-weighted GDP is adjusted by intra European trade weights. An increase (decrease) in real effective exchange rate indicates an appreciation (depreciation). (See Appendix A, B). Data were collected in the databases mentioned before.

Finally, the Output gap, which is the difference between actual GDP or actual output and potential GDP, is obtained with Hodrick Prescott filter methodology (1997). It is used in this article as a control variable.
Section 3: Methodology

An Autoregressive Distributed Lag (ARDL) co-integration framework is used to examine the long run and short-run characteristics of the impact of the REER on Exports. For this reason, we based our empirical study on a basic model that includes the real exchange rate, the weighted GDP and output gaps.

\[ Exports_{it} = \alpha_i + \beta_i \text{REER}_it + \theta_i \text{GDPweighted}_it + \mu_i \text{OutputGap}_it + \varepsilon_{it} \]

To test for co-integration among the variables in the long-run exports function, various co-integration tests may be used such as the Johansen test method (Johansen, 1988) and the two steps Engle and Granger approach (1987). However, the application presupposes that the underlying regressors are all integrated of order one (Pesaran et al. 1996, 2001); and in the presence of a mixture of stationary series and series containing a unit root, standard statistical inference based on conventional likelihood ratio tests is no longer valid and the Johansen procedure may lead to erroneous inferences.

Pesaran et al. (2001) develop a new ARDL bounds testing approach for testing the existence of a co-integration relationship that is applicable irrespectively of whether the underlying series are I(0), I(1).

An ARDL model is a general dynamic specification that uses the lags of the dependent variable and the lagged and contemporaneous values of the independent variables, through which the short-run effects can be directly estimated, and the long-run equilibrium relationship can be indirectly estimated.

Pesaran et al. (2001) introduce the bounds test for co-integration that can be employed within an ARDL specification. This method has definite advantages in comparison to other co-integration procedures since it can be employed regardless of whether the underlying variables are I(0), I(1) or fractionally integrated. Thus, the bounds test eliminates the uncertainty associated with pre-testing the order of integration. Secondly, it can be used in small sample sizes, whereas the Engle–Granger and the Johansen procedures are not reliable for relatively small samples (Narayan, 2004).

The ARDL approach involves two steps for estimating the long-run relationship. The first step is to examine the existence of a long-run relationship among all variables in the equation under examination. Conditional upon co-integration is confirmed, in the second stage, the long-run coefficients (and the short-run coefficients) are estimated using the associated ARDL and ECMs. To test for co-integration in model (1) by the bounds test, a conditional Unrestricted Error Correction Model (UECM) is constructed:

\[
\Delta Exports = \alpha + \sum_{i=1}^{i+4} \beta_i \Delta Exports_{t-i} + \sum_{i=1}^{i+4} \delta_i \Delta \text{GDPweighted}_{t-i} + \sum_{i=1}^{i+4} \theta_i \Delta \text{OutputGap}_{t-i} + \sum_{i=1}^{i+4} \lambda_i \text{REER}_{t-i} \\
+ \phi_1 Exports_{t-1} + \phi_1 \text{REER}_{t-1} + \eta_1 \text{GDPweighted}_{t-1} + \rho_1 \text{OutputGap}_{t-1}
\]

Where \( \Delta \) denotes first difference. The co-integration equation is defined as:

\[ \phi_1 Exports_{t-1} + \phi_1 \text{REER}_{t-1} + \eta_1 \text{GDPweighted}_{t-1} + \rho_1 \text{OutputGap}_{t-1} = 0 \]

---

1 See Appendix C for Dynamic multipliers over the period [1980-2012], [1980-1998] and [1999-2012]
The bounds test methodology implies investigating two statistics the first one, named the tBDM, test for the null of no significance of the error correction term and the second one, implies the examination of the null hypothesis of no co-integration through a joint significance test of the lagged variables $Exports_{t-1}, REER_{t-1}, GDP_{t-1}$, $OutPut_{t-1}$ based on the F-statistics:

$$H_0: \phi_1 = \phi_i = \eta_i = \rho_i = 0$$

$$H_1: \phi_1 \neq \phi_i \neq \eta_i \neq \rho_i \neq 0$$

If the computed F-statistic for a chosen level of significance lies outside the critical bounds, a conclusive decision can be made regarding co-integration of the regressors and the next step is to estimate the ARDL where $-\phi_1 / \phi_i, -\eta_1 / \phi_i, -\rho_1 / \phi_i$ are the long-run elasticities.

The results are shown in the next section. The coefficients of the short run elasticities which are non-significant are dropped (Hendry et al., 1984).
Section 4: Results

In this section we present the estimation results focused on estimating the equation presented in the previous section as follows:

\[
\text{Exports}_i = \alpha_i + \beta_i \text{REER}_i + \theta_i \text{GDPweighted} + \mu_i \text{OutputGap} + \epsilon_i, \quad (1)
\]

Where \( \text{Exports} \) is the export ratio of each country to its partners in the euro area relative to its total exports to developed countries for the Intra European Model and total exports in volume for the global model, \( \text{REER} \) is the real effective exchange rate, GDP is trade-weighted GDP and Output Gap is the output gap of each country.

Results are organized as follows:

Tables 1, 2, 3 and 4 present the estimate coefficient of the long-run relationship for the entire period and for the two sub periods, respectively, for three different periods, over the period [1980-2012], before and after the introduction of the single currency for the global model based on model (1).

Tables 5, 6, 7 and 8 present the estimate coefficient of the long-run relationship for the entire period and for the two sub periods, respectively, for three different periods, over the period [1980-2012], before and after the introduction of the single currency for the Intra European model based on model (1).

4.1 Global Model

Table 1: Long Run coefficients estimates: France [1980-2012]

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<tr>
<td>Exports (-1)</td>
<td>N-C</td>
<td>-0.277</td>
<td>-0.571</td>
<td>-0.131</td>
<td>-0.158</td>
<td>-0.648</td>
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<tr>
<td></td>
<td>(3.701)</td>
<td>(-3.609)</td>
<td>(-3.289)</td>
<td>(-3.335)</td>
<td>(-3.429)</td>
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<tr>
<td>REER(-1)</td>
<td>-0.790</td>
<td>-0.444</td>
<td>-0.824</td>
<td>-0.781</td>
<td>-0.801</td>
<td>-0.601</td>
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<td></td>
<td>(-4.746)</td>
<td>(-2.753)</td>
<td>(-16.707)</td>
<td>(-10.175)</td>
<td>(-3.478)</td>
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<tr>
<td>GDPWeighted</td>
<td>1.742</td>
<td>1.440</td>
<td>1.824</td>
<td>1.780</td>
<td>1.600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(23.194)</td>
<td>(8.997)</td>
<td>(35.643)</td>
<td>(20.800)</td>
<td>(11.620)</td>
<td></td>
</tr>
<tr>
<td>Outpugap</td>
<td>0.001</td>
<td>-0.013</td>
<td>-0.053</td>
<td>-0.066</td>
<td>-0.0007</td>
<td>-0.173</td>
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<tr>
<td></td>
<td>(-0.970)</td>
<td>(-1.389)</td>
<td>(-2.926)</td>
<td>(-4.090)</td>
<td>(-0.173)</td>
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Notes:
1/ Exports (-1) is the error correction parameter
2/ T-BDM in parentheses is the BDM t-statistic testing the null hypothesis: the coefficient associated to exports(1)=0 (indicate that the statistic lies above the 0.1 upper bound)
3/ N-C: Cointegration not verified (according to F-test or to t BDM test statistic)

Table 2: Long Run coefficients estimates: Italy [1980-2012]

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<tr>
<td>Exports (-1)</td>
<td>N-C</td>
<td>-0.532</td>
<td>N-C</td>
<td>-0.136</td>
<td>-0.165</td>
<td>-0.179</td>
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<tr>
<td></td>
<td>(-4.285)</td>
<td>(-3.802)</td>
<td>(-3.450)</td>
<td>(-3.391)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REER(-1)</td>
<td>-0.673</td>
<td>-0.522</td>
<td>-0.423</td>
<td>-0.009</td>
<td></td>
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Notes:
1/ Exports (-1) is the error correction parameter
2/ T-BDM in parentheses is the BDM t-statistic testing the null hypothesis: the coefficient associated to exports(1)=0 (indicate that the statistic lies above the 0.1 upper bound)
3/ N-C: Cointegration not verified (according to F-test or to t BDM test statistic)
For the first model, where the real effective exchange rate is based on consumer price index, the long run relationship over the period 1980-2012 is checked only for one country: Spain. The exchange rate has a greater impact during the first sub-period compared to the second one when the long run relationship is verified showing that factors other than price competitiveness play a determinant role.
Concerning the second model, where the real effective exchange rate is based on Unit Labor Cost cointegration relationship holds for most countries and periods. For Germany the long run relationship is not verified over the first sub-period 1980-1998 while it is for the other countries: Italy, France, and Spain. The results for the total volume of exports suggest that the real effective exchange rate deflated by ULC is a better indicator of price competitiveness than measures based on the CPI (Bayoumi et al. 2011). Indeed, the index of consumer prices is an index that encompasses a wide range of prices unlike the ULC index.

On the other hand, our results suggest that the impact of the real effective exchange rate is less important after the introduction of the Euro in France (the exchange rate is significant but lower in value of the second period), Italy and Spain, and more important than in Germany in the sense that the long run relationship is not verified over the period 1980-2012 and the sub period 1980-1998. The German exception is due to the fact that the first half of the 1990s was particular due to the restructuring of the economy after reunification. Furthermore, over the period from 1999 to 2012, the real effective exchange rate is significant only for France and Germany. For southern countries, in this case Spain and Italy, the exchange rate is not significant when the long-term relationship is verified.

Misalignments of the real exchange rate play an important role in explaining the imbalances and can be corrected by changes in the nominal exchange rate, and / or adjustments in the fundamental determinants of relative prices. Exchange rate policy can thus play a key role in promoting exports. The situation for countries in a monetary union is different, because the central bank has definitely lost the possibility to devalue the currency.

Contrary to countries with a floating exchange rate regime where it is possible to make adjustments in the exchange rate to improve the competitiveness and thus rebalance the current account, imbalances cannot be corrected any more by the exchange rate in the Euro Zone countries. Moreover, the impact of the exchange rate in the second period is lower than the period [1980-1998] given that single currency is supposed to reduce future risks and asymmetric shocks.

The differences between the various indicators for each country raise questions about the assessment of the evolution of the external competitiveness based only on REER indicator. For instance, the strong Spanish growth boosted imports while the decline in domestic demand of Germany after 2001 forced the opportunities for German companies and their European competitors.

Otherwise, the growth of world demand turns out to be the most important determinant of export growth over the sample period 1992-2003 (Di Mauro et al. 2005). These changes also result from differences in growth between the euro zone countries.

It remains that improvements in competitiveness especially in the second half of the 1990s had a role in explaining export performance for Germany and France.

Italy lost all of its competitiveness gains due to the exchange rate depreciation in the early 1990s. But competitiveness can only partly account for the weak Italian export growth, indicating that factors other than price competitiveness may also play a role. The export flows are increasingly affected by the globalization of production as well as rapid technological advances, while on the demand side consumers are becoming increasingly more discerning with regard to quality.

The trade-boosting impacts of Spain’s European Union membership gradually become weaker over time resulting in a levelling-off of Spain’s market share towards the end of the 1990s. However, relatively low levels of labour costs and export prices in comparison to major competitors, combined with the ongoing process of convergence which may imply a continued movement towards a higher ratio of exports to GDP in line with other euro area countries, may also help explain Spain’s ability to maintain relatively higher export share in recent years (Di Mauro et al. 2005).
Yet, the REER for the peripheral countries have only a limited argument about the fact that external competitiveness has deteriorated significantly since the adoption of the Euro (Bayoumi et al. 2011).

The non-significance of the real effective exchange rate suggest that Italy and Spain have are lagged its major competitors with regard to measures of technological and structural competitiveness. In the sense that even the real effective exchange rate can no longer favor the competitiveness of the southern countries of the euro area. Spain was less specialized in the highly contested sectors of textiles, clothes, and apparel and sustained relatively lower losses in manufactures (which were concentrated in the key car sector) while substantially increasing its share in services. Analyses of southern Euro area’s non price competitiveness dynamics, particularly in the case of Italy, highlight the importance of flexible redirection of resources within and across exports. The analysis of export unit values by product relative to other world market participants indicates that most southern Euro area countries have been able to moderately increase the quality of their exports, but not relatively to the Euro Zone cuntries (Bennett et al, 2008). This is consistent with the good performance corrected in terms of value. These two contradictory effects seem to have canceled the effect of real effective exchange rate which is postponing the problem of these countries at a deeper structural level. Note that these increases in unit values in countries such as Italy and Spain may also result from a lack of price competitiveness rather than from an improvement in quality.

Besides, in comparison to the other large Euro area countries, Germany gained relatively more market share in response to the depreciation of the Euro after its launch and managed to maintain its share despite the losses in competitiveness arising from the Euro appreciation from 2002 onwards. Then, the export growth of Germany has been offset by a rather weak export performance by some of the other Euro area countries (30%-40% of Germany exports are sold on the market of the actual euro area). Finally, Germany particularly enjoys large shares in the high-tech sectors both for patents and R&D (Graph 3) when Euro area exports are relatively more specialized in medium-tech products.

Graph 3: Gross domestic expenditure on R&D: France, Germany, Italy and Spain [1988-2012]

Source: OECD

But in recent years, even this market has been forced to confront new “low-cost” competitiveness, from emerging countries and particularly from China, even on its own market.

Thus, the common wisdom ensuring that the euro area exports high tech products and imports low tech ones no longer holds. The euro area countries must deal with the competitiveness imposed by emerging countries in sectors known to be away from price competitiveness (Graph 4).
Moreover, being related to the improvement of export performance thanks to structural reasons, the German export performance took place during a period of particularly weak domestic demand in Germany, but due to a spillover of substantial FDI activity, particularly in the new Euro Zone member states (Di Mauro et al. 2005), as well as successful ongoing industrial restructuring, the fall of domestic demand was exceeded. The negative relationship between the real exchange rate deflated by unit labor cost in 1999 and exports can be explained by the increase in exports with gains in the competitiveness of Germany and France.

Even if Germany has benefited greatly from the control of costs, the impact of the real effective exchange rate in the case of an depreciation may not have the same impact than in the case of appreciation. The results suggest that the mastery of prices and costs has a much greater positive impact on exports high technological content. At the same time exports high technological content safeguard against the appreciation of the exchange rate.

Germany seems to have better export performance while France and Germany have several similarities.

Germany and France showed an increasing specialization in motor vehicles over the two periods, precisely after the entry into force of Maastricht Treaty (1993-1999) and then after Amsterdam Treaty (2000-2006), profiting from the particularly strong growth in world demand. More generally, the high-tech exports (% of manufactured exports) experienced twice the high-tech exports (% of manufactured exports) experienced twice a small re-launch of the sector over 1996-00, 2003-06 and 2008-10. But, Germany and France reduced their specialization in other fast-growing sectors such as chemicals, electrical machinery, rubber and plastic products, as well as in basic metals and fabricated metal products.

Considering extra-Euro area exports only, France also seems to have specialized in radio, TV and telecommunication, while its extra-Euro area aircraft and spacecraft exports are retreating. In contrast, Germany’s specialization in aircraft and spacecraft exports became more pronounced as far as extra-Euro area exports are concerned, while the shift away from the exports of pharmaceuticals appears even more distinct when only looking at global markets outside the Euro area (Di Mauro and Forster, 2008). For the euro area, movements in extra euro area exports were similar to total exports (Di Mauro et al. 2005).

As mentioned before, Germany has been offset by a rather weak export performance by some of the other Euro area countries and most southern Euro area countries have not been able to increase the quality of their exports. A question arises here: What is the effect of exchange rates on intra-
European trade? A second estimate is then performed for each country, taking into account European measures. The Intra Euro Exports Volume is then explained by Intra Euro REER, Intra-Euro Area Foreign Demand and the Output Gap of each country.

### 4.2 Intra European Model

Table 5: Long Run coefficients estimates: France [1980-2012]

<table>
<thead>
<tr>
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<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Exports (-1)</td>
<td>-0.102</td>
<td>N-C</td>
<td>-0.387</td>
<td>-0.177</td>
<td>-0.290</td>
<td>-0.561</td>
</tr>
<tr>
<td></td>
<td>(-3.945)</td>
<td></td>
<td>(-3.851)</td>
<td>(-3.886)</td>
<td>(-3.973)</td>
<td>(-3.782)</td>
</tr>
<tr>
<td>REER(-1)</td>
<td>-0.116</td>
<td>-0.100</td>
<td>-0.094</td>
<td>-0.006</td>
<td>-1.151</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-2.919)</td>
<td></td>
<td>(-4.817)</td>
<td>(-4.016)</td>
<td></td>
<td>(-2.214)</td>
</tr>
<tr>
<td>GDPweighted (-1)</td>
<td>0.258</td>
<td>0.241</td>
<td>0.234</td>
<td>0.134</td>
<td>0.292</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(6.085)</td>
<td></td>
<td>(11.550)</td>
<td>(9.292)</td>
<td></td>
<td>(5.609)</td>
</tr>
<tr>
<td>Outpugap (-1)</td>
<td>-0.015</td>
<td>-0.004</td>
<td>-0.010</td>
<td>-0.008</td>
<td>-0.005</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.372)</td>
<td></td>
<td>(-2.362)</td>
<td>(-1.391)</td>
<td></td>
<td>(-1.032)</td>
</tr>
</tbody>
</table>

Notes:
1/ Exports (-1) is the error correction parameter
2/ T-BDM in parentheses is the BDM t-statistic testing the null hypothesis of the coefficient associated to exports(-1)=0 (indicate that the statistic lies above the 0.1 upper bound)
3/ N-C: Cointegration not verified (according to F-test or to t BDM test statistic)

Table 6: Long Run coefficients estimates: Italy [1980-2012]

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Exports (-1)</td>
<td>-0.191</td>
<td>-0.148</td>
<td>-1.148</td>
<td>-0.298</td>
<td>-0.233</td>
<td>-1.174</td>
</tr>
<tr>
<td></td>
<td>(-4.600)</td>
<td></td>
<td>(-8.791)</td>
<td>(-5.587)</td>
<td>(-4.352)</td>
<td>(-8.862)</td>
</tr>
<tr>
<td>REER(-1)</td>
<td>0.036</td>
<td>0.023</td>
<td>-0.254</td>
<td>-0.049</td>
<td>-0.041</td>
<td>-0.846</td>
</tr>
<tr>
<td></td>
<td>(2.000)</td>
<td></td>
<td>(0.752)</td>
<td>(2.799)</td>
<td></td>
<td>(1.570)</td>
</tr>
<tr>
<td>GDPweighted (-1)</td>
<td>0.100</td>
<td>0.114</td>
<td>0.390</td>
<td>0.087</td>
<td>0.097</td>
<td>0.742</td>
</tr>
<tr>
<td></td>
<td>(5.318)</td>
<td></td>
<td>(3.354)</td>
<td>(12.226)</td>
<td></td>
<td>(3.519)</td>
</tr>
<tr>
<td>Outpugap (-1)</td>
<td>0.007</td>
<td>0.016</td>
<td>0.001</td>
<td>0.001</td>
<td>0.003</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>(1.714)</td>
<td></td>
<td>(2.292)</td>
<td>(2.063)</td>
<td></td>
<td>(0.740)</td>
</tr>
</tbody>
</table>

Notes:
1/ Exports (-1) is the error correction parameter
2/ T-BDM in parentheses is the BDM t-statistic testing the null hypothesis of the coefficient associated to exports(-1)=0 (indicate that the statistic lies above the 0.1 upper bound)

Table 7: Long Run coefficients estimates: Germany [1980-2012]

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Exports (-1)</td>
<td>-0.122</td>
<td>N-C</td>
<td>-0.655</td>
<td>-0.216</td>
<td>-0.190</td>
<td>-0.568</td>
</tr>
<tr>
<td></td>
<td>(-3.628)</td>
<td></td>
<td>(-5.077)</td>
<td>(-4.654)</td>
<td>(-3.400)</td>
<td>(-4.738)</td>
</tr>
<tr>
<td>REER(-1)</td>
<td>-0.074</td>
<td>-1.576</td>
<td>-0.063</td>
<td>-0.078</td>
<td>-0.076</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-2.433)</td>
<td></td>
<td>(-3.767)</td>
<td>(-2.383)</td>
<td></td>
<td>(-4.378)</td>
</tr>
<tr>
<td>GDPweighted (-1)</td>
<td>0.200</td>
<td>-0.333</td>
<td>0.188</td>
<td>0.205</td>
<td>0.201</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(6.212)</td>
<td></td>
<td>(1.940)</td>
<td>(6.740)</td>
<td></td>
<td>(11.417)</td>
</tr>
<tr>
<td>Outpugap (-1)</td>
<td>-0.004</td>
<td>0.0008</td>
<td>-0.007</td>
<td>0.005</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.988)</td>
<td></td>
<td>(0.619)</td>
<td>(-0.304)</td>
<td></td>
<td>(-2.308)</td>
</tr>
</tbody>
</table>
Notes:
1/ Exports (-1) is the error correction parameter
2/ T-BDM in parentheses is the BDM t-statistic testing the null hypothesis: the coefficient associated to exports(-1)=0 (indicate that the statistic lies above the 0.1 upper bound)
3/ N-C: Cointegration not verified (according to F-test or to t BDM test statistic)

Table 8: Long Run coefficients estimates: Spain [1980-2012]

<table>
<thead>
<tr>
<th>Period</th>
<th>REER CPI Based</th>
<th>REER ULC Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.099</td>
<td>(1.903)</td>
</tr>
<tr>
<td>Exports (-1)</td>
<td>-0.181</td>
<td>(3.680)</td>
</tr>
<tr>
<td>REER(-1)</td>
<td>0.028</td>
<td>(0.424)</td>
</tr>
<tr>
<td>GDPweighted (-1)</td>
<td>0.255</td>
<td>(7.055)</td>
</tr>
<tr>
<td>Outpgap (-1)</td>
<td>0.0007</td>
<td>(0.169)</td>
</tr>
</tbody>
</table>

Notes:
1/ Exports (-1) is the error correction parameter
2/ T-BDM in parentheses is the BDM t-statistic testing the null hypothesis: the coefficient associated to exports(-1)=0 (indicate that the statistic lies above the 0.1 upper bound)

The results from export equations suggest that intra-Euro area trade is several times more sensitive to changes in relative prices since the inception of EMU except for Spain and Germany for the second measure. But the coefficient of Real Effective Exchange rate is slightly smaller for the second period.

A monetary union reduces the uncertainty about the future exchange rate. This, in turn, could make trade more sensitive to changes in the exchange rate (Bayoumi et al, 2011). Other factors may explain the different price elasticities. For example, if the goods traded within the Euro area tend to be more similar to each other, they could be substitutable, thus enhancing the impact of price differentials.

The same results suggest, as in the global model, that traditional real effective exchange rate indexes may provide a misleading picture of the effectiveness of Euro depreciation in restoring exports growth in the euro area periphery. The pace of deterioration depends on the measure of relative prices used (Bayoumi et al, 2011). The difference in coefficients is potentially important as it is much more difficult to adjust relative prices to restore competitiveness within a currency union.

This result highlights the need for structural reforms to increase domestic wage and cost flexibility in Euro area countries. This is consistent with (Berger and Nitsch, 2010) who find that EMU has led to larger and more persistent trade imbalances, which they in turn relate to rigidities in product and labor markets (Bayoumi et al. 2011).

Export performance of France and Germany moved globally closely together throughout the period, although German export performance has excelled relative to the others in recent years. Spain and Italy were different to the rest by over- and under-performing respectively relative to this group of countries [Di Mauro, 2005] although the two countries have evolved differently. Indeed, in Italy, intra-zone trade was almost balanced in 1999 before being systematically deficit since. In Spain, the intra-euro area trade balance has more than doubled from 1999 to 2007.
Germanic countries, especially Germany, have gained competitiveness since 1994, and have maintained their REER relatively constant since 1999. France also seems to have depreciated within the Euro area despite recently-expressed concerns about its competitiveness. But Germany seems to have been profiting much more from the change in the composition of the world demand (and therefore demand in Euro Zone) towards high-tech products, at that level, German export performance has excelled compared to the other Euro Area countries (Di Mauro et al. 2005). Indeed, the improvement of price competitiveness can be associated with loss of market share. France recorded losses in export market shares despite an improvement in price competitiveness. Other factors like sectoral export specialization appear to have played a larger role.

The German strategy to reduce costs helped offset the appreciation of the Euro. German companies were able to maintain their price competitiveness without systematically reduce their margin. Germany was able to stabilize its market share especially in the euro area after 2003. The German strategy is akin to a policy of competitive disinflation. France has another wage context, given the appreciation of the euro, French companies have chosen to adjust their margin. French companies have lost market share. This could explain the decrease in the number of exporting firms since 2001. This situation has worsened since the crisis. The surviving firms have managed to stay on the market by compressing their margins.

These lower margins could be at the expense of investment and innovation which are key factors for improving price and non-price competitiveness. The result is that French firms are less innovative than German ones, which explains the difference in export performance.

Countries that have seen their cost competitiveness deteriorated do not systematically recorded losses of market share with respect to export surplus countries (Gaulier and Vicard, 2012).

Spain lost market share were rather moderate comparable to that of France in the Euro zone in terms of the deterioration in competitiveness. The increasing integration of the Spanish economy in world and European trade since the mid-1990s helped to limit losses in market share despite less favorable price competitiveness. The steady decline in market share in Italy is more consistent with the deterioration in competitiveness, particularly the positioning of Italian companies less favorably in terms of range or technological content, particularly exposed to movements in relative prices (Blot and Cochard, 2010).

By contrast, Italy seems to specialize rather strongly in the low-and medium-technology sectors (textiles, etc.), suggesting that these countries are more directly exposed to competition from low-cost countries and new Euro Zone Member States. Then, Italy’s intra-euro area exports seem to have been displaced by increasing competitions from new EU-Member States, partly because the latter countries also specialize in relatively low-tech products.

Overall, the medium-tech specialization of the Euro area might pose a risk for the future, particularly if the high-tech sectors were to grow relatively faster and competition from new entrants in medium-tech products were to become greater, both in terms of costs and in terms of quality (Di Mauro et al. 2005). Such observations are also consistent with Italy’s significant market share losses since 1999.

The export performance of Spain resisted to some extent to the disadvantage related to the appreciation of the real effective exchange rate whose evolution has not been stable over the period. Spain has been favorably affected for an important period by integration effects related to Spain’s accession to the European Union as well as relatively low levels of export prices and Labor Costs compared with competitors. Although Spain has been a drift of their costs relative to Germany between 1999 and 2007 since the recovery from the crisis in Europe Spain seems to show a mastery of this drift (Graph5).
These contradictory developments may cause the cancellation of the effect of the real exchange rate. Spain seems to suffer more from structural problems than price competitiveness problems. Despite the loss in price competitiveness of the country since 1999, the real effective exchange rate is not significant.

Finally, imports have become more technology intensive. Contrary to a common perception that highly advanced European Union countries are specializing in the production and export high technology (or highly capital-intensive) products while importing predominantly low technology (or labor intensive products), the France, Germany, Italy and Spain have moved away from importing low technology while increasing imports of high and medium-high technology products. The decline in the share of low-tech imports has been strongest where their level was particularly high in 1988 (France and Germany). The structure of imports by technology content has become more similar across the south euro area (Bennett et al. 2008).
Conclusion

In this paper we studied the real exchange rates on exports of 4 countries namely, France, Germany, Italy and Spain, from 1980 to 2012 in a double comparative perspective: First, the comparison between 4 countries belonging to the Euro Zone and whose economic evolution considerably differs; then, the comparison between two measurements of the effective real exchange rate.

To investigate the impact of the introduction of the Euro on Exports of each of these countries, we divided the temporal series of studied Euro Zone countries into two sub periods by referring to the time dimension.

The determinants of exchange rates were estimated for periods ranging from 1980 to 1998 and from 1999 to 2012. Theoretically, we expected that the real effective exchange rate impact on exports would be less important since 1999 at intra Euro Zone level. However, our results show that this is not the case.

To speak in more details, our analysis finds that for our sample the real effective exchange rate impact on intra-Euro area exports appears to be much more important than the impact of the real effective exchange rate on global exports.

Our results confirm that price competitiveness and foreign demand can, to a considerable extent, explain export developments at the Euro area level, but goods with high technological content are not protected any more against the competitiveness of emerging countries. The exports are henceforth subject to a double constraint: price and quality.

Otherwise, measures of exchange rate could influence the impact of the price competitiveness to a great extent.

Finally, the results show that Italy and Spain seem to be suffering from structural problems more than from price competitiveness since the real effective exchange rate is not significant when the co-integration relationship is checked.
Appendices:

Appendix A

Graph 6: Inflation vs. unit labor cost index

Source: OECD databases

Appendix B

Appendix B. 1: Part of Exports in Euro Zone% GDP Exports

Graph 7: France, Germany, Italy, Spain [1980-2012]
Appendix B.2: Real Effective Exchange Rate

Graph 8: Global measure France, Germany, Italy, Spain [1980-2012]

Appendix B.3: Real Effective Exchange Rate

Graph 9: Intra European Measure France, Germany, Italy, Spain
Appendix C

Appendix C.1:

Graph 10: Dynamic Multipliers: Response of the Real Effective Exchange Rate: Global Model_REER CPI based

Appendix C.2:

Graph 11: Dynamic Multipliers: Response of the Real Effective Exchange Rate: Global Model_REER ULC based
Appendix C.3:

Graph 12: Dynamic Multipliers: Response of the Real Effective Exchange Rate: Intra Euro Zone Model_REER CPI based

Appendix C.4:

Graph 13: Dynamic Multipliers: Response of the Real Effective Exchange Rate: Intra Euro zone Model_REER ULC based
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