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The Effects of Competitiveness on Trade Balance: The Case of Southern Europe

Oscar Bajo-Rubio, Burcu Berke, and Vicente Esteve

Abstract
According to the conventional wisdom, "peripheral" Southern European countries members of the euro area (Greece, Italy, Portugal, and Spain) suffer from a problem of competitiveness. Since devaluation is not possible because they are part of the euro, the adjustment should come through decreasing wages and prices in these countries, which, by improving the trade balance, should lead to recover the previous levels of employment and growth. In this paper, the authors estimate trade balance equations for the Southern European countries, both for total trade and for the trade performed with the European Union; and taking three alternative measures of the real exchange rate, i.e., based on consumption price indices, export prices and unit labour costs, respectively. Their main conclusion is that demand seems to be more relevant than relative prices when explaining the evolution of the trade balance.

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Keywords Trade balance; real exchange rate; competitiveness

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1. Introduction

The evolution of real exchange rates is an important issue when analysing the price competitiveness of a country. Many countries around the world use devaluation as a tool to improve their trade balances; and this happens not only in fixed exchange rate regimes but also under the managed fluctuation regime beginning after 1973. On the other hand, for a country belonging to a monetary union, such as the Economic and Monetary Union of the European Union (EU), the evolution of the real exchange rate reflects inflation differentials vis-à-vis other countries.

In discussions at the level of the EU about the crisis that started in 2008, the conventional wisdom is that "peripheral" Southern European countries members of the euro area (Greece, Italy, Portugal, and Spain) suffer from a problem of competitiveness. Specifically, it has been argued that these countries experienced before the crisis a greater increase in wages and prices as compared to those of Northern Europe, leading to a loss of competitiveness vis-à-vis the latter. Since devaluation is not possible because they are part of the euro, adjustment, the argument goes, has to come through decreasing wages and prices in Southern Europe. In other words, these countries should apply an "internal devaluation".

Figures 1a and 1b show the evolution of the competitiveness of Greece, Italy, Portugal, and Spain, measured by the real effective exchange rate (REER) computed using consumption price indices (CPIs), vis-à-vis 37 industrialized countries and the EU, respectively, for the period 1994-2014. As can be seen, an appreciation of the real exchange rate (reflecting a higher relative increase in their prices) appears for the four countries along the period, somewhat softened in last years. Notice, however, that such a loss of competitiveness seems to be more nuanced with respect to the EU. Similar conclusions can be derived from Figures 2a and 2b, where REERs are now computed using export prices instead of total prices, as measured by the CPI; and from Figures 3a and 3b, where REERs are computed using unit labour costs (ULCs).

[Figures 1a and 1b here]

[Figures 2a and 2b here]

[Figures 3a and 3b here]

In any case, the policy recommendation that follows is that Southern European countries should implement contractionary fiscal policies aimed to reduce government budget deficits, coupled with structural reforms leading to a lower growth of wages and prices. In fact, the dominant policy stance has been mostly centred in the labour market, and intended to reduce ULCs, which should result in lower relative prices vis-à-vis the rest of the euro area. By restoring external competitiveness, all these measures should allow the trade balance to improve, and hence to recover the previous levels of employment and growth.

A first problem with this argument lies in the own definition of ULCs at the aggregate level. This is a misleading concept, since ULCs calculated with aggregate data are not simply the sum or a weighted average of the firms' ULCs; if anything, aggregate ULCs reflect the distribution of income between labour and capital (Felipe and Kumar, 2011). In addition, such policies have not been very successful in terms of reducing relative prices, given the simultaneous increase in profit margins (Uxó, Paúl and Febrero, 2014). Finally, these policies of austerity have resulted in a deeper recession in all Southern European countries, further complicating the situation (De Grauwe and Ji, 2013).

The aim of this paper is assessing whether changes in the real exchange rates, as a proxy of external competitiveness, affect the trade balance, so the argument sketched above could work. Specifically, we will estimate equations for the trade balance (total, and with the EU) of the Southern European countries members of the euro area (Greece, Italy, Portugal, and Spain). In this way, we would be able to assess to which extent the orthodox argument might hold; at least its first step since, even if the real exchange rate influences significantly the trade balance, the latter is only a share of total aggregate demand. The rest of the paper is organized as follows: the underlying theoretical framework is discussed in section 2, and the empirical results are presented in section 3; section 4 concludes.

2. Theoretical framework

We will develop in this section a simple version of the imperfect substitutes model of international trade (Goldstein and Khan, 1985). This approach can be summarized in the following five equations:

$$M\,(Y, p_m) = X^*(p_m^*) \qquad (1)$$

$$X\,(p_x) = M^*(Y^*, p_x^*) \qquad (2)$$

$$p_m = \frac{p_m^*}{q} \qquad (3)$$

$$p_x = \frac{p_x^*}{q} \qquad (4)$$

$$B = p_x X - p_m M \qquad (5)$$

where M and X are the domestic demand for imports and supply of exports; X^* and M^* the foreign supply of exports and demand for imports; p_m and p_x the price of the goods imported at home and the price of domestic exports, relative to the domestic price level; p^*_m and p^*_x the price of foreign exports and the price of the goods imported abroad, relative to the foreign price level; Y and Y^* the levels of domestic and foreign real income; q the real exchange rate, defined as the price of domestic goods relative to foreign goods; and B the domestic trade balance.

In the above model [see Dornbusch (1975) for a similar framework in nominal terms], equations (1) and (2) represent the equilibrium conditions in the markets for domestic imports and domestic exports, respectively; equations (3) and (4) relate the domestic and foreign currency relative prices of goods through the real exchange rate; and equation (5) defines the home country's trade balance in real terms.

By solving equations (1) to (4) for the levels of domestic imports and exports and the relative prices p_x and p^*_m, as functions of Y, Y^* and q, the trade balance can be written as a function:

$$B = B(Y, Y^*, q) \tag{6}$$

where:

$$\frac{\partial B}{\partial Y} < 0, \ \frac{\partial B}{\partial Y^*} > 0, \frac{\partial B}{\partial q} \gtrless 0$$

Notice that, unlike the cases of changes in domestic and foreign income, the trade balance effect of changes in the real exchange rate is ambiguous. In particular, a depreciation of the real exchange rate, while increasing the value of exports, could lead both to an increase or a decrease in the value of imports, depending on whether its effect on prices or quantities prevails. A depreciation of the real exchange rate will improve the trade balance if the Bickerdike-Robinson-Metzler condition is satisfied, i.e., when:

$$\frac{\partial B}{\partial q} = -\left[\frac{p_x}{q} X(1+\varepsilon)\frac{\eta^*}{\varepsilon+\eta^*} - \frac{p_m}{q} M(1-\eta)\frac{\varepsilon^*}{\varepsilon^*+\eta}\right] < 0 \tag{7}$$

or, in terms of the elasticity of the trade balance to the real exchange rate:

$$\frac{\partial B}{\partial q}\frac{q}{B} = -\left[p_x \frac{X}{B}(1+\varepsilon)\frac{\eta^*}{\varepsilon+\eta^*} - p_m \frac{M}{B}(1-\eta)\frac{\varepsilon^*}{\varepsilon^*+\eta}\right] < 0 \tag{7'}$$

where ε and ε^* denote the (absolute values of the) domestic and foreign price elasticities of the supply of exports; and η and η^* the (absolute values of the) domestic and foreign price elasticities of the demand for imports. In other words, a depreciation of the real exchange rate will improve the trade balance if the term in square brackets in the above expressions is positive (recall that, given our definition of the real exchange rate, a decrease in *q* means a depreciation, and an increase in *q* means an appreciation). In the particular case of infinite supply elasticities and a trade balance initially in equilibrium, the Bickerdike-Robinson-Metzler condition becomes the well-known Marshall-Lerner condition[1]:

$$\eta^* + \eta > 1$$

The first empirical studies estimating exports and imports functions obtained price elasticities that were quantitatively small, although their sum was greater than one in absolute value; in other words, the Marshall-Lerner condition was satisfied so that a depreciation would improve the trade balance (Houthakker and Magee, 1969). Subsequent evidence still found that a depreciation of the real exchange rate improved the trade balance, but with the effect operating with a considerable lag, measured in terms of years (Dornbusch and Krugman, 1976). These lags in the effect of exchange rates on prices and trade volumes would mean that it is costly to adjust trade flows quickly, which could be explained by the tendency of those firms engaged on international trade to commit themselves to particular suppliers for extended periods of time (Krugman and Baldwin, 1987).

The combination of a short-run deterioration with a long-run improvement in the trade balance (or, in terms of equation (7), of a positive short-run with a negative long-run derivative), following a depreciation of the real exchange rate, is known in the literature as a J-curve. The reason for that name is that the graph of the response over time of the trade balance to a real depreciation resembles a "J" sloping to the right. The first use of the term "J-curve" is normally attributed to Magee (1973), who noticed that, while exchange rates adapt instantly, there is a delay in the side of consumers and producers to adapt to the changes in relative prices; that is, trade balances may not improve in the short run because the exchange rate short-term elasticities are smaller than the long-term ones. In other terms, recalling that an exchange rate variation has two effects on trade, i.e., price and volume, the price effect

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[1] Notice that the theoretical model given by equations (1) to (5) is a partial equilibrium one, since the explanatory variables *Y*, Y^* and *q* are taken as exogenous. On the contrary, in a general equilibrium setting the three variables would be endogenous, and the Bickerdike-Robinson-Metzler condition would be no longer valid.

would dominate in the short run and the volume effect in the long run, once the amounts of exports and imports begin to respond to the change in exchange rates.

Following the influential paper of Rose and Yellen (1989), a large amount of empirical papers have been intended to estimate equations for the trade balance as in (6), allowing for a dynamic response of the different explanatory variables and in particular the real exchange rate, so that a J-curve may be detected. Rose and Yellen's initial results were not favourable to the existence of a J-curve for the bilateral trade of the US with Japan, Canada, the UK, France, Germany and Italy between 1960 and 1985, and these results were confirmed by Rose (1991) for the total trade of five countries (the UK, Canada, Germany, Japan and the US) between 1974 and 1986. The whole evidence, however, is inconclusive depending on the countries and periods analysed; a survey of this empirical literature is provided in Bahmani-Oskooee and Ratha (2004).

In the next section, we will present estimates of dynamic equations based on (6), for the cases of Greece, Italy, Portugal and Spain.

3. Empirical results

In order to show the effects of the different explanatory variables of the trade balance, equation (6) will be estimated using the method of Dynamic Ordinary Least Squares (DOLS) of Stock and Watson (1993), following the methodology proposed by Shin (1994). This method has the advantage of providing a robust correction to the possible presence of endogeneity in the explanatory variables, as well as of serial correlation in the error terms of the OLS estimation. Accordingly, we will estimate a long-run dynamic equation including leads and lags of the (first difference of the) explanatory variables in equation (6):

$$\Delta LTB_t = \text{constant} + \theta_1 LY_t + \theta_2 LY^*_t + \theta_3 LREER_t + \sum_{i=-q}^{q} \beta_i \Delta LY_{t-1-i} + \sum_{i=-q}^{q} \gamma_i \Delta LY^*_{t-1-i} + \sum_{i=-q}^{q} \delta_i \Delta LREER_{t-1-i} + \nu_t \qquad (8)$$

where *LTB*, *LY*, *LY** and *LREER* denote, for each country, the logarithms of the trade balance, domestic real income, foreign real income and the real effective exchange rate, respectively; Δ is the first difference operator; and ν_t is an error term. Next, we will perform Shin's (1994) test from the calculation of C_{μ}, a LM statistic from the DOLS residuals that tests for deterministic cointegration (i.e., when no trend is present in the regression)[2].

Equation (8) has been estimated using quarterly data for Greece, Italy, Portugal and Spain. Regarding the definition of the variables, the trade balance is defined as the ratio of real exports to real imports; in addition to total trade (i.e., that made with the whole world), we will also consider the case of trade with the EU (see below). We take as proxies for domestic and foreign real incomes the GDP of each country, and the GDP of either the OECD or the EU, in the equations for total trade or trade with the EU, respectively, all of them in real terms. Finally, three different REERs have been employed in the estimations, computed alternatively using as deflators CPIs, export prices or ULCs; and in all cases vis-à-vis 37 industrialized countries and the EU, which will be used in the equations for total trade and trade with the EU, respectively. The data sources are OECD.Stat for total exports and imports, and all GDPs; and Eurostat for exports and imports to and from the EU, and the REERs. All the data are seasonally adjusted; and the time period is 1994:1-2014:4 for total trade (1995:1-2014:4 in the cases of Greece and Portugal), and 1999:1-2014:4 for the trade with the EU.

First, we have tested for the order of integration of the variables by means of the Phillips-Perron test (Phillips and Perron, 1988), which corrects, in a non-parametric way, the possible presence of autocorrelation in the standard Dickey-Fuller test, under the null hypothesis that the variable has a unit root. The results are shown in Table 1, in panels A and B for the variables used in the estimations for total trade and trade with the EU, respectively. According to the test, all variables can be assumed to be integrated of order one, i.e., stationary in first differences.

[Table 1 here]

The results of the econometric estimation of equation (8) for the total trade of Greece, Italy, Portugal and Spain, in terms of the long-run coefficients and the statistic C_{μ}, appear in Table 2. For each country, three columns appear, according to the measure of the REER employed in the estimation, namely, using as deflators CPIs, export prices or ULCs (first, second and third column, respectively). The number of leads of lags for the first-differentiated

[2] We have also tested for the presence of stochastic cointegration, by including a trend as an additional regressor in the estimated equations, but this trend never proved to be significant (results available from the authors upon request).

variables in the right-hand side of equation (8) has been selected as $INT(T^{1/3})$ (being T the number of observations), as proposed in Stock and Watson (1993)[3].

[Table 2 here]

As can be seen in the table, the null of deterministic cointegration is not rejected in all cases at the 1% level of significance, suggesting the existence of a long-run relationship between the trade balance and their explanatory variables[4]. The estimated coefficients on domestic and foreign real incomes have always the expected signs and are clearly significant, except for foreign income in the case of Italy, which is not significant. The results for the REER, however, are not so clear-cut. The coefficients are estimated with the expected sign (i.e., negative) and are significant only for Portugal and Spain (except for the REER deflated with export prices in the case of Spain); and even so the estimated elasticities are clearly lower than those of domestic and foreign income. In turn, the estimated coefficients are never significant for Italy, unlike the case of Greece, where they are always significant but with a sign opposite to expected (i.e., positive). Finally, Table 3 shows the estimated coefficients on the lags of the REER, which can give us some information about the existence of a J-curve effect; as we can see, some weak evidence of a J-curve appears only for Italy and Portugal, when using the REER deflated with export prices, and with CPIs and export prices, respectively.

[Table 3 here]

When equation (8) is estimated taking as dependent variable the trade balance with the EU, the results are shown in Table 4. Recall that in this case the sample period is notably shorter than for total trade (i.e., 16 years instead of 20-21), so that the results should be taken with care. Again, the null of deterministic cointegration is not rejected at the 1% level of significance (5% for Greece and Portugal with the REER deflated with export prices), suggesting the existence of a long-run relationship between the trade balance and their explanatory variables. The long-run effect of both domestic and foreign real income is always significant, with the expected signs. In turn, the coefficient on the REER is negative and significant for Italy in all cases, for Portugal with the REER based on CPIs and ULCs, and for Spain with the REER

3 The full results, including leads and lags of all the explanatory variables, are available from the authors upon request.

4 The critical values for the C_{μ} statistic are 0.271 and 0.159, at the 1% and 5% significance levels, respectively; and are taken from Shin (1994), Table 1, for m = 3.

based on ULCs; and non-significant in the rest of cases. Lastly, from Table 5 we can see that evidence of a J-curve only appears for Portugal in the equations using the REER deflated with export prices and ULCs.

[Table 4 here]

[Table 5 here]

4. Conclusions

In this paper, we have estimated trade balance equations for the Southern European countries that are members of the euro area (Greece, Italy, Portugal, and Spain). The equations have been estimated both for total trade and for the trade performed with the EU; and taking three alternative measures of the REER, i.e., computed using as deflators CPIs, export prices and ULCs, respectively. The estimation period is 1994:1-2014:4 for total trade (1995:1-2014:4 in the cases of Greece and Portugal), and 1999:1-2014:4 for the trade with the EU; notice that in the latter case the results should be taken with care, since the sample is notably shorter. Our ultimate aim was to assess whether changes in the real exchange rates, as a proxy of external competitiveness, affect the trade balance, so validating the conventional policy recommendation for these countries.

The trade balance equations have been estimated using DOLS, a method that provides a robust correction to the possible presence of endogeneity in the explanatory variables, as well as of serial correlation in the error terms of the OLS estimation. The null hypothesis of deterministic cointegration is not rejected in all cases, suggesting the existence of a long-run relationship between the trade balance and their explanatory variables. While the estimated coefficients on domestic and foreign real incomes have always the expected signs and are clearly significant (with the only exception of foreign income in the case of Italy), this is not generally true for the REER. Specifically, the long-run effect of the REER:

- In the case of Greece, is always significant for total trade, but with the sign of the estimated coefficient opposed to expected; and non-significant for trade with the EU
- In the case of Italy, is always significant for trade with the EU, and non-significant for total trade
- In the case of Portugal, is always significant, except when using the REER based on export prices in the equations for trade with the EU; and the estimated coefficients

are lower than those on domestic and foreign incomes in the equations for total trade

- In the case of Spain, is significant when using the REER based on CPIs and ULCs in the equations for total trade, and with the REER based on ULCs in the equations for trade with the EU; and the estimated coefficients are clearly lower than those on domestic and foreign incomes

Finally, some weak evidence of a J-curve appears for total trade only for Italy and Portugal, when using the REER deflated with export prices, and with CPIs and export prices, respectively; and for trade with the EU for Portugal in the equations using the REER deflated with export prices and ULCs.

Our main result (i.e., that the trade balance is not clearly related to changes in the REER) should not come as a surprise. Almost forty years ago, Kaldor (1978) showed that those countries which had the greatest increase in their market shares over the post-war period were also the ones that experienced a highest increase in ULCs, and hence a highest decline in their price competitiveness: this result is known as Kaldor's paradox. In the next years, the so called "new trade theories" were extensively developed. Based on imperfect competition, where specialization is allowed to be driven by increasing returns, and firms differentiate their products (in terms of design, quality, and the like), these models predict a lower influence of prices on the trade balance. In such a context, Krugman (1989) argues that countries showing higher growth rates will increase their shares of world markets, not by reducing the relative prices of the goods they produce, but by raising instead the number of varieties. On the other hand, especially in the cases of Spain and Italy, the bulk of exports are made by large firms with high levels of productivity. For instance, Spanish exports have shown a rather good performance in last years, despite a large fall in price competitiveness, which might be explained either by the singularity and quality of Spanish products, or the concentration of exports in large firms enjoying productivity levels above the average of the economy (Myro, 2013).

To conclude, it seems that demand appears to be more relevant than relative prices when explaining the evolution of trade flows. Accordingly, in order to improve the trade balance, one should trust more on an increase in external demand rather than lowering relative prices; at the same time that an improvement of domestic demand might jeopardise any favourable developments of the trade balance.

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References

Bahmani-Oskooee, M. and Ratha, A. (2004): "The J-Curve: A literature review", *Applied Economics* 36, 1377-1398.

De Grauwe, P. and Ji, Y. (2013): "Panic-driven austerity in the Eurozone and its implications", VoxEU.org, 21 February 2013; available at http://www.voxeu.org/article/panic-driven-austerity-eurozone-and-its-implications.

Dornbusch, R. (1975): "Exchange rates and fiscal policy in a popular model of international trade", *American Economic Review* 65, 859-871.

Dornbusch, R. and Krugman, P. (1976): "Flexible exchange rates in the short run", *Brookings Papers on Economic Activity* 7, 537-584.

Felipe, J. and Kumar, U. (2011): "Do some countries in the Eurozone need an internal devaluation? A reassessment of what unit labour costs really mean", VoxEU.org, 31 March 2011; available at http://www.voxeu.org/article/internal-devaluations-eurozone-mismeasured-and-misguided-argument.

Goldstein, M. and Khan, M. S. (1985): "Income and price effects in foreign trade", in R. W. Jones and P. B. Kenen (eds.): *Handbook of International Economics*, vol. 2, North-Holland, Amsterdam, 1041-1105.

Houthakker, H. S. and Magee, S. P. (1969): "Income and price elasticities in world trade", *Review of Economics and Statistics* 51, 111-125.

Kaldor, N. (1978): "The effect of devaluations on trade in manufactures", in *Further Essays on Applied Economics*, Duckworth, London, 99-118.

Krugman, P. (1989): “Differences in income elasticities and trends in real exchange rates”, *European Economic Review* 33, 1031-1054.

Krugman, P. and Baldwin, R. (1987): “The persistence of the U.S. trade deficit”, *Brookings Papers on Economic Activity* 18, 1-56.

MacKinnon, J. G. (1996): “Numerical distribution functions for unit root and cointegration tests”, *Journal of Applied Econometrics* 11, 601-618.

Magee, S. P. (1973): “Currency contracts, pass-through, and devaluation”, *Brookings Papers on Economic Activity* 1, 303-325.

Myro, R. (ed.) (2013): *Fortalezas competitivas y sectores clave en la exportación española*, Instituto de Estudios Económicos, Madrid.

Phillips, P. C. B. and Perron, P. (1988): “Testing for a unit root in time series regression”, *Biometrika* 75, 335-346.

Rose, A. K. (1991): “The role of exchange rates in a popular model of international trade: Does the ‘Marshall-Lerner’ condition hold?”, *Journal of International Economics* 30, 301-316.

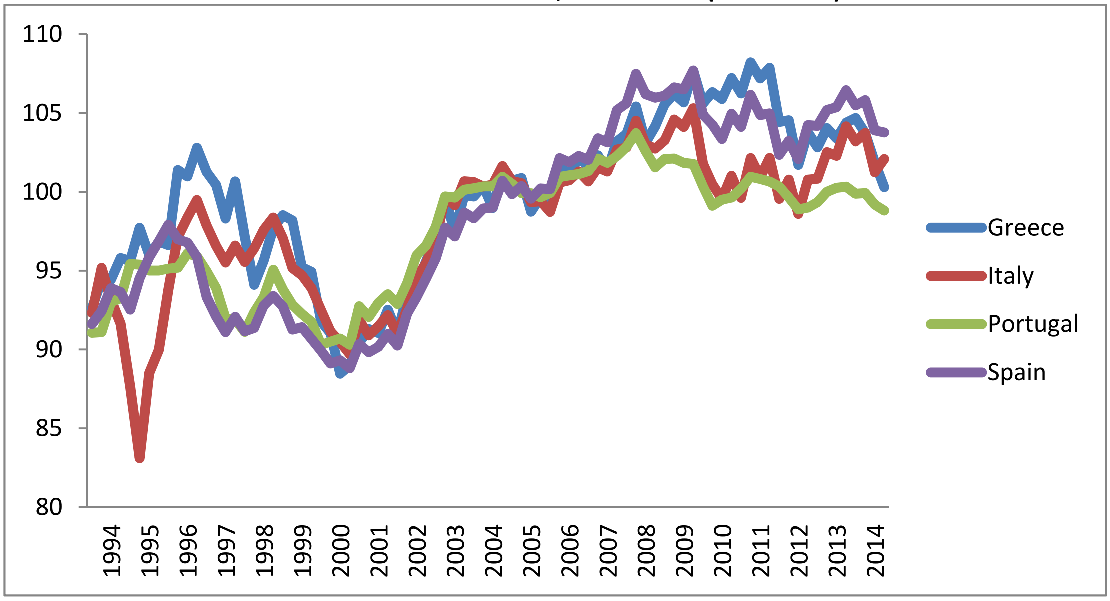
Rose, A. K. and Yellen, J. L. (1989): “Is there a J-curve?”, *Journal of Monetary Economics* 24, 53-68.

Shin, Y. (1994): “A residual-based test of the null of cointegration against the alternative of no cointegration”, *Econometric Theory* 10, 91-115.

Stock, J. H. and Watson, M. W. (1993): “A simple estimator of cointegrating vectors in higher order integrated systems”, *Econometrica* 61, 783-820.

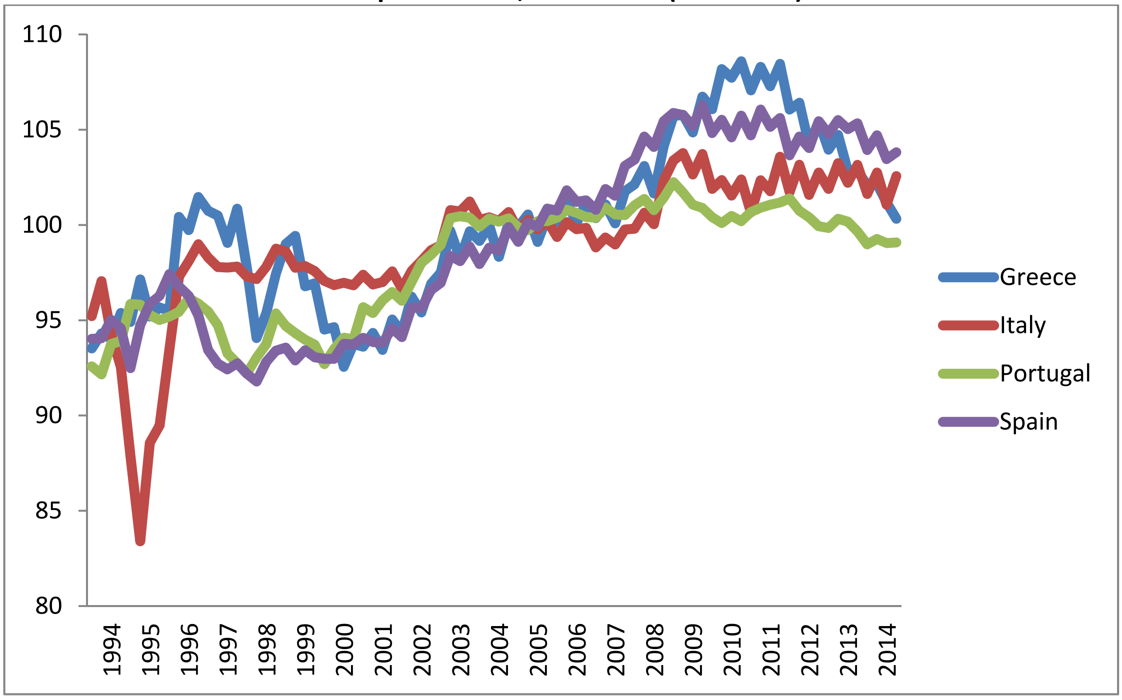
Uxó, J., Paúl, J. and Febrero, E. (2014): “Internal devaluation in the European periphery: The story of a failure”, Working Paper DT-DAEF 2014/2, Universidad de Castilla-La Mancha.

Figure 1a
Real effective exchange rates computed using consumption price indices, vis-à-vis 37 industrialized countries, 1994-2014 (2005=100)



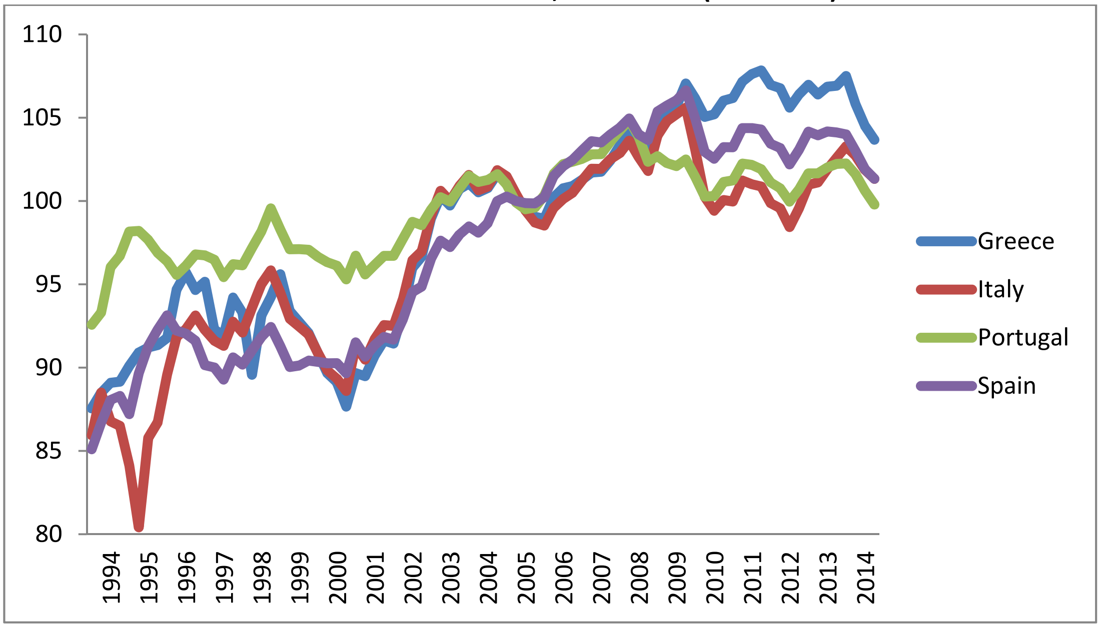
Source: Eurostat.

Figure 1b
Real effective exchange rates computed using consumption price indices, vis-à-vis the European Union, 1994-2014 (2005=100)



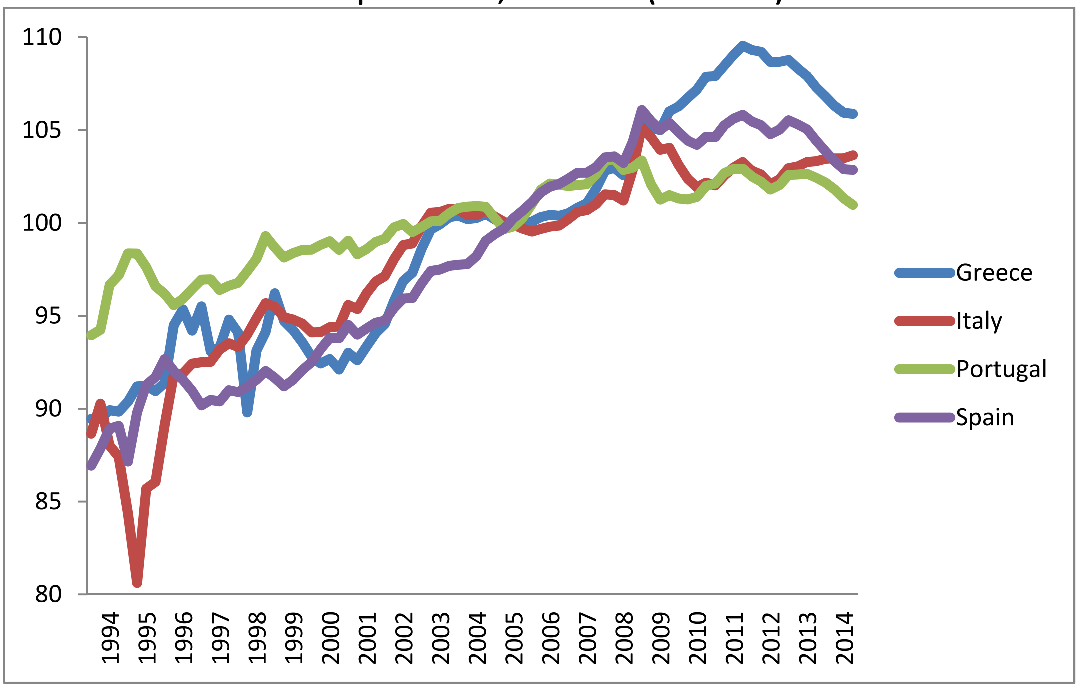
Source: Eurostat.

Figure 2a
Real effective exchange rates computed using export prices, vis-à-vis 37 industrialized countries, 1994-2014 (2005=100)



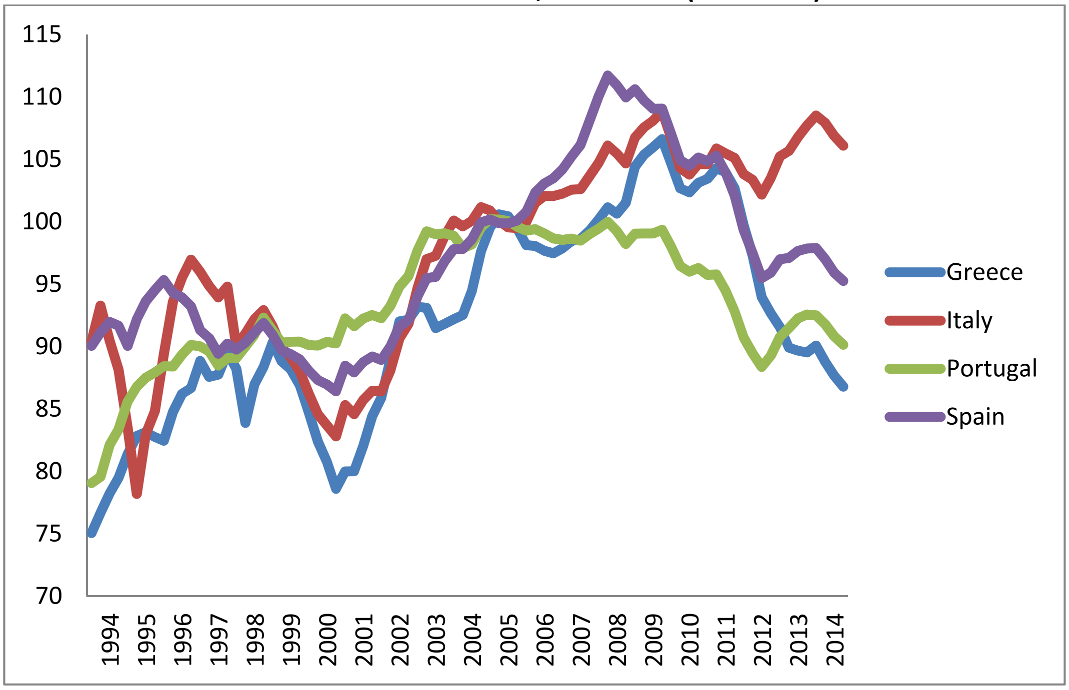
Source: Eurostat.

Figure 2b
Real effective exchange rates computed using export prices, vis-à-vis the European Union, 1994-2014 (2005=100)



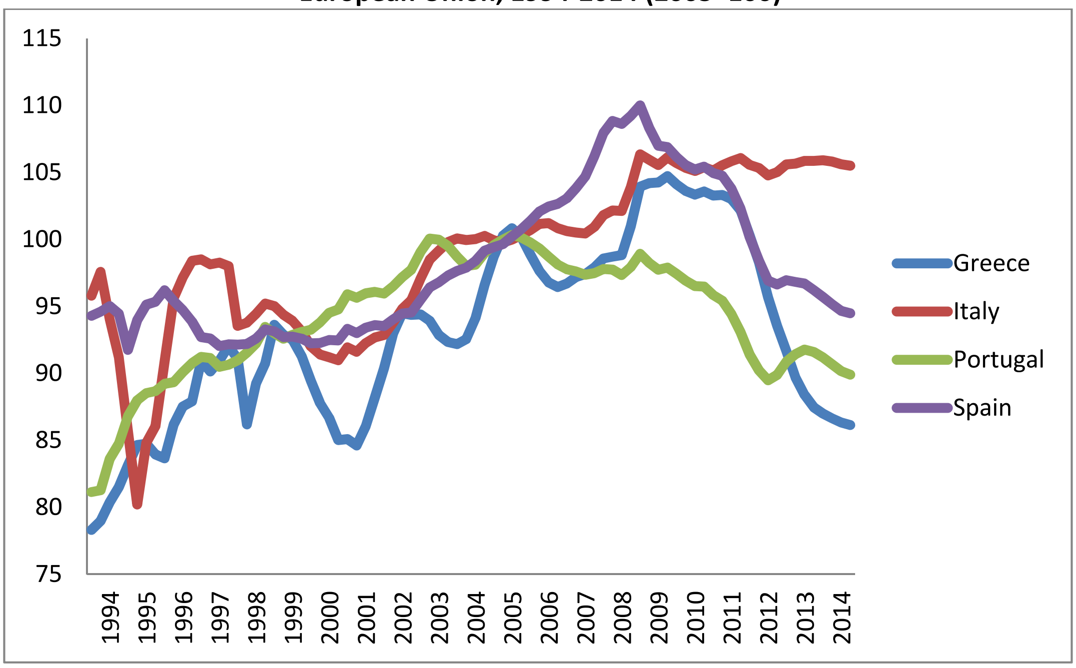
Source: Eurostat.

Figure 3a
Real effective exchange rates computed using unit labour costs, vis-à-vis 37 industrialized countries, 1994-2014 (2005=100)



Source: Eurostat.

Figure 3b
Real effective exchange rates computed using unit labour costs, vis-à-vis the European Union, 1994-2014 (2005=100)



Source: Eurostat.

Table 1
Unit root tests

A) Total trade

	Greece			Italy			Portugal			Spain		
	$Z(t_{\tilde{\alpha}})$	$Z(t_{\alpha^*})$	$Z(t_{\hat{\alpha}})$	$Z(t_{\tilde{\alpha}})$	$Z(t_{\alpha^*})$	$Z(t_{\hat{\alpha}})$	$Z(t_{\tilde{\alpha}})$	$Z(t_{\alpha^*})$	$Z(t_{\hat{\alpha}})$	$Z(t_{\tilde{\alpha}})$	$Z(t_{\alpha^*})$	$Z(t_{\hat{\alpha}})$
LTB	−1.593	−0.618	−0.506	−0.450	−1.581	−1.497	−1.181	−0.524	−0.763	−0.887	−0.960	−0.739
Δ*LTB*	−13.40[a]	−12.17[a]	−12.15[a]	−8.641[a]	−8.422[a]	−8.475[a]	−9.419[a]	−9.197[a]	−9.184[a]	−9.035[a]	−8.990[a]	−9.012[a]
LY	−0.121	−1.744	0.659	−0.927	−2.552	1.122	−1.504	−3.592	1.670	0.125	−2.617[c]	3.176
Δ*LY*	−7.644[a]	−6.354[a]	−6.283[a]	−5.009[a]	−4.455[a]	−4.391[a]	−6.959[a]	−5.867[a]	−5.395[a]	−3.117[c]	−2.308	−1.579[c]
*LY**	−1.552	−2.129	5.065	−1.395	−2.085	5.371	−1.552	−2.129	5.065	−1.395	−2.085	5.371
Δ*LY**	−3.977[b]	−3.869[a]	−2.493[b]	−4.082[a]	−3.908[a]	−2.557[b]	−3.977[b]	−3.869[a]	−2.493[b]	−4.082[a]	−3.908[a]	−2.557[b]
LREER_CPI	−1.669	−1.543	0.232	−2.869	−2.007	0.493	−1.642	−1.221	0.354	−1.610	−1.131	0.982
Δ*LREER_CPI*	−6.523[a]	−6.551[a]	−6.600[a]	−7.606[a]	−7.651[a]	−7.688[a]	−7.069[a]	−7.109[a]	−7.139[a]	−6.431[a]	−6.461[a]	−6.432[a]
LREER_EXP	−2.004	−1.457	1.170	−2.389	−1.890	1.057	−2.070	−1.473	0.215	−1.215	−1.966	1.737
Δ*LREER_EXP*	−7.772[a]	−7.793[a]	−7.748[a]	−8.499[a]	−8.524[a]	−8.498[a]	−6.877[a]	−6.915[a]	−6.961[a]	−7.411[a]	−7.206[a]	−7.041[a]
LREER_ULC	−0.737	−1.670	0.127	−2.551	−1.195	0.631	−0.967	−1.882	0.367	−0.848	−1.293	0.212
Δ*LREER_ULC*	−5.136[a]	−4.988[a]	−5.025[a]	−6.584[a]	−6.601[a]	−6.616[a]	−5.740[a]	−5.423[a]	−5.469[a]	−5.162[a]	−5.101[a]	−5.132[a]

B) Trade with the EU

	Greece			Italy			Portugal			Spain		
	$Z(t_{\tilde{\alpha}})$	$Z(t_{\alpha^*})$	$Z(t_{\hat{\alpha}})$	$Z(t_{\tilde{\alpha}})$	$Z(t_{\alpha^*})$	$Z(t_{\hat{\alpha}})$	$Z(t_{\tilde{\alpha}})$	$Z(t_{\alpha^*})$	$Z(t_{\hat{\alpha}})$	$Z(t_{\tilde{\alpha}})$	$Z(t_{\alpha^*})$	$Z(t_{\hat{\alpha}})$
LTB	−2.033	−0.160	−1.157	−2.016	−1.998	−1.632[c]	−1.633	−0.959	−0.832	−1.752	−0.534	−0.941
Δ*LTB*	−7.831[a]	−7.774[a]	−7.642[a]	−8.911[a]	−8.812[a]	−8.879[a]	−8.795[a]	−8.740[a]	−8.741[a]	−9.061[a]	−8.996[a]	−8.941[a]
LY	−0.893	−1.304	0.139	−1.916	−2.195	0.359	−1.785	−2.381	0.610	−1.334	−3.475[b]	2.151
Δ*LY*	−6.891[a]	−5.815[a]	−5.845[a]	−3.819[b]	−3.476[b]	−3.501[a]	−6.019[a]	−5.622[a]	−5.609[a]	−2.178	−2.161	−2.003[b]
*LY**	−1.882	−2.441	2.563	−1.882	−2.441	2.563	−1.882	−2.441	2.563	−1.882	−2.441	2.563
Δ*LY**	−3.264[c]	−3.105[b]	−2.821[a]	−3.264[c]	−3.105[b]	−2.821[a]	−3.264[c]	−3.105[b]	−2.821[a]	−3.264[c]	−3.105[b]	−2.821[a]
LREER_CPI	−1.353	−1.121	0.039	−2.660	−1.241	0.626	−0.797	−1.664	0.807	0.373	−1.632	2.059
Δ*LREER_CPI*	−4.514[a]	−4.539[a]	−4.582[a]	−6.048[a]	−6.097[a]	−6.074[a]	−7.948[a]	−7.519[a]	−7.476[a]	−6.493[a]	−6.021[a]	−5.590[a]
LREER_EXP	−2.089	−0.846	1.186	−1.845	−1.273	1.494	−1.510	−1.706	0.596	1.134	−2.563	2.440
Δ*LREER_EXP*	−5.123[a]	−5.154[a]	−4.899[a]	−5.579[a]	−5.567[a]	−5.352[a]	−5.837[a]	−5.724[a]	−5.719[a]	−6.844[a]	−5.686[a]	−5.090[a]
LREER_ULC	−0.720	−1.208	−0.445	−2.098	−0.807	1.297	−1.372	−0.649	−0.420	0.026	−1.161	0.053
Δ*LREER_ULC*	−2.978	−2.922[b]	−2.918[a]	−4.448[a]	−4.549[a]	−4.374[a]	−4.187[a]	−3.725[a]	−3.741[a]	−3.638[b]	−3.132[b]	−3.154[a]

Notes:
(i) $Z(t_{\tilde{\alpha}})$, $Z(t_{\alpha^*})$ and $Z(t_{\hat{\alpha}})$ are the Phillips-Perron statistics with drift and trend, with drift, and without drift, respectively.
(ii) [a], [b] and [c] denote significance at the 1%, 5% and 10% levels, respectively. The critical values are taken from MacKinnon (1996).

Table 2

Estimation of long-run relationships for total trade: Stock-Watson-Shin cointegration tests

	Greece			Italy			Portugal			Spain		
constant	−4.044[a]	−1.088	−1.330	8.430[a]	7.674[a]	8.548[a]	3.115[a]	4.398[a]	1.796[b]	−1.044	−1.996[b]	−0.126
	(−4.465)	(−1.008)	(−1.149)	(13.47)	(11.11)	(12.28)	(5.439)	(9.382)	(2.242)	(−1.057)	(−2.074)	(−0.122)
LY_t	−1.725[a]	−1.661[a]	−2.109[a]	−1.255[a]	−1.242[a]	−1.259[a]	−2.538[a]	−2.173[a]	−1.878[a]	−1.838[a]	−1.969[a]	−1.551[a]
	(−12.87)	(−12.27)	(−10.31)	(−6.048)	(−6.296)	(−5.789)	(−14.80)	(−18.73)	(−8.326)	(−7.476)	(−6.817)	(−5.696)
LY^*_t	1.361[a]	0.872[a]	1.230[a]	−0.054	0.057	−0.073	1.513[a]	1.380[a]	1.207[a]	1.709[a]	1.935[a]	1.351[a]
	(7.272)	(3.187)	(4.622)	(−0.483)	(0.572)	(−0.585)	(9.611)	(10.42)	(7.274)	(5.655)	(6.208)	(4.087)
$LREER_t$	1.334[a]	1.531[a]	1.534[a]	−0.105	−0.189	−0.084	−0.570[b]	−1.682[a]	−0.528[b]	−0.405[b]	−0.388	−0.384[a]
	(4.496)	(3.398)	(4.311)	(−0.556)	(−0.906)	(−0.724)	(−2.640)	(−4.600)	(−2.407)	(−2.233)	(−1.288)	(−3.062)
R^2	0.998	0.998	0.998	0.924	0.949	0.916	0.997	0.998	0.996	0.993	0.993	0.994
C_μ	0.058	0.086	0.070	0.066	0.061	0.060	0.064	0.079	0.044	0.043	0.048	0.044

Notes:
(i) t-statistics in parentheses.
(ii) [a], [b] and [c] denote significance at the 1%, 5% and 10% levels, respectively.

Table 3

Short-run coefficients on the real exchange rate: Total trade

	Greece			Italy			Portugal			Spain		
$\Delta LREER_t$	−0.654	−0.970	−0.793	0.347	0.804[b]	0.158	1.465[b]	2.045[a]	0.980	0.867	0.707	0.654
	(−0.945)	(−1.288)	(−1.032)	(0.938)	(2.529)	(0.522)	(2.134)	(3.215)	(1.241)	(1.561)	(1.201)	(1.306)
$\Delta LREER_{t-1}$	0.126	−0.240	0.312	0.200	0.620[c]	0.046	1.178[c]	0.801	0.415	0.066	0.161	0.066
	(0.186)	(−0.292)	(0.423)	(0.542)	(1.962)	(0.138)	(1.893)	(1.362)	(0.567)	(0.119)	(0.255)	(0.126)
$\Delta LREER_{t-2}$	0.257	0.763	0.520	0.386	0.355	0.195	0.797	0.065	0.462	−0.047	0.371	0.216
	(0.388)	(0.968)	(0.734)	(0.804)	(0.895)	(0.490)	(1.076)	(0.100)	(0.557)	(−0.077)	(0.543)	(0.388)
$\Delta LREER_{t-3}$	0.581	1.013	0.667	0.595	0.293	0.498	0.209	−0.417	0.626	0.164	0.470	0.155
	(0.849)	(1.280)	(0.930)	(1.239)	(0.708)	(1.251)	(0.297)	(−0.668)	(0.780)	(0.287)	(0.695)	(0.295)
$\Delta LREER_{t-4}$	0.687	1.257	0.798	0.038	−0.075	0.055	0.535	−0.126	0.829	0.006	0.190	−0.343
	(1.053)	(1.618)	(1.167)	(0.083)	(−0.191)	(0.148)	(0.778)	(−0.206)	(1.128)	(0.010)	(0.285)	(−0.677)

Notes:
See Table 2.

Table 4

Estimation of long-run relationships for trade with the EU: Stock-Watson-Shin cointegration tests

	Greece			Italy			Portugal			Spain		
constant	−16.01[a]	−16.23[a]	−14.58[a]	4.507[a]	1.014	−0.858	2.271[a]	2.978[a]	−1.122[c]	−7.785[a]	−6.972	−4.941[b]
	(−11.60)	(−3.936)	(−6.505)	(6.067)	(1.308)	(−0.973)	(4.510)	(3.845)	(−2.027)	(−4.186)	(−1.414)	(−2.253)
LY_t	−1.759[a]	−1.586[a]	−1.101[a]	−0.778[a]	−0.754[a]	−0.723[a]	−0.711[a]	−0.931[a]	−0.608[a]	−3.217[a]	−2.761[a]	−2.211[b]
	(−9.529)	(−8.933)	(−2.840)	(−3.477)	(−3.760)	(−3.000)	(−3.906)	(−3.815)	(−4.077)	(−4.427)	(−3.846)	(−2.575)
LY^*_t	3.222[a]	3.280[b]	3.045[a]	0.721[a]	0.978[a]	1.107[a]	0.641[a]	0.704[c]	0.815[a]	3.708[a]	3.254[b]	2.828[a]
	(7.951)	(2.483)	(5.937)	(3.191)	(4.263)	(3.463)	(4.288)	(1.707)	(4.924)	(6.490)	(2.638)	(3.101)
$LREER_t$	1.050	0.481	−0.818	−2.407[a]	−1.649[a]	−1.271[a]	−1.511[a]	−1.497	−0.716[b]	0.401	0.236	−0.929[b]
	(0.922)	(0.207)	(−0.987)	(−5.697)	(−4.576)	(−4.376)	(−4.206)	(−0.714)	(−3.660)	(0.267)	(0.089)	(−2.101)
R^2	0.999	0.999	0.999	0.890	0.873	0.875	0.940	0.887	0.951	0.994	0.992	0.996
C_μ	0.088	0.139	0.064	0.085	0.084	0.083	0.113	0.127	0.104	0.070	0.074	0.062

Notes:
See Table 2.

Table 5

Short-run coefficients on the real exchange rate: Trade with the EU

	Greece			Italy			Portugal			Spain		
$\Delta LREER_t$	1.364	2.925	−0.014	0.676	0.977	0.407	0.599	2.637[b]	0.222	1.567	0.540	2.156[c]
	(0.833)	(0.994)	(−0.007)	(0.928)	(1.147)	(0.590)	(1.040)	(2.101)	(0.472)	(1.099)	(0.234)	(1.934)
$\Delta LREER_{t-1}$	−0.036	−4.376	0.453	−1.748[a]	−1.061	−1.034	−1.279[b]	0.575	−0.816	1.097	−0.396	0.301
	(−0.023)	(−1.666)	(0.239)	(−2.796)	(−1.395)	(−1.690)	(−2.073)	(0.399)	(−1.645)	(0.695)	(−0.194)	(0.315)
$\Delta LREER_{t-2}$	1.826	−1.493	0.312	−2.156[a]	−1.351	−1.103	−1.238[c]	0.097	−0.677	1.453	−0.702	0.298
	(1.009)	(−0.417)	(0.180)	(−3.224)	(−1.628)	(−1.638)	(−1.940)	(0.075)	(−1.330)	(1.158)	(−0.371)	(0.347)
$\Delta LREER_{t-3}$	1.702	1.791	2.019	−0.267	0.604	0.349	1.475[c]	2.682[b]	1.476[b]	0.453	−0.369	0.266
	(0.876)	(0.495)	(1.104)	(−0.370)	(0.662)	(0.478)	(2.020)	(2.238)	(2.574)	(0.351)	(−0.223)	(0.289)
$\Delta LREER_{t-4}$	1.264	4.101	−2.013	−0.455	0.266	−0.368	1.014	1.305	0.900	−0.314	0.122	−0.248
	(0.822)	(1.378)	(−1.153)	(−0.652)	(0.310)	(−0.511)	(1.406)	(1.084)	(1.561)	(−0.197)	(0.068)	(−0.238)

Notes:
See Table 2.