

# **The performance of the economies of Portugal and Spain throughout the crisis in the euro area: with or without you?**

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## **Introduction**

In 2009, Garcimartín, Rivas and García (2010-11) elaborated a paper titled “On the role of relative prices and capital flows in balance-of-payments constrained growth: the experiences of Portugal and Spain in the euro area”. The basic idea of that paper was based on the following thoughts: despite, broadly speaking, the balance-of-payments constraint hypothesis as developed by Thirlwall (1979) had been empirically supported (McGregor and Swales, 1985, 1986 and 1991; Bairam, 1988; Bairam and Dempster, 1991; MacCombie, 1989 and 1992; and Sonmez Atesoglu, 1993, 1994 and 1995), it showed some shortcomings highlighted in the literature. In our opinion in that moment, two of them should be analysed. First, temporary disequilibria and capital flows ought to be incorporated into the balance-of-payments constrained growth models. The first equation in Thirlwall’s model (Thirlwall 1979), stated that the BoP must be in equilibrium. This is a plausible hypothesis in the long run but not in the short run. In practice, there is no objective way to distinguish between short and long run, two concepts that, in addition, may change across countries. For this reason, capital flows and BoP disequilibria should be incorporated into the model. Indeed, Thirlwall himself presented three years later an extended version of his original model (Thirlwall and Hussain, 1982), including capital inflows into it by adding a new term that first equation. It must be noted that allowing disequilibria through this addition does not invalidate the BoP constraint theory, since capital inflows are not endogenous to potential growth. It simply means that the external constraint can be relaxed for an economy in a certain moment in time. In fact, what Thirlwall and Hussain found is that the sample countries were BoP constrained, but the growth rates estimated using the new extended model aligned more closely to actual rates than did the old ones. Other extended versions in the same line were developed by Elliot and Rhodd (1999), Hussain (2000),

Moreno-Brid (1998, 2001 and 2003) and Britto and McCombie (2009), finding new evidence to support the BoP constraint theory.

The second crucial assumption of Thirlwall model related to relative prices. According to Thirlwall, relative prices do not play a role in long-run growth for two reasons, which are, to some extent, incompatible. The first is the stability of relative prices in the long run, so that PPP theory holds. The second is that price elasticities are very small in absolute terms, so the expression  $(1+\gamma+\eta)$  is close to zero. Yet, as Alonso and Garcimartín (1998) noted, this is a strong assumption and, furthermore, it is not necessary. Relative prices may play a role and the economy can still be BoP constrained. What is relevant to the theory is not if relative prices have an impact on growth but whether or not they are endogenous to BoP disequilibria. If relative prices decrease in the presence of a deficit, then the neo-classical approach to growth is correct and growth will not be BoP constrained. But, if they are exogenous, the mentioned approach will be incorrect. In the Alonso and Garcimartín's sample of ten OECD countries, they found that relative prices were exogenous in all cases. On the contrary, they argued, the crucial test to the BoP constrained theory is whether or not income (and not prices) adjusts to BoP disequilibria. And this was the case for eight of ten countries in the sample. Other works, using cointegration techniques, also have tested for the long-run adjustment of actual income to BoP constrained income (Alonso, 1999; Bagnai, 2008; and Britto and McCombie, 2009), while other studies have explicitly tested the adjustment of income to BoP disequilibria (Garcimartín et al., 2008).

We considered both critiques important to be incorporated as an extension of Thirlwall's model. This meant that 1) capital flows should play a role in relaxing (temporarily) the BoP constraint; 2) although it did not invalidate the BoP constraint hypothesis, relative prices could influence growth, at least in the short-run and, therefore, the model should take this effect into account; and 3) in order not to reject the BoP constraint hypothesis, it should be shown that income adjusts to external disequilibria.

In Garcimartín et al. (2010-11) we developed an augmented Thirlwall model in order to overcome the deficiencies mentioned above. Our model gave a more important role to both BoP disequilibria and relative prices. The model was tested against the cases of Spain and Portugal for several reasons. First, both Spain and Portugal are BoP constrained. Second, both countries had experienced major changes in their external sector following their respective accessions to the European Union (EU) and the European Monetary Union (EMU). According to Thirlwall's theory, and most of the models inspired by it, it is irrelevant to long-run growth whether an economy uses an independent or a common currency. As we saw, this was not the case, at least not for the Iberian countries. Finally, since Spain and Portugal adopted the euro, the Spanish and Portuguese economies had followed an opposite path, due to reasons closely related to what our model predicted. However, the work developed by Garcimartín et al. (2010-11) analysed the performance of both economies over the period 1975-2007, due to the availability of data for those years, in that moment. The main aim of the present paper is to update that work including the following years (2007-2010) in order to consider the consequences in those economies of the current crisis that broke out during 2007. Furthermore, we try to complete that paper by describing different behaviors of both economies in several scenarios, with or without the existence of a common currency. The paper is organised as follows: section 2 provides a summary of the model proposed by Garcimartín et al. (2010-11). Section 3 presents a detailed description of the performance of the, mainly, external sectors of the economies of Spain and Portugal throughout the analysed

period (1975-2010), and specially based on the years of the crisis, 2007-2010. Section 4 shows the results of the estimates. Section 5 develops the application of the model and, finally, section 6 concludes.

### **An augmented version of the BoP constrained growth model**

Garcimartín et al. (2010-11) presented the above-mentioned model in the following five equations<sup>1</sup>. Each equation represented the adjustment path of the relevant variable to its partial equilibrium level, so the significance of parameter  $\alpha_i$  is crucial to validate the equilibrium equations<sup>2</sup>.

#### **1) Income**

$$\dot{y} = \alpha_1 (x + z_1 + xp - m - mp - er) + \gamma_1 Z_2, \quad (1)$$

where Y represented income, X and M were exports and imports, respectively, XP and MP referred to export and import prices, ER was the exchange rate,  $Z_1$  represented net unrequited transfers<sup>3</sup> and  $Z_2$  stood for net capital inflows.

This equation tested the BoP constraint hypothesis, which could not be rejected as long as  $\alpha_1$  was positive. Thus, in the presence of a deficit, the parenthesis of eq. (1) would be negative, and income would tend to decrease. Yet,  $Z_2$  could relax the BoP constraint ( $\gamma_1 > 0$ ). If the economy showed an external deficit, income would tend to decrease, but this tendency could be mitigated, amplified or even reversed by capital flows. In other words, capital flows would affect the speed of adjustment but not long-run growth.

#### **2) Exports**

$$\begin{aligned} \dot{x} &= \alpha_2 (x^e - x) \\ x^e &= a + \beta_1 (xp - p^* - er) + \beta_2 y^* \end{aligned} \quad (2)$$

Exports adjusted to their partial equilibrium level at a rate defined by  $\alpha_2$ . The equilibrium level was the traditional export function, where exports were determined by the relative prices of exports (XP/ERP\*) and by foreign income ( $Y^*$ ).

#### **3) Imports**

$$\begin{aligned} \dot{m} &= \alpha_3 (m^e - m) \\ m^e &= b + \beta_3 (mp + er - p) + \beta_4 y \end{aligned} \quad (3)$$

Imports adjusted at a speed  $\alpha_3$  to their partial equilibrium level, which was defined by the relative prices of imports (MPER/P) and by domestic income.

<sup>1</sup> Lower-case letters denoted logs, and a dot on top of the variables indicated the derivative with respect to time.

<sup>2</sup> See Gandolfo (1981) for a detailed description of the analysis and econometric estimation of differential equation systems.

<sup>3</sup> As in Garcimartín et al. (2008), we constructed an index of net unrequited transfers because it facilitated the analytical treatment of the model.

#### 4) Capital flows

$$\dot{Z}_2 = \alpha_4(K - Z_2). \quad (4)$$

Capital flows found equilibrium at a speed  $\alpha_4$ . That equilibrium was a constant, that could differ across countries and could be zero. What was relevant for an economy to be BoP constrained was that capital flows do not adjust to BoP disequilibria (at least, not in the long run). In other words, external deficits could not be permanently financed by capital inflows.

#### 5) Exchange rate

$$\begin{aligned} \dot{er} &= \alpha_5(er^e - er) + \gamma_3 Z_2, \\ er^e &= PPP + \delta. \end{aligned} \quad (5)$$

First, we considered prices in domestic currencies as exogenous. Second, the exchange rate was assumed to adjust to its equilibrium level at a speed  $\alpha_5$ . This equilibrium was the PPP exchange rate plus a constant, since there might be permanent deviations from PPP due to the presence of non-tradable goods or barriers to trade. In addition, capital flows could influence the speed of adjustment of the exchange rate, but not its equilibrium level. Thus, if the exchange rate was above its equilibrium, it would tend to converge toward it, but this path could be mitigated, amplified or even reversed by capital flows. These would not affect the long-run exchange rate but could influence short-run deviations.

The steady-state rate of growth of income in this model was<sup>4</sup>

$$\lambda_y = \frac{(\lambda_{xp} - \lambda_{mp}) + \beta_1(\lambda_{xp} - \lambda_{p^*} - \lambda_{PPP})}{\beta_4} + \frac{\beta_3(\lambda_p - \lambda_{mp} - \lambda_{PPP}) + \lambda_{z1} + \beta_2\lambda_{y^*}}{\beta_4}, \quad (6)$$

where  $\lambda_i$  stood for the steady-state growth rate of variable  $i$ . This expression could be interpreted as follows. First, in the long run income was BoP constrained, since capital flows did not permanently finance external deficits. In fact, if prices did not play any role, this

expression became  $\lambda_y = \frac{\beta_2\lambda_{y^*}}{\beta_4}$ , which was Thirlwall's law. Therefore, capital flows might

influence income in the short-run but not in the long-run. Since capital flows were constant in the long-run, if  $K$  was positive and the model was stable, the BoP would show a deficit; and income (though not the rate of growth of income) would be above the level compatible with external equilibrium.

Second, prices did not play a role as long as the exchange rate adjusted to its PPP value. Otherwise, prices had an impact on growth (if the Marshall-Lerner condition held). This meant, for example, that exchange-rate policies could influence (positively or negatively) growth, as long as they were able to maintain the exchange rate deviation with respect to its PPP value. What was important was that even if prices played a role, this did not imply that

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<sup>4</sup> See Appendix I.

the BoP theory did not hold. This became important in explaining the recent economic performance of Portugal and Spain. Finally, note that if exchange rates perfectly adjusted to their PPP values, then equation (6) became Thirlwall's law.

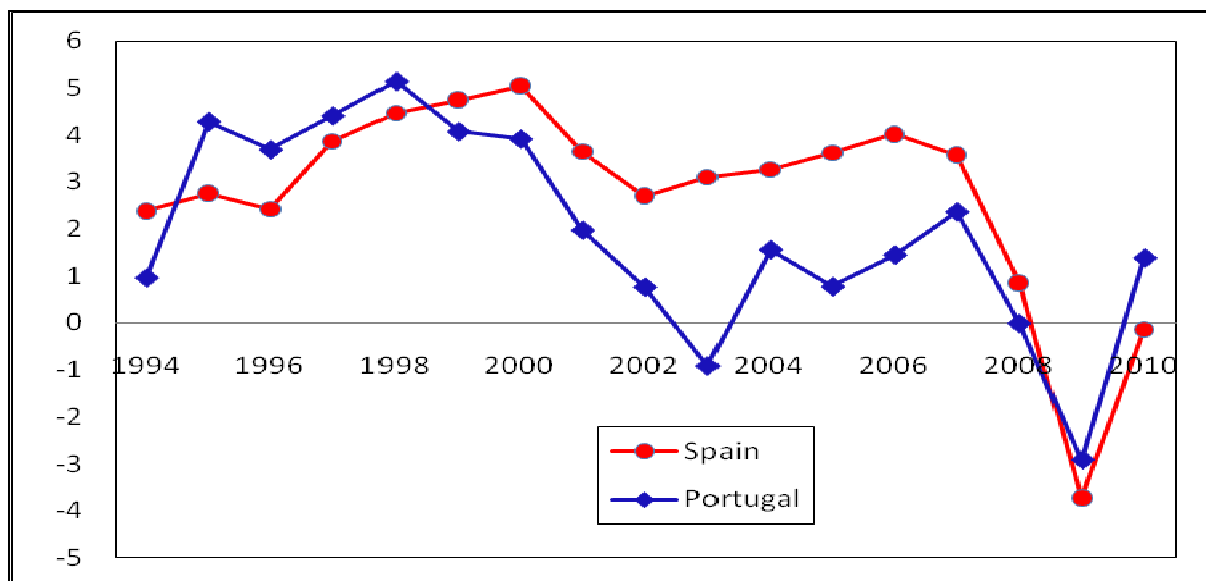
In sum, the model presented above differed from the standard Thirlwall's model in the relevance given to capital flows in the income and exchange rate adjustment paths, and the role that relative prices can play. Capital inflows can slow down BoP adjustment, and growth can be maintained above its long-term rate for a longer period of time. At the same time, capital inflows can slow down the exchange rate adjustment, thus penalising growth. On the contrary, capital outflows, in the presence of an external deficit, can constrain growth to a greater degree, while simultaneously facilitating an exchange rate adjustment, fuelling exports and fostering growth. In the next section we show that this double effect of capital flows is crucial to understanding the two different types of BoP constrained growth recently experienced in Portugal and Spain.

### **Economic performance of Spanish and Portuguese economies throughout the crisis in the euro area**

With regard to the previous period to the current economic crisis, the Spanish and Portuguese economies experienced similar performance in the decades leading up to entry into the euro area. Trade barriers were reduced, fiscal and monetary conditions improved and income per head had been approaching the European average. As a consequence of the modernisation of these economies, both countries met the so-called Maastricht criteria and gained access to the euro area in 1999 with the first group of countries that adopted the euro as the common European currency. Since nominal interest rates fell more rapidly than inflation, Portugal and Spain have had lower real interest than the core EU countries since the late nineties (Gaspar, 2006). This easier access to credit at much lower nominal and real interest rates boosted domestic demand, specially housing demand, by households (Cardoso, 2005). The strong cyclical upturn in Europe (EU-15 GDP growth accelerated from 1.6% in 1991-95 to 2.8% in 1996-2000) contributed to Portugal enjoying higher growth rates than the EU average, as it caught up rapidly from 68.6% of EU-15 GDP per capita in PPS terms in 1995 to 73.5% in 1999. The unemployment rate fell rapidly from 7% in 1995-96 to 4% in 2000.2001 (EC, 2004)

However, since joining, each economy has responded differently: while Portugal suffered a deep stagnation, Spain was experiencing a significant boost. Between 1995 and 1999 GDP grew 4.1% per year in Portugal and 3.3% in Spain, while between 1999 and 2007 the annual GDP growth rate declined to 1.4% in Portugal but increased to 3.6% in Spain. The gap between both countries was even larger between 2002 to 2007: 3.4% in Spain and 0.9% in Portugal (Figure 1).

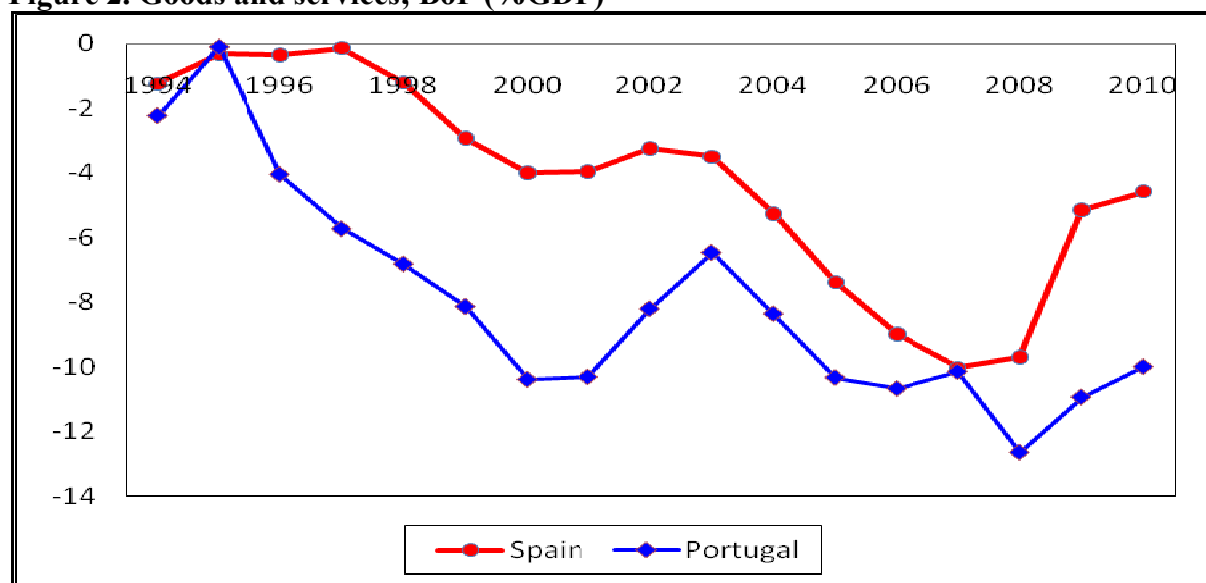
### **Figure 1. GDP growth rate, 1994-2010**



Source: World Bank

Regarding the BoP (goods and services), between 1995 and 1998 – just prior to joining the EMU – Spain exhibited a small surplus (0.3% of GDP), while Portugal experienced a large deficit (7.6% of GDP). Yet, from 1999 onwards, the Spanish surplus turned into a high deficit, while the Portuguese deficit decreased. By 2007 the BoP outcome for both countries was similar (Figure 2).<sup>5</sup>

Figure 2. Goods and services; BoP (%GDP)



Source: World Bank

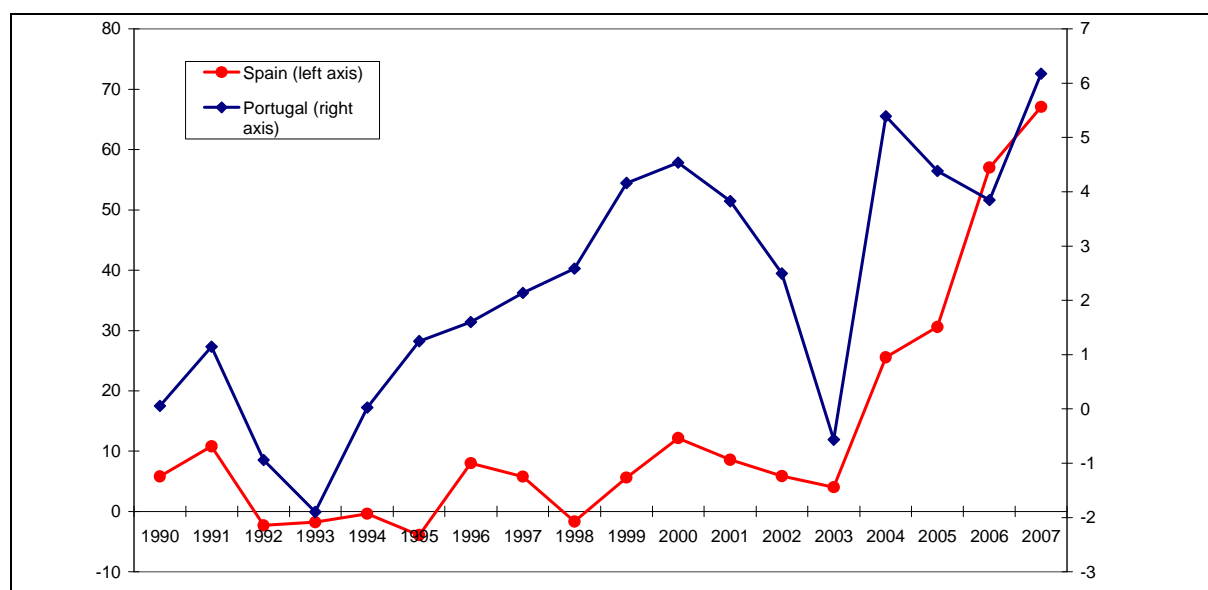
Why have these countries shown such contrary performance since joining the EMU? Why has Spain experienced an economic boom unknown since the 1960s, while Portugal has suffered such a long-lasting stagnation? The augmented BoP constrained growth model presented in the aforesaid paper (Garcimartín et al. (2010-11)) helps answer these questions. On the one hand, both economies are BoP constrained. On the other, the EMU has amplified their

<sup>5</sup> See Lane and Milesi-Ferreti (2006) for a detailed analysis of the Spanish and Portuguese BoP outcome during the period between 1995 and 2004.

respective economic cycles. Spain has exhibited growth over a longer period of time because capital inflows have financed BoP deficits during a longer timeframe than usual, since no currency devaluation was expected. Portugal, on the contrary, has experienced a longer-than-usual stagnation because the return to BoP equilibrium has taken a longer time than usual, since no devaluation — which could improve the BoP outcome — occurred. Both countries joined the euro in different phases of their respective BoP cycles: Spain was close to equilibrium, while Portugal had a large deficit. In addition, while the conversion rate of the Spanish currency against the euro was close to its PPP value, the Portuguese currency was converted at a notably appreciated rate with respect to its PPP value.

As we have assessed above, after Spain and Portugal adopted the euro in 1999, economic performance differed for each country. Portugal was beginning to descend from the recently-reached peak of its cycle and its BoP showed a huge deficit (10% of GDP) when it adopted the new currency. Spain had not yet reached the top of its cycle and its BoP had a much lower deficit (1.8 of GDP), even when it had shown a surplus two years earlier at the time of adoption. Note the important role played by net capital inflows in each of these cases. As can be seen in Figure 3, from 1999 to 2003 Portugal experienced a sharp decrease in capital inflows. This should have accelerated the depreciation of the escudo, fuelled exports, decreased imports, improved the outcome of the BoP and fostered income growth. However, this could not happen because the escudo — as a currency — no longer existed. As a consequence, the adjustment was forced to take place via income. On the contrary, Spain had a much better BoP situation and, as we show below, the value of its currency was much closer to its PPP value. Following the adoption of the euro, the country continued to grow and the BoP started to deteriorate. By 2004 Spain had a deficit of 4% of GDP and had experienced a growth rate above 3% in seven of the previous eight years. Under normal conditions the economy would have adjusted via a reduction in income growth, experiencing currency depreciations and capital outflows. Yet, the euro changed this pattern. Capitals continued to flow into the country since exchange-rate risk had vanished. This made it possible to finance the BoP deficit for a longer period of time, and the economy continued growing above its external constrained level. In sum, the euro had changed the speed of adjustment, as it has also been pointed out by Decressin and Stavrev (2009). In the case of Portugal, depreciation was no longer possible and the country remained below its equilibrium level for a longer period. In the case of Spain, the euro facilitated the entry of capital flows and the country remained above its equilibrium level for a sustained period of time.

**Figure 3. Net capital inflows (1975 constant \$. Billions.)**



Source: World Bank

It is important to note that the path of the escudo prior to the introduction of the euro was different to that of the peseta. Thus, between 1991, the year before the last crisis of the European Monetary System, and 1999, the year that the euro was virtually introduced, the escudo depreciated by 16.3%, while its PPP value dropped by 27.4%, which implies an 11.1% appreciation of the Portuguese currency against its PPP value. The peseta, on the contrary, depreciated by 15.4% against its PPP value in the same time period. In fact, when the Iberian countries joined the euro, the escudo/deutsche mark exchange rate was set at 102.5 and the peseta/deutsche mark at 85.07. Yet, according to the estimates of Garcimartín et al. (2010-11), the equilibrium exchange rates should have been 129.9 and 90.58, respectively. Therefore, Spain joined the euro with a slight (6%) appreciation of its currency following a period of depreciation that saw its currency above its 1994/95 equilibrium value. Alberola. et al. (1999) and Alberola and López (2001) found similar results. On the contrary, according to Garcimartín et al. (2010-11), Portugal joined the euro with a strong appreciation of its currency (21%). The escudo was notably below its equilibrium level. Bulir and Smidkova (2005) and Barrell et al. (2002) also noted the deep negative impact on the Portuguese BoP of the overvalued escudo (between 10% and 20%) in the final stage of the EMU. Martinez-Mongay (2008) argues in similar terms. Blanchard (2006) also points out the problem of the overvaluation of the escudo in the euro area.

With respect to the crisis period (2007-2010), in the case of Spain, as stated in IMF (2011), historically, there are relatively few cases of advanced economies with large negative external imbalances and rigid exchange rate regimes having been able to adjust smoothly. Euro membership may have allowed sustaining larger net external liabilities, but most Euro area economies that had similarly large external positions have been undergoing forced adjustment through crisis-driven deleveraging and domestic adjustment, as it has been the case for Spain and Portugal. Examples of smoother adjustment are to be found in cases where the magnitude of the external position was relatively moderate to begin with, and where the nominal exchange rate was flexible. Reductions of the negative external position were characteristically made possible by strong export-driven growth. In Canada in the nineties, or in Sweden more recently, the adjustment was facilitated by sustained competitiveness gains, on the back of large real and nominal effective exchange rate reductions. In Finland, swings

in the net external liabilities were largely driven by equity valuation effects, yet did also benefit from strong export-driven growth. Denmark is a special case where a current account reversal was accomplished without exchange rate depreciation in the late 1980s, as monetary tightening compressed domestic demand at the cost of very low growth. Finally, New Zealand (and to a lesser extent Australia) provide interesting contrasting examples of persistently large negative external imbalances in spite of flexible nominal exchange rates, possibly in relation with their commodity-exporting status. Spain's balance sheet with the rest of the world is in highly negative territory, reflecting years of large current account deficits. While the current account deficit has improved sharply, it remains significant. Sustaining such a large external position raises potential vulnerabilities and makes for a drawn-out adjustment. This calls for improving the current account at a more rapid pace. Finally, as Parisi-Capone, Menegatti and Roubini (2010) state, there has been a deterioration in the ratio of external solvency of Spain throughout the current economic crisis<sup>6</sup>.

In the case of Portugal, it is taking place a reduction in the current and capital account deficit, common to their main components. The deficit on the current and capital account, which largely corresponds to the economy's net borrowing, was 8.8 per cent of GDP, representing a 1.3 pp decrease of GDP over 2009. The recession of 1984 witnessed a downward trajectory of the deficit on the current and capital account. On the contrary, after the recession of 2003 this deficit increased significantly and, in 2005, was around double the amount registered in 2003. Following the recession of 2009, the deficit on the current and capital account was down in 2010, although it was approximately 2 pp of GDP higher than the average of the last 15 years. The decrease in the deficit of the goods and services account translated, on the one hand, a marked acceleration of exports in 2010, against a backdrop of a significant increase in world trade and recovery of economic activity in Portugal's main trading partners. On the other hand, there was a less marked acceleration of imports, in line with the moderate recovery of global demand. This improvement in the goods and service account balance was common to the goods.

With respect to price and terms of trade effects, in 2010, the prices of the exports and imports of goods and services increased by a similar amount of around 5 per cent, after the decrease noted in 2009. In the case of goods excluding energy, export prices increased significantly more than import prices, generating a positive terms of trade effect and a slightly negative price effect. Over the last few years, the terms of trade of goods excluding energy have been changing positively. In 2010, there has been a significant change in the external financing structure of the Portuguese economy. Particularly in the first half of the year, the external financial profile of the Portuguese economy differed substantially from that observed since the start of the euro area. Underpinning this evolution are the disturbances in sovereign debt markets of Portugal and other euro area countries which were felt at the end of 2009 and were exacerbated starting mid April 2010. This situation was particularly reflected in a strong increase in the restrictiveness of the borrowing conditions for the Portuguese banking system in international wholesale debt markets.

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<sup>6</sup> This ratio is defined as the sum of portfolio and other investments abroad divided by the sum of non-equity portfolio and other investments

## Estimates of parameters considering the economic crisis

Adjustment parameters are significant to a 95% probability. Further, each parameter has the anticipated sign, so all endogenous variables adjust to their long-run equilibrium levels (Tables 1 and 2). In particular, the positive sign of  $\alpha_1$  indicates that both economies are BoP constrained rather than resource constrained, and therefore one of the essential hypotheses of this study cannot be rejected. In addition,  $\gamma_1$  is positive and significant in both countries, which means that capital flows influence the speed of adjustment for income; that is, its short-run rate of variation, but not its long-run growth rate. If capital flows to a country experiencing a BoP deficit, income can grow beyond equilibrium. Similarly, if capital flows out of the country, the adjustment of income will be faster. But, capital flows do not change the long-run income growth rate. In addition,  $\gamma_2$  is positive and significant in both countries, which implies that the speed of adjustment of capital flows to equilibrium has been reduced since the introduction of the euro. In other words, if capital inflows are above the equilibrium level, they will decrease (though, since 1999, the speed of this decrease has declined. This is probably due to the lack of an exchange rate).

Regarding trade functions, price and income elasticities are significant and show the expected sign in both countries. Of importance, price elasticities ( $\beta_1$  and  $\beta_3$ , for exports and imports, respectively) are negative, and the term  $(1+\gamma+\eta)$  lies below zero in both countries. Therefore, the Marshall-Lerner condition holds: relative prices matter. This does not invalidate the BoP constrained growth theory as long as income adjusts to BoP disequilibria. As stated above, this has been the case for the Iberian countries.

With regard to the absolute values of trade elasticities, previous studies show significant differences amongst them. Broadly speaking, our estimates are slightly higher than the average. Leaving aside differences in sample periods and econometric techniques, this can be attributed to the fact that we employ weighted averages to measure foreign income and prices, in the case of exports. We use, as weights, each trade partner's share of total exports (Appendix II). Thus, export income elasticity reaches 1.88 in Portugal and 2.53 in Spain. For the former, a value of 1.30 was found by Senhadji and Montenegro (1999) and 2.57 by Antunes and Souziakis (2009). For Spain, Mauleón and Sastre (1994) report a value of 2.6, Alonso and Garcimartín (1998) of 2.2, Buisan and Gimenez (2003) of 1.4 and, more recently, the Bank of Spain (Banco de España, 2008) estimated values of 1.1 for goods and 2.7 for services. In the case of imports, income elasticities reach 2.04 in Portugal and 2.63 in Spain. For the former, Faini et al. (1988) and Antunes and Souziakis (2009) find a value close to 2, Bairam (1988) reports a value of 1.69, Bennett et al. (2008) of 1.55 and Bagnai (2008) of 1.42. For Spain, import income elasticity reached 0.7 in Mauleón and Sastre (1994), 1.88 in Alonso and Garcimartín (1998), 2.7 in García and Gordo (1998), 2.28 in Bennett et al. (2008) and 2.1 for goods and 1.7 for services in Banco de España (2008).

With respect to price elasticities, all are significant. Exports have a value of -0.26 in Portugal and -2.02 in Spain. Senhadji and Montenegro (1999) found for Portugal an export price elasticity of -2.92, while according to Antunes and Souziakis (2009), it is not significantly different from zero. In their study, although they find evidence supporting BoP constrained growth, they state that prices do not matter in Portugal because elasticities are irrelevant. We disagree with this view and, as we demonstrate below, the recent loss of price competitiveness has been one important factor behind Portuguese stagnation. Regarding Spain, export price elasticity reaches -1.0 in Mauleón and Sastre (1994), -0.59 in Alonso and

Garcimartín (1998), -0.8 in García and Gordo (1998) and -1.3 for goods and -0.9 for services in Banco de España (2008). In the case of imports, our estimates show price elasticities of -0.82 and -0.43 for Portugal and Spain, respectively. For the former, Antunes and Souziakis (2009) found a value of -0.29, while Faini et al. (1988) report -0.64 and Bennett et al. (2008) report -0.51. For Spain, Mauleón and Sastre (1994) estimate -0.4, Alonso and Garcimartín (1998) -0.58, García and Gordo (1998) -0.9, Bennett et al. (2008) -0.28 and Banco de España (2008) -0.6 for goods and -0.7 for services.

Finally, concerning the exchange-rate equation, the positive and significant value of  $\alpha_5$  indicates that the exchange rate adjusts to its equilibrium level. This level is its PPP value plus a constant, which stands for a permanent deviation from the PPP value. It must be highlighted that this is of the utmost importance, since it shows that relative prices (the exchange rate) have a long-term value that is independent of the BoP outcome. In addition,  $\gamma_3$  is negative and significant for both countries, and therefore the exchange rate speed of adjustment depends on capital flows. If the currency is overvalued, it will depreciate, but capital inflows can slow down or even reverse this trend. On the contrary, capital outflows accelerate it.

**Table 1. Estimates of parameters: Spain**

Parameter	Value (t-ratio)	Meaning and speed of adjustment <sup>a</sup>
$\alpha_1$	0.4 (3.38)	Income speed of adjustment: 0.25
$\alpha_2$	1.20 (3.47)	Exports speed of adjustment: 0.83
$\alpha_3$	0.70 (4.64)	Imports speed of adjustment: 1.42
$\alpha_4$	3.78 (3.02)	Capital flows speed of adjustment: 0.26
$\alpha_5$	0.50 (2.26)	Capital flows speed of adjustment: 0.44
$\gamma_1$	0.001 (9.81)	Elasticity of income with respect to capital flows
$\gamma_2$	13.22 (2.69)	Elasticity of capital flows with respect to EMU
$\gamma_3$	-0.02 (3.40)	Elasticity of exchange rate with respect to capital flows
$\beta_1$	-2.02 (9.74)	Price elasticity of exports
$\beta_2$	2.53 (41.49)	Income elasticity of exports
$\beta_3$	-0.43 (4.74)	Price elasticity of imports
$\beta_4$	2.63 (18.4)	Income elasticity of imports

<sup>a</sup> The reciprocal of  $\alpha$  is labeled the mean-time lag, defined as the time necessary for approximately two-thirds of the discrepancy between the observed value of the  $i$ -variable at time  $t$  and its equilibrium level to be eliminated.

**Table 2. Estimates of parameters: Portugal**

Parameter	Value (t-ratio)	Meaning and speed of adjustment <sup>a</sup>
$\alpha_1$	0.21 (3.22)	Income speed of adjustment: 4.76
$\alpha_2$	2.89 (3.41)	Exports speed of adjustment: 0.34
$\alpha_3$	2.21 (3.62)	Imports speed of adjustment: 0.45
$\alpha_4$	6.38 (2.17)	Capital flows speed of adjustment: 0.15
$\alpha_5$	1.29 (2.36)	Capital flows speed of adjustment: 0.77
$\gamma_1$	0.01 (3.32)	Elasticity of income with respect to capital flows
$\gamma_2$	10.31 (2.04)	Elasticity of capital flows with respect to EMU
$\gamma_3$	-0.02 (1.99)	Elasticity of exchange rate with respect to capital flows
$\beta_1$	-0.26 (12.82)	Price elasticity of exports
$\beta_2$	1.88 (48.91)	Income elasticity of exports
$\beta_3$	-0.82 (4.23)	Price elasticity of imports
$\beta_4$	2.04 (24.92)	Income elasticity of imports

<sup>a</sup> The reciprocal of  $\alpha$  is labeled the mean-time lag, defined as the time necessary for approximately two-thirds of the discrepancy between the observed value of the  $i$ -variable at time  $t$  and its equilibrium level to be eliminated.

### **An application of the model: Portugal and Spain throughout the crisis in the euro area**

In order to prove the impact of the overvaluation of the escudo on the euro area, Garcimartín et al. (2010-11) compared accumulated equilibrium growth rates between 1999 and 2007 inside and outside the euro area; that is, with a fixed exchange rate and with an equilibrium exchange rate. The former yielded 19.8% and the latter 39.2. While these results could be biased because of the time it takes to reach equilibrium values, they served to highlight two important points. First, relative prices matter even in the context of BoP constrained growth. Second, they have mattered more for Portugal since its adoption of the euro.

Spain's story has been different. It joined the euro when the BoP, capital inflows and the exchange rate were close to equilibrium levels. Under normal conditions, the natural sequence of events would be income growth above equilibrium and external deficits financed by capital inflows. However, with the introduction of the euro and the subsequent disappearance of exchange rate risk, the impact on income growth could last for a longer time. The external deficit began to correct in 2000, following the usual trend, but in 2002 this trend was reversed, and deficits began to grow, reaching higher-than-usual levels. This meant that income could grow above its equilibrium rate. Between 1999 and 2001, the accumulated actual growth rate was higher than the equilibrium rate. From 2001 onwards, the opposite occurred, indicating that the adjustment had started. Yet, in 2003 that situation turned upside down. The actual growth rate overtook the equilibrium rate and capital inflows increased dramatically.

In fact, the situation was very similar between the periods 1987-1991 and 1998-2000: high growth rates and external deficits. Yet, there is a crucial difference between both periods. At the end of the former growth cycle begins to slow, the BoP starts to move toward equilibrium, capital outflows begin and the currency depreciates, which, in turn, boosts exports and reduces imports. However, while the economic situation was similar at the end of the second period, the reaction was different, especially from 2004 onwards. Income continued to grow at high rates and the external deficit continued to increase. What makes this possible was the strong inflow of capital. Without the euro, the story likely would have been much different; similar to that in the aftermath of the 1987-1991 period. The euro reduces the speed of adjustment: making expansions last longer, as in the Spanish case, but during recessions, creating the need for other types of adjustments, as in the case of Portugal. Currently, the Spanish economy is adjusting towards its equilibrium level. The present situation of the Spanish economy resembles the past of Portugal.

After describing the performance of both economies over the last years, and by means of equation (6), we now develop a simulation of the several scenarios within the observed period, in order to compare the actual to the equilibrium growth rates, in both cases: with and without euro. As it can be seen in table 3, in all cases, both economies show higher values of income growth when comparing the non-euro scenario to the one with euro.

**Table 3: Growth rates**

		Actual				Equilibrium rate without euro (YB <sub>Phon-€</sub> )				Equilibrium rate with euro (YB <sub>Pe</sub> )			
		Spain		Portugal		Spain		Portugal		Spain		Portugal	
		Accum.	Annual	Accum.	Annual	Accum.	Annual	Accum.	Annual	Accum.	Annual	Accum.	Annual
TOTAL	1975-2010	86.69	2.41	91.05	2.53	110.68	3.07	69.89	1.94	90.72	2.52	62.25	1.73
PRE-EURO	1975-1999	56.68	2.26	77.71	3.10	79.83	3.19	43.40	1.73	-	-	-	-
	1999-2010	30.01	2.73	13.34	1.21	30.84	<b>2.80</b>	26.49	<b><u>2.4</u></b>	9.0	<b>0.8</b>	17.14	<b><u>1.56</u></b>
EURO	1999-2007 (pre-crisis)	33.17	4.14	14.98	1.87	32.18	<b>4.02</b>	27.70	<b><u>3.46</u></b>	11.04	<b>1.38</b>	17.94	<b><u>2.24</u></b>
	2007-2010 (crisis)	0.59	0.14	0.10	0.025	-0.1	<b>-0.02</b>	1.17	<b><u>0.29</u></b>	-0.8	<b>-0.2</b>	1.09	<b><u>0.27</u></b>

Both equilibrium rates, with and without euro, entail a balance of payments equal to zero. The growth of income is compatible with a balanced current account. Obviously, that is not the case for the actual growth rate. Concerning the actual growth rate, if compared both values, over the period pre-euro (1975-1999) and the euro period, including the current crisis (1999-2010), they are quite different for the cases of Spain and Portugal. The annual average growth rate is 2.26% and 2.73% for both periods, respectively, in the case of Spain.

Actual data indicates that Spanish economy grew more rapidly when adopting the euro than before. That is not the case for Portugal: the rate of growth in that country diminished from 3.10 (1975-1999) to 1.21 (1999-2010). Even if the crisis period is withdrawn (1999-2007), the results are the same. If we compare the two scenarios of equilibrium rates, with and without euro, the results are remarkably uneven. In the case of Spain, when we compare both growth rates throughout the euro period (1999-2010), there is a paramount difference: 2.8% without euro and 0.8% with it. If we drop the crisis period, the result is proportionally similar: 4.02% vs. 1.38%. Spanish economy would grow much faster but, once more, the scenario without euro would have been much more favorable than the one with euro. In the case of Portugal, over the same period (1999-2010), the annual income growth rate, with and without euro was, 1.56% and 2.4, respectively. When ignoring the crisis period (1999-2007), the results for this economy, with and without euro are, 2.24% and 3.46%, respectively. Apparently striking results are obtained for the case of Portugal when analyzing the crisis period (2007-2010): 0.27% with and 0.29 without euro. Although these results seem to be deceptive, they can be explained by the facts that the period concerned may be too short and that the Portuguese economy was already adjusting its external sector before the breakout of the crisis.

Finally, we develop a simulation where, by the one hand, we try to measure how much both economies would have grown if they had had the possibility of devalue their currencies in a scenario without euro with equilibrium in their BoP, and, by the other hand, how much prices (internal devaluation) would have changed in order to maintain the external equilibrium while growing at the actual rate. Concerning the simulation of the devaluation, we have built three different scenarios: 1%, 2% and 5% devaluation of exchange rate, if it had been possible, over the period 1999-2007. As it can be observed in table 4, both economies would have experienced higher growth rates than the actual scenario and, furthermore, with BoP equals to zero. The application of these demand policies would have been more effective in the case of

Portugal and, of course, the more higher would have been the devaluation of the exchange rate.

**Table 4. Devaluation scenarios, 1999-2007**

		Spain		Portugal	
		Accum.	Annual	Accum.	Annual
Devaluation	1%	19.11	<b>2.12%</b>	29.37	<b>3.26%</b>
	2%	28.53	<b>3.17%</b>	38.98	<b>4.33%</b>
	5%	56.77	<b>6.3%</b>	67.80	<b>7.5%</b>

With respect to the evolution of domestic prices (internal devaluation) needed in order to maintain the equilibrium growth rates in the non-euro scenario, when working out the value of deflator of GDP (P) in equation (6), and holding constant the value of growth rate at that above-mentioned (table 3) growth rates, we obtain the following results: in the case of Spain, inflation actual annual average growth rate is 3.79%. It means that, to grow at an annual rate of growth of 4.02% (scenario without euro and BP=0), Spanish estimated inflation should have been 0.9% per year over the period 1999-2007. If we make the same exercise for the Portuguese economy, we obtain the following values: 3.02% actual annual inflation growth rate; 1.38% annual rate of growth of GDP (non-euro and BP=0) and a needed 0.74% estimated inflation rate per year.

### Concluding remarks

Throughout the mentioned paper developed by Garcimartín et al. (2010-11), we defended that relative prices and capital flows matter in the real world, at least in the short run, and therefore should be incorporated into BoP constrained growth models. To that aim, we presented a model where capital flows influenced the speed of adjustment of income and exchange rates, prices did have a role in trade equations and exchange rates adjusts to their PPP values. By doing this, under normal circumstances long-term growth rates in our model became those predicted by Thilwall's law. Further, if capital flows or exchange rates differ from equilibrium values during a certain period of time our model will take account of this. In our opinion, this is important when testing the BoP constrained growth theory. Regressing Thilwall's law growth rates on actual rates may lead to an erroneous rejection of the BoP constraint hypothesis. We think that this hypothesis should be tested by checking if income adjusts to external disequilibria, without imposing a priori restrictions on prices and capital flows.

To empirically support our model, we used it to analyse a case in which prices and capital flows indeed had played a significant role: the opposite evolution of Portugal and Spain after the introduction of the euro. While the former had suffered a deep stagnation, the latter has experienced a significant boost. According to our model, both economies were BoP constrained. But, while the Portuguese economy joined the Euro in a moment when it was far from equilibrium (strong external deficit and overvalued currency), Spain did so close to equilibrium. The European common currency amplified the economic cycles for both countries. For Portugal, this meant a longer time in the bottom side of the cycle; for Spain it meant a longer time on the top of its cycle. Yet, Spain has already entered into the adjustment

phase and, as the Portuguese lesson showed, it may take a long time to complete it; longer than in the past. As Blanchard (2006) stated, “One may reasonably wonder if, if and when internal demand slows down, Spain may not face a situation similar to that of Portugal today.” In fact, the latest income growth figures are worse in Spain than in Portugal. The similar evolution of Spanish economy when compared to the Portuguese predicted by Blanchard (2006) and Garcimartín (2010-11) is currently working.

We did not mean that a monetary union is a bad thing in a BoP constrained growth world. Undoubtedly, it has many positive effects on trade and growth. What we meant to demonstrate is that it can be dangerous if relative prices move far away from the equilibrium level. As Blanchard (2006) assessed in his analysis of the evolution of the Portuguese economy, the return to equilibrium can be difficult and take a long time. That is the case for the Spanish economy. Once the question of how will be the behaviour or the balance of payments in the case of Spain is answered when observing the Portuguese economy, the next question is how long it will take to return to the equilibrium. Furthermore, when we compare both scenarios, with or without euro, Spain and Portugal would have grown more rapidly over the period 1999-2010 if they had not belonged to the euro area.

Finally, we have built two scenarios in order to calculate the rate of growth of income when a devaluation takes place, in the external sector (exchange rate), and changing domestic prices. The results show that both economies would have grown faster, with equilibrium in the external sector, if these countries had had available the possibility of devaluation. The actual inflation rates in Spain and Portugal over the period 1999-2007 have been much higher than the estimated rates it would be desirable in order these economies to grow with external equilibrium.

## References

Alberola, E.; Cervero, S. G.; López, H.; and Ubide A. “Global Equilibrium Exchange Rates - Euro, Dollar, "Ins," "Outs," and Other Major Currencies in a Panel Cointegration Framework”, *IMF Working Papers* 99/175, 1999, International Monetary Fund.

Alberola, E. and López J. H. “Internal and external exchange rate equilibrium in a cointegration framework: an application to the Spanish peseta”, *Spanish Economic Review*, 2001, vol.3, n.1, 23-41.

Alonso, J. A. “Growth and the External Constraint: Lessons from the Spanish Case,” *Applied Economics*, February 1999, vol. 31, 245-253.

Alonso, J. A. and Garcimartín, C. “A new approach to balance-of-payments-constrained growth model”. *Journal of Postkeynesian Economics*, 1998, Vol. 21, nº. 2, 259-282.

Antunes, M. and Soukiazis, E. “How well the balance-of-payments constraint approach explains the Portuguese growth performance. Empirical evidence for the 1965-2008 Period”, Working Paper nº. 13, 2009, GEMF, Universidade de Coimbra.

Atesoglu, H. S. "Balance of Payments Constrained Growth. Evidence from the United States". *Journal of Post Keynesian Economics*, 1993, vol. 15, nº 4, 507-514.

Atesoglu, H. S. "Balance of Payments Determined Growth in Germany". *Applied Economic Letters*, 1994, vol. 1, nº 6, 89-91.

Atesoglu, H. S. "An Explanation of the Slowdown in US Economic Growth", *Applied Economics Letters*, 1995, 2, 91-94.

Bagnai, A. "Structural breaks, cointegration, and the empirics of Thirlwall's law", *Applied Economics*, November 2008, 1-15.

Bairam, E. "Balance of payments, the Harrod foreign multiplier and economic growth: the European and North American experience". *Applied Economics*, December 1988, nº 20, 1635-1642.

Bairam, E. and Dempster, G. "The Harrod Foreign Trade Multiplier and Economic Growth in Asian Countries". *Applied Economics*, November 1991, vol. 23, n.º 11, 1719-1724.

Banco de España. "Una actualización de las funciones de exportación e importación de la economía española", Boletín Económico, diciembre 2008, Banco de España.

Barrell, R.; Holland, D.; Jakab, Z. M.; Kovacs, M. A.; Smidkova, K.; Sepp, U; and Eufer, U. "An econometric macro-model of transition: policy choices in the pre-accession period", in *Proceedings of AMFET'2001 Conference – Modelling Economies in Transition*, Krag (Poland), Lodz, Absolwent, 2008.

Bennett, H.; Escolano, J.; Fabrizio, S.; Gutiérrez, E.; Ivaschenko, I.; Lissovolik, B.; Moreno-Badia, M.; Schule, W.; Tokarick, S.; Xiao, Y.; and Zarnic, Z. "Competitiveness in the Southern Euro Area: France, Greece, Italy, Portugal, and Spain", IMF Working Paper, 08/112, 2008.

Blanchard, O. "Adjustment within the euro. The difficult case of Portugal". *Portuguese Economic Journal*, April 2007, Vol. 6, No. 1, 1-21.

Britto, G. and McCombie, J. L. S. "Thirlwall's law and the long-term equilibrium growth rate: an application to Brazil". *Journal of Post Keynesian Economics*, Fall 2009, Volume 32, Nº 1, 115-137.

Buisán, A., J.; Caballero C.; and Jiménez, N. "Determinación de las exportaciones de manufacturas en los países de la UEM a partir de un modelo de oferta-demanda", *Boletín Económico*, octubre 2003, Banco de España.

Bulir, A. and Smidkova, K., "Exchange rates in the new EU accession countries: what have we learned from the forerunners?", *Economic Systems* 29, 2005, 163–186.

Cardoso, P. "Household behaviour in a monetary union: what can we learn from the case of Portugal?" *ECFIN Country Focus*, 2004, Volume 2, Issue 20.

Carter, R. and Nagar, A. L. "Coefficients of Correlation for Simultaneous Equations Systems". *Journal of Econometrics*, 1977, vol. 6, 39-50

Elliot, D. R. and Rhodd, R. "Explaining Growth Rate Difference in Highly Indebted Countries: An Extension to Thirlwall and Hussain", *Applied Economics*, 1999, 31, 1145-1148.

European Commission, "The Portuguese economy after the boom", *European Economy*, 2004, Occasional Paper No.8, available from:  
[http://europa.ec.eu/comm/economy\\_finance/publications/occasionalpapers\\_en.htm](http://europa.ec.eu/comm/economy_finance/publications/occasionalpapers_en.htm)

Faini, R.; Pritchett, L; and Clavijo, F. "Import Demand in Developing Countries", World Bank Working Paper, 1988, Country Economics Department, Trade Policy,.

Gandolfo, G. *Qualitative Analysis and Econometric Estimation of Continuous Time Dynamic Models*. Amsterdam, North Holland, 1981.

Gaspar, V. (2006), "Adjusting to the Euro", Paper presented at Third Annual DG Ecfm Research Conference, 7-8 September, 2006

García, C. and Gordo, E. "Funciones trimestrales de exportación e importación para la economía española". Documentos de Trabajo n.º 9822, 1988, Banco de España,.

Garcimartín, C., Rivas, L. and Díaz, S. "Accounting for the Irish growth: a balance-of-payments-constraint approach", *Journal of Post Keynesian Economics*, 2008, Vol. 30, n.º. 3, 409-433.

Garcimartín, C., Rivas, L. and García, P. "On the role of relative prices and capital flows in balance-of-payments constrained growth: the experiences of Portugal and Spain in the euro area", *Journal of Post Keynesian Economics*, 2010-11, Vol. 33, n.º. 2, 281-305.

Hussain, M. "The Balance of Payments Constraint and Growth Rate Differences Among African and East Asian Economies", *African Development Review*, June 1999, 103-137.

IMF Country Report No. 11/216, 2011.

Lane, P and Milesi-Ferreti, G. "The external wealth of nations Mark II: Revised and expanded estimates of foreign assets and liabilities, 1970-2004", IMF Working Paper 06/69, 2006.

McCombie, J. "Thirlwall's Law and Balance of Payments Constrained Growth—A Comment on the Debate". *Applied Economics*, 1989, 21, 611-629.

McCombie, J. S. "Thirlwall's Law and Balance of Payments Constrained Growth, More on the Debate", *Applied Economics*, 1992, 5 (1), 611-629.

Martinez-Mongay, C. "Spain and Portugal in the Euro Area: Lessons for Cyprus", *Cyprus Economic Policy Review*, 2008, vol. 2 no. 1, pp. 33-62.

McGregor, P. G. and Swales, J. K. "Professor Thirlwall and Balance of Payments Constrained Growth", *Applied Economics*, 1985, vol. 17, n.º. 5, 17-32.

McGregor, P. G. and Swales, J. K. “Balance of Payments Constrained Growth: A Rejoinder to Professor Thirlwall”, *Applied Economics*, 1986, , vol. 18, nº. 12, 1265-1274.

McGregor, P. G. and Swales, J. K. “Thirlwall’s Law and Balance of Payments Constrained Growth: Further Comment on the Debate”, *Applied Economics*, 1991, vol. 23, nº. 1, 9-20.

Mauleón, I. and Sastre, L. “El saldo comercial en 1993: un análisis econométrico”, *Información Comercial Española*, 1994, 735, 167-172.

Moreno-Brid, J. C. “On capital flows and the balance-of-payments-constrained growth model”. *Journal of Postkeynesian Economics*, 1998, Vol. 21, Nº. 2, 283-298.

Moreno-Brid, J. C. “Capital Flows, Interest Payments and the Balance-of-Payments Constrained Growth Model: A Theoretical and Empirical Analysis”. *Metroeconomica* 54, 2003, nº. 2-3, 346-365.

Parisi-Capone, Elisa; Menegatti, Christian; Roubini, Nouriel, Comparing Spain With Ireland and Other PIIGS : Better in Some Ways, More at Risk in Others; Roubini Global Economics, 2010.

Senhadji, A. and Montenegro, C. “Time Series Analysis of Export Demand Equations: A Cross-Country Analysis”, IMF Staff Papers, 1999, Vol. 43, No.3.

Thirlwall, A. “Balance of payments constraint as an explanation of international growth rate differences”. *Banca Nazionale del Lavoro Quarterly Review*, 1979, 128(1), 45-53.

Thirlwall, A. P. and Hussain, M. N. “The balance of payments constraint, capital flows and growth rate differences between countries”, *Oxford Economic Papers*, 1982, nº 3, 498-510.

## Appendix I The steady-state rate of growth

The steady-state solution of the model can be found using the method of undetermined coefficients, where all variables —with the exception of dummies— grow at a constant rate, which can be zero. Therefore each variable (i) at time  $t$  can be defined as  $i_t = i_0 e^{\lambda_i t}$ , exception made of  $Z_2$ , which is a constant:  $Z_2 = \bar{Z}_2$ .

Substitution of (I.1) into the model yields

$$\lambda_y = \alpha_1(x_0 + \lambda_x t + z_{l_0} + \lambda_{z_1} t + x_{p_0} + \lambda_{x_p} t - m_0 + \lambda_m t - m_{p_0} - \lambda_{m_p} t - e_{r_0} - \lambda_{e_r} t) + \gamma_1 \bar{Z}_2 \quad (I.1)$$

$$\lambda_x = \alpha_2(a + \beta_1(x_{p_0} + \lambda_{x_p} t - p^*_0 - \lambda_{p^*} t - e_{r_0} - \lambda_{e_r} t) + \beta_2(y^*_0 + \lambda_{y^*} t) - x_0 - \lambda_x t) \quad (I.2)$$

$$\lambda_m = \alpha_3(b + \beta_3(m_{p_0} + \lambda_{m_p} t + e_{r_0} + \lambda_{e_r} t - p_0 + \lambda_{p_t}) + \beta_4(y_0 + \lambda_y t) - m_0 - \lambda_m t) \quad (I.3)$$

$$0 = \alpha_4 (K - Z_2) \quad (I.4)$$

$$\lambda_{er} = \alpha_5 (\delta + PPP_0 + \lambda_{PPP} t - er_0 + \lambda_{er} t) + \gamma_2 \bar{Z}_2 \quad (I.5)$$

Rearranging terms, we obtain

$$\lambda_y = \alpha_1 (x_0 + z_{10} + xp_0 - m_0 - mp_0 - er_0) + \gamma_1 Z_2 + \alpha_1 t (\lambda_x + \lambda_{z1} + \lambda_{xp} - \lambda_m - \lambda_{mp} - \lambda_{er}) \quad (I.6)$$

$$\lambda_x = \alpha_2 (a + \beta_1 (xp_0 - p^*_0 - er_0) + \beta_2 y^*_0 - x_0) + \alpha_2 t (\beta_1 (\lambda_{xp} - \lambda_{p^*} - \lambda_{er}) + \beta_2 \lambda_{y^*} - \lambda_x) \quad (I.7)$$

$$\lambda_m = \alpha_3 (b + \beta_3 (mp_0 + er_0 - p_0) + \beta_4 y_0 - m_0) + \alpha_3 t (\beta_3 (\lambda_{mp} + \lambda_{er} - \lambda_p) + \beta_4 \lambda_y - \lambda_m) \quad (I.8)$$

$$0 = \alpha_4 (K - Z_2) \quad (I.9)$$

$$\lambda_{er} = \alpha_5 (\delta + PPP_0 - er_0) + \gamma_2 \bar{Z}_2 + \alpha_5 t (\lambda_{PPP} - \lambda_{er}) \quad (I.10)$$

For these expressions to be identically satisfied, the following equations must hold

$$0 = (\lambda_x + \lambda_{z1} + \lambda_{xp} - \lambda_m - \lambda_{mp} - \lambda_{er}) \quad (I.9)$$

$$\lambda_x = \beta_1 (\lambda_{xp} - \lambda_{p^*} - \lambda_{er}) + \beta_2 \lambda_{y^*} \quad (I.10)$$

$$\lambda_m = \beta_3 (\lambda_{mp} + \lambda_{er} - \lambda_p) + \beta_4 \lambda_y \quad (I.11)$$

$$Z_2 = K \quad (I.12)$$

$$\lambda_{er} = \lambda_{PPP} \quad (I.13)$$

From this set of equations, the rate of growth of the endogenous variables can be obtained as a function of the growth rates of the exogenous variables. In the case of income, its steady-state growth rate will be:

$$\lambda_y = \frac{(\lambda_{xp} - \lambda_{mp}) + \beta_1 (\lambda_{xp} - \lambda_{p^*} - \lambda_{PPP}) + \beta_3 (\lambda_p - \lambda_{mp} - \lambda_{PPP}) + \lambda_{z1} + \beta_2 \lambda_{y^*}}{\beta_4} \quad (I.14)$$

## Appendix II Data description and data sources

The variables used to estimate the model are in constant prices, except  $Z_1$ , which must necessarily be in current prices. The sample period is 1975-2007, except for the estimation of the exchange rate equation, whose sample period is 1975-1998.

- Y. GDP. Source: World Bank.
- X. Exports of goods and services. Source: World Bank.
- M. Imports of goods and services. Source: World Bank.
- XP. Exports price deflator. Source: Source: World Bank.

- MP. Imports price deflator. Source: World Bank.

- P. GDP price deflator. Source: World Bank.

- P\*. Foreign price level. This index was constructed by weighting the GDP deflators of Portuguese and Spanish export destination countries:

$$P^* = \frac{\sum_j P_j w_j}{e_j},$$

where  $P_j$  is the GDP deflator of country  $j$ ,  $e_j$  represents the exchange rate against the currency of country  $j$ , and  $w_j$  is the weight of country  $j$  in Portuguese and Spanish exports. To construct this indicator we used the top-36 export destinations. Therefore, the evolution of relative prices with respect to the rest of countries is considered to follow this weighted average. All foreign prices have been converted into deutsche marks, which has been used as vehicular currency in this paper. Source: World Bank.

- Z. Index of net current transfers, net FDI and EU transfers (Regional and Cohesion Funds until 1991 and Structural Actions afterwards). Source: for the first two variables, World Bank, for the latter, European Commission.

- Y\*. Weighted foreign GDP. The weights are the share of each country in Portuguese and Spanish exports. As in the case of foreign prices, we have only used the top-36 export destinations to construct this variable. Source: World Bank

Z<sub>2</sub>. Net portfolio investment and net other investment. Source: World Bank.

ER. Exchange rate against deutsche mark. Source: World Bank

PPP. Purchasing Power Parity exchange rate. It has been computed by multiplying the actual exchange rate by the World Bank PPP conversion factor to official exchange rate ratio.

