Application of the balance-of-payments constrained growth model to Portugal, 1965-2008.

ABSTRACT

The present study aims to verify whether the balance-of-payments constrained growth approach is suitable for explaining the Portuguese growth performance during the last decades. To smooth cyclical variations, 15-year overlapping periods are considered in the computation of "Thirlwall's Law", assuming that income elasticity of imports is either constant or variable over time. It is shown that actual growth can accurately be predicted by the ratio of export growth to the income elasticity of the demand for imports. Evidence also reveals that Portugal grew slightly faster than the rate consistent with the balance-of-payments equilibrium accumulating external deficits over time. Considering the pre- and post-accession periods to EU, it is found that Portugal grew at a slower rate in the latter, explained by a higher income elasticity of imports and lower export growth.

JEL code: C13, E12, F43, O24

Keywords: balance-of-payments equilibrium growth rate, income elasticities with respect to trade, overlapping periods, 2SLS regressions

1. Introduction

In the core of the debate between the supply-constrained and the demand-led growth stands the very relevant contribution of Thirlwall, under the Post-Keynesian framework, through what has become known as "Thirlwall's Law". The growth of an economy is ultimately determined by effective demand, especially external demand, instead of being explained by the accumulation of factor inputs as the neoclassical theory assumes. The balance-of-payments equilibrium growth rate is determined by the growth of exports in relation to the income elasticity of the demand for imports, and this is related to the Harrod foreign trade multiplier (Thirlwall, 1980) when it is expressed in a dynamic form.

The general proposition of "Thirlwall's Law" is that whenever an economy grows at a rate higher than that consistent with the balance-of-payments equilibrium, it will run into external deficits which are not sustainable in the long-run, unless capital inflows can finance the ever growing imbalances. In case a country falls into such a trap, domestic income must be adjusted downwards resulting in higher unemployment. It is income that is adjusted to bring the economy back to equilibrium and not relative prices as orthodox balance-of-payments adjustment theory assumes. Competitive devaluations are not the solution, since in the long-run they aggravate domestic inflation, lowering competitiveness and worsening even further external imbalances. Structural solutions are needed to make exports more attractive in external markets and imports less sensitive to changes in domestic income.

The aim of this paper is to analyse whether "Thirlwall's Law" predicts accurately the actual GDP growth of Portugal over the period 1965-2008, a study that has not been done before (but some multi-country studies include Portugal). More specifically, the study is carried out not only for the whole period but also for shorter

overlapping periods, to which the McCombie test (McCombie, 1989) is applied to assess the validity of the Law. The whole period is also divided in the pre- and post-accession periods to the European Union to detect different tendencies in growth performance. In section 2 we reconsider the model developed by Thirlwall to predict a country's actual growth. In section 3 we explain the variables and the data used over the time period considered. Unit root tests are also performed to justify the specification of the export and import demand functions. The export and import demand functions are estimated in section 4, to provide the income elasticities of demand for imports and exports necessary to test "Thirlwall's Law". In section 5 we compute the growth rates consistent with balance-of-payments equilibrium, and compare them to the actual growth rates for 15-year overlapping periods either using a constant or a varying income elasticity of demand for imports over time. The final section concludes on the accuracy of "Thirlwall's Law" as a way of predicting actual growth in Portugal.

2. "Thirlwall's Law" reconsidered

In this section we focus on the original version of "Thirlwall's Law" (Thirlwall, 1979) assuming both that the trade balance[1] is initially in equilibrium and that there are no relative price effects, at least in the long-run. Thirlwall and Hussain (1982) also consider a model starting from disequilibrium on the current account, implying the existence of capital inflows.[2] We will not adopt this extended version in the present study because, although capital inflows can be important in the short-run for adjusting external imbalances, in the long-run their impact on growth is dubious. As Blecker (2009) argues, increasing capital inflows can at most be a temporary way of relaxing the balance-of-payments constraint, but they do not allow a country to grow at the export-led cumulative growth rate in the long-run. What matters in the long term analysis of growth is the growth of exports. In Thirlwall's original model, exports and the income

elasticity of imports play a key role in determining long-run growth because faster growth of exports allows faster growth of the imports needed to pay for the import content of other components of demand.

The model can be described in three equations, in growth rates:[3]

$$m_t = \pi y_t + \psi\left(pd_t - pf_t - e_t\right) \quad \text{Import growth function} \quad (1)$$

$$x_t = \varepsilon z_t + \eta\left(pd_t - pf_t - e_t\right) \quad \text{Export growth function} \quad (2)$$

$$pd_t + x_t = pf_t + e_t + m_t \quad \text{Trade balance equation starting from equilibrium} \quad (3)$$

where m_t, x_t, y_t and z_t (lower case letters) are the rates of growth of real imports, exports, domestic and foreign income, respectively.[4] As for the remaining variables, pd_t and pf_t are the rates of growth of domestic and import prices and e_t is the rate of change of the nominal exchange rate. π and ε are the income elasticities of demand for imports and exports, both expected to be positive and ψ and η are the price elasticities of demand for imports and exports (ψ>0 and η<0).

Substituting equations (1) and (2) into (3) and solving for y_t, we obtain the economy's rate of growth consistent with the balance-of-payments equilibrium $y_{BP,t}$, given by:

$$y_{BP,t} = \frac{(1+\eta-\psi)(pd_t - pf_t - e_t) + \varepsilon(z_t)}{\pi} \quad (4)$$

Assuming that relative prices remain unchanged in the long-run, that is, ($pd_t - pf_t - e_t = 0$), the expression simplifies to:

$$y_{BP,t} = \frac{\varepsilon(z_t)}{\pi} \quad (5a) \qquad \text{or} \qquad y_{BP,t} = \frac{x_t}{\pi} \quad (5b)[5]$$

Generally speaking, the rate of growth of a country is approximately given by the ratio of export growth relative to the income elasticity of demand for imports (5b).[6] It is income growth that adjusts to preserve equilibrium and not relative prices. If a

country wishes to control external deficits (coming from $y>y_{BP}$) it must decrease the constraint on the balance-of-payments, either through an increase in export growth (x) or a decrease in the income elasticity of the demand for imports (π), or a combination of both.

Alternatively, equation (5a) can be rewritten as:

$$\frac{y_{BP,t}}{z_t} = \frac{\varepsilon}{\pi} \tag{5c}$$

This expression tells us that relative income growth between the domestic country and the rest of the world is given by the ratio of the income elasticity of the demand for exports to the income elasticity of demand for imports of the domestic economy. In other words, a country can grow faster than the rest of the world ($y_{BP}>z$) without creating balance-of-payments problems only if its income elasticity with respect to exports is higher than that of its imports ($\varepsilon>\pi$). This interpretation is interesting and related to the concept of convergence or catching-up, where "non-price competitiveness" is the key factor for such tendency to occur. In terms of policy, the country has to improve the supply characteristics of the goods and services produced and turn the economy more "competitive" in international markets. These supply characteristics are related to the quality, design, product differentiation, innovation, post-sale services, etc, which determine the non-price competitiveness.

The hypothesis of constant relative prices has been criticised in the literature (e.g. McGregor and Swales, 1985; 1991; Alonso and Garcimartín, 1998-99; López and Cruz, 2000). By adopting this specification in the present study we do not assume that relative prices do not mater in international trade performance; only that it is of minor significance in the long-run. In most empirical studies in this field relative prices have been shown to be statistically insignificant and even when they are significant the price

elasticities with respect to imports and exports are very low in magnitude when compared to the income elasticities, showing that imports and exports are less sensitive to price changes than to income changes. Blecker (2009) argues that it is safe to conclude that the longer the time period considered the more likely it is that relative prices remain constant. In our study, when relative prices are regressed on a time trend there is no significant trend during the period of analysis showing that the hypothesis of constant relative prices in the long-run is reasonable.[7]

"Thirlwall's Law", as has been defined in equation (5b), will be tested empirically for the Portuguese economy over the period 1965-2008 in the following sections.

3. Variables and data analysis

The period of analysis takes 44 annual observations which we consider to be long enough to accommodate the assumptions of the model. Our aim is to examine whether the balance-of-payments constrained growth approach is adequate to explain the performance of the Portuguese economy over this period. Despite the controversy involving the type of variables to be used – levels or rates of growth - we opt for the latter to avoid the existence of spurious relations, since in principle variables in growth rates are stationary. Thus, the option for dynamic import and export demand functions is suitable and in line with other studies, as in Bairam (1993).

Import and Export growth performance

The first step is to analyse informally the temporal evolution of the variables to detect whether some regular tendencies exist for the whole period, as well as for the periods of the pre- and post-accession to the EU. Combining the information from **Table 1** (the two first rows) and **Chart 1**, we observe that the annual average growth rate of exports

(6.05%) is slightly lower than that of imports (6.53%) over the whole period. From 1993 onwards the gap between the growth of imports and exports is more stable which coincides with the post-Maastricht period and the effort made towards nominal convergence and a fixed exchange rate regime. Dividing the whole sample in the pre- and post-accession periods, it is observed that imports grew faster in the post-accession period (7.60% against 5.37%) and exports grew slower in the same period (5.51% against 6.65%). Another interesting result is that export growth (6.65%) was higher than import growth (5.37%) in the pre-accession period, but this tendency was reversed in the post-accession period, with 5.51% for exports and 7.60% for imports. Therefore, Portugal has been loosing competitiveness in the post-accession period competing in a free market and moving towards a fixed exchange rate system.

[Insert Table 1 around here]

[Insert Chart 1 around here]

Relative income growth performance

From the analysis of **Table 1** (rows 3 and 4) and mostly from **Chart 2**, it is shown that both the growth of domestic income (y) and the growth of foreign income (z) [8] follow a downward trend throughout the whole period. Still, for the whole period the annual average growth rate of domestic income (3.58%) surpasses that of external income (3.19%) showing evidence of moderate convergence. However, for many years (1966, 1969, 1975, 1978, 1981, 1983-1985, 1992-1994, 2000 and finally from 2002 onwards), Portugal was growing at a slower rate than the OECD countries. It is important to note that Portugal grew at a higher rate in the pre-accession period (4.39%) than in the post-accession period (2.84%) and that the difference between the growth of the Portuguese economy and that of the OECD countries was higher in the former (0.69 percentage points - p.p.) than in the latter (0.12 p.p.). Therefore, not only Portugal grew more

rapidly in the pre-accession period but also faster relatively to the OECD countries. In general, the data show that Portugal grew on average at a slightly higher rate than that of the rest of the world and for that to be feasible, according to equation (5c), the income elasticity of the demand for exports (ε) must be higher than that of imports (π).

[Insert Chart 2 around here]

Relative prices of imports and exports

Turning to the analysis of relative prices in **Chart 3** (and **Table 1**, rows 7 and 8), the annual growth rate of relative prices of imports (*rpm*), defined as the difference between the growth of domestic and import prices, reaches a minimum in 1974 (gain in price competitiveness) and the highest value in 1986 (loss of price competitiveness). As for the relative prices of exports (*rpx*), defined as the growth of export less import prices, the behaviour is similar. For both proxies, the 1965-1985 negative average implies a favourable position in terms of price competitiveness, since domestic (for *rpm*) and exports prices (for *rpx*) are not growing as fast as imports prices, and this is the pre-accession period. That pattern is reversed during 1986-2008 (the post-accession period), with import prices growing at a slower rate than domestic and export prices. This tendency is, of course, explained by the removal of import tariffs and exchange rate stability, not allowing competitive devaluations. Combining these results with the export and import behaviour of **Chart 1**, we conclude that Portugal lost competitiveness after joining the EU in 1986, and this is associated with a lower growth performance in the same period relatively to the pre-accession period.

An interesting aspect to notice is a long-run movement of relative prices of imports and exports towards zero, most marked in the post-accession period. This can be taken as evidence that relative prices remain constant in the long-run

($pd_t - pf_t - e_t = 0$) thus justifying the use of equations (5a) or (5b) for predicting Portuguese actual growth.

[Insert Chart 3 around here]

Consumption and investment growth behaviour

Private consumption (*c*) and investment (*i*) growth rates will be used as instruments for domestic growth in the *2SLS* estimation of the import function. This is the reason why these two variables appear in **Table 1** (rows 5 and 6) and they exhibit different growth behaviour. Consumption growth performance is more or less stable, although in the post-accession period a small fall occurred (3.12% against 3.66%). By contrast, investment has been growing faster after Portugal joined the EU (4.29% against 3.21%). Therefore, the slower growth rate of the Portuguese economy in the post-accession period is not due to the lack of investment but rather to the poorer performance of exports and loss of competitiveness of the economy as we observed before.

Current account performance

The last row of **Table 1** reports the current account average (as a percentage of GDP) for the whole period and the two sub-periods before and after Portugal joined the EU. The current account average is always negative, but the striking evidence is that the average external deficit is twice as high in the post-accession than in the pre-accession period (-5.51% against -2.73%). If we consider that the current account includes some current transfers from the EU, these financial inflows were not sufficient to reduce this deficit. This result is consistent with the poorer performance of exports and the relatively higher increase in imports in the post-accession period as we have seen before. The accumulation of higher external deficits could explain the slower growth performance of the Portuguese economy in the latter period and this is consistent with

the balance-of-payments constraint hypothesis which will be tested in the following sections. The correlation coefficient between *y* and *ca* is positive as expected (0.5367) and significant at the 5% level and through the analysis of **Chart 4** it is possible to observe that, generally, both variables move in the same direction.

[Insert Chart 4 around here]

Unit root tests

In time series analysis it is prudent to ensure that the series used are stationary, to avoid the existence of spurious relations. For this reason we performed the usual Augmented Dickey-Fuller tests (*ADF*) to check for unit root properties of the series. Alternatively, the Phillips-Perron (*PP*) test is also used to check if the conclusions from the *ADF* tests are robust, using Newey-West standard errors to account for serial correlation. *ADF* tests are criticized for failing whenever a structural break occurs in the period under analysis, for not considering the change in the mean that it implies.

The unit root tests are displayed in **Table 2**. In the same table we include also those variables that will be used as extra instruments in the estimation of the import demand function: the growth of private consumption (*c*) and the growth of real investment (*i*). As can be observed, all variables are integrated of order 0, *I(0)*, implying that we always reject the null hypothesis of the existence of a unit root. Therefore, all variables we consider in the estimation approach are stationary when expressed in growth rates ensuring that no spurious relations are involved when the import and export functions are estimated.

[Insert Table 2 around here]

4. Estimation of the import and export demand functions

For estimation purposes the import demand function is specified as follows:

$$m_t = a + \pi\,(y_t) + \psi\,(rpm_{t-1}) + \omega_t \qquad (6)$$

It is expected that the growth of imports is positively related to the growth of domestic income and the lagged value of the growth of the relative price of imports (defined as the difference between the growth of domestic and import prices). We use lagged instead of current prices essentially because the latter displayed no statistical significance. In theoretical terms, it may be justified by the fact that relative price changes do not have an immediate impact on import growth, given that international transactions are based on contracts with fixed terms in the short-run. It is thus in conformity with the J-curve effect (Atesoglu, 1993).

Analogously, the export demand function is defined as:

$$x_t = \beta + \varepsilon\,(z_t) + \eta\,(rpx_{t-1}) + \nu_t \qquad (7)$$

It is expected that a higher growth of foreign income (OECD countries) stimulates the growth of exports and that the lagged relative price of exports (defined as the difference between the growth of export and import prices) has a negative impact on export growth.

The first step is to estimate separately each equation by *OLS* and these results are shown in **Table 3**. [9]

[Insert Table 3 around here]

The outcomes for the export function reveal a positive and statistically significant income elasticity of demand for exports, but the price elasticity (whether current or lagged prices are used) has a wrong positive sign.[10] An interesting aspect to highlight is that the income elasticity of the demand for exports (2.57) is higher than that of imports (1.56) and this justifies our earlier finding from the previous section that Portugal grew on average at a faster rate than that of the OECD countries over the whole period, reflecting some kind of convergence or catching-up tendency.

Our focus is on the import demand function and we observe that both the income elasticity and price elasticity of the demand for imports display their expected signs and are statistically significant at the 1% level. However, they may be biased and inconsistent due to the endogeneity of the growth of domestic income. Two reasons can explain this endogeneity, with adverse tendencies: a higher domestic growth may induce more imports and if imports rely on raw materials, machinery and investment equipment, then growth will be induced further. The second reason is from the balance-of-payments perspective: a faster increase in imports relatively to exports will deteriorate the trade balance position affecting negatively the growth of domestic income. Thus, an instrumental variables approach is required to make the results more consistent. We use as instruments for the growth of domestic income (y), the growth of private consumption (c), the growth of investment (i) and the growth of exports (x). The suitability of these instruments will be tested in the *2SLS* estimation approach.

Before turning to the instrumental variables estimation, we jointly run the export and import demand functions by the *SUR* (Seemingly Unrelated Regression) estimation technique (see **Table 3**). In case the error terms across equations are contemporaneously correlated, there are gains in efficiency from using this method in comparison to *OLS* (AlDakhil, 1998; Baum, 2006). The drawback is that in *SUR* all regressors are exogenous (contradicting our assumption of y being endogenous). The results from the *SUR* estimation do not differ substantially from those of *OLS* and according to the Breusch-Pagan (*BP*) test of cross error independence we reject the null hypothesis of error independence between equations at the 5% significance level but only marginally (at the 1% significance level the null is not rejected). Thus, no significant efficiency gains arise from using full information estimation techniques applied to system equations.

Since our aim is to obtain estimates for the income elasticity of demand for imports ($\hat{\pi}$) in order to determine the balance-of-payments equilibrium growth rate relying on the assumption that (*y)* is endogenous, we estimate the import demand function using the *2SLS* method, [11] as in Bairam (1988), Atesoglu (1993; 1995) and Léon-Ledesma (1999).

The estimates of income and price elasticities display the expected signs and are statistically significant. The income elasticity of demand for imports (2.15) is higher than in the *OLS* (1.56) and *SUR* (1.53) methods. Comparing the ratio of the elasticities ($\varepsilon_{OLS}/\pi_{2SLS}$=1.20) with the relative income ratio (y/z =1.12) the approximation is closer than with the *OLS* (ε/π=1.65) and *SUR* (ε/π=1.81) methods, giving evidence in favour of "Thirlwall's Law" as expressed in equation (5c).

The Pagan-Hall heteroscedasticity test indicates the existence of homoscedasticity and thus there is no need for robust standard errors. Additionally, the Cumby-Huizinga test[12] shows the absence of first-order error autocorrelation. The diagnostic tests from the *2SLS* regression are satisfactory. The rank condition for identification is checked through the Anderson canonical correlation LM statistic and shows that the excluded instruments are correlated with the endogenous regressor and the equation is thus identified. Furthermore, the Cragg-Donald Wald F-statistic indicates that the instruments are not weak. The endogeneity test for (y) reveals that this variable cannot be treated as exogenous in the import demand function. We also confirm the hypotheses of exogeneity of the instruments and of non-redundancy (for *x, i* and *c*).[13] Finally, the Sargan statistic leads us to accept the validity of the instruments set.

5. Balance-of-payments equilibrium growth rate

Overall, pre- and post-accession periods

After the estimation of the import demand function, it is possible to compute the growth rate consistent with balance-of-payments equilibrium to compare it with the actual growth rate of the economy over the period 1965-2008. The expression (5b) is the preferred one to compute the balance-of-payments constrained growth rate (Bairam, 1997), due to the instability of the income elasticity of demand for exports over time. The results can be observed in **Table 4**.

[Insert Table 4 around here]

The annual average growth rate of domestic income for the whole period is 3.58% (taken from **Table 1**), which is higher than the average growth rate consistent with the balance-of-payments equilibrium (2.82%), meaning that during the period 1965-2008 Portugal was growing beyond its capacity, accumulating balance-of-payments deficits. In fact, the average current account deficit (as percentage of GDP at market prices), *ca*, is -4.18% for the whole period.

Considering once more the pre- and post-accession periods to the EU there are some interesting remarks to make. In the post-accession period, Portugal not only grew at a lower rate both in terms of income and exports (as we mentioned earlier) but additionally, the income elasticity of imports was higher in this period (2.66) relatively to the pre-accession period (2.22). As a consequence, the growth rate consistent with balance-of-payments equilibrium was lower in this period (2.07) relatively to the pre-accession period (2.99). Therefore, the increase in the income elasticity of demand for imports after Portugal joined the EU was not counterbalanced by the growth of exports to allow a higher growth of domestic income. On the other hand, the increase in imports and the poorer performance of export growth explain the higher external imbalances in the post-accession period measured by the current account deficit as a percentage of GDP (-5.51) which more than doubled relative to the pre-accession period (-2.73).[14]

Table 4 also shows how close is the balance-of-payments equilibrium growth rate (y_{BP}) to the actual growth rate (y) in Portugal. Comparing the difference between the two (y_{BP}-y) we observe that it is always negative, revealing that Portugal grew at a higher rate than that consistent with the balance-of-payments equilibrium and this is in line with the current account deficits accumulated over time. The approximation between the two growth rates is closer for the whole period (0.76 p.p. unexplained) and the post-accession period (0.77 p.p. unexplained), but wider in the pre-accession period (1.40 p.p. unexplained). Overall, "Thirlwall's Law" is a useful instrument for predicting the growth performance in Portugal.

Overlapping periods with constant income elasticity of imports

One criticism of "Thirlwall's Law" relates to the computation of a single growth rate for the whole period (Atesoglu, 1993). In response to that, Pacheco-López and Thirlwall (2006) use rolling regressions to estimate the income elasticity of demand for imports for 17 Latin American countries. Having this in mind, we analyse the same Law considering 30 overlapping periods with a 15-year span. Firstly, we test the validity of the Law by assuming that the income elasticity of demand for imports is the same for all periods, in line with Léon-Ledesma (1999). The results are reported in **Table 5**, where we also display averages of the current account/GDP ratio (ca), the annual growth rates of domestic income (y) and exports (x); the annual growth rate of income consistent with balance-of-payments equilibrium given by $y_{BP} = \frac{x}{\hat{\pi}}$, as well as the corresponding differences relative to the actual growth rates (y_{BP}-y). Following McCombie (1989) we also report $\pi^* = \frac{x}{y}$, that is, the income elasticity of demand for imports assuming equilibrium in the balance-of-payments (or trade balance). If the average π^* for the set

of overlapping periods is not significantly different from $\hat{\pi}$, neither is y from y_{BP}, confirming therefore the validity of "Thirlwall's Law".

[Insert Table 5 around here]

The difference between y_{BP} and y is negative in most of the periods, meaning that the growth rate of the economy was in excess of the rate compatible with the balance-of-payments equilibrium, which in the long-run cannot be sustainable. In eleven out of the thirty overlapping periods, from 1976 to 1997 and later from 1992 to 2008, the difference is positive, which would theoretically imply that Portugal was growing less than it was capable of from the point of view of the balance-of-payments equilibrium and was therefore reducing the external imbalances. From the second column of **Table 5** the reduction in current account deficits is confirmed for the former but not for the latter overlapping periods. This result suggests that for y_{BP} to predict more accurately the actual growth rate in Portugal some adjustments have to be made.

Following McCombie (1989), the average π^* for the 30 overlapping periods is 1.89. When we estimate the import function for the whole period and test whether $\pi = \pi^*$ using the t-test, we conclude that they are statistically equal implying that the condition $y_{BP} = y$ is valid. Therefore, "Thirlwall's Law" is a good predictor of the actual Portuguese growth rate for the period 1965-2008.

Overlapping periods with income elasticity of imports changing over time

Now we compute the income elasticity of demand for imports by estimating the import demand function for each of the 15-year overlapping periods. [15] The specification of the equation is the same as for the whole period, i.e., the growth of imports is related to the growth of domestic income and the growth of lagged relative prices of imports and the estimation method is again *2SLS*, assuming that domestic income is endogenous. Apart from the first two overlapping periods, the results indicate that the equations are

identified. Still, we present the results even for these two problematic estimations, to be consistent with the whole period 1965-2008, defined in the beginning of the analysis.

In **Table 6** we show the income elasticity of demand for imports obtained from the *2SLS* regression for each overlapping period and from **Chart 5** we are able to detect its general tendency.

[Insert Chart 5 around here]

As may be inferred from the chart, there is a general favourable downward tendency up to 1986. After the accession to the EU, there is a sharp increase in the income elasticity of imports that is maintained approximately till 1990. In fact, the EU membership made the Portuguese economy more vulnerable to imports due to the free circulation of goods and services and the abolition of any kind of tariffs on imports. In the following periods, the elasticity drops and keeps more or less stable around that limit until 2004. In the last periods the income elasticity of the demand for imports declines moderately, but its value remains higher than 2 implying an increase in import growth twice the increase in domestic income growth.

Also in **Table 6**, we replicate the income elasticity of the demand for imports compatible with the equilibrium in the balance-of-payments (π^*), for an easier comparison of the results. The McCombie test is performed for each of the overlapping periods and the absolute value of the *t-test* is shown.

[Insert Table 7 around here]

Comparing the estimated income elasticity of demand for imports $\hat{\pi}$, derived from the *2SLS* regressions, with π^*, the hypothesis that y_{BP} is a good predictor of y (that is $\hat{\pi} = \pi^*$) is never rejected at the 5% significance level (the Law is rejected three times only, at the 10% significance level in the periods: 1974-1988, 1985-1999 and 1987-2001). Thus, by implementing the McCombie test our evidence shows that "Thirlwall's Law" is accurate

for predicting actual growth in Portugal, for most of the period considered. McCombie and Thirlwall (1994) argue that y has not to be precisely equal to $y_{BP}(=x/\pi)$, but close enough to be interesting and to suggest that there is a common force operating constraining growth. A number of reasons can be given as to why there may be (usually small) divergence between y and y_{BP}, including biased estimates of π, capital flows and terms of trade effects.

In fact our results show that the actual growth rate is always higher than that compatible with the balance-of-payments equilibrium (except for the last overlapping period), indicating the existence of external deficits. This evidence is now much more in conformity with the negative averages of the current account (as a percentage of GDP) found for each overlapping period, as reported in **Table 5**.

The approach based on the overlapping periods' estimation of the income elasticity of the demand for imports is apparently more appropriate to analyse "Thirlwall's Law", instead of considering a single π estimated for the whole period and then using it to compute the balance-of-payments equilibrium growth rate either for the whole period or for each of the overlapping stages. With the approach from **Table 6**, the McCombie test enables us to analyse the performance of "Thirlwall's Law" period by period. The general conclusion is that the Law accurately predicts actual growth of the Portuguese economy giving support to the balance-of-payments constraint hypothesis.

6. Conclusions

The present study analyses whether the demand-orientated approach based on the balance-of-payments constraint hypothesis is suitable for explaining Portuguese growth in the 1965-2008 period. The model developed by Thirlwall to compute the balance-of-payments equilibrium growth rate is adopted, assuming constant relative prices in the long-run (a plausible hypothesis) and initial equilibrium on trade balance. The import

and export demand functions are estimated to obtain the income elasticities with respect to imports and exports, which are crucial parameters for computing "Thirlwall's Law".

A preliminary data analysis shows that Portugal grew on average at a higher rate than the OECD countries in the whole period, 1965-2008, and this is consistent with the empirical finding that the income elasticity of the demand for exports is higher than that of imports, as "Thirlwall's Law" implies. This corroborates the hypothesis that a country can grow faster than the rest of the world only when its income elasticity of demand for exports exceeds that of imports, as long as capital inflows can compensate external imbalances. It is also observed that Portugal grew faster in the pre- than in the post-accession period to the EU, and this is consistent with higher current account deficits accumulated in the latter as a result of both faster import growth and slower export growth.

The crucial parameter of the income elasticity of demand for imports is obtained by estimating the import demand function by *2SLS*, with domestic income growth being endogenous. Knowing that parameter, the balance-of-payments equilibrium growth rates are computed for a series of 15-year overlapping periods and are compared to the actual growth rates. The approximation of the two rates is quite close, validating "Thirlwall's Law" as a good way of predicting actual growth of the Portuguese economy. The McCombie test reinforces this conclusion. Generally it is found that Portugal grew slightly higher than the rate consistent with the balance-of-payments equilibrium, and this is consistent with the accumulation of current account deficits over the period considered.

In addition, the income elasticity of the demand for imports is estimated individually for each overlapping period and a sharp increase is observed of its value after Portugal joined the EU. Assuming that the income elasticity of imports is changing

over time, the confirmation of “Thirlwall’s Law” becomes more satisfactory. When the McCombie test is performed, it shows that the actual growth in Portugal can be accurately predicted by the balance-of-payments equilibrium growth approach in almost all the overlapping periods.

The overall analysis shows that external demand constraints are crucial for explaining the growth performance of the Portuguese economy, especially in the post-accession period. For the country to achieve sustainable growth rates, exports must increase and import sensitivity to domestic income changes must be reduced, turning the economy more competitive both in domestic and foreign markets and this is compatible with the increase in the balance-of-payments equilibrium growth rate. At the micro level, policies are needed to improve the non-price characteristics of the goods and services associated with quality, design, innovation, product differentiation, marketing and efficient distribution.

Appendix

- ***x*** – Annual growth rate of real exports.

Exports of goods and services at 1995 (2000) prices (national currency; annual percentage change).

- ***m*** – Annual growth rate of real imports.

Imports of goods and services at 1995 (2000) prices (national currency; annual percentage change).

- ***y*** – Annual growth rate of real GDP.

GDP at 1995 (2000) market prices (national currency; annual percentage change).

- ***c*** – Annual growth rate of real private consumption.

Private final consumption expenditure at 1995 (2000) prices (national currency; annual percentage change).

- ***i*** – Annual growth rate of real investment.

Gross fixed capital formation at 1995 (2000) prices (national currency; annual percentage change).

- ***px*** – Annual growth rate of export prices.

Price deflator exports of goods and services (national currency; annual percentage change).

- ***pm*** – Annual growth rate of import prices.

Price deflator imports of goods and services (national currency; annual percentage change).

- ***py*** – Annual growth rate of domestic prices.

Price deflator GDP at market prices (national currency; annual percentage change).

- ***rpm*** – Annual growth rate of the relative price of imports (*py-pm*).
- ***rpx*** – Annual growth rate of the relative price of exports (*px-pm*).
- ***ca*** –Balance on current transactions with the rest of the world (% of GDP at market prices).
- ***z*** – Annual growth rate of real foreign income (OECD countries). Computed by the authors from 1965 to 1994.

1965–1970: GDP at the price levels and exchange rates of 1990 (billions of US dollars) – OECD (1997)

1971–1994: GDP at the price levels and exchange rates of 2000 (billions of US dollars) – OECD (2006)

1995-2008: Real GDP (% change from previous year) – OECD (2009)

Notes:

Data on ***x***, ***m***, ***y***, ***c***, ***i***, ***px***, ***pm***, ***py*** and ***ca*** were taken from European Commission (2002; 2009). Constant figures are at 1995 prices (for 1965-1980) and 2000 prices (for 1981-2008), depending on the Statistical Annex from which they were obtained (2002 and 2009, respectively).

Table 1. Descriptive statistics of variables

Variable	Period	Obs	Mean	Std. Deviation	Min	Max
(1) *m* % Imports	1965-2008	44	6.53	7.78	-24.2	23.1
	1965-1985	21	5.37	9.03	-24.2	14.6
	1986-2008	23	7.60	6.46	-3.3	23.1
(2) *x* % Exports	1965-2008	44	6.05	7.82	-16.4	33.0
	1965-1985	21	6.65	10.66	-16.4	33.0
	1986-2008	23	5.51	3.95	-3.3	12.2
(3) *y* % Domestic income	1965-2008	44	3.58	3.24	-4.3	11.2
	1965-1985	21	4.39	3.85	-4.3	11.2
	1986-2008	23	2.84	2.41	-2.0	7.5
(4) *z* % Foreign income	1965-2008	44	3.19	1.52	0.1	6.3
	1965-1985	21	3.70	1.83	0.1	6.3
	1986-2008	23	2.72	0.99	0.8	4.6
(5) *c* % Consumption	1965-2008	44	3.38	3.20	-2.9	13.0
	1965-1985	21	3.66	4.18	-2.9	13.0
	1986-2008	23	3.12	2.00	-0.1	6.9
(6) *i* % Investment	1965-2008	44	3.78	7.87	-17.4	18.0
	1965-1985	21	3.21	9.28	-17.4	17.9
	1986-2008	23	4.29	6.49	-7.4	18.0
(7) *rpm* % Relative price of imports	1965-2008	44	1.14	7.76	-24.9	27.3
	1965-1985	21	-1.55	7.95	-24.9	8.7
	1986-2008	23	3.60	6.85	-5.5	27.3
(8) *rpx* % Relative price of exports	1965-2008	44	0.10	3.99	-12.9	11.3
	1965-1985	21	-1.04	4.74	-12.9	6.1
	1986-2008	23	1.14	2.88	-3.2	11.3
(9) *ca* Current account	1965-2008	44	-4.18	5.03	-13.5	5.5
	1965-1985	21	-2.73	5.59	-13.5	5.5
	1986-2008	23	-5.51	4.14	-11.9	2.1

Notes:

Variables (1) to (8) are annual growth rates.

Variable (9) is current account as a percentage of GDP at market prices.

Chart 1. Annual growth rate of exports (*x*) and imports (*m*), 1965-2008

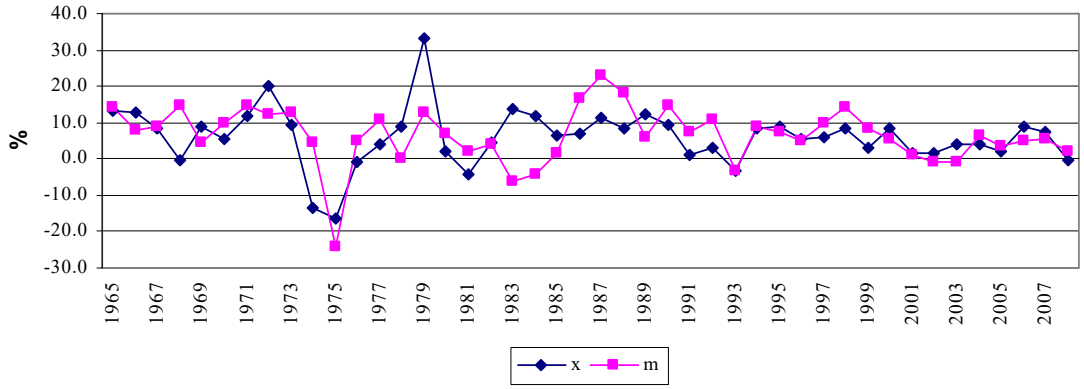

Chart 2. Annual growth rate of domestic (*y*) and foreign income (*z*), 1965-2008

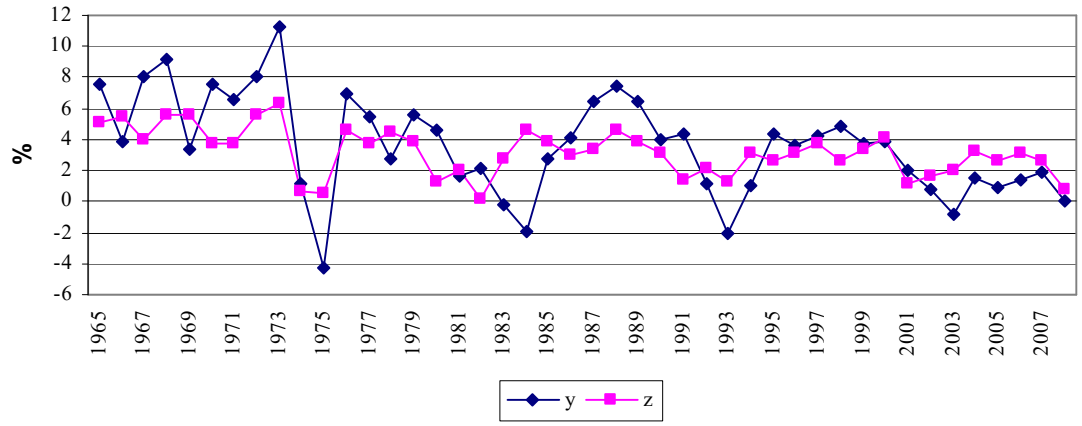

Chart 3. Annual growth rate of relative price of imports (*rpm*) and exports (*rpx*), 1965-2008

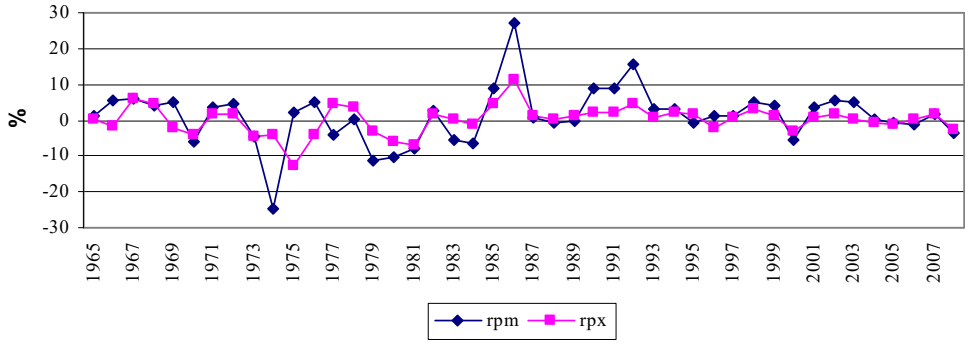

Chart 4. Evolution of actual growth rate (*y*) and the current account as a % of GDP (*ca*), 1965-2008

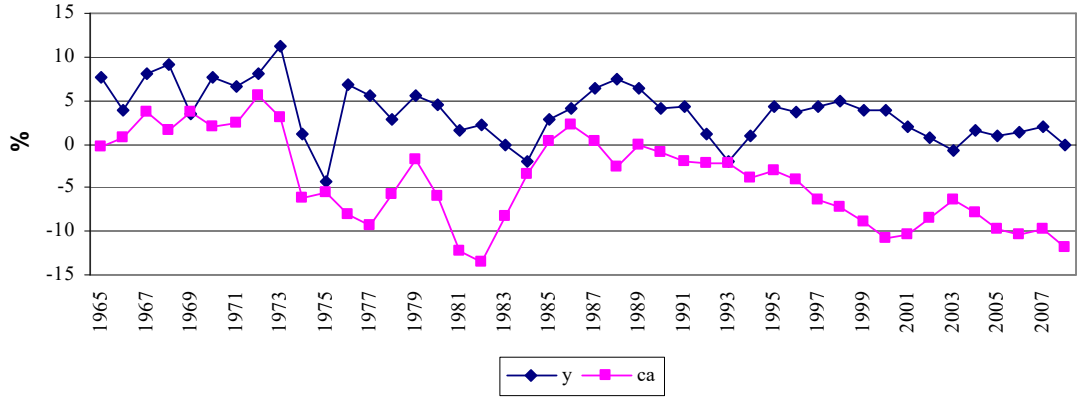

Table 2. Unit root tests, 1965-2008

	Z(t)		1% critical value	
Variable	**ADF**	**PP**	**ADF**	**PP**
m	-3.959***	-4.750***	-3.648	-3.628
x	-5.388***	-4.468***	-3.634	-3.628
y	-4.517***	-4.602***	-4.242	-4.214
z	-5.116***	-4.634***	-4.224	-4.214
c	-3.876***	-3.887***	-3.628	-3.628
i	-5.416***	-3.421***	-3.634	-2.631
rpm	-4.781***	-4.694***	-2.631	-2.631
rpx	-5.016***	-4.213***	-2.633	-2.631

Notes:

ADF - Augmented Dickey-Fuller test for unit root

Regression without constant and trend for: *rpm* and *rpx*.

Regression with constant and with no trend for: *m*, *x*, *c* and *i*.

Regression with constant and trend for: *y* and *z*.

0 lags for *c* and *rpm*, 1 lag for *x*, *z*, *i* and *rpx*, 3 lags for *m* and *y*.

PP - Phillips-Perron test for unit root

Regression without constant and trend for: *i*, *rpm* and *rpx*.

Regression with constant and with no trend for: *m*, *x* and *c*.

Regression with constant and trend for: *y* and *z*.

3 Newey-West lags.

*** Coefficient significant at the 1% significance level. Critical values are provided by Stata.

Table 3. Estimation results from the export and import demand functions

	OLS		SUR		2SLS
Variable	**Exports**	**Imports**	**Exports**	**Imports**	**Imports**
z_t	2.5736***		2.7690***		
	(3.81)		(4.37)		
rpx_{t-1}	0.4730*		0.4263*		
	(1.86)		(1.79)		
y_t		1.5590***		1.5280***	2.1483***
		(7.04)		(7.35)	(7.22)
rpm_{t-1}		0.3639***		0.3670***	0.2881***
		(3.99)		(4.30)	(2.84)
Constant	-2.2876	0.4612	-2.8944	0.5653	-1.4985
	(-0.98)	(0.46)	(-1.32)	(0.59)	(-1.22)
Obs	43	43	43		43
R-squared	0.36	0.70			0.79
F (2,40)	11.42	45.98			44.12
	(0.0001)	(0.0000)			(0.0000)

BP test of error independence across equations	$\chi_1^2 = 3.890$	(0.0486)
Pagan-Hall heteroscedasticity test	$\chi_4^2 = 6.5$	(0.1648)
Cumby-Huizinga autocorrelation test	$\chi_1^2 = 0.0611$	(0.8048)
Anderson canon. corr. LM statistic	$\chi_3^2 = 28.076$	(0.0000)
Cragg-Donald Wald F- statistic #	$F(3,38) = 23.83$	(0.0000)
Endogeneity test	$\chi_1^2 = 14.305$	(0.0002)
Sargan statistic	$\chi_2^2 = 0.908$	(0.6351)

Notes:

Numbers in parenthesis are t-ratio (for estimated coefficients) and p-values (for tests).

*** Coefficient significant at the 1% level. ** Coefficient significant at the 5% level. * Coefficient significant at the 10% level.

#A statistic higher than 10 indicates no weak instruments and consequently, no biases in the coefficients.

Table 4. Evidence of "Thirlwall's Law"

	y	x	π	$y_{BP}=x/\pi$	$(y_{BP}-y)$	ca
1965-2008	3.58	6.05	2.15	2.82	-0.76	-4.18
1965-1985	4.39	6.65	2.22	2.99	-1.40	-2.73
1986-2008	2.84	5.51	2.66	2.07	-0.77	-5.51

Notes:

y, *x* and *ca* were taken from **Table 1**.

$\pi_{1965\text{-}2008}$ was taken from the *2SLS* estimation in **Table 4**.

$\pi_{1965\text{-}1985}$ and $\pi_{1986\text{-}2008}$ come from the *2SLS* regressions for the corresponding sub-periods (the results are available upon request).

Table 5. Actual and balance-of-payments equilibrium growth rates, 15-year overlapping periods.

Period	ca	y	x	y_{BP}	$(y_{BP}-y)$	π^*
1965-1979	-0.96	5.55	7.01	3.26	-2.28	1.26
1966-1980	-1.33	5.35	6.26	2.91	-2.43	1.17
1967-1981	-2.19	5.19	5.11	2.38	-2.81	0.98
1968-1982	-3.34	4.79	4.87	2.27	-2.52	1.02
1969-1983	-3.99	4.17	5.81	2.71	-1.46	1.40
1970-1984	-4.46	3.81	6.01	2.80	-1.02	1.58
1971-1985	-4.56	3.49	6.09	2.84	-0.66	1.74
1972-1986	-4.59	3.33	5.75	2.68	-0.65	1.73
1973-1987	-4.93	3.22	5.15	2.40	-0.82	1.60
1974-1988	-5.31	2.97	5.09	2.37	-0.61	1.71
1975-1989	-4.90	3.33	6.79	3.16	-0.17	2.04
1976-1990	-4.60	3.88	8.51	3.96	0.08	2.19
1977-1991	-4.20	3.71	8.65	4.02	0.31	2.33

1978-1992	-3.73	3.42	8.59	4.00	0.58	2.51
1979-1993	-3.49	3.10	7.76	3.61	0.51	2.50
1980-1994	-3.63	2.79	6.12	2.85	0.06	2.19
1981-1995	-3.43	2.77	6.56	3.05	0.28	2.37
1982-1996	-2.89	2.91	7.23	3.37	0.46	2.49
1983-1997	-2.41	3.05	7.33	3.41	0.36	2.40
1984-1998	-2.35	3.39	6.99	3.25	-0.13	2.06
1985-1999	-2.71	3.77	6.41	2.99	-0.78	1.70
1986-2000	-3.45	3.84	6.53	3.04	-0.80	1.70
1987-2001	-4.29	3.70	6.19	2.88	-0.82	1.67
1988-2002	-4.87	3.33	5.55	2.58	-0.74	1.67
1989-2003	-5.13	2.77	5.26	2.45	-0.32	1.90
1990-2004	-5.64	2.45	4.71	2.19	-0.25	1.93
1991-2005	-6.23	2.24	4.21	1.96	-0.28	1.88
1992-2006	-6.79	2.04	4.71	2.19	0.15	2.31
1993-2007	-7.28	2.09	5.00	2.33	0.23	2.39
1994-2008	-7.93	2.23	5.19	2.41	0.19	2.33
Average						1.89

Notes:

ca – Current account as % of GDP at market prices

y – Annual growth rate of real GDP

x – Annual growth rate of real exports

y_{BP} - balance-of-payments equilibrium growth rate, given by $y_{BP} = \frac{x}{\hat{\pi}}$

$\pi^* = \frac{x}{y}$ - income elasticity of demand for imports assuming trade balance in equilibrium

Chart 5. Evolution of the estimated income elasticity of demand for imports in the overlapping periods

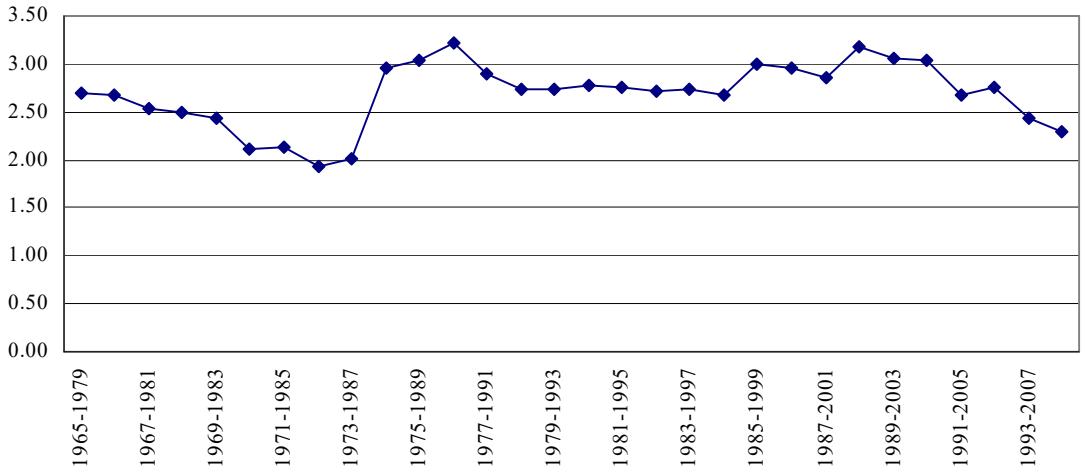

Table 6. Balance-of-payments equilibrium growth rates with income elasticity of imports varying over the 15-year overlapping periods.

Period	π [1]	π^*	Abs. value of the t-test [2]	$y_{BP}=x/\pi$	$(y_{BP}-y)$
1965-1979	2.70	1.26	1.31	2.60	-2.95
1966-1980	2.67	1.17	1.35	2.34	-3.01
1967-1981	2.53	0.98	1.55	2.02	-3.17
1968-1982	2.49	1.02	1.50	1.96	-2.84
1969-1983	2.43	1.40	1.64	2.39	-1.78
1970-1984	2.10	1.58	1.02	2.85	-0.96
1971-1985	2.13	1.74	0.74	2.86	-0.63
1972-1986	1.93	1.73	0.33	2.98	-0.34
1973-1987	2.01	1.60	0.67	2.57	-0.65
1974-1988	2.96	1.71	1.80*	1.72	-1.25
1975-1989	3.04	2.04	1.37	2.24	-1.09
1976-1990	3.22	2.19	1.10	2.64	-1.24
1977-1991	2.89	2.33	0.89	2.99	-0.72
1978-1992	2.73	2.51	0.35	3.15	-0.27
1979-1993	2.74	2.50	0.48	2.84	-0.26
1980-1994	2.77	2.19	1.08	2.21	-0.59
1981-1995	2.76	2.37	0.70	2.38	-0.40
1982-1996	2.72	2.49	0.42	2.65	-0.25
1983-1997	2.74	2.40	0.60	2.68	-0.37
1984-1998	2.68	2.06	1.11	2.61	-0.78
1985-1999	2.99	1.70	1.81*	2.14	-1.62
1986-2000	2.96	1.70	1.71	2.21	-1.63
1987-2001	2.85	1.67	1.78*	2.17	-1.53
1988-2002	3.18	1.67	1.67	1.75	-1.58
1989-2003	3.05	1.90	1.25	1.73	-1.05
1990-2004	3.03	1.93	1.38	1.56	-0.89
1991-2005	2.68	1.88	1.20	1.57	-0.67
1992-2006	2.75	2.31	0.68	1.72	-0.32
1993-2007	2.44	2.39	0.10	2.05	-0.05
1994-2008	2.30	2.33	0.06	2.26	0.03

Notes:

[1] The estimated coefficient from the *2SLS* regression is always statistically significant.

The Anderson canonical correlation LM statistic indicates that the equation is underidentified, for the first two sub-periods.

[2] The null hypothesis is that $\hat{\pi} = \pi^*$, for each overlapping period.

$\hat{\pi} = \pi^*$ always, for a 5% significance level.

* denotes that $\hat{\pi} \neq \pi^*$, for a 10% significance level.

References

AlDakhil, K. “A method for estimating simultaneous equations models with time-series and cross-section data.” *Journal of King Saud University - Administrative Sciences*, 1998, 10(1), 13-28.

Alonso, J., and C. Garcimartín. “A new approach to balance-of-payments constraint: some empirical evidence.” *Journal of Post Keynesian Economics*, Winter 1998-99, 21(2), 259-282.

Atesoglu, H. “Balance-of-payments-constrained growth – evidence from the United States.” *Journal of Post Keynesian Economics*, Summer 1993, 15(4), 507-514.

Atesoglu, H. “An explanation of the slowdown in US economic growth.” *Applied Economic Letters*, 1995, 2, 91-94.

Bairam, E. “Balance-of-payments, the Harrod foreign trade multiplier and economic growth: the European and North American experience, 1970-1985.” *Applied Economics*, 1988, 20, 1635-1642.

Bairam, E. “Static versus dynamic specifications and the Harrod foreign trade multiplier.” *Applied Economics*, 1993, 25, 739-742.

Bairam, E. “Levels of economic development and appropriate specification of the Harrod foreign-trade multiplier.” *Journal of Post Keynesian Economics*, Spring 1997, 19(3), 337-344.

Barbosa-Filho, N. “The balance-of-payments constraint: from balanced trade to sustainable debt.” *CEPA Working Paper 2001.06*, January, 2002.

Baum, C. *An introduction to modern econometrics using Stata*. College Station: Stata Press, 2006.

Baum, C.; Schaffer, M.; and S. Stillman. “Instrumental variables and GMM: estimation and testing.” *Boston College-Department of Economics Working Paper 545*, February 2003.

Baum, C.; Schaffer, M.; and S. Stillman. “Enhanced routines for instrumental variables/GMM estimation and testing.”, *Boston College-Department of Economics Working Paper 667*, September 2007.

Blecker, R. “Long-run growth in open economies: export-led cumulative causation or a balance-of-payments constraint?” *Paper presented at the 2nd Summer School on Keynesian Macroeconomics and European Economic Policies*, 2nd -9th August, Berlin, Germany, 2009.

European Commission. “Statistical Annex of European Economy.” *Directorate General Economic and Financial Affairs*, Spring 2002.

European Commission. “Statistical Annex of European Economy.” *Directorate General Economic and Financial Affairs*, Spring 2009.

Léon-Ledesma, M. “An application of Thirlwall’s law to the Spanish economy.” *Journal of Post Keynesian Economics*, Spring 1999, 21(3), 431-439.

López, J., and A. Cruz. “ ‘Thirlwall’s law’ and beyond: the Latin American experience.” *Journal of Post Keynesian Economics*, Spring 2000, 22(3), 477-95.

McCombie, J. ““Thirlwall’s Law” and balance-of-payments constrained growth – a comment on the debate.” *Applied Economics*, 1989, 21, 611-629.

McCombie, J., and A. Thirlwall. *Economic growth and the balance-of-payments constraint*. Basingstoke: MacMillan Press; New York: St. Martin’s Press, 1994.

McGregor, P., and J. Swales. “Professor Thirlwall and the balance-of-payments constrained growth.” *Applied Economics*, 1985, 17, 17-32.

McGregor, P., and J. Swales. “Thirlwall’s Law and balance-of-payments constrained growth: further comment on the debate.” *Applied Economics*, 1991, 23, 9-23.

Moreno-Brid, J.C. “On capital flows and the balance-of-payments-constrained growth model.” *Journal of Post Keynesian Economics*, Winter 1998-99, 21(2), 283-298.

Organization for Economic Co-operation and Development. “National Accounts – Main Aggregates (vol.I) 1960-1995”, *OECD*, 1997.

Organization for Economic Co-operation and Development. “Statistical Compendium: National Accounts and Historical Statistics 1970-2004”, *OECD*, 2006.

Organization for Economic Co-operation and Development. “Economic Outlook no. 85 Annex Tables”, OECD, June 2009.

Pacheco-López, P., and A. Thirlwall. “Trade liberalization, the income elasticity of demand for imports and growth in Latin America.” *Journal of Post Keynesian Economics*, Fall 2006, 29(1), 41-66.

Thirlwall, A. “The balance-of-payments constraint as an explanation of international growth rate differences.” *Banca Nazionale del Lavoro*, 1979, 128, 45-53.

Thirlwall, A. “Regional problems are “balance-of-payments” problems.” *Regional Studies*, 1980, 14, 419-25.

Thirlwall, A. “The Harrod trade multiplier and the importance of export-led growth.” *Pakistan Journal of Applied Economics*, 1982, 1(1), 1-21.

Thirlwall, A., and N. Hussain. “The balance-of-payments constraint, capital flows and growth rate differences between developing countries.” *Oxford Economic Papers*, 1982, 34, 498-510.

Endnotes:

[1] Although "Thirlwall's Law" refers to balance-of-payments equilibrium on current account, in the empirical literature what is usually used is trade balance of goods and services because this item shows the real competitiveness of the economy.

[2] There is an interesting theoretical analysis on this topic by Barbosa-Filho (2002), who considers the balanced trade, the unbalanced trade and the sustainable debt versions of the balance-of-payments constrained growth models, analysing the implications for trade, growth and real exchange rates. In line with Moreno-Brid (1998-99), the author shows that in the case of small open economies which usually have income-elastic imports (higher than one), Thirlwall's original model (1979) is more likely to be the valid one.

[3] The original model with variables in levels (upper case letters) is the following:

$$M_t = aY_t^{\pi}\left(\frac{PD}{E*PF}\right)_t^{\psi}$$

$$X_t = bZ_t^{\varepsilon}\left(\frac{PD}{E*PF}\right)_t^{\eta}$$

$$PD_t * X_t = PF_t * E_t * M_t$$

[4] For a description of the variables and data sources, see the Appendix.

[5] Equation (5b) is obtained from the restriction $pd_t - pf_t - e_t = 0$ on equation (2).

[6] For details on this explanation, see Thirlwall (1982).

[7] **Chart 3** also shows the close movement of the growth of relative prices around zero.

[8] Foreign income is approximated by the growth rate of the OECD countries. This is a reasonable proxy, since more than 80% of Portuguese imports and exports are associated with these countries. For details on the computation of *z*, see the Appendix.

[9] The regressions were run by Stata 10.

[10] The (unexpected) positive impact of relative prices on exports was also found by Bairam (1988), for Portugal, during 1970-1985. However, the magnitude of the impact is very low when compared to that of income.

[11] For more information on instrumental variables estimation, see Baum et al. (2003).

[12] The Cumby-Huizinga test is a generalization of the Breusch-Godfrey procedure to analyse the independence of the regression errors. It becomes especially useful in contexts of endogenous regressors, existence of overlapping data and conditional heteroscedasticity of the regression error term (Baum et al. 2007).

[13] The exogeneity and redundancy tests are not included in the article for reasons of space, but are available upon authors' request.

[14] It is important to note that current transfers from the EU (included in *ca*) did not contribute substantially to reduce this deficit, signifying that the current account deficit could be even higher without taking into account these transfers.

[15] Léon-Ledesma (1999) used the income elasticity of the demand for imports obtained from the whole period of analysis to predict actual income growth in Spain across various overlapping periods.