A Structural Economic Dynamics Approach to Balance-of-Payments-Constrained Growth[♦]

Ricardo Azevedo Araujo

Catholic University of Brasilia, Brazil

rsaaraujo@pos.ucb.br

&

Gilberto Tadeu Lima

University of São Paulo, Brazil

giltadeu@usp.br

Abstract: It is derived a balance-of-payments equilibrium growth rate analogous to Thirlwall´s Law from a Pasinettian multi-sector macrodynamic framework. The resulting formula, which we call Multi-Sectoral Thirlwall´s Law, asserts that the growth rate of per capita income is directly proportional to the growth rate of exports, such a proportionality being inversely (directly) related to sectoral income elasticities of imports (exports). These elasticities are weighted by the share of each sector in aggregate imports and exports, respectively. Several relevant theoretical, empirical and policy implications can be drawn from such a structural dynamics approach to balance-of-payments-constrained growth.

Key-words: structural dynamics; growth; balance-of-payments-constraint.

Resumo: Baseado em um arcabouço macrodinâmico multisetorial Pasinettiano, deriva-se uma taxa de crescimento com equilíbrio no balanço de pagamentos análoga à Lei de Thirlwall. A expressão resultante, que chamamos de Lei de Thirlwall Multisetorial, estabelee que o crescimento da renda per capita é diretamente proporcional ao crescimento das exportações. Essa proporção está inversamente (diretamente) relacionada com as elasticidades-renda setoriais das importações (exportações) ponderadas pela participação de cada setor no total correspondente. Várias implicações teóricas, empíricas e de política pública relevantes podem ser extraídas dessa abordagem de dinâmica estrutural ao crescimento econômico sob restrição de balanço de pagamentos.

Palavras-chave: dinâmica estrutural; crescimento; restrição externa.

Classificação JEL: O41; O19; O11

Classificação Anpec: Área 5 – Crescimento, Desenvolvimento e Instituições.

♦ We would like to thank Anthony Thirlwall and Luigi Pasinetti for their helpful comments on an earlier draft of this paper. Any remaining errors are our own, though.

1. Introduction

The role played by aggregate demand in the determination of the level of economic activity is a contentious issue. While aggregate demand is asserted to interact with aggregate supply to determine output and employment in the short-run in most macroeconomic models, it is only in some non-neoclassical macroeconomic models that the long-run performance of economic activity is asserted to be determined by aggregate demand as well. Indeed, neoclassical theories of economic growth – both in the original version developed by Solow (1956) and in the several endogenous-growth versions that have been developed since the mid-1980s (see Aghion & Howitt 1998 for a review) – assume that the growth rate of per capita income is determined solely by supply-side factors. These incarnations of the neoclassical growth theory, by assuming that in the long run productive capacity in terms of capital and labour is always fully utilized, actually assume away the very possibility of growth being affected by effective demand.

In an open macroeconomy context, a forceful Keynesian demand-oriented approach emphasizing the external constraints to growth is the so-called theory of "balance-of-payments-constrained growth" (hereafter referred to as BP-constrained growth), also known as "Thirlwall´s Law" (after Thirlwall 1979) – although Thirlwall (1997, p. 378) himself would come to argue later on that perhaps "stylized fact" or "empirical generalization" would be a better description for what came to be known as Thirlwall´s Law than "law".

Basically, the theory of BP-constrained growth postulates that the balance of payments position of a country is the main constraint on its growth rate, since it imposes a limit on demand to which supply can (usually) adapt. As it turns out, observed differences in growth performance between countries are associated with the relative strength of their balance of payments position. According to Thirlwall (1979), assuming that real exchange rates are constant and that trade must be balanced in the long run, there is a very close correspondence between the growth rate of output and the ratio of the growth of exports to the income elasticity of demand for imports. Indeed, this result is the prediction of a dynamic version of Harrod trade multiplier (1933), of which Thirlwall claimed not to be aware at the time, and it is a consistent alternative to the still predominant, neoclassical view that growth-rate differences should be explained by exogenous differences in the rate of growth of factor supplies and technical progress.[1] According to Thirlwall (1997, p. 380), "[t]here are not many countries in the world, particularly developing countries, that could utilize (or generate) more domestic resources given the greater availability of foreign exchange…and the fundamental importance of exports as a component of demand is that it is the *only* component that can provide the foreign exchange to pay for the import content of other components of demand – consumption, investment, and government expenditure" (original emphasis).

It should be stressed that the BP-constrained growth approach, despite being demand-oriented, does acknowledge the importance of supply characteristics of goods. Indeed, observed differences in the income elasticities

[1] The introduction to McCombie & Thirlwall (2004) reads that the balance of payments equilibrium growth rate derived in Thirlwall (1979) is now known as the dynamic Harrod trade multiplier result (p. 12).

of demand for exports and imports reflect the non-price characteristics of goods and, therefore, the structure of production (Thirlwall 1997, p. 383).[2] Hence, the only sure and long-term solution to raising a country's growth rate consistent with balance of payments equilibrium is structural change to raise its income elasticity of exports and to reduce its income elasticity of imports (Thirlwall 2002, p. 78).

Structural change, however, has not been explicitly incorporated into Keynesian, demand-oriented theories of output growth, a notable exception being the so-called structural economic dynamics approach – hereafter referred to as SED approach – developed by Pasinetti (1981, 1993). Actually, a major implication of the SED approach is that changes in the structure of production lead to changes in the rate of growth, so that intercountry differences in the structure of production imply intercountry differences in the rate of growth. In case sectors are characterized by different rates of demand growth (due, for instance, to different income elasticities), the structure of production matters for aggregate economic growth. In fact, in the SED approach a driving force behind structural change are differences in the income elasticity of demand across sectors.

While this connection between the structure of production and overall economic growth is taken up explicitly by Pasinetti (1981, 1993) in a multi-sectoral framework, though mostly in the context of a closed economy, the BP-constrained growth approach put forward by Thirlwall (1979) takes it up in the broader context of an open economy, even if only implicitly by reminding that the composition of exports and imports is reflected in their aggregate income elasticities.

In Pasinetti´s (1981, 1993) multi-sectoral macrodynamic analysis of a production economy, income elasticities for various goods differ and change over time as per capita income increases. Such a non-proportional expansion of demand, in turn, offers different opportunities for sectors to growth. In an open economy, however, as developed in Thirlwall (1979), there is a constraint on the growth of overall demand, no matter how proportional it is across sectors, and therefore on the overall growth performance, which happens to be its balance of payments.

It is therefore only natural that a balance of payments equilibrium growth rate analogous to Thirlwall´s (1979) be derived within a Pasinettian multi-sector macrodynamic framework, and a first contribution of this paper lies in carrying out such a derivation, which is to the best of our knowledge an innovative exercise. Besides, to the extent that such a derivation is performed by adopting an extended version of Pasinetti´s model that incorporates other elements of international economic relations, a second original contribution of this paper is presumed to lie in showing that a SED approach to Thirwall´s Law sheds further light on uneven development. Intended primarily as it is to gain further analytical understanding of the external constraints on growth, the underlying presumption

[2] "Income elasticities determine the balance-of-payments constrained growth rate, but the supply characteristics of goods (such as their technical sophistication, quality etc.) determine relative income elasticities. In this important respect, there can be a marrying of the demand and supply side explanations of the comparative growth performance of nations" (McCombie & Thirlwall 1994, p. 391).

of this paper is that there are sizeable increasing returns, on both theoretical and empirical grounds, to greater cross-fertilisation between the BP-constrained growth approach and the SED approach.

The remainder of the paper is organized as follows. Section 2 reviews the theoretical and empirical literature on the theory of BP-constrained growth that followed from Thirlwall´s original contribution, while Section 3 describes the extended version of Pasinetti´s model of structural economic dynamics from which a balance of payments equilibrium growth rate analogous to Thirlwall´s will be derived. Such a derivation is then performed in Section 5, followed by a discussion of several theoretical, empirical and policy implications which can be drawn from the structural dynamics approach to BP-constrained growth just developed. The closing section summarizes the main conclusions derived along the way.

2. The balance-of-payments-constrained growth approach

Arguably, the BP-constrained growth theory as pioneered by Thirlwall (1979) is Keynesian in that it focuses on the relative income (or growth rate) adjustments required to balance trade at given relative prices (real exchange rate), which is the exact converse of the neoclassical approach. In fact, it emphasizes the “non-price” or qualitative aspects of competitiveness that are reflected in income elasticities, rather than competition based on costs or prices. While in the neoclassical approach countries are treated as normally operating at resource-constrained growth or full-employment levels of output , at least in the long run, in such a Keynesian approach countries are not seen as generally resource-constrained in their long-run growth, which implies that aggregate demand matters in the long run as well as in the short run. According to McCombie (1997, p. 355), however, “[t]he law pertains to long-run *equilibrium growth rates* and not to the determinants of the *equilibrium levels* of economic activity” (original emphasis). Thirlwall (1997, p. 380), in turn, claims that “[I]t is true that the assumptions of the model [namely, that exports are the only component of autonomous demand, that trade is balanced, and the terms of trade remain unchanged] may appear unrealistic in the short run, but the model is designed to understand long-run differences in growth performance”.

An immediately subsequent extension that followed from Thirlwall´s (1979) original approach was the work developed by Thirlwall & Hussain (1982), who modified the model to allow for imbalanced trade with capital flows in the long run, actually finding supporting evidence in a sample of developing countries. In Thirlwall (1983), in turn, it is shown that major centre-periphery models as developed by Prebisch (1950), Seers (1962) and Kaldor (1970), when stripped to essentials, have their conclusions dependent on differences in the income elasticities of demand for exports and imports.

Early theoretical and empirical criticisms on the BP-constrained growth model developed by Thirlwall (1979) were raised by McGregor & Swales (1985, 1986, 1991), with adequate replies being provided by Thirlwall (1986) and McCombie & Thirlwall (1994, 1997a). Basically, such early criticisms have that Thirlwall´s (1979) model failed to distinguish between traded and nontraded goods and to take into account non-price competition. More severely, the model is erroneously claimed to become identical to the standard neoclassical supply

oriented model in case price elasticities of imports and exports are infinite and relative prices are constant. In the same vein, Krugman (1989) – surprisingly without referring to Thirlwall´s earlier contributions – suggests a conventional explanation for the stylized fact that ratios of country growth rates appear equiproportional to ratios of the income elasticities of demand for exports and imports, having called it the 45-degree rule. However, the direction of causation is reversed: it is fast growth, caused by the growth of the labour force in efficiency units, which leads to a high export and/or low import elasticity.

Krugman´s challenge to the view of income elasticities as exogenous parameters that constrain growth was rebutted by Thirlwall (1991). Thirlwall reminded Krugman of the many channels linking slow growth imposed by a balance-of-payments constraint to slow productivity growth, and the opposite where the possibility of fast growth unhindered by balance-of-payments problems leads to fast productivity growth. By contrast, the BP-constrained growth model is a demand-oriented model based on the assumption that factor supplies and technical progress are largely endogenous to the growth of output itself.[3]

McCombie & Thirlwall (1997b) provided a further refinement of the theory of the BP-constrained growth to ensure that the economy's long-run growth is consistent with a sustainable path of foreign indebtedness, and an implied theoretical conclusion is that capital flows cannot permit an individual country to increase its growth rate above that given by the Thirlwall´s Law by very much or for very long. Elliot & Rhodd (1999), in turn, by extending the model in Thirlwall & Hussain (1982) to include the effect of debt servicing, and by sampling the same countries and time span, found evidence of an improved predictability of the BP-constrained growth model.

Moreno-Brid (1998-99) also provided a contribution to the extended version of the BP-constrained growth model developed by Thirlwall & Hussain (1982) by incorporating the constraint that the ratio of current account deficit to output is constant in long-run equilibrium. It is shown that if one allows for capital inflows, but assumes that the ratio of the current account deficit relative to domestic income remains constant, the basic conclusions of Thirlwall´s Law are still valid. Along similar lines, McCombie & Roberts (2002) have argued that under reasonable assumptions regarding the sustainability of net foreign capital inflows as a ratio of national income, the inclusion of these inflows in a BP-constrained growth model would not make a substantial contribution to loosening the balance of payments constraint.

According to Barbosa-Filho (2001), however, Moreno-Brid (1998-99) has two limitations, namely, its BP-constrained growth rate is not necessarily stable and its balance-of-payments constraint does not separate interest payments from imports of goods and non-factor services in the analysis of debt

[3] McCombie & Thirlwall (1994) offers a textbook exposition of such earlier contributions to the debate, together with their replies, including a very early critique by McCombie (1981) and the corresponding reply by Thirlwall (1981), and brings in further material for discussion. Several of the more recent theoretical and empirical contributions to the literature made by McCombie and Thirlwall themselves and by other authors, which are reviewed in the remainder of this section, are reprinted in McCombie & Thirlwall (2004). Instructively, the volume opens with an introduction by the editors that places the whole debate in perspective.

accumulation. Barbosa-Filho (2001) then extends the BP-constrained growth model to allow for a sustainable accumulation of foreign debt taking into consideration both the potential instability of such a constraint and the impact of interest payments on debt accumulation. Like in McCombie & Thirlwall (1997b) and Moreno-Brid (1998-99), persistent – though non-explosive – trade deficits or surpluses are allowed, but unlike these other contributions, interest payments are separated from the imports of goods and non-factor services. As it turns out, a potentially unstable BP-constrained growth rate does not obtain.

Moreno-Brid (2003), without referring to either Elliot & Rhodd (1999) or Barbosa-Filho (2001), argues nonetheless that most of previous theoretical presentations of Thirlwall´s law had not incorporated foreign interest payments explicitly, and empirical studies had failed to take them into account as well. In any case, it is then presented a version of the BP-constrained growth model adapted from Thirlwall & Hussain (1982) that explicitly takes interest payments into account and – though not necessarily imposing as a long-run condition the constancy of the interest rate – generates a sustainable path of external debt accumulation. Besides, the empirical adequacy of the model is claimed to be validated by applying it to the analysis of the Mexican case.

Pugno (1998) analyses the dynamic stability of the original (Thirlwall´s) BP-constrained growth model. The treatment of the labour market becomes necessary to address the issue of price competitiveness, and the original growth formula derived in Thirlwall (1979) may not obtain in short-run equilibrium, though it will obtain in long-run equilibrium. Blecker (1998) develops a general model that combines Thirlwall´s analysis of BP-constrained growth with the hypotheses of markup pricing and partial exchange-rate pass-through, in order to make explicit the link between balance-of-payments equilibrium and changes in relative wages and living standards. This general model reveals that the cases of Keynesian quantity adjustment (slower growth) and neoclassical price adjustment (real depreciation or wage decline) are two possible cases – two poles of a continuum of options available to an uncompetitive country for balancing its trade.

Alonso & Garcimartín (1998-99) contributes to the literature on the BP-constrained growth mainly by incorporating an exports function that includes a technological index intended to capture structural changes in exports, which yield a good fit, and by showing that the null impact of relative prices on growth may not be necessary to derive the main result of the BP-constrained growth. In an empirical estimation for the Spanish economy, support is found for the Thirlwall´s Law, and this is due not to the irrelevance of prices but to the compensating effect of technology: during the period considered, the worsening of relative prices was balanced by the improvement of technology, thus maintaining the country's overall competitiveness level. In their view, "[n]ot taking these two variables into consideration – prices and structural change, proxied by technology – may confirm Thirlwall´s Law erroneously" (p. 266). Besides, a new methodology to test the BP-constrained growth model is adopted, with the main implication of it being tested by identifying the variable by means of which the balance-of-payments equilibrium is achieved. Empirical evidence for several OECD countries supports income as the adjustment variable, which means that growth is indeed balance-of-payments constrained, with relative prices, in turn, not playing a significant role in economic growth. All

in all, the main conclusion obtained in the study is similar to that derived from Thirlwall´s Law: long-run economic growth depends not only on a country's resource endowment but also on its ability to satisfy both domestic and foreign demand.

Given the purpose of this paper, two other theoretical contributions to the literature are worthy of mention. Dutt (2002) incorporates Thirlwall´s analysis of BP-constrained growth into a fully-specified model of North-South trade to show how it can explain uneven development. Indeed, the model simultaneously determines the rate of growth of the North and the South and the evolution of North-South terms of trade, rather than simply taking these terms of trade as exogenously given. Hence, while Dutt (2002) derives uneven development in the context of a two-good, North-South macroeconomic model, in this paper it is adopted an extended version of Pasinetti's structural economic dynamics model (Araujo & Teixeira 2003; 2004) to derive uneven development in the context of a multi-sector dynamic model. Basically, different dynamic patterns of human needs and preferences give rise to different compositions of demand, and thus different balance of payments equilibrium growth rates, in each country.

In turn, Trigg & Lee (2005) explores the relation between the Keynesian multiplier and Pasinetti´s model of pure production, though attention is confined to a closed economy. By drawing from Keynes to apply his concept of the wage unit, it is shown that it is possible to aggregate from Pasinetti´s multi-sectoral model to a genuinely macroeconomic multiplier for the case of a closed economy. Hence, while Trigg & Lee (2005), of which we were not aware at the time our main results were derived, shows how Keynes's multiplier can be derived from multi-sectoral foundations, the model developed in this paper shows how a dynamic version of Harrod trade multiplier (1933), and the corresponding Thirlwall´s (1979) growth formula, can as well be derived from Pasinettian multi-sectoral foundations.

On the empirical front, the BP-constrained growth approach has been favourably tested, in various degrees, to capture the stylized fact that relative growth rates differ in the same proportion as the ratio of export to import income elasticity. For instance, Thirlwall (1979), Bairam (1988), Andersen (1993), McCombie (1997), Alonso & Garcimartín (1998-99), León-Ledesma (1999) and Christopoulos & Tsionas (2003) have found supporting evidence for single – or samples of – developed countries.[4] As another instance, supporting evidence on varying degrees for single – or samples of – developing countries was found

[4] Indeed, McCombie (1997) develops a careful appraisal of the previous empirics of the BP-constrained growth approach, and presents some further supporting evidence for the United States, the United Kingdom and Japan. According to McCombie, these several approaches to the testing of the BP-constrained growth approach all share a common rationale: that disparities in the income elasticities of demand primarily reflect disparities in non-price competitiveness, which are subject to very slow change. Non-price competitiveness reflects such supply-side characteristics as quality, after-sales service, the effectiveness of distribution networks, and so on. It is nonetheless stressed that there is a marked difference between such a Keynesian view and the neoclassical emphasis on the supply side (p. 346).

by Thirlwall & Hussain (1982), Bairam & Dempester (1991), Elliot & Rhodd (1999) and Perraton (2003).[5]

Given the structural, multi-sectoral nature of the model developed in this paper, it is worthy of mention that Bairam (1997) uses a sample of developing and developed countries and found evidence that suggests not only that the ratio of income elasticity of exports to income elasticity of imports (the Harrod foreign trade multiplier) is larger for developing countries than for developed countries, but also that there could be an inverse relationship between the level (stage) of economic development and the value of that ratio for any given country. Thirlwall (1997, p. 381) expresses his concern, however, with the inferences drawn by Bairam, which would imply that developing countries are less balance-of-payments-constrained in their growth than developed countries because the income elasticity of demand for exports is apparently negatively related to the level of per capita income. For Thirlwall, it is dangerous to draw inferences from such a small, selective sample of developing countries that contains mainly newly industrializing countries and very few really poor countries. With a full range of countries from very poor to very rich, Thirlwall would expect an inverted-U relationship showing the income elasticity of exports rising as countries move from primary-product exports to light manufactures and then decreasing as richer countries get locked into antiquated industrial structures (p. 382).

3. An Extended version of Pasinetti's model of structural change

Araujo and Teixeira (2004) have shown that the structural economic dynamics is quite a useful framework to analyse mechanisms that generate uneven development in a North-South set up. These authors have extended Pasinetti's analysis to the case of an open economy, which allows the study of the effects of the international economic relations on the dynamic pattern of production, technological progress and evolution of preferences. In this paper it is employed a version of that model without capital goods to carry on a BP-constrained growth analysis in a multi-sector economy in which productivity and demand vary over time at particular rates in each one of the sectors of two countries: let A denote the advanced country and U the underdeveloped one.

Both countries are assumed to produce $n-1$ consumption goods: one in each vertically integrated sector but with different patterns of production and consumption. From the point of view of country U the physical and monetary flows of commodities can be summarized by three conditions, namely, the condition for full employment of labour, the condition for full expenditure of national income and the trade balance equilibrium, along with the solution for the system of physical and monetary quantities. The full employment condition may be stated as:

[5] Regional supporting evidence is provided by López & Cruz (2000) and Holland, Vieira & Canuto (2004), for samples of Latin American countries; by Moreno-Brid & Pérez (1999), for a sample of Central American countries; by Ansari & Xi (2000), for a sample of Southeast Asian countries; and by Hussain (1999), for a large sample of African and East Asian countries.

$$\sum_{i=1}^{n-1}(a_{in}+\xi\, a_{i\hat{n}})a_{ni}=1 \qquad (1)$$

where a_{in} and $a_{i\hat{n}}$ stand for the demand coefficients of final commodity i, with $i=1,2,...,n-1$. The former refers to domestic and the latter to foreign demand. The production coefficients of consumption goods are given by a_{ni}. The family sector in country *A* is denoted by $\hat{n}$ and the size of population in both countries is related to each other by the coefficient of proportionality ξ. By adopting exponential dynamic paths for the coefficients appearing in (1), Pasinetti (1981, 1993) shows that even if this condition is fulfilled in an initial point in time it will face difficulties to be fulfilled in the subsequent periods due to the existence of particular rates of technical progress and growth of demand for each one of the sectors. This is the approach followed in this paper, though it is assumed that the unemployment rate is constant throughout. The condition for full expenditure of national income is given by:

$$\sum_{i=1}^{n-1}(a_{in}+a_{\hat{i}n})a_{ni}=1 \qquad (2)$$

where $a_{\hat{i}n}$ is the foreign demand coefficient for commodity i produced in country A. The equilibrium in trade balance is given by:

$$\sum_{i=1}^{n-1}(\xi\, a_{i\hat{n}}-a_{\hat{i}n})a_{ni}=0 \qquad (3)$$

An important property of this model is that the trade balance equilibrium can be written not in terms of prices as usual but in terms of labour coefficients: labour coefficients a_{ni} weight both the export and import demand coefficients for commodities i. Therefore, this condition requires that exported commodities expressed in terms of quantities of labour in country U must be equal to imported commodities also expressed in terms of quantities of labour in U. The solution of the system for physical quantities can be expressed as:

$$X_i=(a_{in}+\xi a_{i\hat{n}})X_n, \qquad i=1,2...,n-1 \qquad (4)$$

Thus the physical quantity of each tradable commodity that is produced in country U will be determined by the sum of the domestic and foreign demands. With p_i being the price of commodity i in country U, and w_U the (uniform) wage rate, the set of solution for prices can be expressed as:

$$p_i=a_{ni}w_U, \qquad i=1,2...,n-1 \qquad (5)$$

This solution shows that relative quantities of embodied labour continue to regulate relative commodity prices within the boundaries of each country. Let us assume that the medium of exchange (money) is anchored to gold, so that the exchange rate between the two currencies is fixed by the ratio of gold contents of the two monetary units. For the sake of convenience only, let us assume that this ratio is equal to 1. Let us analyse the relationship among international prices considering that the average overall productivity is ten times greater in A than in U but sectoral productivities differ within a much wider range.

Pasinetti (1981) and Araujo & Teixeira (2004) and have shown that those goods for which differences in productivity are smaller than tenfold will have a lower price in U than in A. This result shows that even in the case where the average productivity in country A is higher than in country U, for those sectors in which the productivity in U is higher than its average productivity, it has comparative advantage in producing these commodities.

Those goods for which differences in productivity are greater than tenfold have a lower price in A than in U. In this case, if international trade is allowed for, goods will move between the two countries. People in country A will buy goods of the first type in U, where they are cheaper, and people in U would buy goods of the second type in A. Country U would be induced to specialize, and then export, the first type of commodity, while country A would be induced to specialize, and then export, the second type of commodity. Indeed, these results concerning patterns of specialization in the two countries provide an important justification for the per capita export and import demand functions that are adopted in the next section.

4. Thirlwall's BP-constrained growth analysis in a Pasinettian framework

From the discussion of the previous section it is reasonable to assume that if $p_{\hat{i}} \leq p_i$, which means that country U does not have comparative advantage in producing good i, then the foreign demand for commodity i is equal to zero, that is $x_{i\hat{n}} = 0$. If $p_{\hat{i}} > p_i$, then let us consider that the foreign demand for commodity i is given by a standard export function, like the one adopted by Thirlwall (1979). This condition can be summarized as follows:

$$x_{i\hat{n}} = \begin{cases} \left(\frac{p_i}{p_{\hat{i}}}\right)^{\eta_i} Y_A^{\beta_i} & \text{if } p_{\hat{i}} \geq p_i \\ 0 & \text{if } p_{\hat{i}} < p_i \end{cases} \qquad (6)$$

where $x_{i\hat{n}}$ is foreign demand for commodity i, η_i is the price elasticity of demand for export of commodity i, with $\eta_i < 0$, while β_i is the income elasticity of demand for exports and Y_A is the national income of country A. By dividing both sides of (6) by the population of country A, given by $X_{\hat{n}}$, we obtain the per capita coefficient for foreign demand of commodity i:

$$a_{i\hat{n}} = \begin{cases} \left(\frac{p_i}{p_{\hat{i}}}\right)^{\eta_i} y_A^{\beta_i} X_{\hat{n}}^{\beta_i - 1} & \text{if } p_{\hat{i}} \geq p_i \\ 0 & \text{if } p_{\hat{i}} < p_i \end{cases} \qquad (7)$$

Likewise, if the country A has no comparative advantage in producing good i the per capita import demand for commodity i in country U is equal to zero, that is $x_{\hat{i}n} = 0$. But if $p_i > p_{\hat{i}}$ then let us consider that the import demand coefficients are given by a standard import demand function, which is given by the following functional form:

$$x_{\hat{i}n} = \begin{cases} \left(\frac{p_{\hat{i}}}{p_i}\right)^{\psi_i} Y_U^{\phi_i} & \text{if } p_i \geq p_{\hat{i}} \\ 0 & \text{if } p_i < p_{\hat{i}} \end{cases} \quad (8)$$

where ψ_i is the price elasticity of demand for imports of commodity i, with $\psi_i < 0$, and ϕ_i is the income elasticity of demand for imports and Y_U is the real income of country U. By dividing both sides of (8) by the population of country U we obtain the per capita import coefficient for commodity i:

$$a_{\hat{i}n} = \begin{cases} \left(\frac{p_{\hat{i}}}{p_i}\right)^{\psi_i} y_U^{\phi_i} X_n^{\phi_i - 1} & \text{if } p_i \geq p_{\hat{i}} \\ 0 & \text{if } p_i < p_{\hat{i}} \end{cases} \quad (9)$$

In case $p_{\hat{i}} > p_i$ we can take natural logarithms in both sides of (7) and differentiate it with respect to time. By adopting the following convention: $\frac{\dot{p}_i}{p_i} = \sigma_i^U$, $\frac{\dot{p}_{\hat{i}}}{p_{\hat{i}}} = \sigma_i^A$, $\frac{\dot{y}_A}{y_A} = \sigma_y^A$, $\frac{\dot{X}_{\hat{n}}}{X_{\hat{n}}} = \hat{g}$, this procedure yields the following growth rate of per capita export demand for commodity i:

$$\frac{\dot{a}_{i\hat{n}}}{a_{i\hat{n}}} = \begin{cases} \eta_i\left(\sigma_i^U - \sigma_i^A\right) + \beta_i \sigma_y^A + (\beta_i - 1)\hat{g} & \text{if } p_i \geq p_{\hat{i}} \\ 0 & \text{if } p_i < p_{\hat{i}} \end{cases} \quad (10)$$

By adopting the same procedure with respect to expression (9) in the case of $p_i > p_{\hat{i}}$, and by adopting the convention that $\frac{\dot{w}_U}{w_U} = \sigma_w^U$ and $\frac{\dot{X}_n}{X_n} = g$, we obtain the following growth rate of per capita import demand coefficient for commodity i:

$$\frac{\dot{a}_{\hat{i}n}}{a_{\hat{i}n}} = \begin{cases} \psi_i\left(\sigma_i^A - \sigma_i^U\right) + \phi_i \sigma_w^U + \left(\phi_i - 1\right) g & \text{if } p_{\hat{i}} \geq p_i \\ 0 & \text{if } p_{\hat{i}} < p_i \end{cases} \quad (11)$$

Let us assume that $g = \hat{g} = 0$, which means that the population in both countries remain constant, and that $\sigma_i^U = \sigma_i^A$, which means that the rate of change of price of commodity i is equal in both countries. In the aggregate BP-constrained growth model developed in Thirlwall (1979), this assumption about relative prices is justified by claiming that even though the terms of trade or real exchange rate may fluctuate in the short run, it appears to remain relatively stable in the long run. In this case expressions (10) and (11) can be respectively reduced to:

$$\frac{\dot{a}_{i\hat{n}}}{a_{i\hat{n}}} = \beta_i \sigma_y^A \quad (12)$$

$$\frac{\dot{a}_{\hat{i}n}}{a_{\hat{i}n}} = \phi_i \sigma_y^U \tag{13}$$

Indeed, only one of the two above equations is valid. Equilibrium in the balance of payment is given by expression (3), and in order for this equilibrium to be maintained, it is necessary that its time rate of change is equal to zero. Formally:

$$\sum_{i=1}^{n-1}(\xi\, \dot{a}_{i\hat{n}} - \dot{a}_{\hat{i}n})a_{ni} + \sum_{i=1}^{n-1}(\xi\, a_{i\hat{n}} - a_{\hat{i}n})\dot{a}_{ni} = 0 \tag{14}$$

Let us consider the case in which there is no technical progress, that is, $\dot{a}_{ni}(t) = 0$. In this case expression (14) simplifies to:

$$\sum_{i=1}^{n-1}(\xi\, \dot{a}_{i\hat{n}} - \dot{a}_{\hat{i}n})a_{ni} = 0 \tag{15}$$

By substituting eqs. (12) and (13) into eq. (15) we obtain after some algebraic manipulation that:

$$\sigma_y^U = \frac{\sum_{i=1}^{n-1}\xi\beta_i a_{i\hat{n}} a_{ni}}{\sum_{i=1}^{n-1}\phi_i a_{\hat{i}n} a_{ni}}\sigma_y^A \tag{16}$$

Eq. (16) is actually the first important result of this paper, as it shows the relationship between the growth rate of per capita income in countries U and A. Let us define Δ as:

$$\Delta = \frac{\sum_{i=1}^{n-1}\xi\beta_i a_{i\hat{n}} a_{ni}}{\sum_{i=1}^{n-1}\phi_i a_{\hat{i}n} a_{ni}} \tag{17}$$

In case $\Delta < 1$ a situation of uneven development will follow, that is, the per capita income of the advanced country grows at a higher rate than the per capita income of the underdeveloped one. After some algebraic manipulation it can be shown that $\Delta < 1$ if and only if:

$$\sum_{i=1}^{n-1}[\phi_i a_{\hat{i}n} - \xi\beta_i a_{i\hat{n}}]a_{ni} < 0 \tag{18}$$

The above inequality holds if the share of consumer expenditures in A for U goods is smaller than the share of consumer expenditures in U for A goods. A usual explanation for this phenomenon is the so-called Engel's Law, which implies a difference in the income elasticity of demand for industrial and primary goods, the latter being typically exported by underdeveloped countries. Prebisch (1950), for instance, argued that the South typically exports primary goods, while the North typically exports industrial goods.

By summing up over (12) and after some algebraic manipulation we obtain that:

$$\sigma_y^A = \frac{\sum_{i=1}^{n-1} \frac{\dot{a}_{i\hat{n}}}{a_{in}}}{\sum_{i=1}^{n-1} \beta_i} \tag{19}$$

In turn, by substituting eq. (19) into eq. (16) and after some algebraic manipulation we obtain that:

$$\sigma_y^U = \frac{\sum_{i=1}^{n-1} \xi \beta_i a_{i\hat{n}} a_{ni}}{\left(\sum_{i=1}^{n-1} \phi_i a_{\hat{i}n} a_{ni}\right)\left(\sum_{i=1}^{n-1} \beta_i\right)} \sum_{i=1}^{n-1} \frac{\dot{a}_{i\hat{n}}}{a_{in}} \tag{20}$$

Eq. (20) is the second important result derived in this paper, as it can be seen as a multi-sectoral version of what Thirlwall (1979) called the balance-of-payments equilibrium growth rate. Given that it was derived in the context of a Pasinettian SED framework, we shall call it Multi-Sectoral Thirlwall´s Law. In fact, eq. (20) asserts that the growth rate of per capita income in country U is directly proportional to the growth rate of its exports, given by the second term in the RHS. The coefficient of proportionality, given by the first term in the RHS, shows that a country will benefit the more from an increase in foreign demand, and thereby experience higher rates of growth that are consistent with balance of payments equilibrium, the lower its sectoral income elasticities of demand for imports, given by ϕ_i, and the higher its sectoral income elasticities of demand for exports, given by β_i.

It should be noticed, however, that these sectoral income elasticities of exports and imports are weighted by coefficients that measure the share of each sector in the total volumes of exports and imports. As it turns out, even in case these sectoral elasticities remain constant, a change in the overall growth rate can be brought about by structural change coming from the evolution of tastes and preferences according to the Engel's Law. A major implication of the Multi-Sectoral Thirlwall´s Law derived here is therefore that changes in the composition of demand or in the structure of production which are not reflected in changes in income elasticities, but come through changes in the share of each sector in aggregate exports or imports, also matter for economic growth. Given the income elasticities of imports and exports, the original Thirlwall´s Law implies that a country's growth rate will rise only in case the growth rate of income outside it rises, whereas the Multi-Sectoral Thirlwall´s Law implies that a country can still raise its growth rate even in case such a rise in the growth of outside income does not occur, provided it can manage to change the sectoral composition of exports and/or imports accordingly.

Several other theoretical implications can be drawn from the structural economic dynamics approach to BP-constrained economic growth developed in this paper. First, such an approach, by being fully an input-output formulation, provides an appropriate framework for addressing other disaggregated issues related to or associated with the Harrod foreign trade multiplier.[6] For instance,

[6] As anticipated earlier, while Trigg & Lee (2005), of whose results we were not aware at the time ours were derived, show how Keynes's closed-economy multiplier can be

an early disaggregation of this multiplier was carried out by Kennedy & Thirlwall (1979), in whose formulation, which they called the input-output formulation, imports are related to expenditure and not to income. This reformulation of the foreign trade multiplier is argued to be based on the proposition that it is wrong to relate imports to income as in conventional income determination analysis since, strictly speaking, all imports are inputs into the firm sector of the economy (including final consumption good imports). While Kennedy & Thirlwall (1979) disaggregated the macroeconomy into four sectors (firm, household, capital and foreign), and overall imports into three categories of autonomous expenditures (consumption, investment and exports), the SED approach to the foreign trade multiplier developed here, by being a fully input-output one, allows for an even more disaggregated analysis in the spirit of Kennedy & Thirlwall (1979).[7]

Second, recall from section 2 that Krugman (1989) challenged the view of income elasticities as exogenous parameters that constrain economic growth by claiming that it is fast growth that leads to a high export and/or low import elasticity. Naturally enough, to Thirlwall´s (1991) cogent rebuttal to Krugman, as recounted earlier, we would only add that a SED approach to BP-constrained growth shows that the flexibility of the structure of production assumed by Krugman cannot be taken as a matter of course.

Third, recall from section 2 that an implication of Pugno´s (1998) stability analysis of Thirlwall´s (1979) growth model is that to address the related issue of price competitiveness it becomes necessary to incorporate explicitly the labour market. Two comments are worthy making in this respect. First, the view of income elasticities as exogenous parameters that constrain long-run growth, but which change in the transition to the long run as per capita income rises, as implied by the SED approach to BP-constrained growth developed here, implies that a fully-specified stability analysis of the balance-of-payments equilibrium growth rate should consider such elasticities as intertemporally endogenous. Arguably, the proposition that such elasticities co-evolve with per capita income does not necessarily imply that that stability analysis must be carried out within a SED approach to BP-constrained growth. Hence, Pugno´s (1998) analysis is not fully-specified even in its original context of a single-good economy, as incomes elasticities of exports and imports are assumed to remain unchanged. Second, while it is true that the addressing of the issue of price competitiveness requires the incorporation of labour market dynamics, an implication of the SED approach is that it is not only the sectoral composition of consumption demand

---

derived from Pasinettian multi-sectoral foundations, the model developed in this paper shows how a dynamic version of Harrod trade multiplier can as well be derived from the same foundations.

[7] The preface to Pasinetti (1981) reads that the basic SED model was complete enough as to be submitted as a successful Ph.D. dissertation at the University of Cambridge by the summer 1962. Pasinetti also points out that two theoretical factors prompted that theoretical investigation into the long-run evolution of industrial economic systems, and they are represented by the two types of theories – the macrodynamic models of growth and the input-output analysis – that he was offered as a research student at Cambridge (1956-57 and 1958-59) and Harvard (1957-58). Regarding input-output analysis, Pasinetti is implicitly alluding to Richard Stone (the father of national income accounting) and Wassily Leontief (who had nevertheless left Harvard for New York University a few years earlier), respectively.

that actually co-evolve with per capita income, but the sectoral composition of employment as well.

Finally, it should be recalled from section 2 that while Dutt (2002) derives uneven development in the context of a fully-specified, though two-good only, North-South macroeconomic model, in this paper it is used a SED approach to derive uneven development in the context of a multi-sector, though not as fully-specified as Dutt´s, macrodynamic model. Indeed, the model developed in Dutt (2002) simultaneously determines the rate of growth of the two regions and the evolution of terms of trade, and produces a long-run equilibrium in which these rates, though stationary, are different. As it turns out, the Northern growth rate is greater than the Southern growth rate, with the effect that uneven development is continuous. Besides, even though the extent of this unevenness is dependent, among other things, on the income elasticities of the demand for the two goods, the composition of imports and exports does not exert an autonomous influence on the absolute difference in the long-run rate of growth of the two regions. To put it more precisely, the share of the overall consumption demand which goes to each good is given by price and income elasticities of the demand for the two goods. In the multi-sector macrodynamic model derived here, in turn, the extent of the uneven development, which is given by equation (17), depends not only on sectoral income elasticities of exports and imports, but on the share of each sector in the total volumes of exports and imports as well. Therefore, the extent of the uneven development may change even in case such income elasticities remain constant, by resulting, for instance, from changes in the composition of demand which are not reflected in changes in income elasticities, but come through changes in the share of each sector in aggregate imports and exports.

The structural economic dynamics approach to BP-constrained economic growth developed here has also implications as regards the empirical results reported in section 2. For instance, Bairam (1997) found evidence that suggests not only that the Harrod foreign trade multiplier is larger for developing countries than for developed ones, but also that there could be an inverse relationship between the level of per capita income and the value of that multiplier for any given country, as the income elasticity of exports seems to be negatively related to per capita income. For Thirlwall (1997), with a full range of countries from very poor to very rich, however, one would expect an inverted-U relationship showing the income elasticity of exports rising as countries move from primary-product exports to light manufactures and then decreasing as richer countries get locked into antiquated industrial structures. In fact, the SED approach to the BP-constrained growth developed here can eventually reconcile both views, as while Bairam´s piece of evidence is the average income elasticity of exports, Thirlwall´s argument can be seen as referring to the share of each sector in total exports. Indeed, Alonso & Garcimartín (1998-99) contributes to the empirics of the BP-constrained growth mainly by incorporating an exports function that includes a technological index to capture structural changes in exports. In an estimation for the Spanish economy, they found evidence that the worsening of relative prices during the period in question was balanced by the improvement of technology, thus maintaining the country's overall competitiveness level. In line with the tone of some results derived in the multi-sector model developed here, they conclude that "[n]ot taking these two variables into consideration –

prices and structural change, proxied by technology – may confirm Thirlwall´s Law erroneously" (p. 266).

As regards Hussain´s (1999) comparison between African and East Asian countries, which have been showing significant uneven development, one could venture that the extent of such unevenness can be explained along the two dimensions identified in the multi-sector BP-constrained growth macromodel developed here. African countries would not only have lower sectoral income elasticities of exports and higher sectoral income elasticities of imports, and hence a lower foreign trade multiplier, than the corresponding values for the East Asian countries, but would as well have a worse sectoral composition of exports and imports. To put it another way, the unevenness of the development between these two sets of countries could be actually greater when measured through what we called the Multi-Sectoral Thirlwall´s Law, equation (20), than when measured through the original Thirlwall´s Law. More broadly, one could venture that for any given country, estimated growth rates would be closer to actual ones when the estimation is made through the Multi-Sector Thirlwall´s Law than when the estimation is made through the original Thirlwall's Law. It should be acknowledged up front, however, that such an estimation of a Multi-Sectoral Thirlwall´s Law, even if the chosen level of sectoral decomposition is low, is likely to face a severe, binding data availability constraint.[8]

Although it is often argued that poorer countries have higher income elasticities of imports than richer countries because the structure of production is different in these two groups of countries, there appears to be no systematic empirical evidence which compares the income elasticity of Northern imports from the South with the income elasticity of Southern imports from the North. A notable recent exception, however, is a set of preliminary results presented and discussed in Dutt (2003), with the North being proxied by the OECD countries or by the countries classified as developed by the World Bank, and the South by non–OECD countries or by the countries classified as developing by the World Bank. In either case, it is found that income elasticity of Southern exports to the North are usually lower than the income elasticity of Northern imports from the South. Besides, evidence is also found that this elasticity gap has been tending to grow over time, for while there is a positive – but not statistically significant – time trend in the Southern exports to the North, there is a statistically significant upward trend in the income elasticity of Southern imports from the North. It is worthy of mention that this trend in the income elasticity of Southern exports was detected despite other empirical studies have shown that there have been significant changes in the composition of developing countries' exports, with primary (manufacturing) goods increasing (decreasing) their share. Indeed, this is quite understandable a result in light of the multi-sectoral approach to BP-

[8] In any case, one could rationalize Hussain's (1999) reference to the problems of balance of payments in the context of African countries as "structural" in nature by describing them along the two dimensions identified in the multi-sector model of BP-constrained growth developed here. In Hussain's own words: "Structural in the sense that it is inherent in the structure of production and the characteristics of the goods produced…To accelerate their growth rate, [African countries] would need to raise the balance-of-payment constraint on growth by shifting to the production of more attractive exports and by reducing the income elasticity of demand for imports" (p. 128)

constrained growth developed in this paper, which shows that sectoral income elasticities of exports for individual countries should be weighted by coefficients that measure the share of each sector in total exports.

In a closing remark, we would suggest that our SED approach to BP-constrained growth also contributes to sectoral policy-making. Indeed, balance-of-payments-constrained countries must pursue supply-side policies to alter the structure of production as regards, for instance, the allocation of resources between tradeable and nontradeable goods and the characteristics of the goods produced. Hence, a structural economic dynamics approach, by its very nature, can inform the formulation of effective BP-constraint-alleviating policies such as import substitution and export promotion. An implication of the SED approach developed in this paper is that the balance of payments equilibrium growth rate depends both on the sectoral income elasticities of imports and exports and on the share of each sector in total imports and exports, so that both dimensions should be taken into account in evaluating the effectiveness of specific BP-constraint-raising sectoral policies. How effective in this respect are trade and industrial policies intended to protect specific domestic sectors, for instance, is an issue which is better addressed by means of a structural economic dynamics approach.[9]

In turn, Pasinetti (1981; 1993), in drawing policy implications from his SED framework, argues that the primary source of international gains is not mobility of goods, which is just a secondary source, but mobility of knowledge. It is international learning – of outside methods of production – that can indeed be claimed to represent the primary source of international gains. In Pasinetti´s view, no mobility of goods – however extended or perfect it may be – will ever fulfil the function of spreading productivity gains, which are an essential source of economic growth, across borders. Therefore, the structural competitiveness of a country, from which ultimately depends its balance of payments equilibrium growth rate according to the SED approach developed in this paper, is crucially determined by international learning, with trade being an important transmission channel.[10]

5. Conclusion

The theory of BP-constrained growth implies that observed differences in growth performance between countries are associated with the relative strength of their balance of payments position. Despite being demand-oriented, such a theory nonetheless acknowledges the importance of supply characteristics of goods. Structural change, however, has not been explicitly incorporated into

[9] Admittedly, other concerns are also to be taken into account as regards protection: "There is an economic case for protection to alter the structure of production and to improve the balance of payments, but it needs to be implemented with prudence and skill to avoid the protection of high-cost inefficient industries and the pursuit of rent seeking" (Thirlwall 2002, pp. 77-8).

[10] According to Pasinetti, "[k]nowledge, in and of itself, can be diffused and learnt, but increases in productivities…are kept within the economic systems in which they are realized…It is therefore at the stage of the transmission and diffusion of knowledge that the relations among nations must find their focal point…It is the acquisition of knowledge that eventually makes the wealth of a nation" (1993, p. 176).

demand-oriented theories of growth, a notable exception being the Pasinettian structural dynamics approach, whose main implication is that changes in the structure of production lead to changes in the growth rate, so that intercountry differences in the structure of production implies intercountry differences in the growth rate.

It is therefore only natural that a balance of payments equilibrium growth rate analogous to Thirlwall´s Law were derived within a Pasinettian multi-sector macrodynamic framework, and a first contribution of this paper was such a derivation. Besides, such a derivation was performed by adopting an extended version of Pasinetti´s model that incorporates other elements of international economic relations, and a second original contribution of this paper was to that a structural dynamics approach to Thirwall´s Law sheds further light on uneven development.

More precisely, the relationship between the growth rate of per capita income in two countries, A and U, was shown to depend on the relationship between the share of consumer expenditures in A for U goods and the share of consumer expenditures in U for A goods. Besides, it was derived a multi-sectoral version of the balance-of-payments equilibrium growth rate, which we called Multi-Sectoral Thirlwall´s Law. Indeed, it asserts that a country's growth rate of per capita income is directly proportional to the growth rate of its exports, with such a proportionality being inversely (directly) related to sectoral income elasticities of demand for imports (exports). In turn, these income elasticities are weighted by coefficients that measure the share of each sector in the total volumes of exports and imports. Hence, even in case these sectoral elasticities remain constant, a change in the overall growth rate can be brought about by structural change coming from, for instance, the evolution of consumption tastes and preferences. In other words, changes in the composition of demand or in the structure of production which are not reflected in changes in income elasticities, but come through changes in the share of each sector in aggregate exports or imports, also matter for growth performance. Income elasticities of imports and exports being given, the original Thirlwall´s Law implies that a country's growth rate will rise only in case the growth rate of income outside it rises, while the Multi-Sectoral Thirlwall´s Law derived in this paper implies that a country can still raise its growth rate even in case such a rise in the growth of outside income does not occur, provided it can manage to change the sectoral composition of exports and/or imports accordingly.

Other theoretical implications were drawn from the structural economic dynamics approach to BP-constrained economic growth developed here. For instance, such an approach, by being fully input-output a formulation, provides an appropriate framework for addressing other disaggregated issues related to or associated with the Harrod foreign trade multiplier. Indeed, it implies that the flexibility of the structure of production assumed in neoclassical approaches to growth dynamics cannot be taken as a matter of course. It also implies that a fully-specified stability analysis of the balance-of-payments equilibrium growth rate should consider income elasticities of imports and exports as varying over time.

The structural economic dynamics approach to BP-constrained growth developed here has been shown to have noteworthy empirical and policy implications as well. For instance, it implies that for any given country,

estimated growth rates could turn out to be closer to actual growth rates when the estimation is made through the Multi-Sector Thirlwall´s Law than when it is made through the original Thirlwall's Law. Furthermore, it may help to reconcile empirical evidence showing an increasing negative gap between the income elasticity of Southern exports to the North and the income elasticity of Northern imports from the South, on the one hand, and changes in the composition of developing countries' exports, with primary (manufacturing) goods increasing (decreasing) their share, on the other hand.

As regards policy, since balance-of-payments-constrained countries must pursue supply-side policies to alter the structure of production, a structural economic dynamics approach can inform the design of effective BP-constraint-alleviating strategies such as import substitution and export promotion, with foreign trade being seen as an important transmission channel for international learning.

Bibliography

AGHION, P. & HOWITT, P. (1998) *Endogenous growth theory*, Cambridge: The MIT Press.

ALONSO, JOSÉ A. & GARCIMARTÍN, C. (1998-99) A new approach to balance-of-payments constraint: some empirical evidence, *Journal of Post Keynesian Economics*, Vol. 21, No. 2.

ANDERSEN, P. S. (1993) The 45-degree rule revisited, *Applied Economics*, 25.

ANSARI, H & XI, Y. (2000) The chronicle of economic growth in southeast asian countries: does Thirlwall´s Law provide an adequate explanation, *Journal of Post Keynesian Economics*, 22(4), Summer.

ARAUJO, R. & TEIXEIRA, J. (2003) An extension of the structural change model to international economic relations, *Metroeconomica* 54(4).

ARAUJO, R. & TEIXEIRA, J. (2004) Structural economic dynamics: an alternative approach to uneven development, *Cambridge Journal of Economics*, Vol. 28, No. 5.

BAIRAM, E. (1988) Balance of payments, the Harrod foreign multiplier and economic growth: the european and north american experience, *Applied Economics*, 20.

BAIRAM, E. (1997). Levels of economic development and appropriate specification of the Harrod foreign-trade multiplier, *Journal of Post-Keynesian Economics*, 19(3).

BAIRAM, E. & DEMPESTER, G. (1991) The Harrod foreign multiplier and economic growth in asian countries, *Applied Economics*, 23(11).

BARBOSA-FILHO, N. (2001) The balance-of-payments constraint: from balanced trade to sustainable debt, *Banca Nazionale del Lavoro Quarterly Review*, No. 219, Dec.

BLECKER, R. (1998) International competitiveness, relative wages, and the balance-of-payments constraint, *Journal of Post Keynesian Economics*, Vol. 20, No. 4.

CHRISTOPOULOS, D. & TSIONAS, E. (2003) A reassessment of balance of payments constrained growth: results from panel unit root and panel cointegration tests, *International Economic Journal*, Vol. 17, No. 3.

DUTT, A. (2002) Thirlwall's Law and uneven development, *Journal of Post Keynesian Economics*, 24(3).
DUTT, A. (2003) Income elasticities of imports, North-South trade and uneven development, in Dutt, A. & Ros, J. (eds) *Development Economics and Structuralist Macroeconomics*, Cheltenham, UK: Edward Elgar.
ELLIOT, D. & RHODD, R. (1999) Explaining growth rate differences in highly indebted countries: an extension to Thirlwall and Hussain, *Applied Economics*, 31.
HARROD, R. (1933) *International economics*, Cambridge, UK: Cambridge University Press.
HOLLAND, M., VIEIRA, F. & CANUTO, O. (2004) Economic growth and the balance-of-payments constraint in Latin America, *Investigación Económica*, Vol. LXIII, 247.
HUSSAIN, M. N. (1999) The balance-of-payments constraint and growth rate differences among African and East Asian economies, *African Development Review*, June.
KALDOR, N. (197O) The case for regional policies, *Scottish Journal of Political Economy*, November.
KRUGMAN, P. (1989) Differences in income elasticities and trends in real exchange rates, *European Economic Review*, 33.
LÉON-LEDESMA, M. (1999) An application of Thirlwall´s Law to the spanish economy, *Journal of Post Keynesian Economics*, Vol. 21.
LOPEZ, J. & CRUZ, A. (2000) Thirlwall´s Law and beyond: the Latin American Experience, *Journal of Post Keynesian Economics*, vol. 22, n. 3, Spring.
McCOMBIE, J. (1981) Are international growth rates constrained by the balance of payments? *Banca Nazionale del Lavoro Quarterly Review*, Vol. 34, No. 139.
McCOMBIE, J. (1997) On the empirics of balance-of-payments-constrained growth, *Journal of Post Keynesian Economics*, Vol. 19, No. 3.
McCOMBIE & ROBERTS, M. (2002) The role of balance of payments in economic growth, in Setterfield, M. (ed.) *The Economics of Demand-Led Growth,* Cheltenham, UK: Edward Elgar
McCOMBIE, J. & THIRLWALL, A. (1994) *Economic growth and the balance of payments constraint*, New York: St. Martin's Press.
McCOMBIE, J. & THIRLWALL, A. (1997a) The dynamic Harrod foreign trade multiplier and the demand oriented approach to economic growth – an evaluation, *International Review of Applied Economics*, 11(1), January.
McCOMBIE, J. & THIRLWALL, A. (1997b) Economic growth and balance-of-payments constraint revisited, in Arestis, P., Palma, G. & Sawyer, M. (eds) *Markets, Unemployment and Economic Policy*, Vol. 2, London: Routledge.
McCOMBIE, J. & THIRLWALL, A. (2004) *Essays on balance of payments constrained growth – theory and evidence*, London: Routledge.
McGREGOR & SWALES, J. (1985) Professor Thirlwall and Balance of payments constrained growth, *Applied Economics*, Vol. 17, No. 1.
McGREGOR & SWALES, J. (1986) Balance of payments-constrained growth: a rejoinder to Professor Thirlwall, *Applied Economics*, 18(12), December.
McGREGOR & SWALES, J. (1991) Thirlwall´s Law and Balance of payments-constrained growth: further comments on the debate, *Applied Economics*, 23(1), January.
MORENO-BRID, J. C. (1998-99) On capital flows and the balance-of-payments constrained growth model, *Journal of Post Keynesian Economics*, Vol. 21.

MORENO-BRID, J. C. (2003) Capital flows, interest payments and the balance-of-payments constrained growth model: a theoretical and an empirical analysis, *Metroeconomica*, Vol. 54, no. 2, May.

MORENO-BRID, J. C. & Pérez, E. (1999) Balance-of-payments constrained growth in central america, *Journal of Post Keynesian Economics*, 22(1), Fall.

PASINETTI, L. (1981) *Structural change and economic Growth – a theoretical essay on the dynamics of the wealth of the nations*, Cambridge, UK: Cambridge University Press.

PASINETTI, L. (1993) *Structural economic dynamics – a theory of the economic consequences of human learning*, Cambridge, UK: Cambridge University Press.

PERRATON, J. (2003) Balance of payments constrained growth and developing countries: an examination of Thirlwall´s hypothesis, *International Review of Applied Economics*, 1(17).

PREBISCH, R. (1950) *The economic development of latin america and its principal problems*, ECLA, New York.

PUGNO, M. (1998) The stability of Thirlwall´s model of economic growth and the balance-of-payments constraint, *Journal of Post Keynesian Economics*, Vol. 20, No. 4.

SEERS, D. (1962) A model of comparative growth rates of the world economy, *Economic Journal*, March.

SOLOW, R. (1956) A contribution to the theory of economic growth, *Quarterly Journal of Economics*, 70.

THIRLWALL, A. (1979) The balance of payments constraint as an explanation of international growth rates differences, *Banca Nazionale del Lavoro Quarterly Review*, Vol. 128.

THIRLWALL, A. (1981) A reply to Mr McCombie, *Banca Nazionale del Lavoro Quarterly Review*, Vol. 34, No. 139.

THIRLWALL, A. (1983) Foreign trade elasticities in centre-periphery models of growth and development, *Banca Nazionale del Lavoro Quarterly Review*, Sept.

THIRLWALL, A. (1986) Balance of payments-constrained growth: a reply to McGregor and Swales, *Applied Economics*, 18(12), December.

THIRLWALL, A. (1991) Professor Krugman's 45-degree rule, *Journal of Post Keynesian Economics*, Vol. 14, No. 1.

THIRLWALL, A. (1997) Reflections on the concept of balance-of-payments-constrained growth, *Journal of Post Keynesian Economics*, Vol. 19, No. 3.

THIRLWALL, A. (2002) *The nature of economic growth*, Cheltenham, UK: Edward Elgar.

THIRLWALL, A. & HUSSAIN, M. (1982) The balance of payments constraint, capital flows and growth rates differences between developing countries, *Oxford Economic Papers*, Vol. 34.