The debate over 'Thirlwall's law': balance-of-payments-constrained growth reconsidered*

Robert A. Blecker
Professor, Department of Economics, American University, Washington, DC, USA

Several recent critiques have questioned the theoretical logic of standard models of balance-of-payments-constrained growth (BPCG) and the empirical support for 'Thirlwall's law'. On the empirical side, critics charge that most econometric estimates of this model have effectively only tested whether exports and imports grow at similar rates in the long run. On the theoretical side, the criticisms have focused on the role of foreign income growth, capital accumulation, relative prices and country size in BPCG models. This article reviews the current state of the debate over these critiques and also offers a brief discussion and evaluation of three alternative models. The alternative models all highlight a significant role for the level of relative prices (or the real exchange rate) in determining long-run growth, which is consistent with recent empirical studies.

1 INTRODUCTION

The theory of balance-of-payments-constrained growth (BPCG), originally proposed by Thirlwall (1979), has become one of the most commonly used approaches to modelling long-run growth among heterodox economists. The popularity of what has become known as 'Thirlwall's' is undoubtedly attributable to two key features of the BPCG approach: its stark theoretical parsimony on the one hand, and its frequent empirical success on the other. As recounted in a retrospective by Thirlwall (2011), the BPCG approach brings together several important strands of previous theory, including Harrod's foreign-trade multiplier, Prebisch's centre–periphery model, the Hicksian 'supermultiplier' and the foreign-exchange constraint in Chenery's two-gap model. The BPCG framework has been extended in numerous directions, including work on capital flows, sustainable debt, structural change, intermediate goods, North–South trade and the impact of trade liberalization. Given its emphasis on external, demand-side constraints, the BPCG approach has provided an appealing alternative to neoclassical growth models

(old and new) with their exclusively supply-side emphasis on factor accumulation and so-called 'total factor productivity growth'.

The fundamental idea of Thirlwall's model can be summarized in intuitive fashion as follows. Assuming that a country cannot have a persistent trade (current-account) imbalance in the long run and that imports are a function of domestic income (output), national income cannot grow faster than the rate which makes imports increase at the same pace as exports. If the growth rate that maintains balance-of-payments (BP) equilibrium is less than the growth rate that would be possible given domestic conditions of demand and supply alone, then the country is said to be BP-constrained. Assuming, further, that supplies of exports and imports are infinitely elastic and relative price (real exchange rate) effects are negligible in the long run, the growth rate of domestic income must equal the ratio of the growth rate of exports to the income elasticity of import demand in the 'weak' version of Thirlwall's law.[1] If we further assume that relative prices (real exchange rates) are constant (have no rising or falling trend) in the long run, then the growth rate of domestic income must also equal the growth rate of foreign income multiplied by the ratio of the income elasticity of export demand to the income elasticity of import demand, in the 'strong' version of Thirlwall's law.

In recent years, a number of heterodox critics (for example, Razmi 2011; 2015; Ros[2] 2013: 239–243; Clavijo/Ros 2015a) have questioned both the theoretical logic of Thirlwall's law and the empirical evidence in its favour. These critics have argued that many empirical tests of this law (either version) are testing a virtual tautology that is likely to be satisfied by almost any country's data, provided only that exports and imports grow at similar rates in the long run. On the theoretical side, the new criticisms have attacked two of the key underlying premises of standard BPCG models: the assumptions that exports are infinitely elastic in supply (constrained only by foreign demand) and that relative price (real exchange rate) adjustments are unimportant, ineffective or unnecessary. On the latter point, the critics (as well as some defenders of the BPCG approach) have argued that levels of real exchange rates (RERs) can be important variables in tightening or loosening long-run BP constraints, even if rates of change in RERs (or relative prices) are not.

These criticisms open up the possibility that a BP constraint could be important for many countries, but (especially in small countries defined as international price-takers) the BP constraint could operate via mechanisms other than those contemplated in Thirlwall's law or other constraints (such as domestic capital accumulation) could be more binding under certain conditions. This paper will discuss these critiques and responses by defenders of the traditional BPCG model in Sections 2 and 3; it will also, in Section 4, briefly summarize and assess a few alternative models. In order to focus on the core issues, the discussion is deliberately limited to the most basic types of BPCG models, omitting the various sorts of extensions mentioned earlier.

2 TESTING A TAUTOLOGY?

Most empirical tests of Thirlwall's law have focused on determining whether actual, long-run average growth rates are close to the BP-equilibrium growth rates predicted by the BPCG model. Using a wide variety of econometric methodologies (the details of which

---

1.   The distinction between the weak and strong versions of Thirlwall's law is due to Perraton (2003).
2.   For authors with Hispanic double last (family) names, this article uses only the first (paternal) family name in the shortened citations in the text, while providing the full (double) last/family names in the reference list.

need not detain us here), numerous empirical studies have confirmed that actual average growth rates are close to BP-equilibrium growth rates for the vast majority of countries and (long-run) time periods considered (see Thirlwall 2011 for a survey and references).[3] However, as argued long ago by McCombie (1981) and more recently by Clavijo/Ros (2015a) and Razmi (2015), it can be claimed that such tests of Thirlwall's law are testing a near-identity that is likely to be satisfied for almost any country regardless of whether its growth is BP-constrained in the sense of Thirlwall or not. We follow Clavijo/Ros's presentation here, but the essence of these arguments is the same.

The weak and strong versions of Thirlwall's law can be represented mathematically as[4]

$$\hat{Y}_{B1} = \frac{\hat{X}}{\eta_m} \tag{1}$$

and

$$\hat{Y}_{B2} = \frac{\eta_x \hat{Y}^*}{\eta_m} \tag{2}$$

respectively, where $\hat{Y}$ is the growth rate of real output (national income), $\hat{X}$ is the growth rate of the real volume of exports, η_x and η_m are the income elasticities of demand for exports and imports (respectively) and a superscript * designates a 'foreign' variable. The variable $\hat{Y}_{Bi}$ represents the BP-equilibrium growth rate for the 'home' country as defined by the two versions of Thirlwall's law ($i = 1$ for weak, $i = 2$ for strong); $\hat{Y}$ with no subscript is the actual (long-run average) home growth rate.

According to the near-tautology (or near-identity) argument, econometric estimates of η_x and η_m are likely to approximate the ratios of the growth rates of each trade variable (the volume of exports or imports) to the corresponding income growth rate (foreign or domestic), that is, $\eta_x \approx \hat{X}/\hat{Y}^*$ and $\eta_m \approx \hat{M}/\hat{Y}$ (where $\hat{M}$ is the growth rate of the real volume of imports) – especially if relative price effects are negligible in the long run. Then, it is easy to see that either equation (1) or (2) is equivalent to

$$\frac{\hat{Y}_{Bi}}{\hat{Y}} \approx \frac{\hat{X}}{\hat{M}}, \tag{3}$$

where $i = 1, 2$ is either version of Thirlwall's law (weak or strong). Hence, a statistical test of whether $\hat{Y} = \hat{Y}_{Bi}$ is equivalent to a test of whether $\hat{X} = \hat{M}$.

Thus, Thirlwall's law will appear to be confirmed (that is, the null hypothesis that $\hat{Y} = \hat{Y}_{Bi}$ will not be rejected) for any data set in which $\hat{X} \approx \hat{M}$, that is, the quantities of exports and imports grow at approximately the same rate in the long run. However, the longer the time period considered, the more likely it is that the latter will be true in almost any country's data. For example, even though the US trade balance for goods and services shifted from a surplus of 0.5 per cent of gross domestic product (GDP) in 1967 to a deficit of 2.9 percent of GDP in 2015, nevertheless the average annual growth rates of real exports and imports were nearly identical over the 1968–2015 period (5.67 and 5.53 per cent for

3.   Razmi (2011) notes that conventional BPCG models have a tendency to overpredict long-run average growth rates, which he attributes to their failure to take nontraded goods into account.
4.   We skip the mathematical derivations here for reasons of space and because they are well-known in the literature (for example, McCombie/Thirlwall 2004; Thirlwall 2011; Blecker 2013b); the key assumptions were stated in the introduction.

goods and services, or 5.82 and 5.95 per cent for goods alone).[5] As a very large economy that experienced a shift of −3.4 percentage points of GDP in its trade balance for goods and services over this almost half-century period, it is difficult to maintain that the US economy was BP-constrained in any meaningful sense. Clearly, the US was able to obtain sufficient net financial inflows to sustain an increasing trade deficit as its growth exceeded a rate that would have been consistent with maintaining balanced trade (Blecker 2013a). Moreover, the US economy is usually regarded as a demand-driver for the entire global economy, constrained mainly by its own domestic aggregate demand (consumption, investment and government spending). Thirlwall himself has always acknowledged that some countries must be unconstrained by their BP in order for other countries to be so constrained, and the largest economies like those of the US, China and Japan are prime candidates for *not* being BP-constrained.[6] Nevertheless, any standard empirical test of Thirlwall's law using long-run US data will appear to confirm it because $\hat{X} \approx \hat{M}$ in the underlying data.

Thirlwall (1981) responded to this critique – in an argument reiterated more recently by McCombie (2011) – by pointing out that econometric estimates of the income elasticities η_x and η_m need not equal the observed ratios of growth rates $\hat{X}/\hat{Y}^*$ and $\hat{M}/\hat{Y}$, respectively, as long as relative prices are controlled for in the estimated demand functions for exports and imports. McCombie (ibid.: 357) – who has long since accepted Thirlwall's response to his own critique of 1981 – then argues that relative price effects on export or import demand are small or insignificant in most studies, implying 'that it is not relative prices that, for example, cause imports to adjust, but changes in income in a Keynesian manner'. McCombie (ibid.) is certainly correct in saying that 'inclusion of the [relative price] term means that the law is not an identity', but if anything it would seem logical that if relative price effects are small or insignificant, then the estimated income elasticities should be *closer* to the observed ratios $\hat{X}/\hat{Y}^*$ and $\hat{M}/\hat{Y}$ than if relative price effects were large and significant. Moreover, if supply curves for exports or imports are not infinitely price-elastic (horizontal), as discussed below (especially for the case of exports in small countries), then conventional estimates of price elasticities of demand (which take prices as exogenous) are subject to simultaneity bias and could be biased downward (in absolute value).[7] In any event, the contention of the critics is that this method of testing Thirlwall's law amounts to testing a near-identity, not an exact one, and it remains to be seen empirically how much standard estimates of income elasticities differ from those ratios of growth rates.

Another response comes from Pérez (2015: 58), who argues that identifying the mechanism that achieves equilibrium between the growth rates of exports and imports

5.   Author's calculations based on data from the US Bureau of Economic Analysis (2016). The somewhat surprising fact that the growth rate of exports is slightly higher than the growth rate of imports for goods and services together is due to the relatively rapid growth of real exports of services using the BEA's chain-type quantity indexes, but the difference is very small. The years used here were chosen because the quantity indexes for real exports and imports in this source only go back to 1967, and hence the first year for which growth rates could be computed is 1968.
6.   The view that the US and China are not BP-constrained is supported by Razmi's (2015) finding that the foreign (world) growth rate is insignificant in regressions for US and Chinese income growth, after controlling for the rate of domestic capital accumulation. Alonso/Garcimartín (1998/1999) found that US national income does not adjust significantly in response to trade imbalances. They found that Japanese income does adjust, but earlier Thirlwall (1979) had found Japan to be an exceptional case in which growth was limited by capacity constraints at least up to the 1970s.
7.   Razmi (2005: 681–682) reports finding a much larger (greater than unity, in absolute value) price elasticity for Indian imports using methods that control for simultaneity, compared with earlier studies that did not use such methods.

constitutes the 'essence' of Thirlwall's law, which 'establishes that it is through variations in the level (or growth rate) of income that an equilibrium between [in our notation] $\hat{X}$ and $\hat{M}$ is achieved, not by an adjustment in relative prices'.[8] Although this is a correct statement of the essence of Thirlwall's law, nevertheless finding that $\hat{X} = \hat{M}$ does not necessarily demonstrate that adjustment occurs through variations in income growth rather than relative prices or other mechanisms (for example, supply-side adjustments). In short, this defence does not vindicate the use of tests of equality between actual and BP-equilibrium growth rates as meaningful tests of the causal story implied by Thirlwall's law.[9]

It is important to recall, however, that the 'near-identity' critique is only a criticism of certain types of empirical tests of Thirlwall's law. This critique suggests that statistical tests of equality between the actual and BP-equilibrium growth rates have weak power to reject the null hypothesis that these growth rates are equal. This critique does not necessarily disprove Thirlwall's law, however; it simply implies that other, more powerful statistical tests are required to validate it. These more powerful tests are found in the (relatively fewer) studies that have more directly tested what Pérez calls the essence of the law: whether BP equilibrium is achieved through adjustments in national incomes rather than relative prices.

Along these lines, Alonso/Garcimartín (1998/1999: 266, 276) noted that the hypothesis of Thirlwall's law 'cannot be tested through the degree of correlation between [the] actual and Thirlwall's Law rate[s] of growth', and instead proposed to explicitly 'test the balance-of-payments constraint hypothesis by identifying the variable by means of which the balance-of-payments equilibrium is achieved'. Alonso/Garcimartín tested the two alternative hypotheses (income adjustment vs relative price adjustment) for ten industrialized countries. They found that the income adjustment mechanism was statistically significant and had the right sign (income grows more rapidly in response to a rising trade surplus, or more slowly in response to a widening deficit) in eight of the ten countries considered (the US and France were the two exceptions); in contrast, the price adjustment mechanism was statistically insignificant for all countries studied.

Alonso/Garcimartín embedded their equations for the adjustment of income or relative prices in a simultaneous equations framework. Although this is a good methodology for addressing simultaneity issues, it makes the estimates for any given equation subject to possible bias if other equations in the model are misspecified. For the export and import demand functions, the authors used a dynamic specification of gradual convergence to equilibrium levels, which effectively imposes equal time lags on the quantity and price variables. However, most empirical studies that don't impose this restriction find that lags are considerably longer for relative price effects than for income effects (see Blecker 1992), and this could account for why Alonso/Garcimartín found fairly low price elasticities for most countries. Also, since these authors used annual data, their results may only pertain to short- or medium-run adjustment processes; they do not necessarily imply that relative prices do not adjust (in terms of shifts in mean levels) over much longer periods of time.

Some additional evidence along these lines comes from studies that have used cointegration methods. For example, Lima/Carvalho (2008) find that national income and exports are significantly cointegrated with each other but not with the RER, using annual

8.   All translations from Spanish sources were done by the author.
9.   The same argument applies to the use of cointegration methods to test for 'long-run' (in a time-series sense) relationships between variables such as exports, imports and national income (see, for example, Moreno-Brid 1999; Pérez/Moreno-Brid 1999; Razmi 2005): finding that such a relationship (cointegrating vector) exists does not suffice to prove the direction of causality between those variables.

time-series data for Brazil. This study covers a long period (1930–2004), but given its use of annual data, the adjustment processes for which it tests are likely medium-run in nature. Earlier, Razmi (2005: 668) found that price variables were sometimes significant in cointegrating vectors for India, but in some estimates they adjust 'in the "wrong" – that is, disequilibrating – direction', and he also found that equilibrium for the import relationship was reached 'in approximately four years'. To the best of this author's knowledge, no one has formally tested for adjustments over longer data frequencies (for example, 5- or 10-year periods), which would require the use of panel data for large numbers of countries.[10]

3 THEORETICAL CRITIQUES

Some other critiques have focused on various assumptions or implications of standard BPCG models. We will confine our discussion here to three issues that have featured prominently in the most recent debates: the role of foreign income growth versus domestic capital accumulation, the difference between the level and the rate of change of relative prices, and the distinction between small and large economies. Other issues, especially those that have been covered extensively in earlier debates (see McCombie 2011), will not be addressed here.

3.1 Foreign income growth and domestic capital accumulation

Assuming that income elasticities of export and import demand are relatively stable over time – as most BPCG theorists have assumed[11] – the strong version of Thirlwall's law (equation (2)) implies that we should observe a strong positive correlation between individual countries' growth rates and foreign growth. Razmi (2015) finds that this is not the case, using a data set composed of 167 countries with data averaged for 5-year periods to focus on long-run relationships.[12] First, he shows graphically that the raw correlation between individual country growth rates and world growth rates is not generally positive; for most of the countries in his sample, there is simply no correlation (the individual country growth rates are independent of world growth), and for almost a third of the sample the correlation is anomalously negative.

More formally, Razmi (2015) tests for the statistical significance of foreign growth effects by estimating an econometric model explaining national growth rates, using panel data for the 167 countries with 5-year time periods. The foreign (world) growth variable always has a

10. It is only one observation, but Ibarra/Blecker (2016) found that after a prolonged period (1960–1974) in which the Mexican economy grew persistently faster than its BP-equilibrium rate, the economy subsequently experienced adjustments in both national income (which grew more slowly over the next 2 decades) and the RER (which tended to depreciate), with both kinds of adjustment occurring not smoothly but through a series of BP and currency crises up to 1994–1995.
11. An exception is found in the multisectoral BPCG model (Araújo/Lima 2007; Gouvea/Lima 2010), in which the aggregate income elasticities η_x and η_m are expressed as trade-weighted averages of the corresponding elasticities for individual industries or products. Such weighted averages are likely to evolve as a result of structural change, that is, shifts in industry shares of exports and imports, even if industry-level elasticities remain constant. Still, this model would lead us to expect a positive relationship between foreign and domestic income growth, albeit one with a possibly time-varying coefficient.
12. Since Razmi's data set (taken from Penn World Tables version 8.0) covers the years 1950–2011, the final period (2005–2011) consists of 7 years.

positive sign and is statistically significant in most estimates, but the magnitude of its coefficient drops notably when the domestic capital accumulation rate is included in the model – and the world growth rate becomes insignificant when the generalized method of moments (GMM) is used to control for endogeneity. When both variables are included, the coefficient on the capital accumulation rate always exceeds the coefficient on the world growth rate. A counterargument (by defenders of the standard BPCG approach) could be that investment is endogenous and responds (via the accelerator mechanism) to domestic income growth, which in turn is driven by exports – in which case the direction of causality between capital accumulation and income growth would be the opposite of what Razmi assumes. Also, foreign income retains a positive coefficient (which is significant in some specifications) in Razmi's estimates, after other variables are controlled for, and a trade-weighted measure of foreign income (or foreign expenditures on imports) for each country might be a better measure than total world income for identifying foreign income effects.

In addition, Razmi finds that currency undervaluation, defined using the procedure of Rodrik (2008), has a positive effect on growth that is statistically significant in some of the estimates (especially the ones using GMM or two-stage least squares to control for simultaneity). Overall, Razmi's results do not necessarily imply the absence of a BP constraint, but they do imply that if such a constraint exists and is binding, it likely reflects effects of RER levels and domestic capital accumulation that are ignored in standard BPCG models.

3.2 Level vs rate of change in relative prices

Razmi's finding of a significant effect of the RER (in levels) echoes a wide range of studies, both empirical and theoretical, that question the neglect of relative price effects in the traditional BPCG approach. In the standard Thirlwall-type model, the general solution for the BP-equilibrium growth rate incorporating the rate of change in relative prices is

$$\hat{Y}_{B3} = \frac{(\varepsilon_x + \varepsilon_m - 1)(\hat{E} + \hat{P}^* - \hat{P}) + \eta_x \hat{Y}^*}{\eta_m}, \tag{4}$$

where ε_x and ε_m are the relative price (RER) elasticities of export and import demand respectively (in absolute value), $\hat{E}$ is the rate of nominal currency depreciation (E is the exchange rate in home currency/foreign currency), and $\hat{P}$ is the price inflation rate (again a superscript * indicates a foreign variable). Relative price (RER) effects are usually dismissed by asserting either 'elasticity pessimism' (that is, $\varepsilon_x + \varepsilon_m \approx 1$) or else that relative prices (RERs) do not change significantly in the long run (in which case $\hat{E} + \hat{P}^* - \hat{P} \approx 0$).[13]

Empirical evidence on elasticity pessimism is mixed: some studies (for example, Cline 1989) find that the Marshall–Lerner condition ($\varepsilon_x + \varepsilon_m > 1$) is satisfied for most countries, while others (for example, Alonso/Garcimartín 1998/1999) find that it does not

---

13. Although few BPCG theorists use this terminology, the condition that $\hat{E} + \hat{P}^* - \hat{P} = 0$ is the same as what is conventionally called relative purchasing power parity (PPP, understood here as a long-run proposition). Razmi (2015) claims that assuming PPP is inconsistent with Thirlwall's law, because the BPCG model requires that $\hat{P} = \hat{P}^* = 0$ (since prices of exported and imported goods are fixed in the seller's currency). Hence, in his view, any non-zero rate of nominal depreciation $\hat{E}$ would cause the real exchange rate to change and hence would affect $\hat{Y}_{B3}$ via equation (4). However, in the long run, exogeneity of prices of imported and exported goods (in the seller's currency) requires only that $\hat{P}$ and $\hat{P}^*$ are constant (that is, P and P^* increase at rates that are independent of the volumes traded), not that they are zero, so relative PPP can still hold as long as $\hat{E} = \hat{P} - \hat{P}^*$ in the long run.

hold (and elasticity pessimism is validated) for most countries.[14] In contrast, it is quite easy to claim that $\hat{E} + \hat{P}^* - \hat{P} \approx 0$ should hold in the long run. While there are substantial shifts in RERs over short and medium horizons, there is increasing evidence that RERs are mean-reverting over very long periods, and it's not credible to view relative prices as continuously rising or falling in the very long run. As McCombie (2011: 358) states, 'even if the Marshall–Lerner conditions are satisfied, to increase permanently the *growth* of exports and to reduce the growth of imports would require a *continuous* depreciation of the currency, which is implausible' (emphasis in original). Thus, the assumption of constant relative prices (or a stationary RER) has been the primary basis for assuming that the relative price (RER) effects in equation (4) are negligible and hence relying on equation (1) or (2) instead.

But even if RERs don't change continuously in the long run, as would be necessary for the relative price term in (4) to be non-negligible, this does not necessarily imply that the *level* of the RER may not have a significant impact on a nation's growth. Many empirical studies (for example, Rodrik 2008; Berg et al. 2012; Rapetti et al. 2012; Razmi 2015), using a variety of methodologies, have found that RER levels (or degrees of undervaluation relative to estimated equilibrium levels) have significant effects on economic growth in many countries – especially developing countries and, in some studies, industrialized countries as well. Razmi (2015) expressly compares the level and rate of change in the RER in his econometric model and, for the most part, finds that the RER level (measured as the degree of undervaluation) is more statistically significant in explaining countries' growth (averaged over 5-year periods) than the rate of change in the relative price.[15] Thus, even if it is not realistic for a country to gain a continually increasing competitive advantage by continuously depreciating its RER, it is entirely plausible – indeed, empirically supported – that countries that maintain undervalued levels of their RERs for substantial periods of time can obtain long-term growth benefits (including, according to Berg et al. 2012, longer durations of rapid growth 'spells') as a result.

3.3 Country size

The standard BPCG model assumes what might be called a 'Keynesian small economy', in the terminology of Branson (1983: 48): a country that has infinitely price-elastic supplies of both exports and imports. This is effectively the same assumption ('prices set in the seller's currency') upon which the conventional Marshall–Lerner analysis of the response of the trade balance to a devaluation rests. The assumption of an infinitely elastic supply of imports is not controversial for most countries, except perhaps the very largest (for example, the US, China). But critics of the traditional BPCG approach have argued that assuming an infinitely elastic supply of exports is unrealistic for most countries, which are small players (and hence price-takers) in their export markets. In an argument anticipated by McGregor/Swales (1985: 21), more recently Ros (2013), Clavijo/Ros (2015a) and Razmi (2015) contend that the 'small economy' model is more appropriate for many if

---

14.   The estimated price elasticities in Alonso/Garcimartín (1998/1999) may have been biased downward (in absolute value) as a result of the restriction on lag lengths, as discussed earlier. Later, Garcimartín et al. (2010/2011) found higher price elasticities that satisfy the Marshall–Lerner condition for Spain and Portugal.
15.   In a related study, Boggio/Barbieri (2016) find that levels (rather than growth rates) of relative unit labour costs have significant effects on changes in countries' export market shares. These authors develop an updated version of the Beckerman (1962) model of export-led growth, which they argue is more empirically supported than the Dixon/Thirlwall (1975) version because of the latter's emphasis on rates of change in relative prices.

not most countries (especially developing nations): they are price-takers in both export and import markets, which implies that they have infinitely elastic supplies of imports and infinitely elastic *demand* for exports. This in turn implies that the equilibrium quantity of exports must be determined by supply constraints in the exporting country's industries. In this situation, the strong version of Thirlwall's law cannot apply because it requires a downward-sloping demand curve for exports. Small countries may be subject to BP constraints on their growth, but, if so, these constraints depend critically on the (exogenous) world terms of trade for the countries' exports and the accumulation of capital in their export industries, rather than the growth rate of foreign income.[16]

This line of criticism suggests that the traditional BPCG model is more applicable to larger countries (although perhaps not the very largest) – countries that have sufficient (excess) industrial capacity to be able to export large amounts of goods with constant costs, and which are big enough to influence the prices of their export products so that they effectively face downward-sloping export demand curves. However, many of the efforts to formalize a BP constraint for large countries (for example, Dutt 2002; Ros 2013: 239–243) suggest that a long-run equilibrium with balanced trade can only be reached if relative prices are endogenous, that is, the terms of trade or RER must adjust along with the country's growth rate in order to achieve balanced trade, contrary to the standard versions of Thirlwall's law.

Nevertheless, one may question how accurately the conventional 'small country model' describes the long-run situation for many developing countries or smaller industrialized nations. Of course, export supplies are limited at any point in time by the capacity of a country's export industries, which depends on the available capital, skills and technology. But over long periods of time, capital can be accumulated, skills can be acquired and technologies can be improved. Many typical export factories (for example, apparel sweatshops, electronics assembly plants) can easily be relocated or replicated, creating what is effectively a highly (if not infinitely) elastic long-run supply function for exports even in moderately small countries (although the very smallest countries may still be limited in their export capacity by virtue of their size). Also, the price-taker specification assumes that domestic and foreign goods are perfect substitutes, which may or may not be a good approximation to reality depending on the nature of a country's export products.

Furthermore, even if individual exporting countries can be regarded strictly as small economies facing infinitely elastic export demand curves at exogenously given world prices, they may be subject to a fallacy of composition (Blecker/Razmi 2008; 2010). That is, if a large number of such countries attempt to export similar products simultaneously, they may be large enough as a group that an increase in their collective supply will depress the world prices of their export products. Viewing such exporting economies as a group, they collectively face a downward-sloping export demand curve, and because of the easy ability to ramp up production of similar products across a wide spectrum of exporting nations, total supplies from such a group of countries may effectively be infinitely elastic in the long run. Technically speaking, these countries individually still face infinitely elastic demand curves for their exports, but as a practical matter they cannot expect to sell any quantity of exports they can produce at a constant price as long as rival competitor nations are similarly engaged in export-promotion efforts.

However, the fallacy-of-composition argument does not rescue the traditional solutions for Thirlwall's law, in which relative prices are irrelevant. When many countries are

---

16.   Of course, at a global level, relative prices (especially the terms of trade for primary commodities) may depend on world demand conditions, but for a small country these effects are transmitted through those prices.

exporting similar types of products, what might be called their 'cross exchange rates' (their relative prices or RERs relative to competing exporting nations) become important determinants of their export success and, hence, their growth (Blecker 2002; Blecker/Razmi 2008; 2010). In these cases too, levels of RERs can be important determinants of long-term growth outcomes.

4 THREE ALTERNATIVE MODELS

Both critics and defenders of the traditional BPCG approach have offered a rapidly expanding array of alternative or extended models in recent years in efforts to address some of the perceived deficiencies in the standard versions. For reasons of space, we will confine ourselves here to three such alternatives, and we will not be able to cover all of their equations and mathematical derivations (for which the interested reader is referred to the original articles). These three models were chosen to highlight responses to some of the criticisms noted above, but it should be noted that they are just the tip of a very large iceberg of new modelling in (or alternatives to) the BPCG approach. At best, this brief discussion will hopefully convey some of the 'flavour' of each model and some idea of each one's strengths and limitations.

4.1 The Clavijo/Ros model[17]

Clavijo/Ros (2015a) offer a hybrid model that combines some neoclassical features (a Cobb–Douglas production function for aggregate output and marginal product factor pricing) with some classical or structuralist assumptions (all savings come out of profits, the rate of accumulation depends on the rate of profit, and a fixed proportion of capital goods – assumed to be unity for simplicity – is imported). In the large country case, the model solves for an equilibrium terms of trade (relative price), which equates the growth rates of exports and imports. Growth thus follows Thirlwall's law, but relative prices (the terms of trade) must settle at a unique level in order to reach the BP-constrained equilibrium. In the small country case, because the supply of exports is proportional to the capital stock and the same good is consumed at home and exported, only the 'surplus' left over after domestic consumption is available for export (and therefore the proportion between exports and the capital stock depends positively on the saving rate). Thus, in the small country case, the causality is reversed from that found in Thirlwall's model: the growth rate (capital accumulation rate) determines the growth rate of exports, not the other way around.

Some of the assumptions made by Clavijo/Ros (2015a) are subject to counter-criticism. The Cobb–Douglas production function and marginal productivity theory of income distribution are particularly dubious for well-known reasons (see, for example, McCombie 2000/2001). However, the model would probably yield similar results with an alternative specification of production and distribution (for example, fixed coefficients and mark-up pricing). Also, the specification of saving and investment implies that aggregate demand is necessarily profit-led, which is at least a debatable proposition (Vernengo 2015; Blecker 2016). The implication that exports constitute the residual of the output left over after consumption (in the small country case) seems oddly out of joint with

---

17.   The discussion in this subsection benefited from clarifying comments in email correspondence from Jaime Ros, 21 July 2016.

the fact that many export industries are highly specialized sectors (often engaged in component production or assembly work within global supply chains) that produce very little for domestic consumption (Vernengo 2015). Pérez (2015) accuses Clavijo/Ros of assuming full employment and Say's law, but Clavijo/Ros (2015b) respond that employment (labour demand) is an endogenous variable in their model and hence (given an exogenous labour supply) there can be unemployment.

Clavijo/Ros (2015b: 83, n. 4) clarify that their definition of a 'large country' is one that is 'large in the sense that it confronts endogenous terms of trade, but not large enough so that its own level of income and expenditure could affect external [foreign] income which is taken as given'. This is perhaps a realistic characterization of some medium-size countries that are significant suppliers of their specialized export products, but it is certainly different from the standard concept of a large country in the sense of one that is big enough for its import demand to affect foreign income.

4.2 The Razmi model

Razmi (2015) provides a general framework for considering BP-constrained growth under alternative assumptions about country size and market structure. His system of equations neatly nests the Thirlwall's law (traditional BPCG) solution and an alternative solution that makes the small country (price-taker) assumption. Essentially, these two solutions differ depending on whether the supply or demand for exports is assumed to be infinitely elastic (both coincide in assuming an infinitely elastic supply of imports). Razmi's solution for the BP-equilibrium growth rate for the small country case can be written in our notation as:

$$\hat{Y}_{B4} = \frac{\sigma_p \hat{E} + \sigma_k \hat{K}(EP^*/P)}{\eta_m}, \tag{5}$$

where $\hat{K}$ is the rate of growth of the capital stock in the export sector (assumed to be an increasing function of the RER level, EP^*/P) and σ_p and σ_k are the elasticities of export supply with respect to export prices and the capital stock, respectively.

In this solution, growth is determined principally by the rate of capital accumulation in the export sector, which constrains the supply of exports when these face an infinitely price-elastic (horizontal) demand curve.[18] Razmi further assumes that the accumulation rate is an increasing function of the level of the RER, because a real depreciation (a rise in EP^*/P) increases the profitability of export production and thereby induces greater investment in export sectors.[19] Importantly, it is the level (not the rate of change) of the RER that governs capital accumulation and, through it, export supply and the BP-equilibrium growth rate. A comparison of the alternative solutions expressed in equations (4) and (5) then provides a rationale for Razmi's empirical work comparing rates of change and levels of relative prices as well as the capital-accumulation rate versus foreign income growth, as discussed earlier.

Razmi (2015) does not explicitly model the adjustments of saving, investment, income distribution and other domestic variables that are required to make output grow at the

18.   This solution also includes a term involving the rate of nominal currency depreciation $\hat{E}$. The author explains this term by observing that 'a nominal exchange rate change translates into a change in the domestic currency export price facing producers' in the small-country case (Razmi 2015: 15, n. 21).

19.   This assumption is supported by some recent empirical work on RERs and profitability effects in investment functions, including Blecker (2007) for the US and Ibarra (2015) for Mexico.

BP-equilibrium rate in the long run. In this paper, Razmi provides a model of BP equilibrium under alternative assumptions about the structure of the export market, not a more general macro model that embeds a BP-equilibrium condition.[20] However, the relevance of the pure small-country case can be questioned for the reasons given earlier: endogenous capital accumulation in export sectors effectively makes export supplies much more elastic in the long run than they are in any short-run period (with the stipulation that the supply constraints will tend to be overcome more rapidly in countries with more competitive RER levels), and the efforts of many countries to increase exports of similar products simultaneously can run afoul of the fallacy of composition. Thus, one should be cautious in regard to the applicability of a strict small-country model beyond the very smallest countries or ones that are able to increase their own exports without other countries following suit.

4.3 The Oreiro model

Building upon earlier work by Palley (2002) and Setterfield (2006), Oreiro (2016) extends a BPCG model to address the question of how the BP-equilibrium growth rate can be reconciled with two other concepts of long-run equilibrium or 'balanced' growth: the 'natural' rate of growth, which is equal to the growth rate of the labour force plus the growth rate of labour productivity, and the 'warranted' rate of growth or growth rate of potential output (assumed to be determined by the rate of capital accumulation). Oreiro's model includes a Kaldor–Verdoorn equation that makes labour productivity endogenous (as an increasing function of output growth) as well as endogenous adjustments in capacity utilization (which must converge to a stable rate in the long run).[21] Most importantly – and these are Oreiro's key innovations – he incorporates two important effects of the RER level. First, he assumes (for reasons similar to those of Clavijo/Ros and Razmi) that firms' desired investment (capital accumulation) depends positively on the level of the RER because of the latter's impact on profitability. Second, he assumes that the income elasticity of import demand is decreasing in the RER (a real depreciation lowers this income elasticity).[22]

Oreiro's model solves for a unique long-run equilibrium level of the RER that ensures equality between the three rates of growth (BP-equilibrium, natural and warranted/potential); this equilibrium is stable on the assumption that increases in the RER (real depreciations) occur in response to widening trade deficits (imports growing faster than exports). Oreiro's model is clearly applicable to a large country, since the relative price is endogenous (although, like Clavijo/Ros, Oreiro takes foreign income growth as exogenous). As in Clavijo/Ros, the RER level must adjust to a unique equilibrium level in the long run, albeit

20.   In an earlier paper, Razmi (2011) showed that the standard BPCG results based (implicitly) on assuming a single domestically produced good do not easily generalize to a three-good (exportables, importables and non-tradables) framework.
21.   Oreiro (2016: 200) notes that the strength of Kaldor–Verdoorn effects depends on the manufacturing share of GDP, which in turn depends on the RER, but other factors (such as institutions, infrastructure, education, uncertainty, financial constraints, R&D spending, etc.) could also play a role.
22.   In contrast, Palley (2002) had assumed that the income elasticity of import demand is increasing in the utilization rate. The motivation for Oreiro's assumption is that a real depreciation makes a country's economy less specialized in the sense that more types of goods can be produced at home, so any given expansion of national income will result in a smaller proportional increase in imports. For other efforts to endogenize the income elasticities of export and import demand in models incorporating a BP constraint, see (for example) Cimoli/Porcile (2014), Gabriel et al. (2016) and Ribeiro et al. (2016).

one determined by a somewhat different set of parameters. Oreiro's model supports a view of the RER and BP equilibrium that is different from the traditional BPCG approach:

> in the long-run equilibrium, there is no such thing as an external constraint for growth (see Bresser-Pereira et al. 2015, ch. 4). In fact, if the real exchange rate is at its proper level, [the] income elasticity of imports will assume a value that allows imports to grow at a rate compatible with current-account balance. Growth of domestic output will only be limited by the level of dynamic economies of scale [Kaldor–Verdoorn effects] … (Oreiro 2016: 200)

Like all such models, Oreiro's is subject to some caveats. Although Oreiro's model contains an investment function, it lacks an explicit saving function or any further specification of domestic demand. The warranted growth rate is determined only by the investment function, not by overall goods-market equilibrium (saving = investment + net exports).[23] Also, Oreiro's stability analysis depends critically on an assumption about RER adjustment that has been disputed by most BPCG theories and which is not supported by the relevant empirical studies cited earlier (Alonso/Garcimartín 1998/1999; Lima/Carvalho 2008) – although, as also noted earlier, those studies may only have identified short-run or medium-run adjustment processes and Oreiro's hypothesis relates to long-run RER adjustment.

5 CONCLUSIONS

The debates about the standard BPCG model and the new alternative models surveyed here suggest a number of important directions for future research in relation to whether and how BP constraints operate under a variety of different structural conditions. Many recent theoretical models and empirical studies imply a significant role for relative prices or RERs (in levels rather than growth rates) in explaining how BP constraints operate and how they are linked to long-run growth. These new perspectives thus suggest that price (cost) competition may possibly matter at least as much as non-price competition in global markets, contrary to what adherents of the traditional BPCG approach have usually claimed.

However, this leaves open the question of *how* (levels of) prices and costs affect BP constraints and long-run growth. Are the effects felt through conventional channels, such as by influencing demand for exports and imports (where perhaps price elasticities have been underestimated as a result of simultaneity bias and other statistical flaws in conventional estimates)? Or do price (cost) effects occur through some of the alternative channels that have been emphasized in the more recent literature, which include: inducing structural change in the composition of traded goods industries, thereby altering the weighted-average income elasticities for aggregate exports and imports (Cimoli/Porcile 2014); influencing the profitability of traded goods production and hence affecting the rate of domestic investment (Clavijo/Ros 2015a; Razmi 2015; Oreiro 2016); and/or affecting income distribution and technological gaps (Ribeiro et al. 2016)? More research is clearly needed to identify the channels through which levels of relative prices (or RERs or relative unit labour costs) affect long-run growth and to test which ones are most important empirically in various countries.

Also, real-world export markets are undoubtedly more complex than they appear in any of the standard supply-and-demand models (either a pure small economy or a Keynesian small economy, as defined above). Although *prices* of many goods may be set in global markets – so that many countries are effectively price-takers for their exports – the *costs* of production

---

23.   One way to defend Oreiro's specification on this point would be to consider that his 'investment function' is really a reduced-form solution of the demand system for the accumulation rate, in which case (similar to Clavijo/Ros) it effectively assumes profit-led demand.

(especially labour costs, and net of any imported raw materials or intermediate goods) are set by domestic conditions in each exporting nation. Multinational firms produce (or source) products wherever the price–cost margin for each good (or each portion of the supply chain) is most favourable, provided that adequate quality can be assured, transportation costs are not too high, etc. This could explain why relative unit labour costs have a significant influence on export market shares (as shown by Boggio/Barbieri 2016), even if many countries are too small to influence the prices at which the goods are ultimately sold.

Future research is also required to determined whether relative prices (or RERs) adjust in the ways assumed in certain theoretical models in the long run (even if they don't adjust in the 'right' direction in the short or medium run), in addition to the adjustments of income upon which the BPCG approach has traditionally focused. Another key empirical question is the direction of causality between export growth and capital accumulation: does the former cause the latter (as assumed implicitly in Thirlwall's law), or does the latter cause the former (as in some of the newer small-country models)? Perhaps this is a case of truly 'circular and cumulative causation', in which investment is required to promote exports and success in exporting in turn induces further investment.

Finally, it is also important to clarify how the BP constraint operates or how BP equilibrium is achieved in countries with different structural characteristics, including (but not limited to) country size. Certainly, small countries may behave very differently from large countries for the reasons explained earlier, but many nations are probably intermediate between the pure small and large country cases. Similarly, countries that export different types of goods (such as primary commodities, labour-intensive manufactures and advanced technology products) are likely to face very different conditions in global markets in terms of how prices are set, whether price or non-price competition is more important, whether supply constraints are binding, and so on. In all of these respects, future work on BP-constrained growth would do well to adopt a structuralist perspective and recognize that different models may be needed for different countries and situations.

REFERENCES

Alonso, J., Garcimartín, C. (1998/1999): A new approach to the balance-of-payments constraint: some empirical evidence, in: *Journal of Post Keynesian Economics*, 21(2), 259–282.

Araújo, R.A., Lima, G.T. (2007): A structural economic dynamics approach to balance-of-payments-constrained growth, in: *Cambridge Journal of Economics*, 31(5), 755–774.

Beckerman, W. (1962): Projecting Europe's growth, in: *Economic Journal*, 72(December), 912–925.

Berg, A., Ostry, J.D., Zettelmeyer, J. (2012): What makes growth sustained?, in: *Journal of Development Economics*, 98(2), 149–166.

Blecker, R.A. (1992): Structural roots of U.S. trade problems: income elasticities, secular trends, and hysteresis, in: *Journal of Post Keynesian Economics*, 14(3), 321–346.

Blecker, R.A. (2002): The balance-of-payments-constrained growth model and the limits to export-led growth, in: Davidson, P. (ed.), *A Post Keynesian Perspective on Twenty-First Century Economic Problems*, Cheltenham, UK and Northampton, MA: Edward Elgar, 69–88.

Blecker, R.A. (2007): The economic consequences of dollar appreciation for U.S. manufacturing profits and investment: a time-series analysis, in: *International Review of Applied Economics*, 21(4), 491–517.

Blecker, R.A. (2013a): Global imbalances and the U.S. trade deficit, in: Cynamon, B.Z., Fazzari, S.M., Setterfield, M. (eds), *After the Great Recession: The Struggle for Economic Recovery and Growth*, Cambridge, UK: Cambridge University Press, 187–215.

Blecker, R.A. (2013b): Long-run growth in open economies: export-led cumulative causation or a balance-of-payments constraint?, in: Harcourt, G.C., Kriesler, P. (eds), *The Oxford Handbook of Post-Keynesian Economics*, vol. I, *Theory and Origins*, Oxford: Oxford University Press, 390–414.

Blecker, R.A. (2016): Wage-led versus profit-led demand regimes: the long and the short of it, in: *Review of Keynesian Economics*, 4(4), 373–390.

Blecker, R.A., Razmi, R. (2008): The fallacy of composition and contractionary devaluations: output effects of real exchange rate shocks in semi-industrialised countries, in: *Cambridge Journal of Economics*, 32(1), 83–109.

Blecker, R.A., Razmi, R. (2010): Export-led growth, real exchange rates and the fallacy of composition, in: Setterfield, M. (ed.), *The Handbook of Alternative Theories of Economic Growth*, Cheltenham, UK and Northampton, MA: Edward Elgar, 379–396.

Boggio, L., Barbieri, L. (2016): International competitiveness in post-Keynesian growth theory: controversies and empirical evidence, in: *Cambridge Journal of Economics*, published online, February, doi: 10.1093/cje/bev067.

Branson, W.H. (1983): Economic structure and policy for external balance, in: Hooke, A.W. (ed.), *Exchange Rate Regimes and Policy Interdependence*, Washington, DC: International Monetary Fund, 39–66.

Bresser-Pereira, L.C., Oreiro, J.L., Marconi, N. (2015): *Developmental Macroeconomics: New Developmentalism as a Growth Strategy*, London: Routledge.

Cimoli, M., Porcile, G. (2014): Technology, structural change and BOP-constrained growth: a structuralist toolbox, in: *Cambridge Journal of Economics*, 38(1), 215–237.

Clavijo Cortes, P.H., Ros Bosch, J. (2015a): La Ley de Thirlwall: una lectura crítica, in: *Investigación Económica*, 74(292), 11–40.

Clavijo Cortes, P.H., Ros Bosch, J. (2015b): Respuesta a Ibarra, Pérez y Vernengo, in: *Investigación Económica*, 74(292), 81–90.

Cline, W.R. (1989): *United States External Adjustment and the World Economy*, Washington, DC: Institute for International Economics.

Dixon, R.J., Thirlwall, A.P. (1975): A model of regional growth-rate differences on Kaldorian lines, in: *Oxford Economic Papers*, 27(2), 201–214.

Dutt, A.K. (2002): Thirlwall's Law and uneven development, in: *Journal of Post Keynesian Economics*, 24(3), 367–390.

Gabriel, L.F., Jayme, F.G., Oreiro, J.L. (2016): A North-South model of economic growth, technological gap, structural change and real exchange rate, in: *Structural Change and Economic Dynamics*, 38(September), 83–94.

Garcimartín, C., Rivas, L.A., García Martínez, P. (2010/2011): On the role of relative prices and capital flows in balance-of-payment-constrained growth: the experiences of Portugal and Spain in the euro area, in: *Journal of Post Keynesian Economics*, 33(2), 281–306.

Gouvea, R.R., Lima, G.T. (2010): Structural change, balance-of-payments-constraint, and economic growth: evidence from the multisectoral Thirlwall's Law, in: *Journal of Post Keynesian Economics*, 33(1), 169–204.

Ibarra, C. (2015): Investment and the real exchange rate's profitability channel in Mexico, in: *International Review of Applied Economics*, 29(5), 716–739.

Ibarra, C., Blecker, R. (2016): Structural change, the real exchange rate and the balance of payments in Mexico, 1960–2012, in: *Cambridge Journal of Economics*, 40(2), 507–539.

Lima, G.T., Carvalho, V.R. (2008): Macrodinâmica do produto sob restrição externa: a experiência brasilera no período 1930–2004, in: *Economia Aplicada*, 12(1), 55–77.

McCombie, J.S.L. (1981): Are international growth rates constrained by the balance of payments? A comment on Professor Thirlwall, in: *Banca Nazionale del Lavoro Quarterly Review*, (139), 455–458.

McCombie, J.S.L. (2000/2001): The Solow residual, technical change, and aggregate production functions, in: *Journal of Post Keynesian Economics*, 23(2), 267–297.

McCombie, J.S.L. (2011): Criticisms and defences of the balance-of-payments constrained growth model: some old, some new, in: *PSL Quarterly Review*, 64(259), 353–392.

McCombie, J.S.L., Thirlwall, A.P. (eds) (2004): *Essays on Balance of Payments Constrained Growth: Theory and Evidence*, London: Routledge.

McGregor, P.G., Swales, J.K. (1985): Professor Thirlwall and balance of payments constrained growth, in: *Applied Economics*, 17(1), 17–32.

Moreno-Brid, J.C. (1999): Mexico's economic growth and the balance of payments constraint: a cointegration analysis, in: *International Review of Applied Economics*, 13(2), 149–159.

Oreiro, J.L. (2016): Inconsistency and over-determination in balance-of-payments-constrained growth models: a note, in: *Review of Keynesian Economics*, 4(2), 193–200.

Palley, T.I. (2002): Pitfalls in the theory of growth: an application to the balance-of-payments-constrained growth models, in: Setterfield, M. (ed.), *The Economics of Demand-led Growth*, Aldershot, UK and Brookfield, VT: Edward Elgar, 115–125.

Pérez Caldentey, E. (2015): Una lectura crítica de la 'lectura crítica' de la Ley de Thirlwall, in: *Investigación Económica*, 74(292), 47–65.

Pérez, E., Moreno-Brid, J.C. (1999): Terms of trade, exports and economic growth in Central America: a long-term view, in: *Banca Nazionale del Lavoro Quarterly Review*, (211), 431–449.

Perraton, J. (2003): Balance of payments constrained growth and developing countries: an examination of Thirlwall's hypothesis, in: *International Review of Applied Economics*, 17(1), 1–22.

Rapetti, M., Skott, P., Razmi, A. (2012): The real exchange rate and economic growth: are developing countries different?, in: *International Review of Applied Economics*, 26(6), 735–753.

Razmi, A. (2005): Balance-of-payments-constrained growth model: the case of India, in: *Journal of Post Keynesian Economics*, 27(4), 655–687.

Razmi, A. (2011): Exploring the robustness of the balance of payments-constrained growth idea in a multiple good framework, in: *Cambridge Journal of Economics*, 35(3), 545–567.

Razmi, A. (2015): Correctly analysing the balance-of-payments constraint on growth, in: *Cambridge Journal of Economics*, published online, November, doi: 10.1093/cje/bev069.

Ribeiro, R.S.M., McCombie, J.S.L., Lima, G.T. (2016): Exchange rate, income distribution and technical change in a balance-of-payments constrained growth model, in: *Review of Political Economy*, published online, July, doi: 10.1080/09538259.2016.1205819.

Rodrik, D. (2008): The real exchange rate and economic growth, in: *Brookings Papers on Economic Activity*, (2:2008), 365–412.

Ros, J. (2013): *Rethinking Economic Development, Growth, and Institutions*, Oxford: Oxford University Press.

Setterfield, M. (2006): Thirlwall's law and Palley's pitfalls: a reconsideration, in: Arestis, P., McCombie, J., Vickerman, R. (eds), *Growth and Economic Development: Essays in Honour of A.P. Thirlwall*, Cheltenham, UK and Northampton, MA: Edward Elgar, 47–59.

Thirlwall, A.P. (1979): The balance of payments constraint as an explanation of international growth rate differences, in: *Banca Nazionale del Lavoro Quarterly Review*, 32(128), 45–53.

Thirlwall, A.P. (1981): A reply to Mr. McCombie, in: *Banca Nazionale del Lavoro Quarterly Review*, (139), 458–459.

Thirlwall, A.P. (2011): Balance of payments constrained growth models: history and overview, in: *PSL Quarterly Review*, 64(259), 307–351.

US Bureau of Economic Analysis (2016): National Income and Product Accounts (NIPAs), Table 4.2.3, release of 28 June, URL: www.bea.gov (accessed 1 July 2016).

Vernengo, M. (2015): Una lectura crítica de la crítica al modelo de Thirlwall, in: *Investigación Económica*, 74(292), 67–80.