



A multi-sectoral balance-of-payments-constrained growth model with sectoral heterogeneity[☆]



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ABSTRACT

This study builds a multi-sectoral balance-of-payments-constrained growth model that incorporates structural heterogeneity between sectors and countries, such as differences in labor productivity, price competition, shares of exports and imports, and the quality of commodities. The model in the current paper generates more comprehensive results than those presented by Thirlwall (1979), Blecker (1998), and Araujo and Lima (2007), even though it contains their properties and reproduces their implications. Furthermore, compared with these existing works, the current model sheds more light on the relationship between the trade structure, international competition, productivity dynamics, and economic growth. It also shows the differences between industrial and macroeconomic phenomena, by presenting an example that illustrates how changes in nominal wages, the Kaldor–Verdoorn effect, and the degree of market competition in both countries affect economic growth in the home country.

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1. Introduction

This study builds a multi-sectoral balance-of-payments-constrained (BOPC) growth model. I comprehensively reveal how the economic growth of the home country is impacted by changes in the (i) wage growth rate, (ii) growth rate of the foreign country, (iii) dynamics of labor productivity, and (iv) increase in international competition. These issues are examined in the presence of heterogeneity in labor productivity, cost-price competition, export and import shares, and the quality of commodities between sectors and countries.

The BOPC growth model is a post-Keynesian, demand-led approach that postulates that the balance-of-payments position of a country imposes a limit on effective demand, to which supply can usually adapt. As is well known and I show below, in the canonical expression of BOPC growth, the economic growth rate of a country is determined by the so-called Thirlwall's law that originates in Thirlwall (1979).¹ Thirlwall's law implies that a country's

GDP growth rate is dependent on the GDP growth rates of other countries and that the ratio of the income elasticities of demand for exports and imports reflects non-price competitiveness. On the basis of this result, an economic policy implication is derived that to be non-price competitive, it is important to increase the attractiveness of the home country's exports compared with imported goods. Thirlwall's law reveals the mechanism of economic growth in the open economy context by focusing on a country's quantitative (exports, imports, and economic growth) and qualitative (non-price competitiveness) aspects.

Soukiazis and Cerqueira (2012) survey the development of various BOPC models, among which I extend the multi-sectoral model. I review the existing literature in Section 2 in detail. By taking BOPC growth as a long-run phenomenon, these models assume purchasing power parity (PPP). Variations in the terms of trade (the real exchange rate) are normally considered to be irrelevant for BOPC growth. This assumption implies that the models do not sufficiently

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¹ Thirlwall (2012) explains that Thirlwall's original model is built on the proposition of a limit to the external deficit–GDP ratio, beyond which financial markets become nervous. In other words, its basic idea is that economic growth with an

ever-growing deficit is unsustainable. This is why the standard BOPC model starts with the condition of a balance-of-payments equilibrium. It should also be noted that the BOPC model was established with critical implications for the export-led growth model à la Kaldor (1970), whose idea was formalized by Dixon and Thirlwall (1975). This is because the export-led growth model ignores the role of import demand and neglects the BOPC condition in determining the rate of economic growth. See also Blecker (2013) for a comprehensive survey of this topic and Razmi (2013) for a unification of the characteristics of both theories.

consider some important effects of relative price variations for economic growth. These variations come from changes in nominal wages, sectoral differences in labor productivity, market structure, and the price competitiveness of firms. Consequently, the relationship between these intriguing determinants of relative prices (terms of trade) and BOPC growth remains relatively unexplored in the existing literature.

It is important to consider the causes and consequences of changes in relative prices, especially in a multi-sectoral model. First, the empirical evidence shows that the impact of the establishment of PPP and relative prices on economic growth is mixed. Second, even if relative price effects are not likely to work in the long run (i.e., PPP holds in the long run), the effects still work in the short-to medium-run periods. In this process, the long-run growth path is not necessarily independent of a chain of shorter periods, which is the reason that relative price effects should not be neglected. Third, in the disaggregated model, the nominal exchange rate cannot simultaneously offset the change in relative prices in many sectors. Taking these factors into consideration, it is more appropriate to build a BOPC model that can also capture the influence of relative price changes on economic growth.

This study further extends the multi-sectoral BOPC growth model by including international competition and productivity dynamics. By incorporating cumulative causation and relative price effects, the current paper builds a model that is applied not only to long-run periods, but also to medium-run periods. I set up a model that places heterogeneous industrial structures, such as the different growth rates of labor productivity, exports and imports, preferences for commodities, and market competition, at the core of the analysis in the following manner. First, this study constructs a multi-sectoral model in which there is international trade between two countries that have multiple sectors in line with [Pasinetti \(1981, 1993\)](#), and [Araujo and Lima \(2007\)](#). Second, the market competition aspect of BOPC growth is introduced based on the Kaleckian model. Extending [Blecker \(1998\)](#)'s idea to multi-sectoral models, I assume international cost-price competition between each sector of both countries. Third, the structural aspects of BOPC growth such as sectoral export and import shares, market structure, and price competitiveness as well as the dynamics of productivity differences among sectors are investigated by using the concept of the Kaldor–Verdoorn effect.²

Thus, this paper reveals how structural heterogeneities, identified as changes in the sectoral composition of exports and imports, sectoral labor productivity dynamics, and intensifying international price competition, affect the economic growth rate of the home country. Although some of these attempts have been made in the existing literature, the current paper presents an economic growth model that can be used to comprehensively understand these results. Furthermore, it reveals some important results, hitherto undiscovered, by addressing the four questions mentioned above. I especially find that (i) the current model sheds more light on the relationship between the trade structure, international competition, productivity dynamics, and economic growth than the model in [Araujo and Lima \(2007\)](#). Specifically, (ii) the effect of a wage increase on the economic growth rate depends on the sum of cost-price competition elasticity, weighted by the share of exports and imports. Because of this, a rise in the home wage does not

necessarily decrease economic growth. This result contrasts with that of [Blecker \(1998\)](#). (iii) It also shows an example of the difference between industrial and macroeconomic phenomena. At the industrial level, a rise in the wage rate in the home country necessarily deteriorates each sector's trade balance, whereas its impact on the trade balance at the macroeconomic level is not necessarily the same. Such an implication may be close to what Keynesian economics has emphasized thus far as the fallacy of composition: it is not established that something is true of the macroeconomy just because it is true of some industry that composes the macroeconomy.

The remainder of the paper is organized as follows. Section 2 reviews the contribution of the existing literature on BOPC models. Section 3 builds an extended version of the multi-sectoral BOPC growth model with heterogeneous industrial structures. Section 4 first derives the economic growth rate under the multi-sectoral BOPC growth model with international competition and then explains the generality of the model. Furthermore, by way of a comparative static analysis, this section presents several theoretical and political implications that are specific to the multi-sectoral version of the BOPC growth model with structural heterogeneity. Section 5 presents my conclusion.

2. Related literature

Many contributions have been made since the seminal work of [Thirlwall \(1979\)](#). [Soukiazis and Cerqueira \(2012\)](#) comprehensively summarize the recent contributions with regard to the history, theory, and empirical evidence of BOPC growth models. The BOPC growth model has been subject to many extensions to account for several issues. According to [Thirlwall \(2012\)](#), the main research directions cover many topics such as incorporating capital flows, interest payments on debt, and terms of trade movement or disaggregating the model by commodities (multi-sectoral model) and trading partners to conduct an empirical investigation.

The original Thirlwall's law assumed that revenues from exports pay for imports. However, given that some economies attract financial capital, this assumption is too restrictive. Thus, Thirlwall's law has been revised to take into account the flows of financial capital. [Thirlwall and Hussain \(1982\)](#) is a seminal paper that includes capital inflows. By doing so, the authors find the short-run growth effects of real capital flows. The model is empirically analyzed from the 1950s to the 1970s, showing that capital inflows prompt economic growth in some countries. In this model, changes in export prices also affect the economic growth of developing countries by way of the real value of net financial inflows.

Contrary to this model that allows a perpetually rising ratio of net borrowing, [Moreno-Brid \(1998\)](#) addresses the long-run sustainability condition of indebtedness in the BOPC growth model, while [Moreno-Brid \(2003\)](#) adds interest payments on debt. In this framework, the sustainability condition of indebtedness is defined as the constant ratio of deficit to GDP, and the interest payment out of capital flows is included. These frameworks reveal that the existence of capital flows affects BOPC growth rates and that interest payments impose a constraint on these rates.

The impact of terms of trade or the role of relative prices in BOPC growth seems to be controversial. In many BOPC models, there are no relative price effects, and Thirlwall's law is derived as a long-run growth rate. However, according to some empirical studies, the results of the dynamics of relative prices or the real exchange rate and its impact on economic growth are mixed. For instance, [Alonso and Garcimartin \(1998\)](#) empirically show that relative prices play no role in economic growth because price elasticities are so low and relative prices do not adjust the BOPC disequilibrium. On the contrary, by applying the cumulative causation model to OECD countries, [Leon-Ledesma \(2002\)](#) empirically finds that prices do

² Introducing these effects into the multi-sectoral model with international competition is reasonable because productivity dynamics are one of the determinants of cost and price competitiveness. Furthermore, it is this circulatory effect on the economic growth rate that Kaldorian export-led growth has emphasized under cumulative causation ([Dixon and Thirlwall, 1975](#); [Setterfield and Cornwall, 2002](#)). However, as indicated in the preceding footnote, the canonical export-led model ignores the role of imports and thus the BOPC condition. With regard to the role of changes in relative prices in BOPC models, see also Section 2.

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