



# A North–South Model of Economic Growth, Technological Gap, Structural Change and Real Exchange Rate



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## ABSTRACT

The aim of this work is to present a model of economic growth, technological gap, structural change and real exchange rate in a formal and theoretical manner, explicitly incorporating the effects of North–South technology gap and the real exchange rate (RER) at a level compatible with its “industrial equilibrium” taking in account the external constraint. In the short term, an increase in the South growth rate of the demand implies that its natural growth rate must also rise, i.e., the level of industry participation and economic productivity should also increase. In the long run the effect of RER on economic growth is conditional on the size of the technological gap and the level of industry participation in South gross domestic product. This condition generates two different dynamics such as a saddle path and multiple equilibriums. To a large extent these results are achieved from the model complex dynamics.

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## 1. Introduction

Structural change and technological development in open economies are linked directly to the pattern of productive specialization. The productive structures of the countries are formed from their different competitive capabilities both domestically and in foreign markets.

According to the ECLAC’s structuralism and structuralist macroeconomics contributions, different patterns of specialization among countries are central to the explanation of economic backwardness. More developed productive structures can produce and exports more sophisticated goods, and help to catch up by reducing the technological

gap and the development of new technological capabilities in their national innovation systems.

A growing literature has been showing that a competitive level of the real exchange rate (RER) can help the economies to offset their technological and productive asymmetries by means of redefining their patterns of specialization. In general, there is a support in the empirical literature that stable and depreciated RERs favors exports diversification toward higher technological goods. Still, an overvalued real exchange rate discourage firms to invest in more sophisticated tradable goods, reducing the intensity of learning and negatively affecting the income elasticity of exports<sup>1</sup>. Indeed, according to Gala (2006, 2008) and Cimoli

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<sup>1</sup> Following Bhaduri and Marglin (1990), Gala (2006, 2008) shows that depreciated real exchange rates contributes to increase investment and capital accumulation through the rise of capacity utilization and exports. If the response of investment and exports are sufficiently elastic, the

et al. (2013) cases of success in catching up process and convergence in the years after the World War II had depreciated levels of the real exchange rates as well as industrial and technological governmental active policies.

The aim of this paper is to present a formal model of economic growth, technological gap, structural change and real exchange rate that encompasses the effects of the North–South technology gap and the level of real exchange rate (RER) at a level compatible with its “industrial equilibrium” on economic growth in external constraint conditions<sup>2</sup>.

The model intends to integrate technological gap and the real exchange rate level in a Kaldor–Verdoorn cumulative causation framework, showing their effects on the productive structure of developing countries (South) and developed countries (North). In this sense, integrates Evolutionary and Post-Keynesian approaches, as well as analyses how government policies can influence the path of the catching up process.

The basic theoretical hypothesis is that the effect of the level of the real exchange rate over the long-term growth depends on the extent of the technological gap and the level of share of industry in GDP for each country.

The economic growth of the South and the potential for catching up are related to its history of economic development (path dependency) and the degree of sophistication of its national innovation system (IS). Countries with greater capacity for learning and spillovers absorption have a higher possibility of carrying out the process of catching up. Otherwise, they may remain in a low-growth trap (“falling behind”). In this model new channels to economic growth and the potential for catching up are formally explored from the share of industry in gross domestic product and the use of real exchange rate (among others factors).

In a first long-term set up, the technological gap between the North and South is constant and the model presents a saddle path so that the stability thereof is conditional to the initial parameters. In another long-term set up it is considered the dynamic change of the technological gap over time. In this case the system displays multiple equilibriums: one stable and other unstable.

To a large extent, these results are achieved from the model complex dynamics. Due to its endogenous features, the model does not converge “automatically” to a certain point. Much of the development of complex dynamic

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economy will go into a pattern of investment-led growth. Regarding the process of technological change, if the real exchange rate is excessively appreciated this will affect the profitability of investments in the industrial sector, where increasing returns to scale are present. The reallocation of resources to non-industrial sectors, such as activities involving the production of commodities and services, where we observe decreasing returns to scale, the real appreciation of the exchange rate reduces the overall productivity of the economy. In the work of Hausmann et al. (2005) were identified 83 episodes of growth acceleration where the rate of growth of per capita income was raised by 2 percentage points or more in a sustainable manner for at least eight years. Before each episode occurred sharp depreciation of the real exchange rate (RER). In Sections 4–6 the arguments concerning the real exchange rate will be further developed in accordance with the purposes of the present work.

<sup>2</sup> In this work RER is defined as the price of foreign currency in terms of domestic currency adjusted by the price levels set by the North (developed economy) and South (developing economies).

economy has been presented by post-Keynesian models (Rosser, 2006)<sup>3</sup>.

To fulfill the proposed objective this paper is divided into seven other sections, besides this introduction. Section 2 presents the structuralist macroeconomics arguments about the productive asymmetry and economic growth. Section 3 displays the basic structure of the model which relates economic growth with external constraint and the potential output growth rate. Section 4 shows the part of the model related to structural change and the real exchange rate. Section 5 presents the relationship of the real exchange rate, mark up, wage and price levels. Section 6 makes the analysis of the long-term stability of the model considering a constant technological gap. Section 7 shows the technological gap dynamics and the Verdoorn learning growth rate in the long run. In this case, the technological gap will be changing over time. Finally, in Section 8, the final remarks are presented.

## 2. Structuralist macroeconomics and productive asymmetries

According to Dutt and Ros (2003, p.6), since the beginning of the 1980s there has been a resurgence of the research on economic development by at least four branches/developments.

In the first branch/development it was observed a blooming new neoclassical approach applying the tools of industrial organization, game theory and economics of information to agrarian issues, causes of poverty and income inequality. This tradition enlarges the applications of microeconomic theory on those issues<sup>4</sup>. In the second development the emphasis was put on major macroeconomic features of neoclassical growth theory and the renewed interest by the new growth theories<sup>5</sup>. The third development presents a less formalized literature that reexamines the experience of developing countries, especially for the East Asian NICs (Newly Industrialized Countries). This approach is interdisciplinary, incorporating ideas and theories of sociology, political science and economics<sup>6</sup>.

A fourth development, object of this section, shares the post Keynesian and the Kaleckian theory of economic growth. It analyses the determinants of growth, income distribution, inflation and fiscal complications as well as balance of payments issues, especially in developing countries (Dutt and Ros, 2003).

The structuralist macroeconomics presents a variety of macroeconomic models, in which the simplest version of these models consists of “two sectors”, as long as

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<sup>3</sup> For a deeper discussion about this topic see Setterfield (2006b) – “Complexity, Endogenous Money and Macroeconomic Theory” – Chapter 6 – J. Barkley Rosser, Jr.

<sup>4</sup> Examples for this approach are in Ray (1998), Bardhan and Udry (1999) and Basu (1998).

<sup>5</sup> To a review and evaluation of this literature see Ros (2000).

<sup>6</sup> According to Dutt e Ros (2003, p.7): “(…) there appears to be a move away from extreme views on matters such as state intervention and free market policies with the recognition, that the state and markets both have a role to play in development”. For further extension of this development see Amsden (1991) and Wade (1990).

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