The BRICS's Long-Term Economic Performance: A Comparative Analysis

André Nassif

Fluminense Federal University (UFF) and the Brazilian Development Bank (BNDES), andrenassif27@gmail.com

Carmem Feijo

Fluminense Federal University (UFF)
cbfeijo@gmail.com

ElianeAraújo

State University of Maringá (UEM)
elianedearaujo@gmail.com

Rio de Janeiro, Brazil

October, 2015

Paper prepared for the 19th Annual Conference of the Research Network Macroeconomics and Macroeconomic Policies ("FMM Conference: The Spectre of Stagnation? Europe in the World Economy/Area: Comparison of Economic Performance in Different Parts of the World"), Berlin, Germany, 22-24 October, 2015. The authors thank Luis Carlos Bresser-Pereira, Renato Baumann, Cláudio Leal, Marcelo Machado Nascimento, Francisco Eduardo Pires de Souza, Ricardo Agostini Martini and the participants of the workshop organized by the Planning Area of the Brazilian Development Bank (BNDES), 24 July, 2015. The authors are responsible for any remaining errors. The views and positions of this paper are those of the authors, and do not reflect the Brazilian government's, nor the BNDES's opinions.

ABSTRACT

Despite its popularity, the acronym BRICS (Brazil, Russia, India, China and South Africa) would not be justified if one considers the historical, economic and cultural differences among the countries in the group. However, after the acronym was created in 2001 as BRIC (South Africa was included later), the governments of the BRICS have engaged in international and political negotiations in the recent years as if they were an economic regional group. Thus, our aim in this paper is to compare the economic performance of the BRICS using descriptive statistical indicators between 1980 and 2013, and econometric evidence based on estimates of Thirlwall's law for the period 1995-2013. A parametric test revealed that, except for Russia, our predicted balance of payments growth rates did not statistically differ from the actual GDP growth rates for the BRICS. Our results confirm that China and India have shown a rapid catching up path between 1995 and 2013. Although Russia's long-term growth trajectory cannot be confirmed, Brazil and South Africa, by having shown estimated balance-of-payments-constrained long-term growth rates below (Brazil) or far below (South Africa) the world economic growth rate, have entered into a falling behind path in the last two decades.

Keywords: structural change; economic development; catching up; falling behind; BRICS

JEL classification: 011; 014; 019; 047; P52

The BRICS's Long-Term Economic Performance: A Comparative Analysis

1. Introduction

The acronym BRIC (Brazil, Russia, India and China), which later became BRICS with the inclusion of South Africa, was first coined by the Goldman Sachs economist Jim O'Neill. It then appeared in a Goldman Sachs paper (see Wilson and Puroshothaman, 2003) that aimed to estimate long-term economic growth rates for those countries until 2050. This study, which used demographic projections and a model of capital stock accumulation and productivity growth, concluded that the BRICS could be larger than G6 in dollar terms by 2040 and a much larger force in the world economy by 2050. This central conclusion was so appealing that the acronym BRICS perhaps became better known in global markets than several regional economic agreements such as ALADI (Latin American Integration Association), CARICOM (The Caribbean Community) and ASEAN (Association of Southeast Asian Nations).[1]

As a matter of fact, the wide acceptance of this acronym would not be justified by an in-depth comparative investigation into the economic development of the countries that constitute the group. In the case of BRICS, however, one can say that the creature went far beyond the creator. After the publication of the Goldman Sachs paper, the governments of the BRICS countries not only created an international New Development Bank as well as a US$100 billion Contingent Reserve Arrangement, but have also engaged in international and political negotiations in recent years as if they were an economic regional group. This strongly suggests that, actually, BRICS became more than just an acronym. Therefore, notwithstanding their historical, economic and cultural differences, their increasing political and economic influences justify a comparative study on the economic performance of the BRICS countries in the last decades.[2] In particular,

[1] There have been several summits in which the respective BRICS's heads of state discussed diplomatic cooperation and market integration. The BRIC formally became the BRICS (with the inclusion of South Africa) at the third summit in Hainan, China, in April 2011. See O'Boyle (2014).

[2] As O'Boyle (2014:1) recognizes, the BRICS countries have taken on "a greater geopolitical role, which aims to enact institutional reforms that shift global power".

we aim to investigate the long-term economic performance of the BRICS countries, using descriptive statistical indicators and econometric evidence, in order to identify which of them have succeeded in accelerating the catching-up process and which of them are, in contrast to the Goldman Sachs projections, falling behind.

One of the few consensus views in economic theory is related to the main driving force for long-term economic growth. Both neoclassical and heterodox economists agree that, everything else being equal, technological progress is the main engine of long-term economic growth.[3] However, the main point of disagreement concerns **how** a country can generate and diffuse technological progress and, therefore, accelerate economic growth. Broadly speaking, while the neoclassical approach emphasizes the role of free markets in efficiently allocating resources to provide maximum social welfare in the economy, the heterodox approach challenges this belief, questioning the capacity of free markets to provide the best allocation of resources in both static and (mainly) dynamic terms. Not coincidentally, the main normative implication of this theoretical divergence is that neoclassical economists emphasize deregulation and free trade policies in providing *sine qua non* conditions for accelerating technological progress and long-term economic growth, while heterodox economists emphasize the role of the state in combining policy instruments to influence private markets' decisions and short- and long-term economic performance.

If one compares economic policy regimes that the BRICS have adopted in the past decades, he or she will realize that China is the only one that has gone far from laissez-faire or even unconditional free trade policies. First of all, it is hard to regard the Chinese economy as a totally capitalist economy or a market economy, given the severe control over all markets (goods, money and exchange rate markets) by the government (Inter-American Development Bank, 2004; Artus *et.al.,* 2011). Since the early 1980s the "great openness to the world" was limited to the Special Economic Zones (SEZs), enclaves within which multinational enterprises have been located and have had the freedom to import parts, components and other inputs with zero import tariffs and other tax exemptions for producing exclusively to export. China's domestic market has been highly protected from foreign competition and from free operations of multinational firms. Note that protection here does not necessarily means non-tariff and tariff barriers against imports, but other

[3] In the history of economic thought, some forces are more emphasized than others as the main drivers of economic development, such as capital accumulation (see Marx, 1887), institutions (see North, 1990) or even stable long-term expectations and investment to GDP ratios (see Keynes, 1936 especially ch.11 and 12). However, technological progress is one of the most important factors to accelerate labour productivity, generate structural change and sustain economic development.

ways of protecting domestic markets in China. Non-tariff barriers were eliminated and tariff imports sharply reduced in the mid-1990s. However, since then, although the Chinese governments have been relaxing the previous prohibition to multinational enterprises establishing plants to sell in their internal market, the authorisation has been subject to several constraints and conditional requirements, such as the transfer of technology and know-how to local firms, joint-ventures with state-owned enterprises, among others (Feenstra, 1998; Interamerican Development Bank, 2004; Cesarin, 2005; Artus *et.al*., 2011). In some sense, Chinese development strategies seem to be following, in very radical terms, List's famous recommendation of protecting national infant industries during the time required for catching up and acquiring the capacity to compete in global markets.

India's liberalising reforms in the early 1990s, in turn, were adopted in a much more cautious way. For instance, Indian trade liberalisation lasted more than 10 years (WTO, 2002); short-term foreign capital flows were relaxed for financial resources directed towards stock markets, but not to private and governmental securities (Patnaik and Shah, 2012; Subbarao, 2014) and industrial policies have been closely coordinated with short-term macroeconomic policies (particularly monetary and exchange rate policies) with the goal of creating dynamic comparative advantages and sustaining long-term economic growth (Government of India, 2014). With well successful interventions in the foreign exchange markets and moderate capital controls, the Reserve Bank of India have preserved the stability of the real exchange rate and avoided India's currency overvaluation in real terms (Subramanian, 2010; Subbarao, 2014).

Meanwhile, Brazil's, Russia's and South Africa's liberalising reforms were introduced from the early 1990s on and were implemented quickly and without a fine coordination with short-term macroeconomic policies. Actually, we can say that in these economies, liberalising reforms were introduced as a "shock therapy" (Lin, 2009). From the 2000s on, these economies have started to use active industrial policies again, but, for several different reasons, they have been facing coordination problems. Not by chance, saved in episodically times, since the 1990s, Brazil´s, Russia´s and South Africa´s currencies have cyclically overvalued in real terms (see, among others, Nassif, Feijó and Araújo, 2011 and 2015; Gaidar Report, 2014; Faulkner *et a*l , 2013).

These different national strategies suggest that the way each country engages in international trade and global capital flows does matter in influencing its long-term economic performance. With the main goal of presenting empirical evidence of the BRICS's long-term economic performance on a comparative perspective, this paper is divided into three additional sections. Based on preliminary evidence that some of the

BRICS countries have adopted more state interventionist policies while the others have prioritized more liberal strategies, since the early 1990s, Section 2 presents a discussion on the theoretical principles that support these different approaches to accelerate economic development. Section 3 shows descriptive statistics for the period 1980-2013 and econometric evidence on the long-term economic performance of the BRICS between 1995 and 2013. Section 4 draws the main conclusions.

2. Static comparative advantage versus developmental strategies to promote economic development: a review of the debate

2.1 The theoretical debate

It is a commonplace to take the evolution of per capita income as the standard indicator of the pace of a country's catching-up process over time. The investigation is mainly concerned with identifying the economic forces that could explain the rapid and sustainable growth of per capita income necessary for the country to catch up. A relative consensus has emerged that, everything else being equal, the creation and diffusion of innovation and technological progress is the main engine to promote structural change and economic development. However, the forces responsible for easing the creation and diffusion of innovation and technological progress represent the main point of disagreement among theoretical economists.

The theoretical approaches concerning that issue are broadly two. The first one, the liberal approach [4] as we could call it (which follows the neoclassical paradigm), is based on the belief that market forces are, apart from a few exceptions, sufficient to provide the best allocation of resources in the economic system, and so to boost and diffuse technological progress as well as accelerate long-term growth. According to this approach, economic development results from the efficiency with which resources are combined in the economy as a whole. The second one, which we could label the developmental approach (or national strategic approach, which follows the heterodox paradigm), challenges the assumption that market forces are strong enough on their own to provide the best economic efficiency both in static and dynamic terms.

[4] The term liberal is used in the economic (and not political) sense, and it is different from the term neoliberal which is associated to the "Washington Consensus" "new" liberal agenda as codified by Williamson (1990).

2.1.1 The liberal approach

The liberal approach has been built together with international trade theories, especially under the umbrella of the theory of comparative advantage, in its neoclassical version, the so-called Heckscher-Ohlin-Samuelson model (H-O-S). In its well-known textbook presentation, the H-O-S model not only kept unchanged the Ricardian necessary condition for countries to trade in the global economy (different inter-industrial relative costs and prices in each country in "autarky") but also was constructed through an integrated theoretical body to ideologically support the advantages of free international trade: since all countries in the world specialize in activities or industries with minor relative costs and prices (explained, in turn, by the intensive use of the factor considered abundant in each of them)[5], the adoption of free trade strategies could allow them to provide the best allocation of resources in order to maximize economic efficiency.

The H-0-S standard theoretical model, which supports the argument that free trade is the first-best strategy to provide both countries static benefits, fits well in the Walrasian general equilibrium model and fulfills the conditions for reaching the maximum social well-being in the Pareto sense. Any State intervention (through domestic or trade policies) would only be justified if markets fail to show the best economic result. Even so, policy intervention would be a "second best" compared with the "first best" provided by free market forces.

In particular, it is Samuelson´s factor price equalization theorem (Samuelson, 1948; 1949; 1962) that gave support for not considering relevant the kind of product traded in international markets. In fact, if free trade promotes the equalization of all relative prices of goods and factors, it does not matter if a country specializes and exports either coffee or airplanes. In the modern microeconomic theory of market failures, government should only care about horizontal policies aiming to correct failures that prevent market forces from producing more technologically sophisticated goods.

[5] The Ricardian sources of comparative advantage (intersectoral differences in relative productivity and technologies) were confirmed by several empirical tests (see McDougall, 1951; and Balassa, 1963). However, it was the Heckscher-Ohlin (H-O) approach that turned out to be hegemonic in the static theory of international trade, even though the H-O version has not, paradoxically, been confirmed by Leontief's (1953) most famous statistical test. As Dosi and Soete (1988: 415-416) pointed out, given the political implications of the so-called Leontief "paradox", following empirical strategies were used to test the Heckscher-Ohlin model with the introduction of variables (e.g. labour skills) that do not derive rigorously from the original theory.

Most of the literature that incorporates the role of static increasing returns to scale, product differentiation and oligopolistic competition in trade models have not given up the canonical H-O model as the base for determining the net trade pattern (i.e. exports minus imports). Krugman (1979, 1980, 1981) showed that while relative factor endowment continued to be the main force to explain the net trade pattern in each country (expressed by inter-industrial trade among countries in the world economy), the combination of increasing returns to scale and product differentiation is responsible for determining the intra-industrial international trade. Since it is assumed that in international markets all firms compete under conditions of monopolistic competition *à la* Chamberlin, the lack of barriers to entry and exit assures that all of them can just obtain normal economic profits. Therefore, gains from trade are assured once consumers in each country can have access to a greater variety of differentiated products with decreasing prices. [6]

Even in "new trade theory" models, which incorporate assumptions such as imperfect competition, static economies of scale and product differentiation, the gains from trade are expressed in static terms.[7] It is true that a strand of the [neoclassical] "new trade theory" has emphasized the dynamic impacts of trade flows on long-term growth (see Grossman and Helpman, 1991). In general terms, a country can accelerate its long-term growth if it is able to take advantage of the immense flow of knowledge derived from globalized trade. The main problem with these models is that they understand knowledge as a good that can be freely captured or traded in global markets. Indeed, technology is restrictively understood as a "blueprint" derived from activities of research and development in a specific sector characterized by the existence of a large number of firms under monopolistic competition. In any case, even under these restrictive assumptions, Grossman and Helpman (1991, ch.9: 246-250) show that, if there is a significant technological gap between two countries, the one lagging the most in terms of technological and innovative capacities may not be able to capture the knowledge flow generated by free trade. If this is the case, the less innovative country, despite enjoying static gains from trade (through access to a greater variety of differentiated goods), would grow slower than its trade partner.

[6] We should recall Graham (1923), who was the first author to challenge the general conclusion that free trade was beneficial to all countries following such strategies. According to him, even static gains from trade could be severely impaired in a country pursuing free trade strategies if a sharp reallocation of resources should occur from industries with increasing returns to scale (especially in the manufacturing sector) to industries with non-increasing returns to scale. Krugman, Obstfeld and Melitz (2012:145-148) also recognize that countries can lose from trade, although stress that "the difficulty of identifying external economies in practice is one of the main arguments against activist government policies towards trade (op. cit: 148).

[7] For details, see Helpman and Krugman (1985).

2.1.2 The developmental approach

The developmental approach has many contributions and roads to be explored. Prebisch (1950) was one of the first economists to challenge, particularly in the context of Latin American economies, the normative liberal implications of the H-O-S model, especially Samuelson's theorem of factor-price equalization. For him, this theorem does not hold in the real world, because goods differ as to their respective income elasticity of demand – higher for manufactured products (especially those more technologically sophisticated) than for traditional goods, especially primary ones. Based on his centre-periphery model, Prebisch (*op. cit*.) identified the connections between international trade and balance of payments, anticipating important insights developed later on by Nicholas Kaldor (1966; 1970) and A. P. Thirlwall (1979) about balance of payment restrictions on growth. According to Prebisch's theory, since goods in which "peripheral" countries are specialized (basically primary products) have lower income elasticity of demand than those in which "centre" countries are specialized (manufactured goods), reciprocal static gains from free trade are not assured, for relative prices in a long term perspective tend to benefit advanced countries. On the other hand, because developing countries specialize in goods with low income elasticity of demand, their long-term economic growth is constrained by balance of payments, according to Thirlwall's law.

As Thirlwall (2011) recently recognized, Thirlwall's law (Thirlwall, 1979) is strongly based on Prebisch's (1950) critique. Thirlwall's law is generally expressed as :

$$\frac{\dot{Y}}{\dot{Y}*} = \frac{\varepsilon_X}{\pi_M} \tag{1}$$

where $\dot{Y}$ is the rate of economic growth in the domestic country; $\dot{Y}*$ is the rate of world economic growth; ε_X is the income elasticity of demand for exports; and π_M is the income elasticity of demand for imports Thirlwall's law can be used as an indicator to evaluate whether a country has been in a catching-up or falling-behind process for a long period (Nassif, Feijó and Araújo, 2015). In fact, equation (1) shows that the convergence of the rate of economic growth in a particular country (say, a developing country) to world economic growth depends on the ratio of income elasticity of demand for exports to that for imports. In other words, if the country's trade specialization pattern is such that the

income elasticity of demand for exports increases at a slower rate than that for imports, it will not sustain long-term growth, because balance-of-payment constraints will emerge, forcing the economy to slow down its growth path.

Equation (1) is the "strong" version of Thirlwall's law, which assumes constant relative prices in international trade in the long-term (and, therefore, constant real exchange rates). A "weak" version of Thirlwall's law can be expressed as:

$$\frac{\dot{Y}}{\dot{Y}^*} = \frac{X}{\pi_M} \tag{2}$$

Equation (2) can also be used as a measure of a country's convergence to the world economy over time when the parameter ε_X is not estimated. As Thirlwall (2011:17-18) argued, in this case, "[actual] export growth (X) must also include the effect of relative price changes as well as the effect of the world on [the country's] income growth, which weakens somewhat the argument that the balance of payments is always brought into equilibrium by domestic income changes". He added: "The model is best tested, therefore, using the "strong" version if robust estimates can be made of ε_X".[8]

Prebisch was not the first author to challenge the theories of comparative advantage in the history of economic thought.[9] The developmental tradition started with Hamilton (1791) and List (1841), continued to be developed by Posner (1961) and has been modelled by post-Schumpeterian authors such as Giovanni Dosi, Luc Soete and Keith Pavitt (1990). In this book, Dosi, Pavitt and Soete (1990) point out that Ricardian and H-O models assume that, once a country abandons autarkic strategies by engaging into free trade, aggregate national income does not change. Trade, then, does not have any effect on growth, but only on the improvement of relative efficiency in alternative uses of productive resources, given the same national aggregate level of income that prevailed in autarky. Therefore, even if both countries might gain from free trade strategies, these benefits would be static in the sense that they not only would represent a reallocation of resources towards sectors in which each of them has comparative advantage, but also would provide each country with greater aggregate consumption than would have been possible under autarkic conditions. In a few words, gains from trade is static and once for all.

[8] Comparing the right side of equation (2) with the actual growth rate of a country, one can evaluate how much the growth rate predicted from the balance-of-payments-constrained model (the right side of equation 2) fits the country's actual growth rate..

[9] The authors and roads to be explored on this topic are numerous. We focus on authors who have discussed the catching-up process in the context of an open economy. For this reason, we cast aside important development models such as Rosenstein-Rodan's (1943) big push theory and Lewis's (1954) model of economic development with unlimited supply of labour.

Another important critical contribution of the post-Schumpeterian literature is found in Dosi, Tyson and Zysman (1989), when the auhors introduce the concept of "Schumpeterian efficiency" to refer to the dynamic effects of resource allocation on the path and direction of technological change. The authors do not totally reject the importance of efficiency evaluated in static terms according to either the Ricardian or Heckscher-Ohlin tradition. However, they argue that if the economy is managed in such a way as to yield only static efficiency in resource allocation, a trade-off will occur between "Ricardian efficiency" and "Schumpeterian efficiency".[10] Summing up, Dosi, Tyson and Zysman (1989) argue that, since the opportunities for technological change are quite differentiated by goods and sectors, an allocation of resources wholly (or almost wholly) oriented to free markets and relative prices, despite improving the efficiency of the economy in static terms ("Ricardian efficiency"), could jeopardize technological development and long-term growth ("Schumpeterian efficiency"). This trade-off can be explained by the peculiarities involving innovative activities. "Heretic" authors such as Rosenstein-Rodan (1943), Schumpeter (1943), Hirschman (1958), Posner (1961), Kaldor (1966) and Nelson and Winter (1982) emphasize that most innovative activities come from the manufacturing sector and are subject to static and dynamic economies of scale[11] that operate through several dimensions.[12]

Kaldor (1966) was the first to highlight the static and dynamic economies of scale as a "macro-phenomenon", emphasizing the importance of a large and diversified manufacturing sector for developing countries. Indeed, he was one of the pioneers to call attention to the damage a developing country still in a catching-up process suffers by embarking on a premature de-industrialization.

In a recent debate about the importance of manufacturing for long-term growth, many authors have emphasized the role of tradable services, especially those in information and communications technology (ICT), as an important source of both labour

[10]This is the most important aspect of the post-Schumpeterian models of, for example, Dosi, Pavitt and Soete (1990) and Dosi, Tyson and Zysman (1989), compared with the endogenous growth models applied to open economies, such as those described in Grossman and Helpman' s (1991) seminal work. In several models shown in this book, a stock of knowledge is considered synonymous with technology.

[11] As can be checked in every microeconomic textbook, static economies of scale depend on the size of the firm, while dynamic economies of scale depend on the accumulation of knowledge and learning over time.

[12] First, innovative activities, which involve high entry costs and large financial resources subject to sunk costs, lead to significant static economies of scale once they are introduced into the productive process. Second, considering that innovative activities are highly dependent on learning, accumulation of knowledge and job training, the more firms and industries innovate, the higher will be their dynamic economies of scale. Third, the technological gap does matter, in the sense that since innovative activities are non-ergodic and cumulative ("path dependence"), the more technologically advanced firms, industries and countries are, the more their potential to introduce successful innovation in new methods of production and new goods. Finally, the potential for spillover of external economies (Marshallian economies) into the rest of the economy is greater for industries with more technological content, which are part of the manufacturing sector.

productivity and economic growth. In this sense, the traditional classification of manufacturing activities should be updated to include ICT services.This is an important remark because after the microelectronics revolution, several tradable services (e.g. software, information and communications technology, and R&D) are, along with the manufacturing sector, increasing forces to boost labour productivity, structural change and growth. Zysman *et al*. (2010) argue that, since these "new" tradable services are connected to the strategies and production of firms and industries that operate in both the manufacturing (predominantly) and primary sectors, rigidly separating the forces of change driven by the manufacturing sector and the high-tech tradable services is neither possible nor necessary.[13]

In short, the developmental strategies depart from both the theoretical and normative implications related to the liberal approach based on comparative advantage as authors reject the general equilibrium paradigm, and work on important effects that international and intersectoral adjustments have on macroeconomic activities. According to Dosi, Pavitt and Soete (1990: 26-27), the growth of each economy is often balance of payment constrained, and this constraint becomes tighter or looser according to the levels and composition of the participation of each country in world trade flows.

2.2 The normative debate

So far, we have been discussing issues related to the "positive" economics (i.e. the theoretical part) of the liberal versus developmental approach controversy. A panoramic discussion of the "normative" economics related to this controversy is needed. As, anticipated earlier, the theoretical arguments of the liberal approach do not support industrial policy and other governmental interventions, unless there is a clear evidence of market failures.[14] Even so, authors in favour of the liberal approach always stress the difficulty of correctly identifying market failures, so governmental intervention can aggravate the original flaw, creating a "government failure".[15] In other words, liberal economists reject governmental intervention in the process of economic development, and prefer the use of governmental policy mechanisms that benefit the economy as a whole

[13] In other words, in countries where these new forces of change are significant – the developed countries, basically, and at least one of the BRICS, India, where the software "industry" has been one of the most important engines of economic growth in recent decades – tradable services, rather than reducing the weight of the manufacturing sector (especially in developing countries), should be analysed as an additional force contributing to structural change and economic development.

[14]The theory of market failures was pioneered by Samuelson (1954), Meade (1955) and Bator (1958).

[15] For details, see Corden (1974: 13).

(through the so-called horizontal instruments of industrial policy), such as investment in infrastructure and education and subsidies in research and development (R&D).

More recently, even some economists who favour a more pro-active industrial policy have analysed it within the market failure framework. Hausmann and Rodrik (2002), for instance, define the process of economic development as a "self-discovery" of new processes, goods and activities. Since there are plenty of imitators, both in a specific country and in the global economy, entrepreneurs are continuously facing lack of information about the real possibility of capturing all return gains from the introduction of innovations either in goods and services or in productive processes (or, in the authors' words, in discovering new processes, goods and activities).[16] In this context, the role of government in developing countries is to help potential innovators to discover new processes, goods and activities with high possibility of being demanded by markets.

The challenge is to choose the most appropriate instrument to boost successful innovations in the market. Instead of import protection, which would not be able to discriminate between actual innovators and copycats, Hausmann and Rodrik (2002) recommend public credit (provided by development banks, for example) to potential innovators. The authors rightly conclude that while consumers demand "new discoveries", trade protection tends to prevent actual innovators from recovering the sunk costs of R&D by promoting premature entry of imitators into the market and creating excessive entry of enterprises, undermining the gains from economies of scale in activities subject to increasing returns to scale. Nevertheless, the issue is that a free trade tariff, by stimulating major import penetration of close substitute goods, would drive away potential local innovators before they had had time to learn and spread out their products in the market. The major challenge for policy-makers is to find a balance through which adequate trade protection can stimulate innovation and avoid undesirable entry of imitators, but, at the same time, innovative producers can have access to intermediate and capital goods with low or zero import tariffs.

[16] As Hausmann and Rodrik (2002:5, emphasis from the original) point out,

> *Typically, the intellectual property regime protects discoverers of **new** goods through the issuance of temporary monopolies, i.e., patents. But the investor in the developing country who figures out that an **existing** good can be produced profitably at home does not normally get such protection, no matter how high the social return. Indeed, ease of entry by competitors (i.e., imitators or copycats) is normally judged to be an important indicator of how well markets function—the lower the barriers to entry, the better. Free entry makes the nonappropriability problem worse, and undercuts the incentive to invest in discovering what a country is good at producing. Laissez-faire cannot be the optimal solution under these circumstances, just as it is not in the case of R&D in new products.*

On the other hand, the developmental approach supports active industrial and technological policies in developing countries in order to accelerate their catching-up process.[17] The main argument is that firms, sectors and countries differ as to their technological capabilities and innovative potential in the global economy. In addition, considering that technologies have specific peculiarities such as path dependence and lock-in (Arthur, 1989, 1990), a country (say, a developed one) that is specialized in producing engineering-science and knowledge-based goods tends to reinforce this pattern of specialization, while another (say, a developing country) whose activities are concentrated on the production of natural-resource-based goods tends to perpetuate its productive structure and pattern of specialization in these activities, in the absence of appropriate industrial and technological policies. Therefore, since goods and sectors have different long-term income elasticities of demand, economic theory clearly supports a combination of selective ("vertical") and horizontal instruments of industrial and technological policies that aim to change the productive structure of a developing economy and, therefore, the pattern of trade specialization (i.e. promote "dynamic comparative advantages") and to accelerate economic development. [18]

In other words, the role of governmental intervention is to combine a set of policy instruments such as moderate trade protection, production subsidies, R&D subsidies, public credit, local content requirements and governmental purchases in order to promote technological transformation, structural change and, consequently, economic development.[19] As most dynamic industries are part of the manufacturing sector, selective instruments should preferentially target those with more capacity to generate innovations and spillover effects of technological progress throughout the economic system.

However, it is important to stress that the major challenge faced by governments is **how** to combine selective mechanisms with horizontal instruments and for **how long**. With regard to selective instruments, some questions are hard to answer. For instance, which

[17] Gerschenkron (1962) was one of the first authors to show that there is little empirical evidence to support the claim that economic backwardness is overcome without active state intervention. According to Amsden (2001: 85), "as a catch up strategy, free trade appears to have been limited to Switzerland and Hong-Kong". Chang (2003: 2) also showed that most developed countries used "bad trade and industrial policies, such as infant industry protection and export subsidies" in the past.

[18] Unsatisfied with the lack of attention to the effectiveness of Brazil's industrial and technological policies in promoting a change to a more sophisticated industrial structure since trade liberalization was implemented in 1990, Nassif (2000) showed that, from the theoretical point of view, there is no incompatibility between both policy strategies (that is to say, between trade liberalization and industrial and technological policies).

[19] As a matter of fact, we are aware that some of these policy instruments are constrained by multilateral agreements under the World Trade Organisation (WTO).This means that these instruments should be used without violating these multilateral agreements. Ocampo *et al.* (2009, ch. 9) advocate credit policies by developmental banks, as a powerful instrument still not constrained by multilateral trade agreements, to promote structural change to reduce the technological gap.

industries should be primarily targeted? What should be the best policy instrument – an import tariff, an R&D subsidy or a combination of both? These policies should not only be effective in terms of structural change and economic development but also avoid the predominance of corruption and rent-seeking unproductive activities.

Although there is no magic rule to answer these questions, we could draw some important lessons from the experience of the highly successful countries of East Asia (especially South Korea).[20] These could be summarized as follows: i) the levels of protection must be moderate or low, and high levels of protection as in the case of Latin American countries in the import substitution period (especially during the 1970s and 1980s) must be avoided; ii) the degree of dispersion must be relatively low, and a situation in which some industries have high and others have low levels of effective import tariff must be avoided; iii) the protection level for intermediate and capital goods not targeted by industrial policy must be close to what is provided in a free trade policy; iv) public incentives (import tariff, subsidies, public credit, and so on) must be temporary in order to avoid corruption and rent-seeking unproductive activities; v) governments must be "hard" in the sense that they must require economic performance from private entrepreneurs who benefit from public incentives over time (in terms of reducing the technological gap, increasing labour productivity and reducing average costs, among other results); vi) investment and qualitative improvement in education and job training are essential to realize the expected results from industrial and technological policies; last but not the least, vii) there must be a fine coordination between the long-term industrial and technological policies and the short-term macroeconomic policies (especially monetary, fiscal and exchange rate policies).

The last point deserves further attention because it is necessary to observe that a macroeconomic policy regime to promote catch up must be able to maintain a countercyclical fiscal policy, a low and stable long-term inflation rate, low real interest rates and a competitive real exchange rate (that is to say, a marginal undervaluation of the domestic currency in real terms) over time.[21] The capacity of policymakers to maintain the latter three macroeconomic prices around those levels is a *sine qua non* condition for reducing the opportunity cost of investment in both productive and innovation projects and,

[20] See especially Alice Amsden's masterful work (1989).

[21] Extensive empirical literature shows that an overvalued currency in real terms for a long period of time tends to reduce economic growth. As we stressed elsewhere (see Nassif, Feijó and Araujo, 2011; 2015), a domestic currency marginally undervalued in real terms is essential for a developing country to pursue its catching up process and long-term growth. This conclusion was empirically supported by Rodrik (2008), Williamson (2008) and Berg and Miao (2010).

therefore, augmenting the possibility that the expected results of the industrial and technological policies are realized.

Government interventions aiming at accelerating structural change to increase and sustain long-term growth rate will not work if those key macroeconomic prices are not in the "right" place. Among the three macroeconomic prices, one is the most important for a developing country to continue its catching up trajectory: the real exchange rate. This is so in virtue of its direct or indirect impact on several other microeconomic and macroeconomic variables. As Bresser-Pereira, Oreiro and Marconi (2014:10-11) pointed out:

> *Imports, exports, the investment rate, the saving rate, and inflation depend on it [on the real exchange rate]. Investments depend on it because we may think the exchange rate as the light switch that connects or disconnects the efficient business enterprises existing in a country from foreign markets and their own domestic markets. (…). The main problem that developing countries face is the tendency to the cyclical and chronic overvaluation of the exchange rate. If this tendency is not duly neutralized, the macroeconomic prices will be wrong (…): the exchange rate will be overvalued, the wage rate and all other revenues will be artificially high, the expected profit rate will be depressed, the interest rate will tend to be high, and, if the depreciation of the national currency is still taking place (it didn´t level out) the inflation rate will fall. Thus, while the rentier capitalist will be happy with a high real interest rate, the business entrepreneurs - the men and women that really accumulate capital and innovate – will only invest to keep their plants technologically competitive [if they even do so].*

In developing countries, there have been two forces contributing to the cyclical tendency of their domestic currency to appreciate: the first, a structural force, is the "Dutch disease", which severely affects some of the BRICS's larger exporters of commodities, like Brazil, Russia and South Africa. The second one is predominantly a financial force that acts in countries with a very open external capital account, again, as having been the case of Brazil, Russia and South Africa since the early 1990s. In phases during which global financial markets are liquid, excessive net capital inflows can move towards countries whose policy-makers have chosen to sustain economic growth with foreign savings, contributing, therefore, to the appreciation of the domestic currency in real terms.[22] Considering that the overvaluation trend jeopardizes long-term growth, a government has a set of useful policy instruments to prevent this from happening. While the effect of the "Dutch disease" on the cyclical trend of currency appreciation can be neutralized by an income tax on the Ricardian rents generated by commodity exports,[23] the impact of

[22] In some sense, this second force can also be understood as structural because the strategy of growth with foreign savings, although not sustainable in the long-term, is the government's choice of a particular country.
[23] This is Bresser-Pereira, Oreiro and Marconi's (2014) suggestion.

excessive net capital inflows on currency appreciation can be avoided with a mix of policy instruments, such as sterilized purchases of international reserves in the spot exchange market, other foreign exchange interventions and ad hoc capital controls.[24]

From a comparison between the developmental strategies of the East Asian and Latin American economies during the relevant period of rapid industrialization under the import substitution strategy of the latter countries (especially in the 1970s), most Latin American countries (including Brazil) followed none of those seven lessons listed above. In the case of Brazil, liberalizing reforms were adopted between 1990 and 2002 in such a way that developmental strategies were neglected. Moreover, most of those lessons were not followed in Brazil even from 2003 on, when active industrial and technological policies were restored.[25] Even if one suspects that the differences in dealing with policy intervention are related to the cultural peculiarities of those continents, we prefer to believe that most cultural problems (e.g. corruption and rent-seeking) can be changed by policy over time.[26] In other words, we believe in learning by doing in order to improve both the design and adoption of efficient industrial as well as technological policies.

3. The BRICS's long-term economic performance: empirical evidence

Since the early 1990s, most developing countries have been following the so-called neoliberal policies, which basically involve trade liberalization, privatization of state-owned enterprises, liberalization of financial markets and full capital account convertibility. Indeed, macroeconomic policies supported by the "old macroeconomic consensus" that prevailed until the 2008 global crisis became the main prescription for economic policy aimed at promoting sustained long-term growth.

However, as well remarked by Palma (2013: 2), there is an important difference in the way Asian and Latin American economies embraced neoliberal economic reforms. Asian emerging economies followed the neoliberal agenda with a more pragmatic approach, as Palma observes, never giving up pro-growth macroeconomic policies, although a neoliberal discourse "to appease the gods of the market was adopted. Latin American economies, on the other hand, and Brazil in particular, has been taken by the

[24] Blanchard, Adler and Carvalho Filho (2015:2) showed that "foreign exchange intervention leads to less exchange rate appreciation in response to gross inflows". Ostry *et.al*. (2011:15) suggested that capital controls can be "a legitimate part of the toolkit to manage capital inflows in certain circumstances".

[25]See, for instance, Cimoli, Dosi and Stiglitz (2009: 6, table 1.1), which compares different strategies (and therefore different performances) in the East Asian and Latin American countries in the 1980s and 1990s.

[26] This point was supported by the Brazilian singer and songwriter Caetano Veloso in a discussion with one of the authors of this paper.

neoliberal ideology … as completely (and fiercely) as the Inquisition conquered Spain", in Palma's shrewd reference to Keynes' position against Ricardo's in relation to Say's law.

Then, we assume that differences in the way economic policies have been followed in the BRICS under the neoliberal agenda greatly explain different long-term economic performances. We also consider that short-term macroeconomic policy (especially monetary and exchange rate policy) can have a permanent effect on the economy, which can be captured by changes in the productive structure and pattern of international trade.

In order to shed some light on these issues, this section has two main goals: i) evaluating the BRICS's long-term economic performance in a comparative perspective, through descriptive statistical data on economic growth, change in productive structure, evolution of the technological gap and patterns of international trade since the early 1990s; and ii) identifying which of the BRICS countries have embarked on a catching-up trajectory and which have entered into a falling-behind path, based on an econometric estimation of the long-term elasticity of demand for exports and imports and the Thirlwall's law.

3.1 BRICS's long-term growth performance indicators

It is a well-known fact that the growth rate of the world economy has decreased since the implementation of liberal institutional reforms in developed countries[27] in the 1980s. As shown in Table 1, from 1961 to 1979, the world average growth rate was 4.8 per cent per year, and it dropped to 2.8 per cent per year in the 1980-2013 period. Among the BRICS, the Brazilian economy decelerated the most, its growth rate decreasing from 6.9 per cent per year to 2.4 per cent per year, followed by South Africa, which saw its growth rate reduced by half – from 4.5 per cent per year to 2.3 per cent per year. Both performed below the world average in the 1980-2013 period. The Russian economy, for which no data are available before 1980, showed the worst results, growing above the world average only in the 2000s. The Indian economy showed a different pattern, moving from a growth rate below that of the world economy in the 1961-79 period (3.4 per cent per year) to an average growth rate well above the world growth rate (6.2 per cent per year in the 1980-2013 period). The Chinese economy was the most successful, consistently growing above the world economy in all the periods.

Figures 1A and 1B complement the information in Table 1, showing the evolution of GDP growth rates of the BRICS relative to the world economy, setting 1980 as the base

[27] The main references here are to President Ronald Reagan's economic policy in the United States, called Reaganomics, and Margaret Thatcher's institutional reforms in the United Kingdom, known as Thatcherism.

year. Figure 1A shows the moment of inflexion in the growth trajectory of Brazil (1987), Russia (1986) and South Africa (1985) relative to the world average rate of growth. These economies, although growing more than the world average from 2000 onwards (Table 1), in a longer time horizon, are still behind the other economies, considering the world performance as reference (Figure 1B).

Table 1

Average real GDP growth rate (in percentage): the BRICS and the world economy, selected periods

	World	Brazil	Russia	India	China	South Africa
1961-79	4.8	6.9	n.a.	3.4	5.7	4.5
1980-89	3.0	2.2	2.2	5.6	7.8	1.7
1990-99	2.7	1.7	-5.2	5.8	6.8	1.3
2000-09	3.1	3.2	5.4	7.2	11.4	3.6
2010-13	1.7	3.1	3.4	6.2	8.7	3.0
1980-13	**2.8**	**2.4**	**1.0**	**6.2**	**8.7**	**2.3**

Note: n.a.: not available.
Source: World Development Indicators/The World Bank for World estimates (GDP at 2005 US dollar), and database of Groningen Growth and Development Centre (GGDC)/University of Gronengen for the BRICSs estimates (GDP at 1990 US dollars converted at Geary Khamis PPPs). https://www.conference-board.org/data/economydatabase/. Accessed on 8 February 2015.

Figure 1A

Log of GDP growth: the BRICS and the world economy

1980-1989 (1980=100)

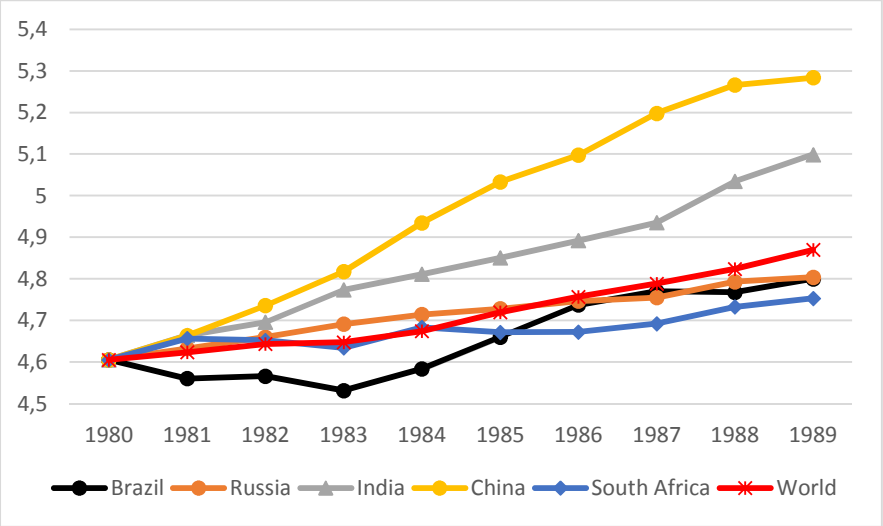
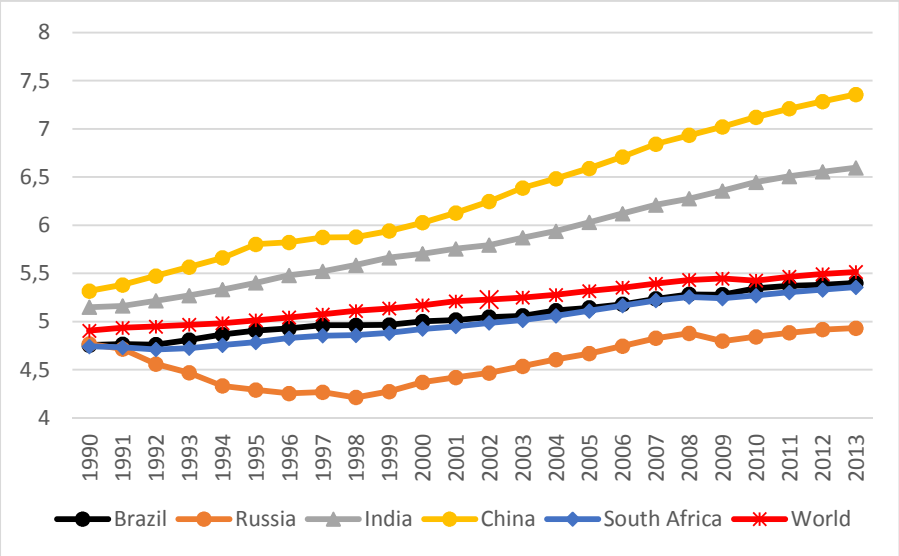


Figure 1B

Log of GDP growth: the BRICS and the world economy

1990-2013 (1980=100)



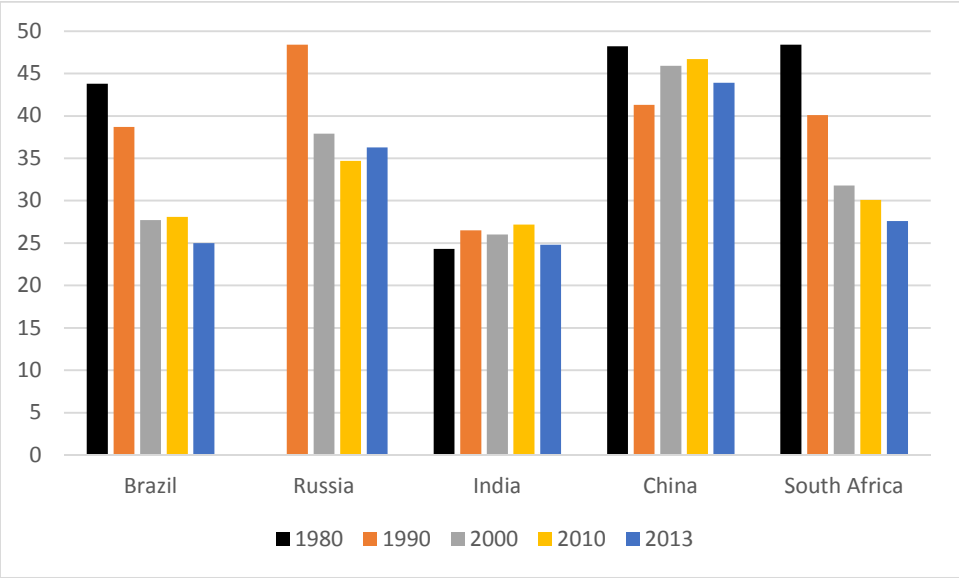
Source: World Development Indicators/The World Bank for world estimates (GDP at 2005 US dollars) and GGDC for the BRICS estimates (GDP at 1990 US dollars converted at Geary Khamis PPPs). https://www.conference-board.org/data/economydatabase/. Accessed on 10 February 2015.

One explanation for the differences in growth dynamics among the BRICS can be found in Kaldor's writings (in particular, Kaldor, 1966, 1970), in which the author argues that the manufacturing sector, with a strong presence of static and dynamic economies of scale, is the "engine of growth". From this perspective, differences in growth performance are related to, among other things, the productive structure of the economies. Figure 2 shows how the share of manufacturing in aggregate value added in the economy has been changing among the BRICS between 1980 and 2013. Except for India, which could keep relatively unchanged the share of its manufacturing sector in total GDP, all the other countries registered a decrease in the weight of the manufacturing sector in total value added. Brazil, Russia (since 1990) and South Africa were the ones with the greatest losses. It is worth observing that the greatest losses for these economies have occurred in the 2000s, when Brazil, Russia and South Africa benefited from high commodity prices in international markets and favourable terms of trade. In the case of Brazil and South Africa, this latter factor, associated with sharp net capital inflows, contributed to a significant overvaluation of their domestic currency in real terms over the second half of the 2000s (Nassif, Feijó and Araújo, 2011; 2015, for the case of Brazil; and Arezki *et.al*., 2012, for the case of South Africa).

Figure 2

The BRICS: Share of the manufacturing sector in total value added (in percentage)

Selected years



Note: Manufacturing sector includes mineral extraction

Source: World Development Indicators/The World Bank

The arguments in favour of manufacturing as the engine of growth also call attention to the composition of the productive structure. This is so because, according to Kaldor (1966), an economy is able to fully exploit the benefits of the economies of scale of its manufacturing sector only when it has completed the industrialization process, that is to say, when the manufacturing structure has reached its maturity.[28]

Kaldor (1966) argues that the maturing of an "immature" economy is based on the growth of aggregate demand. From this standpoint, the capital accumulation generated by the industrialization process is the key variable of economic development, since it speeds up technological change, benefiting the economy as a whole – as reflected in lower unit costs and higher-quality export products, enabling domestic producers to compete on foreign markets. Therefore, in the Kaldorian analytical perspective, the growth trajectory of an immature economy greatly depends on the space for long-term developmental policies to be implemented. In the case of the BRICS, most of the observed divergence in growth patterns can be explained by the way the short-term liberal agenda of economic policy has been tackled by each country. In this sense, a rapid and sharp drop in the weight of manufacturing value added in the total economy might indicate a process of early de-industrialization, if we assume that all the BRICS present still immature productive structures, in Kaldorian terms.

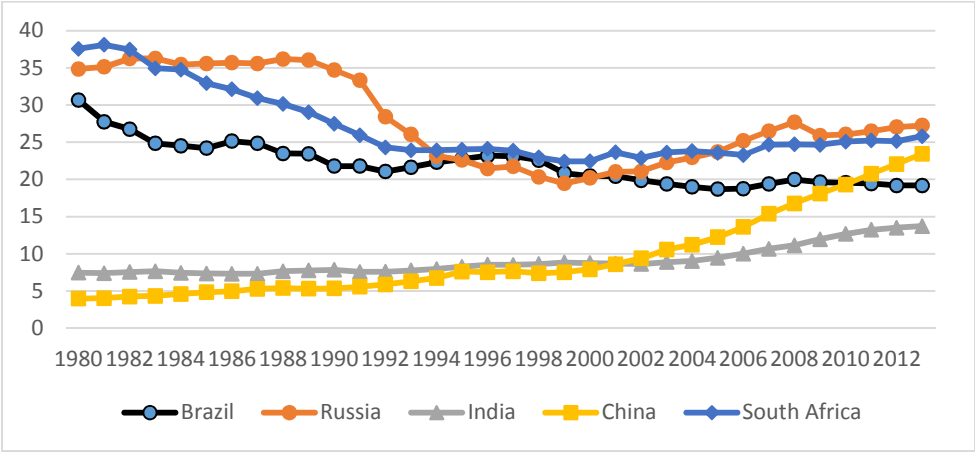
A further investigation in order to evaluate how immature the productive structures are is to measure the productivity gap (Figure 3). The productivity gap is constructed as the distance, in percentage terms, of the GDP per person employed in an economy relative to the economy at the technological frontier, here assumed to be the United States. The evolution of the productivity gap of the BRICS is quite revealing of the impact of changes in productive structures (Figure 2) for each economy. The three economies with the lowest growth rates and relatively greater loss in manufacturing weight – Brazil, Russia and South Africa – were the ones with the lowest distance in terms of productivity gap in 1980. Through the 1980s, their distance increased relative to the US productivity level. India and China, on the other hand, followed the opposite trajectory, consistently shortening the distance in terms of the US productivity level during the whole period. Since the 2000s, Brazil's productivity continued to fall relative to the United States', in contrasting to the other economies' productivity gap, which showed a decreasing movement.

[28] An immature economy is characterized by a large supply of labour in low-productivity sectors, which can be absorbed by more productive sectors as the industrialization process spreads towards them. Countries would attain the maturity phase when productivity levels among all economic sectors become more aligned.

Figure 3

The BRICS: the productivity gap (1980-2012)

GDP (US dollar converted at Geary Khamis PPP) per person employed as percentage of the United States'



Source: The Conference Board Total Economy Database
GGDC/University of Gronengen (https://www.conference-board.org/data/economydatabase/)
Accessed on 10 February 2015.

Therefore, the evidences presented so far has shown that, although the BRICS are economies which have already developed, at some degree, semi-complex industrial structures, according to Kaldor's theory, none of them have yet completed the industrialization process in such a way they are able to fully exploit static and dynamic economies of scale and sustain high gains from the overall productivity and economic growth.

A clear indicator of the incomplete nature of the industrialization process is the fact that, except for China, the trade balance displays a structural deficit in more technological-intensive goods. So, the dynamism of the manufacturing sector that largely explains the growth rate of an economy can be evaluated through the composition of the foreign trade based on a taxonomy which captures not only the intensity of using each factor of production but also the main determinant of competition in international markets. Tables 2 and 3 break down the structure of the BRICS's exports and imports of manufactured goods for 2000 and 2013 into four groups: the natural resource-based group, the labour-intensive group, the scale-intensive group, and the engineering-science and knowledge-based group. Appendix 1 (Table 1A) lists the industries that comprise each group.[29]

[29] This classification is a modified version of the taxonomy proposed by Pavitt (1984) in his seminal paper.

Table 2

BRICS's exports of manufactured goods classified according to factor and technological intensity for 2000 and 2013 (in percentage)

	Brazil		Russia		India		China		South Africa	
	2000	2013	2000	2013	2000	2013	2000	2013	2000	2013
Natural resources-based	8.9	11.7	52.3	73.2	22.5	31.6	4.0	4.5	21.4	16.6
Labour intensive	8.7	3.5	2.5	0.7	33.3	14.0	26.8	9.3	6.0	3.6
Scale intensive	25.4	16.8	20.8	12.7	17.2	22.8	8.0	5.0	30.5	34.3
Engineering-science and knowledge-based	18.8	12.6	5.6	3.3	4.9	9.6	41.5	56.8	9.7	9.7
Total	61.8	44.6	81.2	89.9	77.9	78.0	80.3	75.6	67.6	64.2

Source: Authors's elaboration based on the United Nations/Comtrade

Table 2 shows that the share of natural resources-based manufactured goods in total exports has increased for all countries, except South Africa, in the 2000-2013 period. In the case of Brazil and Russia, this group of manufactured goods is the only one that increased its share in total manufacturing exports in the period, an indication of the evolution of the Dutch disease in these countries in the period.. Among the BRICS, China showed the lowest concentration of natural resources-based goods in manufacturing exports.

Exports of labour-intensive manufactured goods have decreased in importance in all countries in the period. However, the share of scale-intensive manufactured goods increased in total exports in India and South Africa, and so did the engineering-science and knowledge-based goods in India and China.

Concerning the changes in the countries' pattern of international specialization, the Brazilian and Russian economies have displayed an increasing specialization trend in industrial commodities. India has shown a tendency towards a more diversified basket of manufactured goods exported, increasing the share of natural resources-based, scale-intensive, and engineering-science and knowledge-based goods. China is clearly becoming more specialized in exports of engineering-science and-knowledge-based

manufactured goods, while South Africa has shown a quite stable composition of industrial exports in the period.

Table 3

BRICS's imports of manufactured goods classified according to factor and technological intensity for 2000 and 2013 (in percentage)

	Brazil		Russia		India		China		South Africa	
	2000	**2013**	**2000**	**2013**	**2000**	**2013**	**2000**	**2013**	**2000**	**2013**
Natural resources-based	17.7	21.5	12.4	6.8	50.6	48.0	7.6	7.8	20.3	26.3
Labour-intensive	4.3	5.9	5.5	10.7	2.3	2.2	21.0	7.3	6.2	6.8
Scale-intensive	28.6	32.9	20.7	29.3	13.3	14.7	10.8	5.7	20.1	23.2
Engineering-science and knowledge-based	32.1	26.3	21.2	29.2	12.3	13.7	42.5	51.1	28.5	24.3
Total	82.7	86.6	59.8	76.0	78.5	78.6	81.9	71.9	75.1	80.6

Source: Authors' elaboration based on the United Nations-Comtrade.

On the side of manufacturing imports (Table 3), Brazil and South Africa sharply increased the share of natural resources-based goods. The share of China practically remained unchanged. As to imports of labour-intensive manufactured goods, Brazil and Russia, which had reduced the export share of this group, augmented their import share. Except for China, the other BRICS economies have increased the share of scale-intensive industrial goods in total manufacturing imports. Finally, only Brazil and South Africa registered a significant decline in the share of engineering-science and knowledge-based goods in total manufacturing imports. Considering that these latter imports used to be highly correlated with investment expenditure, this result reflects the lower economic dynamics of these countries during the period, compared with the other BRICS countries.

Summing up, trade flows of manufactured goods are quite revealing of how trade affect long-term growth rate (as discussed in Section 2.1). In the period analysed, we observe that Brazil shrank its industrial exports, while it increased its share of industrial imports in total imports. Moreover, while total industrial exports have declined, the share of exports of natural resources-based goods has increased, indicating that the economy is in a process of technological regression, and so, loosing vigour to grow. Brazil and Russia show more clear signs of deindustrialization and international specialization in natural resources-based goods. The increase in India's trade flows of more technologically

sophisticated goods suggests a virtuous process of industrial change in its economy. China is the best example of an economy, highly interventionist, where dynamism in both domestic and external markets is leading a structural change towards goods of higher value added and technological content. Even considering that the share of industrial exports and imports in total exports and import, respectively, has declined from 2000 to 2013, its trade flows of engineering-science and knowledge-based manufactured goods had increased over the period. South Africa, the smallest economy among the BRICS, reduced the share of industrial exports, but increased the share of all groups of industrial goods, except engineering-science and knowledge-based goods. On the imports side, the share of South Africa's industrial imports increased over the period. Even so, South Africa is the only country among the BRICS to have shown a relatively stable international trade pattern.

3.2 Econometric estimates of Thirlwall's law for the BRICS : which countries are catching up and which are falling behind?

As discussed in Section 2, according to Thirlwall's law (equation (1), the larger the ratio between a country's estimated income elasticity of demand for exports and its estimated elasticity of demand for imports, the faster will be its economic growth consistent with its balance of payments equilibrium. This result can be a powerful indicator of the capacity of a country to converge to (catch up with) or diverge from (fall behind) the per capita income levels of advanced economies. Since Thirlwall's (1979) seminal article was published, growth models with balance of payments constraints have been tested for several countries or group of countries with econometric time series or panel data models. Thirlwall (2011) summarizes these empirical analyses.

To proceed with the econometric estimation of the BRICS's long-term growth rates compatible to their balance of payments equilibrium, we start with the estimation of demand functions for exports and imports from a conventional multiplicative specification as follows[30]:

$$X_t = A_t\,(REER_t)^{\varphi}\,Y^*_t{}^{\varepsilon X} \qquad (3)$$

$$M_t = A_t\,(REER_t)^{\Psi}\,Y_t^{\pi M} \qquad (4)$$

[30] This specification follows Pacheco-López and Thirlwall (2006).

where A is the constant term; X is the volume of exports; $RRER$ is the real effective exchange rate; Y^* is the world income; ε_X is the income elasticity of demand for exports (> 0); M is the volume of imports; Y is the domestic income (as a proxy for aggregate expenditure); φ is the price elasticity of demand for exports (> 0)[31]; ψ is the price elasticity of demand for imports (< 0); π_M is the income elasticity of demand for imports (>0); and t is a time subscript.

Taking the logarithm of the components of equations (3) and (4) and adding the constant term, we draw the following equations to be estimated (small letters mean logarithms, and countries are identified by subscript i):

$$x_{it} = a_X + \varphi\,(reer_i) + \varepsilon_X\,(y^*_i) + e_t \quad (5)$$

$$m_{it} = a_M + \psi\,(reer_i) + \pi_M\,(y_i) + e_t \quad (6)$$

Our aim in this section is to empirically estimate these equations for the BRICS: Brazil, Russia, India, China and South Africa. Data for all BRICS countries are only available for the period 1995-2013. Data on exports (x) and imports (m), measured in quantum, were taken from the World Economic Outlook/International Monetary Fund database; GDPs (y), expressed in constant values, were obtained from the World Development Indicators/World Bank database; the world GDP (y*), available on the World Economic Outlook/International Monetary Fund database, was obtained by subtracting the GDP of each country; and *reer* is the real effective exchange rate, obtained from the Bank for International Settlements database.[32]

The Dickey-Fuller (ADF) unit root tests, as proposed by Said and Dickey (1984), showed that for all series in level we cannot reject the null hypothesis (H_0) that the series are not stationary at a 5 per cent significance level (results with the authors upon request). In addition, by performing the ADF test for the first difference of the series, the t statistics calculated allow rejection of the null hypothesis, indicating that the series are stationary in first difference and therefore are $I\,(1)$ [results with the authors upon request].

[31] Since the real exchange rate (RER) is defined as the domestic currency price of a foreign currency, an increase in the real exchange rate means a depreciation in the domestic currency in real terms as well as an expectation of augment of exports (provided that the Marshall-Lerner condition is satisfied). In contrast, a decrease in the RER means an appreciation of the domestic currency in real terms as well as an expectation of reduction of imports.

[32] World Economic Outlook/International Monetary Fund database: http://www.imf.org/external/pubs/ft/weo/2015/01/weodata/index.aspx ; World Development Indicators/World Bank database: http://data.worldbank.org/indicator; Bank for International Settlements database: http://www.bis.org/statistics/eer/index.htm. All data accessed on 27 March 2015.

As the demand functions for exports and imports for the BRICS are non-stationary, we proceed to check for a cointegration relationship, which implies the existence of a long-term "balanced" relationship among these variables. The Johansen test (1988) is used for this purpose and is based on an autoregression vector (VAR) in which all variables are endogenously determined. The cointegration vectors can be found from two likelihood ratio tests: trace and maximum value. We take the results of the maximum value test[33], whose basic idea is to check the significance of the largest eigenvalue, comparing the null hypothesis that *r* cointegration vectors are significant, against the alternative that the number of vectors *r +1* is significant, e.g. r = 0 against *r = 1*, *r = 1* against *r = 2*, and so on. Considering the 5 per cent significance level, we can reject the null hypothesis of no cointegration and accept the alternative hypothesis that the demand functions for exports and imports include a cointegration vector (results with the authors upon request). Therefore, the Johansen test indicates a long-term stable relationship among these functions in the BRICS countries. As the variables are *I (1)* and cointegrated, we can work with them in level. Following Hamilton (1994:558), in time series with such characteristics the ordinary least square (OLS) estimator is consistent for all parameters.

The estimated price and income elasticities of demand for exports and imports for the BRICS are presented in Tables 4 and 5. Estimated coefficients for price elasticity of demand for exports were significant only for China and India, while those for price elasticity of demand for imports were significant only for Brazil, India and South Africa. In all cases the sign of the estimated price coefficients for exports and imports were as expected, unless for of the price elasticity of demand for imports in South Africa. This result suggests that a depreciation of the rand tends to increase South Africa's imports, instead of decreasing them. However, as Krugman, Obstfeld and Melitz argue (2012:424), differently from exports, "imports can rise or fall when the real exchange rate rises [when the domestic currency is depreciated in real terms], so the effect of a real exchange change [on imports] is ambiguous".

The constant term and the estimated coefficients for income elasticity of demand for exports and imports were significant at 1 per cent level for all BRICS countries. China has the highest coefficient for income elasticity of demand for exports (5.81), which implies that a 1 per cent increase in world income increases China's exports by almost 5.8 per cent. India shows the second-largest coefficient (2.66), followed by Brazil (1.74) and

[33] Following Enders (2009),if the results of the two tests are different, the best choice is the result of the maximum value test.

Russia (1.08). South Africa shows an inelastic income elasticity, which means that an increase of 1 per cent in world income implies a rise of only 0.64 per cent in South African exports.

As for the income elasticities of demand for imports, Russia shows the largest coefficient (2.23), followed by Brazil (2.01), China (1.56) and South Africa (1.50). India showed the lowest income elasticity of demand for imports among the BRICS in the period 1995-2013.

Table 4

The BRICS: price and income elasticity of demand for exports (1995-2013)

Country	Constant (a_X)	Income elasticity of demand for exports (ε_X)	Price elasticity of demand for exports (φ)
Brazil	-2.26***	1.74***	0.30
Russia	-1.24***	1.08***	-0.06
India	-3.51***	2.66***	0.31**
China	-7.99***	5.81***	1.10***
South Africa	-6.39***	0.64***	-0.24

Note: *** significant at 1 per cent; ** significant at 5 per cent; * significant at 10 per cent.
Source: Authors' elaboration based on econometric estimates.

Table 5

The BRICS: price and income elasticity of demand for imports (1995-2013)

Country	Constant (a_M)	Income elasticity of demand for imports (π_M)	Price elasticity of demand for imports (ψ)
Brazil	-2.18***	2.01***	-0.35***
Russia	-2.58***	2.23***	0.34
India	-1.50***	1.31***	-0.57*
China	-1.84***	1.56***	0.39
South Africa	-1.61***	1.50***	0.42*

Notes: *** significant at 1 per cent; ** significant at 5 per cent; * significant at 10 per cent.
Source: Authors' elaboration based on econometric estimates.

Table 6 presents the results for the "strong" (expressed by the ratio $\frac{\varepsilon_X}{\pi_M}$, as formulated in equation 1) and "weak" (expressed by the change in exports to the π_M ratio, as shown by equation 2) versions of Thirlwall's law. The " strong" version, at a first sight, clearly indicates that among the BRICS only China and India are in a catching up trajectory. Their estimated growth rates compatible with their balance of payments equilibrium are highly above the world´s economy growth rate (around 272 per cent and 103 per cent, respectively, on average). Brazil, Russia and South Africa, according to this indicator, are economies falling behind, as their estimated long-term growth rate is below the average of the world´s growth rate. However, in order to ensure the robustness of the estimates, Thirlwall (2011) suggested to follow some statistical and parametric tests.

Table 6

BRICS's actual GDP growth, change in exports and Thirlwall's law (1995-2013)

Country	Actual GDP growth (in percentage)	Change in exports (X) (in percentage)	ε_X / π_M Thirlwall's law ("strong" version)	X / π_M Thirlwall's law ("weak" version)
Brazil	3.17	6.01	0.87	2.99
Russia	3.32	4.17	0.48	1.86
India	6.95	9.56	2.03	7.30
China	9.67	15.91	3.72	10.20
South Africa	3.13	4.23	0.43	2.82

Source: Authors' elaboration based on econometric estimates.

The last column in Table 6, labeled as the "weak" version of the Thirlwall´s law (Thirwall, 2011), when compared with the actual real GDP growth rates (first column), gives a hint about the consistency of the estimated balance-of-payments-constrained growth rates. Comparing both rates, we note that the actual and the estimated growth rates consistent with the long-term balance of payments equilibrium (" weak" version) are very close for all BRICS countries, except for Russia. For India, China and South Africa the estimated " weak" version of the Thirlwall´s law was very close to their observed growth rate during the 1995-2013 period, and for Brazil was quite the same. The rank

correlation between the actual and predicted growth rates of our sample is 0.989 and the difference in percentage points between the mean deviation of the actual from the predicted growth rates is 0.52, when considering all the countries, and 0.34, when excluding Russia.[34]

Following Thirlwall (2011), we run a parametric test proposed by McCombie (1989), in order to evaluate how well Thirlwall's law fits our data. To proceed with the McCombie´s test , we calculate the income elasticity of demand for imports (π_M*) that would make the actual GDP growth rate equal to the estimated GDP growth rate which is consistent with balance of payments equilibrium . The following step is to verify if there is a statistically significant difference between π_M* and the estimated π_M (Table 5). If not, the estimated balance of payments constrained growth rate will be a good predictor of the actual GDP growth rate.[35] The results are listed in Table 7.

[34] In Thirlwall's seminal paper (1979), the rank correlation between the actual and predicted growth rates of the countries for the 1951-1973 period was 0.891, and the mean deviation of the actual from predicted rates over a sample of 11 countries was 0.56 (Japan was excluded because, like Russia in our exercise, it showed a significant difference between both rates).

[35] An empirical application of this test can also be found in Hussain (1999).

Table 7

McCombie's test of Thirlwall's law

Country	Estimated income elasticity of demand for imports π_M	Standard error	Implied income elasticity of demand for imports π_M*	Test result
Brazil	2.01	0.10	1.90	1.10**
China	1.56	0.11	1.65	0.82**
India	1.31	0.07	1.38	1.00**
Russia	2.23	0.17	1.26	5.71
South Africa	1.50	0.11	1.35	1.36**

Notes: The test is the absolute value of the *t*-statistics based on the null hypothesis that π_M is equal to π_M*.
* * Indicates that π_M* is not statistically different from π_M.

As we can see in Table 7, Brazil's, China's, India's and South Africa's predicted growth rates did not statistically differ from their actual growth rates. This means that, except for Russia, our estimated balance of payments constrained growth rates performed very well for explaining the BRICS's long-term economic growth. Therefore, as Table 6 illustrates, among the BRICS, China and India are the only countries that show an estimated growth rate compatible to its long-term balance of payments equilibrium much above the world economic growth rate in the 1995-2013-period. Since our estimated growth rate for Russia was not a good predictor of its actual growth rate we cannot confirm whether Russia is falling behind. However, Brazil and South Africa show semi-stagnant and stagnant long-term economic performances, respectively, with an estimated balance-of-payments-constrained growth rate below (87 per cent in the case of Brazil) or far below (only 43 per cent in the case of South Africa) the world growth rate between 1995 and 2013, suggesting that these economies, although at different paces, have entered into a falling-behind path.

4. Concluding remarks

The acronym BRICS was created in the early 2000s to identify those economies with potential capacity to show accelerated growth in the next 40 years relative to the advanced economies, given their demographic and other economic characteristics. Our study showed, however, that, considering the economic performance observed so far, not all BRICS economies have fulfilled that expectation. In order to compare the BRICS's long-term economic performance, we presented a background discussion on how each country has managed to balance its short- and long-term economic goals in order to explain their diverse growth paths. In other words, considering that the BRICS economies follow different short and long-term economic policies, we assumed that these differences matter and have implications for their different long-term economic growth rates.

In the theoretical discussion, in which the "liberal" and the "developmental" approaches were reviewed, we concluded that the main challenge to developing countries is to find a balance between the static gains from the liberalization of their economies (especially trade) – as strongly emphasized by "liberal" economists – and the risks of dynamic losses, in terms of low long-term economic growth rates, associated with the fact that free markets are not able to provide the best "Schumpeterian" (or, in some sense, "Kaldorian") allocation of resources towards the most dynamic industries in international markets – as emphasized by "developmental" economists. In other words, what each country produces, exports and imports matters in explaining its structural change and long-term economic growth rate.

In the normative debate, the market-failure versus governmental-failure arguments were analysed based on lessons from the experience of the successful countries of East Asia. One important conclusion we have reached is that there is a sort of learning by doing in the improvement of both design and adoption of efficient industrial and technological policies, as well as in the development of state institutions. The main issue for most developing economies is how to provide space for the implementation of short-term and long-term developmental policies in such a way that appropriate economic (industrial, technological and macroeconomic) policies can be developed to promote the catching-up process by accumulating expertise in the learning-by-doing mechanism.

The analysis of the evolution of the BRICS economies between 1980 and 2013 has revealed sharp differences in their long-term economic performance. Taking the evolution of the productivity gap, for instance, we observed that Brazil, Russia and South Africa –

the three economies that have shown the lowest annual average growth rates and the greatest losses in the share of manufacturing in total output in the 1980-2013 period – have not been able to narrow the productivity gap during the period. Conversely, China and India have been able to consistently reduce their productivity gap throughout the period. In the 2000s, the Brazilian productivity gap continued to increase, in contrast to the other economies' productivity gap, which showed a decreasing trend.

Changes in the trade balance, too, show striking differences among the BRICS. Brazilian manufactured exports relative to total exports, for instance, decreased from 61.8 per cent in 2000 to 44.6 per cent in 2013, while industrial imports slightly increased in the same period. In the case of Russia, primarization of industrial exports was remarkable: exports of natural resources-based products increased from 52.3 per cent in 2000 to 73.2 per cent in 2013; total industrial imports, in turn, increased from 59.8 per cent to 76.0 per cent, suggesting an accelerated deindustrialization process. India has shown a stable share of manufactured exports and imports in total trade between 2000 and 2013. However, China's industrial exports as a share of total exports decreased from 80.3 per cent to 75.6 per cent in the same period, the share of engineering-science and knowledge-based industrial exports increased from 41.5 per cent to 56.8 per cent and industrial imports relative to total imports decreased 10 percentage points (from 81.9 per cent in 2000 to 71.9 per cent in 2013). South Africa has shown rather stable percentages for industrial exports and imports, with a decrease in industrial exports (from 67.6 per cent to 64.2 per cent between 2000 and 2013) and an increase in industrial imports (from 75.1 per cent to 80.6 per cent in the same period).

To conclude our empirical discussion, we presented the econometric estimates of BRICS's long-term growth rates corresponding to their balance of payments equilibrium, according to Thirlwall's law. Comparing the estimated rates according to the "strong" and "weak" versions of Thirlwall's law, we could also check the consistency of our estimations, as well as identify which economies have been able to catch up and which of them have entered into a falling-behind trajectory. Our results show that, among the BRICS, only China and India have shown balance-of-payments-constrained long-term growth rates above world economic growth. Our estimates confirm that these two Asian countries have been two of the most dynamic economies in the global economy and have maintained a rapid catching up path in the last few decades.

In contrast, Brazil and South Africa, by having shown estimated balance-of-payments-constrained long-term growth rates below the world economic growth rate, have entered into a falling behind path. Since our estimated growth rate for Russia was not a

good predictor of its actual growth rate, we cannot confirm that this country has, in fact, shown a falling behind trajectory.

According to our theoretical discussion, the results for China and India can be seen as a consequence of their greater ability to apply industrial policy instruments consistently in the management of short-term economic policy over the last three decades. This ability has increased their potential capacity to promote industrial change and economic development. Brazil, Russia and South Africa, in turn, for different reasons and in different degrees, opened up their economies at a faster pace, dismantling old institutions established to promote industrialization and economic development. Actually, the reduction of protection measures was justified as a strategy to correct distortions and static economic inefficiencies that resulted from several decades of semi-autarkic economies. Indeed, since the manufacturing labour productivity of these economies has slowed down since the 1980s, greater integration to the world economy was also justified as a way to revert this negative trend. However, since Brazil, Russia and South Africa adopted both rapid trade liberalization and open capital movements (especially short-term capital flows), unlike China and India, not only did their external fragility increase, but their policy space to promote structural change and long-term growth diminished significantly.

References

AMSDEN, A. (1989). *Asia's Next Giant: South Korea and Late Industrialization*. Oxford: Oxford University Press.

AMSDEN, A. (2001). *The Rise of the "Rest": Challenges to the West from Late-Industrializing Economies*. New York: Oxford University Press.

AREZKI, R., DUMITRESCU, E., FREYTAG, A. and QUINTYN, M. (2012). "Commodity Prices and Exchange Rate Volatility: Lessons From South Africa's Capital Account Liberalization". IMF Working Paper WP/12/168. Washington, D.C.: International Monetary Fund.

ARTHUR, B. (1989). "Competing Technologies, Increasing Returns, and Lock-in by Historical Events". *The Economic Journal*, Vol.99, no 394:116-131, March.

ARTHUR, B. (1990). "Positive Feedbacks in the Economy," *Scientific American*: 92-99, February.

ARTUS, P., MISTRAL, J. and PLAGNOL, V. (2011). “L’Émergence de la Chine: Impact Économique et Implications de Politique Économique”. Paris: Conseil d’Analyse Économique:1-311.

BALASSA, B. (1963). “An Empirical Demonstration of Classical Comparative Cost Theory”. *Review of Economics and Statistics*, Vol.45, nº 3:231-238.

BATOR, F (1958). The Anatomy of Market Failure. *Quarterly Journal of Economics* LXXII, 351-379.

BERG, A. and MIAO, Y. (2010). “The Real Exchange Rate and Growth Revisited: The Washington Consensus Strikes Back?” IMF Working Paper 10/58. Washington: International Monetary Fund.

BLANCHARD, O, ADLER, G. and CARVALHO FILHO, I. (2015). “Can Foreign Exchange Intervention Stem Exchange Rate Pressures from Global Capital Flow Shocks?”. IMF Working Paper WP/15/159. Washington, D.C.: International Monetary Fund. July.

BRESSER-PEREIRA, L.C., OREIRO, J. L. e MARCONI, N. (2014). Developmental Macroeconomics: New Developmentalism as a Growth *Strategy.* London: Routledge.

CESARIN, S. (2005) “Ejes y Estrategias del Desarrollo Cconómico Chino: Enfoques para América Latina y el Caribe”. *In*: S.Cesarin, S. and C. Moneta (orgs). China y America Latina: Nuevos Enfoques Sobre Cooperación y Desarrollo. ¿ Una Segunda Ruta de la Seda? Buenos Aires: BID-INTAL:3-48.

CHANG, H.J. (2003). *Kicking away the ladder: development strategy in historical perspective.* London: Anthem Press.

CIMOLI, M., DOSI, G. and STIGLITZ, J. (2009). “The Political Economy of Capabilities Accumulation: The Past and Future of Policies for Industrial Development”. In: M. Cimoli, G. Dosi and J. Stiglitz. *Industrial Policy and Development. The Political Economy of Capabilities Accumulation*. Oxford: Oxford University Press: 1-16.

CORDEN, W. M. (1974). *Trade Policy and Economic Welfare.* Oxford: Oxford University Press, 2nd revised edition, 1997.

DOSI, G. and SOETE, G. (1988). “Technical Change and International Trade”. In: G. Dosi, C. Freeman, R. Nelson, .R G. Silverberg and L. Soete (eds). *Technical Change and Economic Theory.* London: Pinter-Publishers: 401-431.

DOSI, G., PAVITT, K. e SOETE, L. (1990). *The Economics of Technical Change and International Trade*. London: Harvester Wheastsheaf.

DOSI, G., TYSON, L. e ZYSMAN, J. (1989). "Trade, Technologies, and Development: A Framework for Discussing Japan". In: J. Zysman *et. al.* (eds.). *Politics and Productivity*. New York: Ballinger.

ENDERS, W. (2009). Applied Econometric Time Series: An intuitive applications oriented general discussion of time series econometrics. Third Edition. Hoboken, NJ: John Wiley & Sons, Inc.

FAULKNER, D., CHRISTOPHER, L. and MAKRELOV, K. (2013). “Achieving Higher Growth and Employment: Policy Options for South Africa”. *Working* Paper 13/03. South African Reserve Bank.

FEENSTRA, R.C. (1998). “One Country, Two Systems: Implications of WTO Entry for China. Department of Economics, University of California, Davis, June.

GAIDAR REPORT (2014). Russian Economy in 2013: Trends and Outlooks, Issue 35: Industrial Policy in Russia in 2000–2013: Institutional Features and Key Lessons, Section 6: 395-428, Moscow: Gaidar Institute for Economic Policy.

GERSCHENKRON, A. (1962). *Economic Backwardness in Historical Perspective: a Book of Essays*. Cambridge, MA.: Belknap Press of Harvard University Press.

GOVERNMENT OF INDIA (2014). "Compendium of Plan Schemes of DIPP-2014". New Dehli: Government of India/Department of Industrial Policy and Promotion. (http://dipp.nic.in/English/Publications/compendium_PlanScheme.pdf). Access in June, 1st, 2015.

GRAHAM, Frank D. (1923). "Some Aspects of Protection Further Considered". *Quarterly Journal of Economics* 37: 199-227, February.

GROSSMAN, G. M. e HELPMAN, E. (1991). *Innovation and Growth in the Global Economy*. Cambridge (Mas.): The MIT Press.

HAMILTON J.D. (1994). *Time series analysis.* Princeton, NJ: Princeton University Press.

HAMILTON, A. (1791). "Report on Manufactures". Secretary of Treasury of the United States of America
(http://www.constitution.org/ah/rpt_manufactures.pdf). Accessed on 18 April 2015.

HAUSMANN, R. and RODRIK, D. (2002). Economic Development as Self-Discovery. *NBER Working Paper Series*, W.8952. Cambridge, MA: National Bureau of Economic Research.

HELPMAN, E. and KRUGMAN, P.R. (1985). *Market Structure and Foreign Trade.* Cambridge, MA.: The MIT Press.

HIRSCHMAN, A. O. (1958). *The Strategy of Economic Development.* New Haven: Yale University Press.

HUANG, Y. (2012). “How Did China Take Off?”. Journal of Economic Perspectives, Vol. 46, nº 4, Fall: 147-170.

HUSSAIN, M.N. (1999) “The Balance of Payments Constraint and Growth Rate Differences Among African and East Asian Economies”. African Development Review,Vol.11 (1). June:103-137.

INTER-AMERICAN DEVELOPMENT BANK. (2004). The Emergence of China: Opportunities and Challenges for Latin America and the Caribbean. Washington: Inter-American Development Bank.

JOHANSEN, S. (1988), Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, Vol. 12: 231-254.

KALDOR, Nicholas (1966). *Causes of the Slow Rate of Economic Growth of the United Kingdom. An Inaugural Lecture*. Cambridge: Cambridge University Press.

KALDOR, N (1970). The case for regional policies. *Scottish Journal of Political Economy*. Vol. 17, Issue 3: 337-48.

KEYNES, J.M. (1936). *The General Theory of Employment, Interest and Money*. Cambridge (UK): Cambridge University Press.

KRUGMAN, P.R., OBSTFELD, M. and MELITZ, M.J. (2012). *International Economics. Theory and Policy*. Ninth Edition. New York: Addison-Wesley.

KRUGMAN, Paul R. (1979). "Increasing Returns, Monopolistic Competition, and International Trade”. *Journal of International Economics*, 9 (4): 469-479. November.

KRUGMAN, Paul R. (1980). “Scale Economies, Product Differentiation, and the Pattern of Trade. *American Economic Review* 70: 950-959.

KRUGMAN, Paul R. (1981). “Intraindustry Specialization and the Gains from Trade”. *Journal of Political Economy,* 89 (5): 959-974.

LEONTIEF, W. (1953). “Domestic Production and Foreign Trade: the American Capital Position Re-examined”. Proceedings of the American Philosophical Society.

LEWIS, W. A. (1954). "Economic Development with Unlimited Supplies of Labor". *Manchester School of Economic and Social Studies*, 22 (2):139:191.

LIN, J. (2009). “Answer to Chang”. *In*: J. Lin and H.J. Chang. “Should Industrial Policy in Developing Countries Conform to Comparative Advantage or Defy it? A Debate Between Justin Lin and Ha-Joon Chang”. *Development Policy Review*, Vol. 27 (5), 2009: 483-502.

LIST, F. (1841). *The National System of Political Economy.* London: Longmans, Green and Co., 1909 (http://oll.libertyfund.org/titles/315) , Acessed on 7 May 2015.

MARX, K. (1887). *The Capital. A critical analysis of capitalist production*. Vol. I. First English edition, edited by Frederick Engels. London: Penguin Books, 1990.

McCOMBIE, J.S.L.(1989) “Thirlwall’s Law and Balance of Payments Constrained Growth: – A Comment on the Debate’. *Applied Economics* Vol. 21 (5), May: 611-629.

McDOUGALL, G.D.A. (1951). “British and American Exports: A Study Suggested by the Theory of Comparative Costs”. *The Economic Journal* 51:697-724. December.

MEADE, J. (1955). *Trade and Welfare*. London and New York: Oxford University Press.

NASSIF, A. (2000). A Articulação das Políticas Industrial e Comercial nas Economias em Desenvolvimento Contemporâneas: Uma Discussão Analítica. *Revista de Economia Política (Brazilian Journal of Political Economy)* Vol. 20, nº 2(78), abril-junho: 3-22.

NASSIF, A., FEIJO, C. and ARAUJO, E. (2011). “The Long-term “Optimal” Real Exchange Rate and the Currency Overvaluation Trend in Open Emerging Economies: the Case of Brazil”. UNCTAD Discussion Papers nº 206. Geneva: United Nations Conference on Trade and Development (UNCTAD). December (available at http://unctad.org/en/pages/publications/Discussion-Papers-(Series).aspx). Accessed on 15 June 2015.

NASSIF, A., FEIJO, C. and ARAUJO, E. (2015). Overvaluation Trend of the Brazilian Currency in the 2000s: Empirical Estimation. *Revista de Economia Política (Brazilian Journal of Political Economy*). Vol. 35, nr.1 (138):3-27. January-March.

NASSIF, A., FEIJO, C. and ARAÚJO, E. (2015). “Structural Change and Economic Development: is Brazil Catching-up or Falling-Behind?”. *Cambridge Journal of Economics* Vol. 39, September: 1307-1332.

NELSON, R. R. e WINTER, S. (1982). An Evolutionary Theory of Economic Change. Cambridge (Mas.): Harvard University Press.

NORTH, D. (1990). *Institutions, Institutional Change and Economic Performance. Cambridge*: Cambridge University Press.

O’BOYLE, B. (2014). “Explainer: What are the BRICS?” Council of Americas. Available at http://www.as-coa.org/articles/explainer-what-are-brics?gclid=Cj0KEQjw7_mrBRDH4Y2UjLHEmfcBEiQA8OTHf0pFMLxJcqyZMx1I0sfN3MRK-Q8myZehrQwzaqd9f8MaAs6B8P8HAQ . Accessed on 15 June 2015.

OCAMPO. J. A. RADA, C and TAYLOR, L. (2009). *Growth and Policy in Developing Countries: a Structuralist Approach*. New York: Columbia University Press.

OSTRY, J., GHOSH, A.R., HABERMEIER, K.,LAEVEN, L., CHAMON, M., QURESHI, M.S., KOKENYNE, A. (2011). “Managing Capital Inflows: What Tools to Use?”. IMF Staff Discussion Note. SDN/11/06. Washington, DC.: International Monetary Fund. April 5.

PACHECO-LÓPEZ, P. and THIRLWALL, A.P. (2006). Trade Liberalisation, the Income Elasticity of Demand for Imports and Growth in Latin America. *Journal of Post Keynesian Economics*, Fall.

PALMA, J G. (2013). Was Brazil´s Recent Growth Acceleration The World´s Most Overrated Boom? Cambridge Working Papers in Economics 1248, Cambridge, UK.

PATNAIK, I. and SHAH, A. (2012). Did the Indian Capital Controls Work as a Tool of Macroeconomic Policy? Unpublished paper.

(Available at http://www.nipfp.org.in/media/medialibrary/2013/04/wp_2011_87.pdf). Accessed on 15 May 2015.

PAVITT, K. (1984). “Sectoral Patterns of Technical Change: Towards a Taxonomy and a Theory”. *Research Policy* 13: 343-373.

POSNER, M. (1961). International Trade and Technical Change. *Oxford Economic Papers*, Vol. 13.

PREBISCH, R. (1950). *The Economic Development of Latin America and its Principal Problems*. New York: Economic Comission for Latin America, United Nations Department of Economic Affairs.

RODRIK, D (2008). The Real Exchange Rate and Economic Growth. *Brookings Papers on Economic Activity*, (2):365–412.

ROSENSTEIN-RODAN, P. N. (1943). "Problems of Industrialization of Eastern and South-Eastern Europe". *Economic Journal*, 53: 202-211. June-September.

SAID, S. E.; DICKEY, D.A. (1984). Testing for Unit Root in Autoregressive–Moving Average Models of Unknown Order. *Biometrika*, Vol. 71: 599-607.

SAMUELSON, P. (1954). The Pure Theory of Public Expenditure. *Review of* Economics and Statistics 36(2): 386-389.

SAMUELSON, P. A. (1948). International Trade and the Equalization of Factor Prices. *The Economic Journal*, 58: 168-184.

SAMUELSON, P. A. (1949). International Factor Price Equalization once Again". *The Economic Journal* 59:181-197.

SAMUELSON, P. A. (1962). "The Gains from International Trade Once Again". *The Economic Journal*, 72: 820-829.

SCHUMPETER, J.A. (1943). Capitalism, Socialism and Democracy. London: Routledge.

SUBBARAO, D. (2014). "Capital Account Management: Toward a New Consensus?". In: G. Akerlof, O. Blanchard, D. Romer and J. Stiglitz (eds). *What Have we Learned? Macroeconomic Policy after the Crisis*. Cambridge, MA: The MIT Press: 265-270.

SUBRAMANIAN, A. (2010). "New PPP-based Estimates of Renminbi Undervaluation and Policy Implications". VoxEU, 16 April. Available at: (http://www.voxeu.org/index.php?q=node/4962). Accessed on 20 June 2015.

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

THIRLWALL, A. P. (2011). Balance of Payments Constrained Growth Models: History and Overview. *PSL Quarterly Review*, Vol. 64 (259): 307-351.

WILLIAMSON, J. (2008). Exchange Rate Economics. *Working Paper Series* WP 08–3. Washington, DC, Peterson Institute for International Economics.

WILLIAMSON, J. (1990). “What Washington Means by Policy Reform”. In: J. Williamson (ed.). *Latin American Adjustment: How Much Has Happened.* Washington: Peterson Institute for International Economics: 7-20.

WILSON, D. and PUROSHOTHAMAN, R. (2003). Dreaming with BRICs: The Path to 2050. *Global Economic Paper* nº 99. Goldman Sachs. October 1nd (http://www.goldmansachs.com/our-thinking/archive/archive-pdfs/brics-dream.pdf). Accessed on 12 May 2015.

WTO (2002). Trade Policy Reviews: First Press Release, Secretariat and Government Summaries. India: June 2002. Geneva: World Trade Organization. (https://www.wto.org/english/tratop_e/tpr_e/tp195_e.htm). Accessed on 29 May 2015.

ZYSMAN, J., FELDMAN, S., MURRAY, J., NIELSEN, N.C and KUSHIDA, K.E. (2010). Services with Everything: The ICT-Enabled Digital Transformation of Services. *BRIE Working Pap*er 187a

Appendix 1

Table 1A

Manufacturing sector classified according to factor and technological intensity

NATURAL RESOURCES-BASED

Mineral extraction
Oil and Alcohol
Food Products
Beverage
Wood Products
Pulp, paper and paper products
Non-metallic mineral products

LABOUR INTENSIVE

Textile products
Manufacture of clothing items and accessories
Preparation of leather and its artifacts and footwear
Metal products
Furniture and other industries

SCALE INTENSIVE

Chemicals
Rubber and plastic
Metallurgy
Motor vehicle and parts

ENGINEERING-SCIENCE AND KNOWLEDGE-BASED

Machines and equipment
Machinery, equipment and electrical material
Computer equipment, electronic and optical products
Other transport equipment