

Is Brazilian premature deindustrialization a case of Dutch disease?

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Abstract

The term “Dutch disease,” coined by *The Economist* (1977), describes how a commodity boom can overvalue a currency, erode industrial competitiveness, and lead to deindustrialization. While the neoclassical view ties it to resource booms, an alternative framework, developed by Palma (2005) and the new developmentalist school (Bresser-Pereira, 2008, 2020), links it in Latin America to post-1990s liberalizing reforms. This paper tests whether the Brazilian economy exhibits Dutch disease. Despite evident signs of premature deindustrialization, no previous study has directly modeled its connection to Dutch disease within Palma’s and the new developmentalist interpretation, particularly under Brazil’s neoliberal reforms. Using time series econometric models (1999–2024), we first assess whether the real exchange rate is shaped by Dutch disease variables. We then examine its relationship with deindustrialization, based on Palma’s and new-developmental hypotheses. The results support these interpretations, identifying Dutch disease as a key driver of Brazil’s premature deindustrialization. The paper concludes with brief policy recommendations.

Keywords: Dutch disease, natural and premature deindustrialization, Brazil.

JEL classification: O1; O47; O49.

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1. Introduction

The term "Dutch disease", coined by *The Economist* in 1977¹, refers to the economic crisis that hit the Netherlands in the 1960s after the discovery of vast natural gas reserves. With relatively unregulated markets, the surge in profitability drew resources away from manufacturing and toward the natural resource sector. The phenomenon was considered a "disease" because a commodity export boom triggered real currency appreciation, leading to a decline in manufactured exports, industrial contraction, and accelerated deindustrialization.

In the seminal neoclassical model developed by Corden and Neary (1982), the phenomenon arises when a boom in one tradable sector — such as natural resources — diminishes profitability in other tradable sectors, like manufacturing, thereby altering the economy's productive structure. Later, Jones and Neary (1984) demonstrated that non-tradable sectors, particularly low-productivity services, tend to benefit disproportionately, ultimately hindering long-term development.

An alternative interpretation, originally proposed by Palma (2005) and later expanded by new developmentalism (Bresser-Pereira, 2008, 2020, 2020a), argues that Dutch disease in developing economies arises not necessarily from commodity booms, but primarily from liberalizing economic reforms. In particular, trade liberalization and external financial openness since the 1990s have exacerbated structural dependence on commodities. These reforms undermined industrial policy instruments—such as import tariffs and managed exchange rates — that had previously supported industrialization. Brazil illustrates this pattern: following the liberalizing reforms of the 1990s, especially rapid trade liberalization, and external financial openness, the share of commodities in total exports rose from 38.8% in 1990 to 65.8% in 2020, a shift accompanied by premature deindustrialization and economic stagnation (Nassif and Morceiro, 2025).

The main objective of this paper is to empirically test whether Brazil can be classified as a case of Dutch disease, addressing a critical gap in the literature. Although numerous studies have documented that Brazil represents one of the most severe cases of premature deindustrialization in the world economy,² to the best of our knowledge, no research has yet provided an econometric demonstration of the mechanisms linking this

¹ See *The Economist* (1977).

² See Nassif, Feijó and Araújo (2015), Nassif, Bresser-Pereira and Feijó (2018), Nassif et.al (2020), Morceiro and Guilhoto (2023), Iasco-Pereira and Morceiro (2024), Morceiro and Tessarim (2024) and Rodrik (2016), among others.

structural decline to Dutch disease, as interpreted by Palma (2005) and new developmentalism — namely, as a consequence of the neoliberal economic reforms implemented in the 1990s. It must be acknowledged that, as far as we know, the recent study by Bacha et al. (2024) is the only one to have positively tested for the existence of Dutch disease in Brazil. However, the authors not only choose to use the traditional concept of Dutch disease (that is, associated with a boom in the natural resource sector) but also dissociate this phenomenon from the issue of premature deindustrialization. According to Bacha et al. (2024: 3), they “stick to the traditional concept of the Dutch disease because its determinants differ from those that cause premature deindustrialization” (Bacha et al., 2024, p.3).

The paper is organized as follows. Section 2 reviews the neoclassical and structuralist–new developmentalist theoretical literature on Dutch disease. Section 3 examines key aspects of Brazilian economic policy—focusing in particular on exchange rate policy—and presents a set of economic indicators directly or indirectly linked to the Dutch disease phenomenon in Brazil. Section 4 employs time series models for the period 1999–2024 to first assess whether the real exchange rate is influenced by variables associated with Dutch disease, and then to analyze its relationship with deindustrialization, based on the frameworks of Palma and the new developmentalist school. Section 5 draws the main conclusions and policy implications for Brazil.

2. Theoretical literature on Dutch disease: neoclassical versus structuralist and new developmentalist approaches

In this section, we will briefly summarize the theoretical literature on Dutch disease. We will analyze the main aspects of the neoclassical theoretical modeling of Dutch disease, as well as the newer structuralist and new developmentalist arguments about the phenomenon. Finally, we will discuss the key points of the famous conjecture: when endowed with an abundance of natural resources, do countries have a blessing or a curse for their future development?

2.1 Dutch disease: the neoclassical model

Following the emergence of the problem in the Netherlands, Corden and Neary (1982) developed a neoclassical theoretical model to analyze the interrelationships among

the affected variables and the long-term impacts on economic development. Their seminal work laid the foundation for what would become known as Dutch disease theory. The authors develop a model of a small open economy characterized by perfect competition and full employment, comprising two traded sectors — energy and manufactures — and one nontraded sector — services. The primary objective is to examine how the economy responds to a boom in the natural resource-based traded sector (energy).

The model explores various outcomes depending on key assumptions, such as the degree of intersectoral factor mobility or the presence of sector-specific factors, with labor being the only mobile input. A central mechanism of the model is the decomposition of the boom's impact into two distinct channels: the movement effect and the spending effect. The movement effect captures the reallocation of resources following a productivity surge in the energy sector. This increase draws labor — and capital, if factors are mobile — away from manufacturing, directly reducing output and employment in that sector, thereby leading to deindustrialization. In contrast, the spending effect operates through real exchange rate appreciation. The resource boom raises national income, which in turn increases demand for nontraded services. This heightened demand drives up the relative price of nontraded goods compared to traded goods, resulting in an appreciation of the real exchange rate and further contributing to deindustrialization.

The central point is that both effects resulting from the natural resource boom give rise to deindustrialization: the first effect does so directly ("*direct deindustrialization*"), while the second operates indirectly, as it is mediated through real exchange rate appreciation. It is worth emphasizing that Corden and Neary (1982) suggest the adverse effects of Dutch disease can be mitigated through policy measures such as exchange rate management and strategic allocation of government spending.

Corden (1984) revisits and expands upon the main arguments of the earlier Corden and Neary (1982) paper by incorporating additional macroeconomic considerations — such as domestic absorption effects, monetary rigidities, capital flows, expectations, and sectoral dynamics. He also applies the theoretical framework to the (presumed) case of Dutch disease in the context of Britain's North Sea oil boom. Notably, Corden discusses and, to some extent, endorses protectionist responses to Dutch disease, although he characterizes them as a "second-best" policy option.

Jones and Neary (1984), in a well-known survey of neoclassical theories of international trade, reinforce the main conclusion of earlier studies. They show that following a natural resource boom, the manufacturing sector may experience a sharp

contraction, as the boom disproportionately enhances the profitability of nontradable sectors — particularly traditional services such as commerce and retail — which typically exhibit lower productivity than manufacturing. This dynamic is labeled a “disease” because it compromises the country's long-term development prospects.

2.2 Structuralist and new developmentalism arguments for Dutch disease

In the previous subsection, we observed that under laissez-faire conditions and fully liberalized international trade, the combined movement effect and the spending effect lead to deindustrialization — either directly (without changes in the real exchange rate) or indirectly (through real exchange rate appreciation). This outcome is a central insight of neoclassical models of Dutch disease, which typically assume the discovery of, or a boom in, natural resources.

However, in a seminal paper, Palma (2005) introduces a revised concept of Dutch disease, one that is not rooted in a natural resource boom. Instead, he argues that the growing dominance of the commodities sector — comprising primary and resource-based industrial goods — within the productive and export structures of developing countries stems from a series of liberalizing economic reforms adopted under “shock therapy” approaches, particularly trade and capital account liberalization, implemented from the 1990s onward. According to Palma (op.cit.), the most significant long-term consequence of these neoliberal reforms was the disruption of industrialization and the catching-up process in developing countries, leading to an acceleration of premature deindustrialization.

In a more recent study, Palma (2019: 925–930, boldfaces ours) clarifies his original arguments, as illustrated in the following extended quotation:

“The recent deindustrialization of many countries in Latin America, unlike that of the Netherlands and the United Kingdom, was not triggered by the discovery of natural resources or the development of an export-oriented services sector. This deindustrialization — strongly marked by Dutch disease characteristics — was instead induced by a radical shift in economic policy and development strategy, particularly concerning the import substitution industrialization (ISI) agenda. Fundamentally, it was the result of a drastic process of trade and financial liberalization, carried out in a context of rapid institutional change, which led to an abrupt reversal of the industrialization

*process that had previously been state-led (...). Brazil and the three Southern Cone countries (Argentina, Chile, and Uruguay) are among the Latin American nations whose manufacturing employment levels were most rapidly affected by the economic reforms. These countries had previously achieved higher levels of industrialization and were also among those that implemented the reforms most deeply and quickly (...). Thus, analytically speaking, cases of Dutch disease should be distinguished from other, more typical cases of deindustrialization, such as those that have occurred in most industrialized countries. The latter should be understood more as **evolutionary [natural] deindustrialization** processes — that is, in mature economies where manufacturing employment shifts to other sectors as part of the natural course of economic development. From the same perspective, Dutch disease in Latin America — induced by economic policies and institutional changes — should instead be seen as a case of **induced premature deindustrialization**.*

Yet, the new developmental theory of Dutch disease stems from the contributions of Bresser-Pereira (2008; 2020, 2020a) and other authors (Bresser-Pereira, Oreiro, and Marconi, 2014; Nassif, 2025).³ This approach revisits Palma's central argument that Dutch disease in developing countries is linked to the consequences of liberalizing reforms which, by reducing the level of protection in these economies (through import tariffs, competitive real exchange rates, and other industrial policy instruments), led them back to a pattern of specialization based on Ricardian natural comparative advantages — that is, a reliance on natural resource-based goods (commodities).

From this perspective, the new developmentalism views Dutch disease as a structural challenge facing commodity-exporting countries. Those that succeeded in industrializing and catching up (e.g., South Korea) were able to neutralize this competitive disadvantage — typically through mechanisms such as import tariffs, other protection instruments (export subsidies, long-term credit from public banks, etc), and active exchange rate policy to avoid domestic currency overvaluation. In contrast, countries that underwent premature deindustrialization had initially mitigated the effects of Dutch disease but later abandoned these protective measures following trade and financial liberalization. As Bresser-Pereira (2020: 640) explains:

³ For readers interested in a more detailed new developmentalist analysis of Dutch disease, see Nassif (2025, ch. 6).

“The Dutch disease is a competitive disadvantage that blocks the industrialization of a developing country (for instance, Venezuela or Saudi Arabia) or causes deindustrialization of a middle-income or a rich country that previously neutralized the disease but, in a given moment, liberalized trade and so dismantled the mechanism that neutralized the disease (the case of Brazil)”.

Also, the new developmentalism framework retains the core mechanism of the traditional version: a commodity export boom generates increased foreign exchange inflows, resulting in real currency appreciation. However, it expands the framework by introducing three distinct concepts of “equilibrium” real exchange rates and connecting them to the Dutch disease phenomenon: the current equilibrium, based on purchasing power parity (PPP); the industrial equilibrium, which ensures the competitiveness of domestic firms by inducing them to adopt the best available technology in their respective sector; and the external debt equilibrium, which maintains the sustainability of external debt relative to GDP.

While the PPP-based real exchange rate promotes current account balance and appears neutral across economic sectors, it may fall short in supporting long-term industrialization. In contrast, the industrial equilibrium real exchange rate — which implies an undervalued domestic currency — enhances the global competitiveness of domestic firms that operate with the best available technologies. When commodity prices surge and Dutch disease goes unaddressed, the nominal exchange rate tends to appreciate toward the current equilibrium rather than remaining closer to the industrial equilibrium. This shift undermines industrial development and reinforces dependence on primary exports.

According to the new developmental theory, for economic development to be sustainable and support catching up, the five main macroeconomic prices (profit rate, real exchange rate, real interest rate, real wage rate, and inflation rate) must remain at appropriate levels. However, for this approach, the real interest rate and the real exchange rate are the most important for sustaining economic growth, because:

i) the real interest rate, by measuring the opportunity cost of investments in real (“physical”) capital, compared to other assets (including financial assets), affects the expected profitability of investments, that is, it affects the marginal efficiency of capital.

In other words, the higher the real interest rate, the lower the willingness of entrepreneurs to invest in real capital and, therefore, the lower the economic growth; and (ii) the real exchange rate, understood as the relative price that affects the prices of goods and services traded internationally (the prices of exported, imported, and domestic products that compete with the imports), also affects the expected profitability of investments aimed at meeting local and international demands, because an overvalued exchange rate disconnects investment projects that use the best technology in their market. Thus, the lower the real exchange rate — that is, the more overvalued the national currency is to the dollar or a basket of foreign currencies —, the lower the investments directed at meeting local and international demands. In other words, according to new developmentalism, with the domestic currency tendentially overvalued, entrepreneurs tend to face difficulties in **accessing** the existing effective demand. In this same vein, job creation tends to benefit the rest of the world because the expansion of domestic demand ends up leaking, in large part, into imports.

For Bresser-Pereira, Oreiro, and Marconi (2014), the real exchange rate works as a switch that connects or disconnects companies that use the best available technology in their respective markets, confirming or rejecting their **access** to existing demand. Within this framework, only the industrial equilibrium real exchange rate aligns with sustained economic development. As emphasized by Bresser-Pereira, Oreiro, and Marconi (2014), exchange rate policy should be guided by competitiveness, not merely by current account balance. Failing to do so risks trapping the country in a cycle of premature deindustrialization, external vulnerability, and long-term economic stagnation.

Brazil's experience since the economic liberalizing reforms in the 1990s and even after adopting a floating exchange rate and inflation-targeting regime in 1999 illustrates this trajectory: persistent currency overvaluation, driven by policy-induced excessive capital inflows during the international liquidity bonanza, has accelerated premature deindustrialization and increased the economy's exposure to external shocks. This has resulted in repeated episodes of capital flight and sharp currency depreciation ("overshooting"), triggering inflation, corporate insolvency, and financial instability, as will be further discussed ahead (Section 3).

2.3 Natural resource-rich economies: blessing or curse?

The theory of the resource curse, a by-product of Dutch disease theory, argues that countries rich in natural resources often fail to use this wealth to drive industrialization and inclusive long-term economic growth. Instead, these resources tend to entrench predatory elites and inhibit the development of strong institutions. The neoclassical foundation of this theory is Sachs and Warner (1995), who sought to respond to the following question: Does natural resource abundance promote or hinder economic growth? By running large cross-country regressions for the period 1970–1989 and controlling for variables such as initial income, trade policy, government efficiency, investment rates, and other control variables, they “found a negative correlation between resource abundance and economic growth”. As one might expect natural wealth to finance development, this counterintuitive result would lead us to conclude that resource-rich economies are, indeed, destined for the resource curse. Are they?

Today, several studies show that natural resources-rich economies are not necessarily destined for a curse (see, for instance, Di John, 2009 and Van der Ploeg, 2011). But, a long time ago, Celso Furtado offered a deeper and earlier structuralist analysis in his essays on Venezuela (1957; 1974), diagnosing how oil wealth failed to structurally transform the economy despite high per capita income.

Furtado observed that Venezuela’s overreliance on oil led to a distorted productive structure, where gains in oil productivity did not spread to agriculture or industry. The overvalued currency, a consequence of large foreign exchange inflows, undermined the domestic manufacturing sector and encouraged imports. Government revenues from oil were invested mainly in capital-intensive infrastructure with limited employment effects, while industrial development and labor absorption were neglected. For Furtado, this trajectory reflected Dutch disease well before it was labeled as such in the Netherlands in the 1960s.

Rather than labeling resource wealth as an inevitable curse, Furtado argued it could be a blessing, provided it was channeled into policies that promote productive diversification, industrialization, and human capital formation. He advocated for public investment in sectors with strong externalities, especially in education, technical training, and industries with strong linkages. Echoing Lewis (1954) and Hirschman (1958), he emphasized directing investment to labor-intensive sectors to absorb structural unemployment and raise aggregate average productivity.

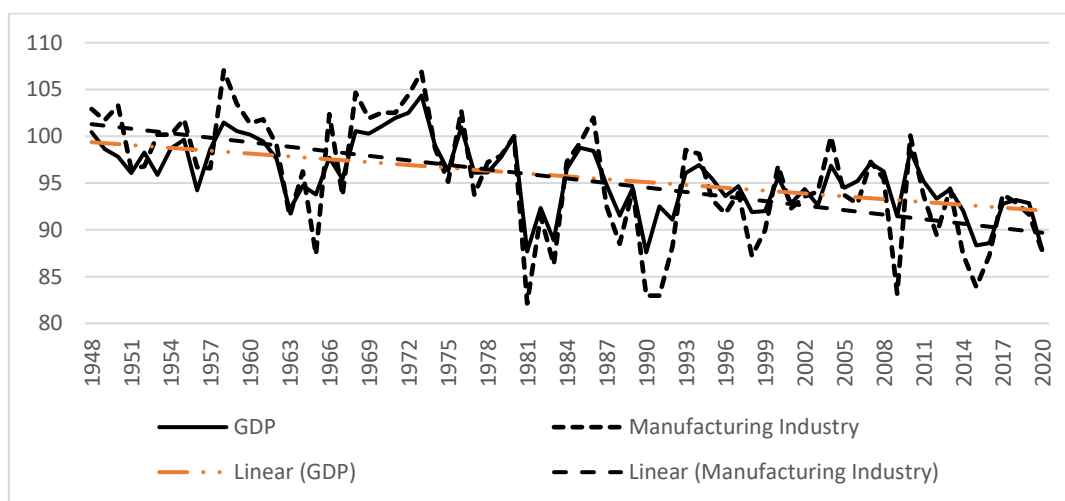
Ultimately, Furtado warned that without structural reforms and a shift toward inclusive development strategies, Venezuela — and other resource-rich countries — would fall into stagnation, income concentration, and external dependency. His original analysis remains highly relevant for understanding the limitations of resource-based growth and the conditions under which it may become a blessing or a curse for resource-rich developing economies.

3. The Brazilian economy since the 1950s: from accelerated growth to premature deindustrialization and stagnation

From the post–World War II period until the late 1970s, the Brazilian economy stood out as one of the most dynamic in the world in terms of growth. This era was characterized by rapid industrialization: between 1948 and 1980, the manufacturing sector expanded at an average annual rate of 8.6%, while GDP grew by 7.4% per year. Labor productivity also rose sharply, registering an impressive average annual increase of 4.5% between 1950 and 1980 (Nassif, 2024). Moreover, during this period, Brazil began to shift away from its historical reliance on primary product exports, instead showing a growing capacity to generate domestic aggregate demand as a key driver of economic dynamism.

The external debt crisis of the 1980s marked the beginning of a shift toward a period of low economic dynamism and a reversal of Brazil’s industrialization process, leading the economy into a state of near stagnation. Figure 1 illustrates the growth trajectories of GDP and the manufacturing sector since 1948, along with their respective trend lines, clearly highlighting this turning point. From the 1980s onward, the manufacturing sector experienced a sustained decline in its growth rate—a trend that deepened following the 2008 global financial crisis. Since 2010, industrial growth has outpaced overall economic growth in only three years.

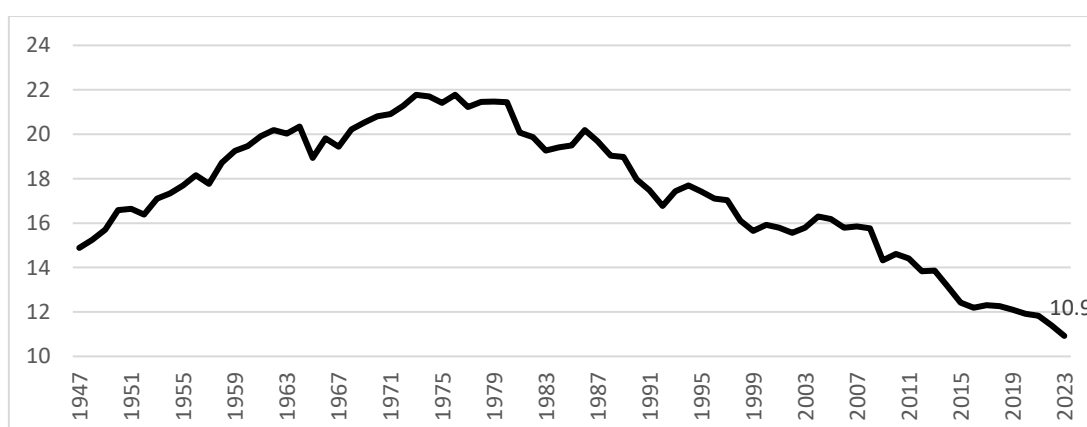
**Figure 1: Evolution of GDP and Manufacturing Industry in Brazil
(1948-2024) – In index number 1980=100**



Source: Brazilian Statistical Office (IBGE), National Accounts, elaborated by the authors.

Complementing Figure 1, Figure 2 depicts the evolution of the manufacturing sector's share in total value added, measured at constant 2018 prices. Since the mid-1980s, this share has declined almost continuously, with the downturn becoming significantly more pronounced from the 2010s onward. By 2023—the most recent year for which data are available—manufacturing accounted for just 10.9% of GDP, a level even lower than that recorded in 1947.

**Figure 2: Brazilian manufacturing sector as a proportion of GDP
(1947-2023, in percentage) – at 2018 prices**



Source: Updated series based on Morceiro and Guilhoto, 2023, Table 1, kindly provided by P. C. Morceiro. Primary data from the Brazilian Statistical Office (IBGE).

This section argues that the virtuous growth cycle observed in the post-war period was underpinned by a profound structural shift toward more capital-intensive sectors,

driven by an economic policy strategy aimed at closing the gap between Brazil's per capita income and that of the developed world. This strategy was strongly influenced by the thinking of the Economic Commission for Latin America and the Caribbean (ECLAC), which maintained that income expansion in non-industrialized economies depended heavily on overcoming the persistent deterioration in the terms of trade for their exported goods. For agrarian-exporting countries like pre-war Brazil, sustained per capita income growth required a transition toward industrialization, led and coordinated by the state. According to the ECLAC perspective, the productive transformation of late-developing economies would not result from market-led resource allocation but from deliberate state planning. The state's role was to identify and promote strategic sectors capable of driving industrialization and productivity growth (Bértola and Ocampo, 2010).

The state-led industrialization strategy was implemented through a policy of import substitution, which involved imposing high tariffs on consumer goods to protect infant domestic industries, alongside subsidies to encourage industrial exports. Although this approach generated microeconomic inefficiencies in the allocation of productive resources, it proved effective in driving sustained economic growth. However, the strategy was largely dismantled in the 1990s with the onset of trade and financial liberalization, marking a significant shift in Brazil's development model toward the principles of the Washington Consensus. Between 1981 and 2024, the average annual GDP growth rate fell to 2.1%, while the manufacturing sector expanded by only 0.6% per year.

According to Palma (2005, 2019) and Bresser-Pereira (2020), it was the radical shift in the economic policy regime that triggered changes in relative prices, ultimately disadvantaging the manufacturing sector. As discussed in the previous section, the uncritical adoption of liberal economic policies significantly reduced the state's policy space to pursue a development and industrialization agenda. Deindustrialization, therefore, should be understood as the outcome of a deliberate policy choice—one that replaced the active use of protectionist measures aimed at transforming the productive structure with a non-interventionist approach, grounded in the belief that free markets would allocate resources efficiently through static comparative advantage.

The consequences of this policy choice in economies still undergoing development include deindustrialization, as they tend to specialize in sectors with "natural" comparative advantages, thereby reinforcing the symptoms of the so-called "Dutch disease". For this reason, when deindustrialization occurs before the economy has

completed a stage of mature industrialization, it is referred to as *premature*, and the economy loses its dynamism and competitiveness.⁴

Table 1 shows the evolution of Brazil's productive structure since the post-war period. It was in the 1970s that the manufacturing industry reached its peak share, accounting for nearly 30% of total value added. This share declined sharply from the 1990s onward, and by the 2010s, it had fallen to less than half of its value in the 1970s.

Table 1: Share of main sectors of Brazilian economic activities in total value added (current prices)

Selected periods from 1951 to 2020 (in percentage)

Periods	% Share of main sectors of activity -1951-2020			
	Agriculture	Total Industry (including Manufacturing)	Manufacturing	Services
1951-60	22.5	26.3	20.2	51.1
1961-70	15.7	32.6	25.8	51.5
1971-80	11.5	38.1	29.4	50.0
1981-90	10.0	39.9	28.8	49.7
1991-00	7.3	32.5	17.6	60.3
2001-10	5.7	27.2	16.2	67.1
2011-20	5.3	23.3	12.4	71.4

Source: Brazilian Statistical Office (IBGE). National Accounts, elaborated by the authors.

During the thirty years of virtuous growth in the Brazilian economy (1950–1980), the industrial sector's structure became more complex, with a greater concentration in capital-intensive sectors. The dynamism in terms of the growth rate of Brazilian

⁴ It is important to note that Rodrik (2016) observes deindustrialization as a phenomenon affecting both developed and developing economies. However, echoing Palma's seminal argument (2005), Rodrik emphasizes that in developing countries—particularly in Latin America—this process is *premature*, as these nations are losing opportunities for industrialization at significantly lower income levels than those experienced by advanced economies. As a result, they are undergoing a faster and earlier deindustrialization trajectory. This relative decline in the role of manufacturing as an engine of growth is often accompanied by increased specialization in sectors aligned with existing comparative advantages. In this context, authors such as Tregenna (2014) and Dosi et al. (2021) argue that both premature deindustrialization and excessive reliance on static comparative advantage constrain the ability of developing economies to catch up with their developed counterparts. See also Nassif et al. (2015).

manufacturing, as mentioned, resulted from the shift in the composition of subsectors within the industrial matrix — that is, from the increasing weight of the more dynamic industries.

As described in the theoretical literature on structural change processes, the faster an economy grows, the more efficient it is at reallocating productive resources from low-productivity activities — typically associated with the production of low-value-added goods, such as those intensive in natural resources — to activities that produce higher-value-added goods. Table 2, drawing on data from the Industrial Censuses, presents the shifts in the relative shares of manufacturing subsectors. These subsectors are categorized according to Pavitt's (1984) classification, which groups industries based on their factor inputs and the key characteristics that shape how they compete in the market.

**Table 2: Share of Brazilian manufacturing subsectors, selected years
(in percentage)**

Group of sectors of activity of the manufacturing industry	% share in total manufacturing			Difference in percentage points		
	1970	1980	2000	1980-1970	2000-1980	2000-1970
Resource based	32.6	29.7	38.4	-2.9	8.7	5.8
Labor-intensive	15.9	17.2	11.5	1.3	-5.7	-4.4
Scale Intensive	37.1	38.6	33.2	1.5	-5.4	-3.9
Specialised Suppliers	9.9	11.7	11.2	1.8	-0.5	1.3
Science Based	4.5	2.8	5.8	-1.7	3.0	1.3

Source: Brazilian Statistical Office (IBGE) Industrial Censuses, elaborated by the authors.

In 1970, the industrial structure was dominated by scale-intensive and resource-based sectors. By 1980, the share of resource-based industries had declined, while specialized supplier, scale-intensive, and labor-intensive sectors had gained ground. In other words, up to the early 1980s, the evolution of Brazil's productive structure reflected steady progress through the stages of industrialization, with the domestic production of both consumer⁵ and capital goods becoming increasingly internalized.

⁵ According to Wells (1976; 1977), the expansion of consumer credit facilities since the late 1960s played a major role in broadening the domestic market for durable goods in Brazil, enabling households to adopt

From 1980 to 2000, a period marked by the onset of premature deindustrialization—when manufacturing’s share of total value added declined from 30.3% in 1980 to 15.3% in 2000—the three industry groups that had previously gained weight lost ground in their share of total manufacturing. In other words, the decline of the manufacturing industry in the country’s productive matrix occurred due to the relative loss of importance of sectors that were more capital-intensive and technologically sophisticated.

In 2000, the science-based group showed a gain in share; however, this gain was concentrated in a single product (the production of medium-sized aircraft). The progression of the deindustrialization process becomes evident in 2000 when comparing the sectors’ shares in the two extreme years of the table: from 1970 to 2000, labor-intensive and scale-intensive sectors retreated in the productive structure, losing a combined total of 8.3 percentage points, while the natural resource-intensive sector advanced by 5.8 percentage points. These are initial signs of a process of premature deindustrialization, mainly due to the weakening of the productive links within the scale-intensive group.

3.1 A successful productive transformation process through industrialization: protectionism, exchange rate policy, and National Development Plans

The industrialization process driven by import substitution relied heavily on broad protectionist measures to support infant industries. Two policies were particularly instrumental in enabling this productive transformation: first, the protection of priority industries through high tariffs and market reserves for domestic production, reinforced by the “National Similar Law”;⁶ and second, an exchange rate policy that provided preferential rates for the import of capital goods and various intermediate inputs.

consumption habits similar to those of wealthier peers. The growing consumption of ‘modern’ durable goods by the middle class, as well as the emulation of upper-class consumption patterns by the lower classes across the entire income distribution, represented a significant achievement. Thus, Brazil in the late 1960s and throughout the 1970s can be understood as a combination of conspicuous consumption and mass consumption. This consumption pattern enabled the domestic absorption of industrial production within a “low-wage industrialization strategy”.

⁶ According to the National Similar Law (in effect since 1938, but enforced in practice from 1968 onward), importers could request tariff exemptions provided that no similar product was manufactured domestically. Although the legal provisions required that government officials compare the price, quality, and delivery time of domestically produced goods with those of their international counterparts, in practice, the Foreign

Concerning import policy, tariffs and surcharges were complemented by import controls implemented through both explicit and implicit non-tariff barriers. As Braga and Tyler (1990) point out, these non-tariff measures proved to be significantly more effective as instruments of protection.

Regarding exchange rate policy, in response to external financing difficulties in the early 1950s, Instruction 70 of the Superintendency of Currency and Credit (SUMOC) was introduced in 1953. This measure established a multiple exchange rate system that categorized productive sectors into five priority levels, ranked from highest to lowest. Foreign currency was allocated through auctions, often resulting in significant premiums over the official fixed exchange rate of 18 Brazilian cruzeiros per U.S. dollar. The system served a dual purpose: conserving scarce foreign reserves and, more importantly, functioning as a mechanism of industrial protection. Illustrating its protectionist character, between 1954 and 1957, the exchange rate premiums for Categories III to V ranged from 63% to 296% above the official rate (Silva, 1983, p.189; Dib, 1987, p.29).⁷

One of the most distinctive features of Brazil's industrialization process was the persistence of high inflation. To preserve export competitiveness amid accelerating price levels, the government adopted a policy of *mini-devaluations*—known as a *crawling peg*—beginning in 1968. This regime remained in place, with few interruptions, until March 1990. In his analysis of this exchange rate policy, Zini Jr. (1995) concludes that it was largely effective in preventing a chronic overvaluation of the Brazilian currency, particularly during the 1970s. Within this broader context of persistent inflation, exchange rate policy was primarily oriented toward maintaining the purchasing power of the national currency relative to the U.S. dollar.

In addition to chronic inflation, domestic infrastructure bottlenecks underscored the need for increased public investment. The significant acceleration of industrialization during the 1950s was largely driven by the implementation of the Target Plan (*Plano de Metas*) under President Juscelino Kubitschek (1956–1961).⁸ The plan outlined a

Trade Office (CACEX) made decisions on an *ad hoc* basis, routinely denying import requests whenever the mere existence of domestic production could be confirmed. For details, see Nassif (1995).

⁷ In addition to the regulatory instruction, Instruction 113 of the Superintendency of Currency and Credit (SUMOC) was established in January 1955, which, among other measures, allowed the import of equipment and production goods without foreign exchange coverage.

⁸ Broadly speaking, the success of the Target Plan (*Plano de Metas*) lay in its capacity to coordinate a comprehensive set of economic policy instruments aimed at overcoming infrastructure bottlenecks and modernizing Brazil's industrial base. One of its most notable achievements was the effective coordination of investment decisions, particularly significant in an era when industrialization required the construction

proactive role for the state in investing in key infrastructure and basic sectors, while also promoting private investment. It pursued two main objectives: first, to modernize economic infrastructure — particularly in energy and transportation — to support the growing demands of industrial expansion; and second, to prioritize strategic industries capable of addressing critical gaps in the country's import structure.⁹

Another significant boost to Brazilian industrialization came with the implementation of the Second National Development Plan (II PND), carried out between 1975 and 1979. Launched in 1975, the plan aimed to deepen the process of import substitution, with a strategic focus on key industrial and energy sectors (especially intermediate goods). It prioritized domestic production in areas such as steelmaking, heavy chemicals, non-ferrous metals, and non-metallic minerals, while also expanding investment in the energy sector, particularly oil exploration and electricity generation. Notably, the II PND also promoted the development of alternative energy sources to reduce dependence on oil derivatives, with a strong emphasis on fuel alcohol, which achieved considerable success.

The external shocks of 1979–1980 — characterized by a second spike in international oil prices and rising interest rates on foreign debt — abruptly ended Brazil's period of rapid economic growth. Although the economy still expanded by 9.2% in 1980, mounting balance of payments imbalances and accelerating inflation soon plunged the country into what would later be termed the “lost decade” of the 1980s. The strategy of promoting industrialization through external borrowing revealed its vulnerabilities, as the international environment became increasingly adverse to the continued debt accumulation of countries without convertible currencies.

It is important to acknowledge that the import substitution-based development strategy also exhibited microeconomic weaknesses. Most of these were linked to high levels of domestic protection, excessive dependence on the technology and capital of multinational enterprises (notably capital goods and durable consumer goods industries), and limited innovative capacity. With few notable exceptions — such as Petrobras in oil

of large-scale industrial plants. In addition to its planning role, the state also acted as a financial coordinator, facilitating the implementation of strategic investment projects.

⁹ By identifying priority industries—such as steel and petroleum—alongside dynamic sectors including capital goods, durable consumer goods, and intermediate goods, the plan reinforced a core of economically and technologically interconnected activities. The selection of these priority sectors also aimed to secure the domestic supply of essential goods needed to sustain economic growth, while minimizing pressure on the balance of payments.

extraction and Embraer in the aircraft industry — Brazil failed to develop a broad portfolio of genuinely “made in Brazil” products. Moreover, in manufacturing subsectors characterized by high capital-labor ratios, the absence of a well-calibrated balance between domestic protection and external competitive pressure led to industries operating at suboptimal scales, with average costs significantly above international levels.

Nonetheless, despite these microeconomic inefficiencies, the macroeconomic performance of the Brazilian economy during the period remains indisputable, as evidenced by the high annual average growth rates of both GDP and labor productivity between 1950 and 1980. Rather than addressing these structural weaknesses through targeted reforms and a reorientation of industrial policy, the country shifted to a neoliberal strategy in the early 1990s —implemented in the form of shock therapy — as will be discussed in the next subsection.

3.2 The radical shift in development policy since the 1990s: Abandoning developmentalism, embracing neoliberalism

The external debt shock of the early 1980s prompted Brazil to abandon, during the 1990s, the developmentalist strategy it had pursued since the post-war era—a model that had underpinned the country's industrialization. Throughout the decade, difficulties in renegotiating the debt persisted, exacerbating domestic imbalances such as mounting inflationary pressures and a protracted fiscal crisis.

The acceleration of inflation during the 1980s was largely driven by the pervasive indexation mechanisms — both formal and informal — that shaped Brazil's monetary and financial transactions. After multiple unsuccessful attempts to contain inflation through heterodox economic plans in the 1980s and early 1990s,¹⁰ price stability was finally achieved in 1994 with the introduction of the Real Plan (*Plano Real*).

From that point onward, Brazil deepened its economic liberalization. Trade liberalization had already advanced rapidly between 1990 and 1994,¹¹ while the external financial opening began in 1992. This shift marked a new development strategy centered

¹⁰ Cruzado Plan (February 1986); Bresser Plan (June 1987); Summer Plan (January 1989); Collor Plan (1990).

¹¹ Brazil's trade liberalization officially began in 1988 with a significant reduction in nominal import tariffs, particularly in the manufacturing sector. However, the reform had limited practical impact due to the continued presence of numerous non-tariff barriers—such as import restrictions on thousands of goods, many of which were blocked amid the exchange rate crisis. As a result, the initial phase of trade liberalization proved largely ineffective. For further details, see Nassif (2003).

on integrating the Brazilian economy into global markets. Trade liberalization was rightly seen as a necessary step to increase domestic competition and revive labor productivity, which had stagnated since the mid-1980s. However, it was implemented in the form of "shock therapy": most non-tariff barriers were abruptly removed, nominal import tariffs were sharply reduced, and capital account liberalization proceeded rapidly. Although trade openness also served as a tool for price control during the fight against high inflation under the Real Plan, its abrupt implementation posed significant adjustment challenges.

Financial liberalization, meanwhile, was expected to attract capital inflows that could help finance balance of payments deficits.¹² Collectively, the neoliberal reforms of the 1990s dismantled many of the protective instruments — such as domestic industry protection, active exchange rate policies, and public investment — that had played a central role during Brazil's industrialization period.

The rapid overhaul of the tariff system, the external financial liberalization of the Brazilian economy, and the abandonment of industrial policy during the 1990s gradually dismantled the protective framework that, according to Bresser-Pereira (2020a), had helped neutralize the effects of Dutch disease during the period of accelerated industrialization. However, the most consequential shift for the Brazilian manufacturing sector was the change in exchange rate policy, which became the primary anchor for the country's price stabilization strategy.¹³

While the Real Plan succeeded in curbing high inflation, the adoption of a (semi-)fixed exchange rate regime—under conditions of free capital mobility and a high reliance on external savings—proved ultimately unsustainable. The Brazilian economy faced successive speculative attacks during the Mexican crisis (1995), the Asian financial crisis (1997), and the Russian crisis (1998), all of which disrupted capital inflows and intensified external vulnerability. These pressures culminated in the abandonment of the (semi-)fixed exchange rate regime in January 1999. During the Real Plan period, the real

¹² In defense of the neoliberal reforms, Gustavo Franco (2000) argues that Brazil's chronic inflation stemmed from a development strategy that created deep structural imbalances—imbalances that, in his view, could only be resolved through a decisive break in the 1990s. According to Franco, the country's economic performance after 1982 was disastrous, marked by a collapse in both growth and productivity. While the prevailing narrative attributed the crisis to external factors, the so-called "lost decade" offered, in his assessment, an opportunity to reopen the debate on the detrimental effects of excessive protectionism, heavy regulation, and controls over prices, credit, and investment. The success of the Real Plan in stabilizing prices—underpinned by economic liberalization and privatization—became a central argument against the import substitution model as a viable development strategy.

¹³ Kume (1996) observes that the acceleration of trade liberalization occurred concurrently with increased exchange rate exposure, driven by the appreciation of the real against the dollar.

exchange rate had remained overvalued by more than 20% on average. The transition to a floating exchange rate regime triggered a sharp depreciation, with the currency overshooting before eventually stabilizing. This floating regime, adopted in early 1999, remains in effect today.

3.3 The macroeconomic policy "tripod": Floating Exchange Rate, inflation targeting, and primary surplus targets

With the adoption of a floating exchange rate regime in January 1999, Brazil transitioned to an inflation-targeting framework as its new monetary anchor. At a theoretical level, this shift was expected to restore monetary policy autonomy within a context of price stability (Mundell, 1960). Between 2003 and the onset of the global financial crisis in 2008, Brazil benefited from highly favorable terms of trade—fueled by a boom in commodity prices for its exports and an environment of ample global liquidity. These factors contributed to a sustained real appreciation of the Brazilian currency.

Remarkably, this trend of currency appreciation continued even after the end of the commodity boom—apart from a brief interruption following the 2008 crisis—lasting until the recession of 2015–2016. This persistence can largely be attributed to the interplay between a conservatively managed inflation-targeting regime and a floating exchange rate system, operating within a global environment of sustained liquidity.

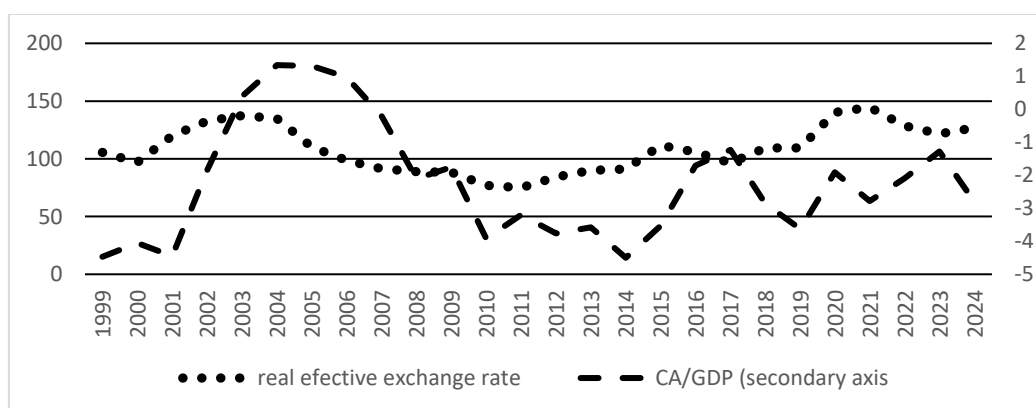
As discussed by Nassif et al. (2022), although the theoretical Mundell-Fleming model predicts greater monetary policy autonomy under open capital market conditions, the reality is quite different for peripheral economies like Brazil. These countries, which rely heavily on external capital and issue non-convertible currencies, are integrated into global financial markets in a structurally subordinate position. As a result, they are highly exposed to sharp fluctuations in exchange rates.

Because international capital flows are inherently pro-cyclical, monetary policy in such economies often turns to the domestic interest rate as a tool to manage exchange rate volatility. However, since an overvalued exchange rate tends to dampen domestic inflation, monetary authorities—particularly under orthodox inflation-targeting regimes—have a strong incentive to maintain high interest rate differentials relative to advanced economies. This strategy attracts foreign capital inflows, allowing currency appreciation to reinforce domestic price stability.

Moreover, as evidenced by Brazil's experience over the past two and a half decades, prolonged currency overvaluation has had harmful effects on the country's productive structure. It has contributed to premature deindustrialization and intensified the external constraint on growth. Figure 3 illustrates the relationship between current account balances as a percentage of GDP (right axis) and the real effective exchange rate (left axis). Two key patterns emerge: first, Brazil's current account deficits are closely linked to periods of real currency appreciation; second, when these deficits become unsustainable, adjustment tends to occur abruptly—either through sharp currency depreciations, as seen in 1999, or through a combination of depreciation and deep recession, as was the case during the 2015–2016 downturn.

Following the severe recession of 2015–2016, Brazil underwent a sluggish economic recovery between 2017 and 2019, which was then disrupted by the onset of the COVID-19 pandemic in 2020. Since that time, the real effective exchange rate has tended toward undervaluation. However, this recent trend largely reflects elevated risk premia resulting from a series of global shocks since 2020—including the COVID-19 pandemic, the war in Ukraine, rising global inflation, and, more recently, the tariff war initiated during the Trump administration. Given the limited policy space to implement autonomous macroeconomic measures, a return to a period of abundant global liquidity could once again lead to an overvaluation of the Brazilian real.

Figure 3: Real effective exchange rate index and current account (CA) balance/GDP in Brazil: 1999-2024 (in percentage)



Source: Central Bank of Brazil and Ipeadata.

In short, Brazil's subordinate integration into international financial markets has shaped an exchange rate management dynamic characterized by high domestic interest

rate differentials relative to external rates and substantial holdings of international reserves. These tools have been used to buffer capital flow volatility and, in turn, to limit the inflationary impact of sudden currency depreciations.

However, as argued by the new developmentalist literature (Bresser-Pereira, 2020), the strategic price that guides resource allocation toward the manufacturing sector is the real exchange rate. In economies with comparative advantages in natural resource exploitation, like Brazil, the real exchange rate tends to appreciate over time. In Brazil's case, the liberal turn in economic policy entailed the dismantling of mechanisms that had previously countered the effects of Dutch disease. Combined with unrestricted capital mobility, this shift has led to a persistently overvalued real exchange rate, undermining competitiveness in the long term.

As a result, the neoliberal macroeconomic framework adopted since the early 1990s has played a central role in the decline of the manufacturing sector within Brazil's productive structure. One consequence has been a regressive shift in both production and exports, pushing the Brazilian economy back toward its Ricardian roots—namely, a specialization based on its natural resource endowments.

Table 3 illustrates the evolution of Brazil's international trade pattern over selected years. The share of primary goods in total exports rose sharply—from around 15% in 2000 to nearly 50% in 2023—clearly signaling an increasing reliance on products tied to static comparative advantages. During the same period, manufactured exports declined by more than 30 percentage points. All categories of manufactured goods experienced steep contractions, with the sole exception of resource-based products, which saw a modest increase. These trends reflect a clear pattern of premature deindustrialization.

On the import side, the composition changed little between 2000 and 2023. The most notable trend was a growing dependence on imported manufactured goods, further highlighting the erosion of Brazil's domestic manufacturing base within its overall productive structure.

**Table 3: Share of goods' total exports and imports -
Selected years from 2000-2023 (in percentage)**

	Exports				Imports			
	2000	2010	2020	2023	2000	2010	2020	2023
Primary Goods (Agriculture and Mining)	14.6	34.8	46.5	48.3	12.3	13.1	7.7	9.5
Manufacturing	83.3	63.1	53.5	51.5	87.3	85.9	91.3	90.0
Resource-based	18.4	21.3	20.7	20.2	3.8	3.1	4.2	3.9
Labor-intensive	9.1	4.1	2.5	2.0	4.5	5.8	6.3	5.3
Scale Intensive	29.8	21.1	18.3	18.0	23.6	26.8	20.1	25.4
Specialised Suppliers	14.0	8.3	5.5	5.9	19.0	19.0	21.0	18.8
Science Based	12.0	8.4	6.4	5.3	36.4	31.1	39.7	36.6
Not classified	2.0	2.1	0.0	0.3	0.4	1.0	1.0	0.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: OECD; Data calculated and kindly provided to the authors by Paulo C. Morceiro. Classification according to Pavitt (1984).

In summary, the analysis presented in this subsection highlights Brazil as a textbook case of premature deindustrialization and re-primarization of its export basket — hallmarks of a chronic Dutch disease condition. This hypothesis will be tested in the following section. Broadly defined by Palma (2005) and within the new developmentalist framework (Bresser-Pereira, 2020a), Dutch disease arises from an economic policy orientation that prioritizes rapid trade liberalization and financial openness, promoting a growth strategy dependent on the absorption of external savings.

As shown, this approach led to a significant loss of economic policy autonomy and contributed to a persistent trend of real exchange rate appreciation between 1994 and 2014 (see Figure 3). This, in turn, eroded the competitiveness of the manufacturing sector. The sharp decline in the share of manufactured goods in total exports and the growing concentration in low value-added primary products have effectively locked the Brazilian economy into a trajectory of low productivity growth and limited structural transformation.

4. Is the Brazilian economy a case of Dutch disease? Empirical evidence based on econometric estimates

As previously discussed, there is a substantial body of empirical literature (see footnote 2) that identifies Brazil as one of the most prominent cases of premature deindustrialization. However, few studies have examined whether this phenomenon is associated with the traditional concept of Dutch disease—that is, deindustrialization resulting from a boom in the natural resources sector.¹⁴ Moreover, to our knowledge, no existing research has investigated whether Brazil’s premature deindustrialization is linked either to the neoclassical definition of Dutch disease or to the frameworks proposed by Palma and the new developmentalist approach.

If the latter hypothesis holds, Brazil’s deindustrialization can be interpreted as a form of Dutch disease stemming not from a natural resource boom, but, rather, from a broader set of neoliberal economic reforms. These reforms exposed the economy to persistently high real interest rates and highly volatile real exchange rates, with a long-term trend towards currency overvaluation. This environment, in turn, has led to a significant misallocation of resources, favoring low-productivity service sectors and deepening the concentration of exports in commodity-based goods.

This section aims to econometrically assess through monthly statistics whether Brazil’s premature deindustrialization, over the period 1999–2024, can be attributed to Dutch disease dynamics. The empirical strategy is divided into two stages. In the first stage, we estimate the determinants of the Brazilian real exchange rate. The goal is to examine whether a Dutch disease proxy variable, alongside other explanatory variables drawn from the theoretical literature, plays a statistically significant role in explaining the behavior of the real exchange rate. In the second stage, we assess whether the real exchange rate, together with other relevant variables, helps explain changes in the share of the manufacturing sector in GDP, an indicator of industrialization or deindustrialization.

More specifically, in the first stage, we test whether the real exchange rate is significantly influenced by variables associated with Dutch disease, such as commodity price indices and interest rate differentials (as a proxy for external financial openness). If

¹⁴ To the best of our knowledge, the paper by Bacha et al. (2024) is the only empirical study analyzing the existence of Dutch disease in Brazil according to the neoclassical concept.

so, we proceed to the second stage, where the objective is to test whether deindustrialization — proxied by the seasonally adjusted fixed-base industrial production index — is correlated with the real exchange rate and additional explanatory variables aligned with the new developmentalist interpretation of Dutch disease. These include not only commodity price indices but also variables capturing the effects of liberalizing reforms, such as nominal import tariffs and a proxy for external financial openness. If these variables are found to be statistically significant, the results would support the hypothesis that Brazil's premature deindustrialization is driven by Dutch disease mechanisms, as interpreted by the new developmentalist literature.

4.1 Determinants of the long-term real exchange rate in Brazil (1999–2024)

In the economic literature, particularly from a new-developmental perspective, it is widely acknowledged that developing economies with high external financial openness tend to experience a persistent overvaluation of their currencies in the long run. One of the main drivers of this phenomenon is the so-called Dutch disease: in commodity-exporting countries, sustained real exchange rate appreciation often results from excessive net foreign currency inflows linked to natural resource exports, especially during commodity price booms.

A second major factor contributing to chronic currency overvaluation, particularly in Latin America, is the monetary strategy adopted by many central banks. These institutions frequently maintain high real interest rates to attract foreign capital and promote growth through external savings, which further reinforces upward pressure on the exchange rate.

Against this backdrop, the following subsection estimates a model for real exchange rate determination, intending to identify the variables that have influenced its long-term behavior in Brazil over recent decades. Special emphasis is placed on variables highlighted by new-developmental theory—namely, the commodity price index (as a proxy for Dutch disease) and the interest rate differential—alongside additional variables

selected based on the methodological framework developed in our earlier work (Nassif et al., 2017).¹⁵

The econometric specification of the model for determining the long-run trajectory of the real exchange rate is given by:

$$\text{Log}RER_t = c_0 + \beta_1 \text{Log}Y_t + \beta_2 \text{Log}CA_t + \beta_3 \text{Log}CI_t + \beta_4 \text{Log}DIF_t + \beta_5 \text{Log}IR_t + \beta_6 \text{Log}CR_t + \varepsilon_t \quad (\text{eq.1})$$

all variables are expressed in logarithms:

RER is the real exchange rate;

Y is real GDP per capita in U.S. dollars;

CA is the current account balance as a share of GDP;

CI is the current commodity price index;

DIF is the interest rate differential between the domestic short-term interest rate (Selic/Over) and the U.S. short-term interest rate (2-year T-note, for the international rate);

IR is the stock of Brazil's international reserves as a share of GDP;

CR is Brazil's sovereign risk premium, represented by the JP Morgan EMBI Brazil Sovereign Foreign Currency index;

ε is the error term, and the subscript **t** denotes time (in our econometric model, monthly observations).

The dataset covers the period from January 1999 to December 2024 and the detailed specification of the sources is in the first part of Table A the Appendix.

The first step in the empirical analysis involved conducting unit root tests using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) procedures. The results indicated that all the series are integrated of order one, meaning they are non-stationary in levels but stationary in first differences.

Since the variables are non-stationary and share the same order of integration, the Johansen (1988) cointegration approach can be employed to investigate whether a stable long-run relationship exists among them. As the test indicated the presence of one

¹⁵ A detailed discussion on the determinants of the real exchange rate can be found in Nassif, Feijó, and Araújo (2017).

cointegrating vector among the series, it is possible to confirm the existence of a long-term equilibrium relationship among the model's variables.

Given that the series are non-stationary and cointegrated, Equation (1) can be estimated using both Ordinary Least Squares (OLS)¹⁶ and the Vector Error Correction Model (VECM). Table 1 presents the results of the econometric model. All estimated coefficients are statistically significant and display the expected signs,¹⁷ as summarized in the table.

Tabela 4: Determinants of the long-term real exchange rate in Brazil -(1999-2024)

Dependent Variable: Real exchange rate (RER)

Variable	Variable	OLS Coefficient (t-statistic)	Variable	VEC Coefficient (t-statistic)
Constant	<i>C</i>	14.35*** [6.49]	<i>C</i>	-16.76
Log of GDP per capita	<i>lnY₋₃</i>	-0.19*** [-4.56]	<i>lnY₋₁</i>	-0.74*** [-5.94]
Log of Commodity index	<i>lnCI</i>	-0.23* [-1.68]	<i>lnIC₋₁</i>	-0.15*** [3.65]
Log of Current Account Balance / GDP	<i>lnCA</i>	0.05*** [4.52]	<i>lnCA₋₃</i>	0.07*** [-3.46]
Log of Interest Rate Differential	<i>Ln(DIF)₋₃</i>	-0.10*** [-6.04]	<i>Ln(DIF)₋₁</i>	-0.07* [-1.79]
Log of International Reserves / GDP	<i>lnIR</i>	0.28*** [9.53]	<i>lnIR₋₁</i>	0.35*** [6.32]
lnCR (Log of Brazil Risk Premium)	<i>lnCR</i>	0.22*** [7.70]	<i>lnCR₋₃</i>	0.32*** [4.58]

Note on OLS model: R-squared: 0.67; Adjusted R-squared: 0.66; Durbin-Watson: 1.67; F-statistic: 102; Prob (F-test): 0.00; Number of observations: 309 after adjustments. Variables Y and DIF were included with 3 lags.

Note on VEC model: 3 lags; Number of observations: 302 after adjustments. All variables were included with one lag. Order of the variables in the VEC: RER DIF IR CA PIBPC IC LEMBI

Notes: *** Significant at 1%; ** Significant at 5%; * Significant at 10%

The results presented in Table 4 indicate that all explanatory variables are statistically significant and display the expected signs, underscoring their relevance in explaining Brazil's long-term real exchange rate (RER) behavior. In both the OLS and

¹⁶ According to Hamilton (1994), when the variables in the model exhibit these properties, OLS remains a super-consistent estimator. For a formal demonstration, see Hamilton (1994:587).

¹⁷ For a detailed justification of the expected signs of these variables, see Nassif et al. (2017).

VEC models, the logarithm of GDP per capita exhibits a significant negative relationship with the RER, suggesting that higher income levels are associated with real appreciation, an outcome consistent with the Balassa-Samuelson effect (see Obstfeld and Rogoff, 1996, p. 212).

The commodity price index also shows a negative coefficient, indicating that increases in commodity prices lead to an appreciation of the real exchange rate. This result aligns with the Dutch disease hypothesis in both neoclassical and developmentalist theories and is statistically significant in both models, though at the 10% level in the OLS estimation.

In the OLS model, the current account balance, international reserves, and the country risk premium are all statistically significant and positively signed. This suggests that stronger external balances and higher reserve accumulation tend to depreciate the RER, while higher risk premiums are associated with depreciation, findings that align with theoretical expectations. Meanwhile, the interest rate differential is negative and significant in both specifications, supporting the view that higher domestic interest rates attract capital inflows and lead to real exchange rate appreciation, a result consistent with Palma's and the new-developmentalists' interpretation of Dutch disease.

The consistency of these results across both models, coupled with robust t-statistics, reinforces their economic and statistical significance. Taken together, the findings provide strong empirical support for core propositions of the new-developmentalists' approach regarding the structural drivers of currency overvaluation in developing economies. Specifically, the negative and significant relationship between the commodity price index and the RER confirms the presence of Dutch disease dynamics: rising commodity prices lead to foreign exchange inflows that appreciate the domestic currency. Likewise, the significant negative effect of interest rate differentials on the RER suggests that high domestic interest rates—used as a strategy to attract foreign capital—further contribute to currency appreciation.

Overall, these results reinforce the new-developmentalists' argument that both external factors (such as commodity dependence and reliance on external savings) and internal factors (such as monetary policy stance) systematically contribute to the persistent overvaluation of the real exchange rate in Brazil. This overvaluation, in turn, reflects deeper structural vulnerabilities rooted in Dutch disease dynamics.

4.2 Determinants of premature deindustrialization in Brazil in the period 1999–2024: A case of Dutch disease?

According to new developmentalist scholars, particularly Bresser-Pereira et al. (2019), the processes of international trade and external financial liberalization implemented in Brazil since the late 1980s have played a central role in driving up real interest rates, tending to reduce the real exchange rate (i.e., overvalue the Brazilian currency), and dismantling domestic protection for manufactured goods. These liberalization measures effectively nullified earlier policies designed to mitigate the effects of Dutch disease. As a result, Brazil experienced a long-term trend of significant real exchange rate overvaluation between 1994 and 2014, which ultimately eroded the competitiveness of its manufacturing sector.

In the previous section, the real exchange rate was modeled as a function of several key variables: real GDP per capita in U.S. dollars, the current account balance as a share of GDP, the international commodity price index, the interest rate differential between domestic and U.S. short-term interest rates, the stock of international reserves (as a share of GDP), and Brazil's sovereign risk premium. These variables — originally introduced in the context of real exchange rate determination — are now revisited for their indirect impact on manufacturing performance, transmitted through their influence on the real exchange rate.

Building on this framework, the present section empirically investigates premature deindustrialization incorporating additional control variables, besides the real exchange rate, to capture the dimensions of trade liberalization and financial openness. These new variables capture the broader context of Palma's and the new developmentalist reinterpretations of Dutch disease. The goal is to assess how changes in external and monetary policy regimes from 1999 onwards have shaped industrial competitiveness through their effect on the real exchange rate, and consequently on the allocation of domestic resources.

The econometric specification of this model is built on a monthly basis and is represented in Equation 2. Once again, the details on the construction of the series can be found in the second part of Table in the Appendix.

$$\text{LogIND}_t = c_0 + \beta_1 \text{LogRER}_t + \beta_2 \text{LogTLL}_t + \beta_3 \text{LogFIN}_t + \varepsilon_t \quad (\text{eq. 2})$$

all variables are expressed in logarithms and calculated as follows:

IND, our dependent variable, is used as a proxy for deindustrialization and is calculated as the seasonally adjusted fixed-base industrial production index, with 2002 as the base year (2002 = 100);¹⁸

RER is the real effective exchange rate;

TLI is the proxy for trade liberalization, specifically the nominal import tariff adjusted by the monthly industrial production (fixed-base series);¹⁹

FIN is the proxy for external financial openness, constructed as the sum of monthly gross financial flows as a percentage of trade flows;

ε is the error term, and the subscript t denotes time (in our econometric model, monthly observations).

The econometric strategy follows the same approach as in the previous section, beginning with unit root tests, cointegration analysis, and the estimation of both OLS and VEC models. As previously noted, all series have one unit root and share a common cointegration vector. The results of the econometric models are presented in Table 5.

Table 5: Determinants of premature deindustrialization in Brazil (1999-2024)
Dependent Variable: Industrial Production Index (IND)

Variable	Variable	OLS Coefficient (t-statistics)	Variable	VEC Coefficient (t-statistics)
Constant	C	6.49*** [8.18]	C	-16.76
Log real exchange rate	$\ln RER_{-1}$	0.25*** [15.62]	$\ln RER_{-1}$	0.74*** [5.94]
Log trade liberalization proxy	$\ln TLI_{-6}$	-0.21*** [-7.27]	$\ln TLI_{-1}$	-0.15*** [3.65]
Log external financial openness proxy	$\ln FIN_{-1}$	-0.04*** [-3.66]	$\ln FIN_{-1}$	-0.07*** [-3.46]

¹⁸ The observed data for our dependent variable — the share of manufacturing value-added in total value-added — is only available on a quarterly or annual basis. To address this limitation, we use a proxy variable for deindustrialization (**IND**): the monthly Physical Production Index for the manufacturing industry, published by the Brazilian Statistical Office (IBGE). This index is assumed to reflect changes in the industrial structure, as its weighting system is based on the value-added contribution of each product to the total value added of the manufacturing sector. As a chained monthly index, it dynamically captures relative gains and losses in the weight of each product and, accordingly, determines the growth dynamics of the manufacturing industry. Over a long-time span, as the growth of the manufacturing industry accelerates (or decelerates), its contribution to total value-added increases (or decreases).

¹⁹ The variable **TLI** is also not available on a monthly basis. In this case, we constructed a monthly proxy by applying the monthly variation in manufacturing industry production to the annual tariff estimates provided by Castilho et al. (2025).

Note on OLS model: R-squared: 0.67; Adjusted R-squared: 0.66; Durbin-Watson: 1.75; F-statistic: 197; Prob (F-test): 0.00; Number of observations: 306 after adjustments. Variables Y and DIF were included with 3 lag.

Note on VEC model: 4 lags; Number of observations: 307 after adjustments. All variables were included with one lag. Order of the variables in the VEC: IND, RER, COM, and FIN.

Notes: *** Significant at 1%; ** Significant at 5%; * Significant at 10%

In addition to the OLS estimation, we employed a Vector Error Correction (VEC) model, which accounts for potential endogeneity bias by treating all variables as endogenous within the system. This approach acknowledges the simultaneous determination of variables and estimates a system of equations that captures both short- and long-run dynamics, thereby mitigating the effects of structural endogeneity. As Enders (2015, p. 390) notes, “because the VEC model is a system of equations in which each variable is treated as endogenous, it helps mitigate concerns regarding endogeneity that often affect single-equation models.”

The results indicate that a more undervalued real exchange rate is positively and significantly associated with the growth dynamics of Brazil's manufacturing sector over the analyzed period. This finding is consistent with new-developmental theory, which posits that maintaining a competitive real exchange rate—defined as a stable rate at the industrial equilibrium level—is crucial for sustaining industrial dynamism in developing economies.

Furthermore, the real exchange rate coefficients were not only statistically significant but also exhibited the greatest explanatory power regarding Brazil's premature deindustrialization. This reinforces the interpretation that the phenomenon is closely linked to the effects of Dutch disease.

In addition, the proxy variables for trade liberalization and external financial openness were also significant in explaining premature deindustrialization in Brazil. Taken together with the persistent trend of real exchange rate overvaluation, these findings lend strong support to the hypotheses advanced by Palma (2005) and new-developmental scholars: that Dutch disease has been the principal driver of Brazil's premature deindustrialization in recent decades.

5. Conclusion and policy implications

Most empirical studies agree that Brazil has experienced one of the most severe cases of premature deindustrialization in the global economy. However, to our knowledge, Bacha et al. (2024) is the only study that empirically examines whether this process is linked to Dutch disease. While their results confirm such a connection, their analysis is grounded in the neoclassical framework, which attributes Dutch disease to only commodity price booms. This interpretation led the authors to the misleading conclusion that Brazil's deindustrialization stems from supply-side issues, such as weak human capital or low trade openness.

In contrast, our main contribution is to apply the interpretation advanced by Palma (2005) and the new developmentalist school, which sees Brazil's premature deindustrialization as a form of Dutch disease rooted not in resource booms, but in neoliberal reforms. These reforms — centered on rapid trade and external financial liberalization — dismantled protections for domestic industry, constrained macroeconomic policy space, and exposed the economy to high real interest rates and chronically overvalued, volatile exchange rates, in the last decades.

Our findings confirm Palma's and the new developmentalist hypotheses: Dutch disease has been a key driver of Brazil's premature deindustrialization in recent decades. Based on this evidence, we draw two important economic policy implications.

The first implication is that, to halt the process of deindustrialization and resume a path of sustained economic development, the Brazilian government must remain committed to industrial policies focused on innovation and the diffusion of technological progress. Notably, as the global economy advances toward replacing current carbon-intensive technologies with low-carbon alternatives, Brazil faces significant opportunities at a time when the global playing field is still relatively level. The country has substantial potential not only to expand its energy diversification through environmentally sustainable technologies (e.g., solar and wind power), but also to scale up the industrial transformation of so-called critical minerals—lithium, copper, rare earth elements, cobalt, and nickel. These minerals are essential inputs for high-tech sectors such as semiconductors, electric vehicle batteries, solar panels, computers, smartphones, and national defense, all of which are expected to experience rising long-term demand. However, the way these strategic minerals will be utilized in the future — pure extractivism *versus* industrial and technological transformation — will determine

whether they become a blessing or a curse for us. As Pessoa (2025, p. 46) warns in his doctoral dissertation, if these windows of opportunity are not promptly and effectively seized, Brazil risks becoming locked into a model of green extractivism in the absence of appropriate industrial policy—replicating a core-periphery dynamic and “renewing and reinforcing a colonial relationship—one that can be understood as green colonialism.”

The second policy implication is that it is long past time for Brazilian governments—regardless of their political-ideological orientation — to reposition the macroeconomic regime (monetary, fiscal, and exchange rate policies) as supportive of industrial policy. Brazil’s macroeconomic policy, based on the so-called macroeconomic tripod, tends to trap the economy in tendency of high real interest rates and currency overvaluation. The results of our research show that this trap has contributed to the weakening of Brazil’s manufacturing sector in recent decades. It is true that, since the Covid-19 pandemic crisis, the Brazilian real has remained undervalued, but this recent cycle reflects a succession of external shocks such as the pandemic itself, the Ukraine war, and the instability caused by the Trump administration’s trade war. Once the current international instability subsides and global conditions improve, the absence of changes in Brazil’s macroeconomic regime could lead the real to resume its tendency toward overvaluation.

This requires adjustments to the macroeconomic policy framework, such that: i) the inflation-targeting regime becomes more flexible, balancing the objectives of price stability with sustained GDP growth; ii) fiscal policy moves away from the assumption of expansionary austerity—which, by presupposing the permanent freezing of real government expenditures, lacks empirical support—and instead embraces fiscal responsibility, where public spending (including interest payments on public debt) is programmed to ensure long-term sustainability of the gross public debt-to-GDP ratio while also enabling adequate investment in physical and human capital (infrastructure, education, health, and social programs); and iii) the floating exchange rate regime follows the lead of several Asian countries, rejecting passive “dirty float” approaches in favor of a managed float system. In such a regime, the central bank actively employs a range of instruments—spot and futures market interventions, and, in exceptional cases, ad hoc capital controls—to keep the real exchange rate at a competitive level (i.e., at the industrial equilibrium), avoiding currency overvaluation.

Taken together, these recommendations function as mechanisms to neutralize Dutch disease in Brazil. In practice, they are essential for reversing deindustrialization,

restoring economic development, and enabling the country to catch up to income and welfare levels comparable to those of developed nations.

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Appendix
Table A1 - Description of the data source

	Variables in equation 1
RER	Actual real effective exchange rate – Central Bank of Brazil (http://www.bcb.gov.br), series 11752
Y	Real GDP per capita in US Dollars - elaborated by taking the annual Brazil GDP per capita in US dollars (from Brazil's Central Bank series 21776) and transforming it on a monthly basis using Brazil's US dollar GDP (series 4385). Population estimated by the Brazilian Institute of Geography and Statistics (IBGE) – http://www.bcb.gov.br
IC	Commodity price index – IMF commodity net export price index, individual commodities weighted by the ratio of net exports to GDP, rolling weights,
CA	Current account balance as a share of GDP - Brazil's Central Bank series 23079
DIF	Short-term interest rate differential – difference between Brazil's Central Bank monthly interest rate series for SELIC from IPEADATA; and the US T note 2 years, from IPEADATA (transformed in a monthly base)
IR	Stock of Brazil's international reserves as a share of GDP – Brazil's Central Bank (series 3546) and Brazil's GDP in dollar (serie 4192)
CR	Brazil's risk premium – EMBI Brazil sovereign foreign currency - Standard & Poor's monthly series, IPEADATA. From July 2024 onwards, updated series applying the variation of CDS 5 years from https://br.investing.com/rates-bonds/brazil-cds-5-years-usd-streaming-chart/
	.
	Variables in equation 2
IND	Monthly Industrial Production index, seasonally adjusted, fixed-base 2002 = 100 , Brazilian Statistical Office (IBGE)
RER	Actual real effective exchange rate – Brazil's Central Bank (http://www.bcb.gov.br), serie 11752
TLI	Trade liberalization – elaborated as nominal tariff adjusted for the monthly industrial production index (fixed base). Source for the nominal tariff from Castilho et al (2025)
FIN	Financial openness – elaborated as the sum of gross financial flows as a percentage of trade flows. IPEADATA for gross trade flow and Brazil's Central Bank for the gross flow of IDE(12 months moving average).