

Global productive fluctuations hindering structural change: effects on Brazilian industrial investment (2000-2019)

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This article analyses the subordination of the Brazilian productive structure due to its asymmetric internationalisation. In particular, we discuss the effects of global productive fluctuations on domestic industrial investment between 2000 and 2019. It starts with a concise review of the structuralist framework regarding foreign direct investment and development, followed by a summary of the contemporary characteristics of these capital flows and global value chains, and an overview of Brazil's external sector. Section II provides an account of asymmetric internationalisation, while section III entails the empirical analysis. It shows that (i) Brazilian industrial investment co-moved with global production variations and responded to them in a subordinate manner; (ii) FDI inflows and domestic industrial investment exhibited concurrent movement, hindering the autonomy of domestic economic policy. These findings align with arguments from the structuralist literature concerning productive structure and national autonomy, adding a new angle to assess its old questions.

Keywords: foreign direct investment; autonomy; industrial investment; development; Brazil.

JEL Codes: F21; F63; N16.

Introduction

Industry and autonomy are important in any development theory, particularly within the Latin American structuralist tradition. Among the various aspects of this broad discussion, one theme of special interest to developing economies is the role of foreign capital, particularly

Foreign Direct Investment (FDI). The control of certain parts of the productive structure by external companies has been commonplace in central and peripheral countries since the latter half of the 20th century. Still, the nature of the flows and their impacts on the host economy have undergone substantial changes. Theoretical and empirical discussions about the theme have also evolved over time.

This paper aims to contribute to the structuralist interpretation of the presence of foreign direct investment (FDI) in peripheral countries, dealing with one of its possible implications. We examine the hypothesis of an indirect effect of global productive fluctuations on the domestic industrial behaviour of a denationalised economy. This study focuses on Brazil's experience from the early 21st century until 2019, before the economic impacts of the COVID-19 pandemic.

The paper starts with a concise review of the pertinent concepts within the structuralist framework regarding foreign direct investment (FDI) and development. This is followed by a summary of the contemporary characteristics of these capital flows and global production networks, as well as an overview of Brazil's external sector. With this foundation in place, section II provides a comprehensive account of the denationalisation, or more precisely, the asymmetric internationalisation of the country's productive structure, a process that became prominent in the 1990s. Section III entails an empirical analysis of the aforementioned indirect channels. Based on post-Keynesian and structuralist macroeconomics, our econometric analyses show that (i) Brazilian industrial investment co-moved with global production variations and responded to them in a subordinate manner; (ii) FDI inflows and domestic industrial investment exhibited concurrent movement, suggesting it as a channel through which global production fluctuations hinder the autonomy of domestic economic policy. These findings align with conventional arguments from the structuralist literature concerning

productive structure and national autonomy, adding a new angle to assess the old questions. Finally, a fourth section delivers the concluding remarks.

Structuralist ideas, FDI flows and Brazil

According to Bielschowsky (2000), the ECLAC thinking introduced by Raúl Prebisch in the late 1940s was defined by a historical-structural approach, organised in three levels of analysis: i) the international insertion of Latin American countries in a centre-periphery system; ii) domestic structural conditions concerning economic and social aspects related to growth, technological progress, employment, and income distribution; and iii) the priorities, limitations, and opportunities for state intervention. The intersection between i) and ii) initially emphasised industrialisation as an essential step in overcoming underdevelopment, requiring corresponding state efforts (iii). The autonomy of the industrial sector was seen as critical due to its strategic potential. It can drive sustainable development, promote consistent economic growth, reduce social and income inequalities, and alleviate poverty. These ideas remain central to most heterodox macroeconomic theories (Blecker and Setterfield 2019; Bielschowsky and Torres 2018) and international organisations' studies (ECLAC 2012; UNIDO 2013).

Inside the structuralist tradition, over the span of seven decades, the original concepts have been subject to revisions and adaptations in parallel with profound changes in the international economic landscape. The necessity and consequences of foreign capital, particularly in the form of Direct Investment, have been a central discussion.

Structuralism literature presents a winding road of theoretical perspectives on this topic. Classical scholars and the early ECLAC documents (Prebisch 1949) emphasised the ambiguous role of foreign capital in peripheral economies. On the one hand, it was seen as crucial for addressing the chronic shortage of savings, facilitating large-scale infrastructure projects, transferring technological and managerial expertise, and boosting foreign currency reserves.

On the other hand, concerns were raised about its potential to increase vulnerability through the outward flow of profits, undermine national industrialisation efforts and political autonomy, threaten domestic companies, and worsen economic disparities and structural disparities, particularly due to technological inadequacy and dependence. As per their perspective, Foreign Direct Investment (FDI) should be carefully monitored, regulated, and permitted only when it aligns with the industrialisation project.

The "Campinas School" (Tavares 1972; 1985; Cardoso de Mello 1982) represents a shift in this perspective, stressing the necessity of foreign capital to address the challenges of late industrialisation in the mid-20th century. Given the level of capitalist competition and technological demands, developing the capital goods industry - the crucial step for internalising economic dynamics - could not predominantly rely on domestic capital. However, even in this scenario, state regulation was deemed essential for aligning the activities of public companies, national private firms, and multinational corporations, preserving national autonomy on macroeconomic and technological grounds¹.

In the 1990s, a new approach known as "Neo-structuralism" emerged, aiming to evaluate foreign direct investment (FDI) in Latin America in the context of productive and financial globalisation (Fajnzylber 1990; ECLAC 1990; see Bielschowsky 2020 for appraisal). This perspective leaned even more favourably towards foreign capital, influenced by the ideological climate following the "debt crisis" and significant shifts in global production. Still recognising the ambiguous nature of foreign capital, this framework stressed the need for more stringent control and coordination to harness its potential benefits. Nevertheless, the emphasis on autonomy issues waned due to the promises of the technological revolution and the renewed external sources of financing².

Throughout this evolution, it is possible to state that, despite variations in emphasis and general stance, the structuralist literature has focused on three major concerns regarding foreign

direct investment and development. These include i) the balance of payments needs and consequences of foreign investments, ii) technological requirements and dependencies, and iii) the effects of internationalisation on the domestic macroeconomy. This paper will primarily concentrate on the third aspect.

In parallel, essential changes in the nature, motivations, and consequences of FDI flows have also occurred over the last decades. The multi-domestic competition between large transnational companies of the 1950s and 1960s was gradually replaced by a global (or regional) operation, giving birth to the productive side of globalisation. Or, in more contemporary terms, the emergence of global value chains (GVCs) as a special configuration of the new global production (Bair 2014; Coe et al. 2017; Durand and Milberg 2020). As Milberg and Winkler (2013) point out, the global industry has undergone profound changes since the last quarter of the twentieth century, especially the process of de-verticalisation, fragmentation and outsourcing of production activities, something that sets up an internationalised and widespread network of products and inputs supply. While the core countries hold intellectual oligopolies of high-technology products applied, the simpler and lower value-added stages are transferred to highly competitive markets in the periphery. Therefore, industrialisation policies no longer deal with the complete transposition of the activities of multinational companies to the domestic territory but rather with a few nodes in GVCs. The practical meaning of industrialisation changes its shape, and it is more scattered and susceptible to disconnections from domestic productive structures and national investment decisions.

Brazil has a rich history of attracting FDI. In the late 1950s, the country's "heavy industrialisation" relied on multinational companies and a coordinated division of tasks with state-owned companies managing infrastructure and basic supplies and domestic private capital dominating the production of components, non-durable goods, services, and primary sectors.

Throughout the "national-developmentalism" period that followed, Brazil evolved into an urban industrial economy with a significant role for foreign capital, characterised by substantial economic growth despite facing challenges such as inflation, social inequality, technological backwardness, and balance of payments crises. The external indebtedness of the 1970s triggered the "lost decade" of the 1980s, during which the country faced exclusion from external financing and missed out on the new FDI flows occurring in other developing regions, particularly Southeast Asia.

The 1990s saw the resurgence of private capital flows, accompanied by a significant denationalisation process facilitated by FDI, as detailed in section II. As part of a broader liberalisation initiative, trade and financial openness and privatisation endeavours reshaped the country's productive framework. While access to external financing was crucial in controlling high inflation through the Real Plan (1994), the country remained significantly vulnerable externally. Throughout the early years of the new century, the nation experienced successive exchange rate crises (1998/99, 2001/02), but in the past two decades, there are clear indications of an enduring transformation (Biancarelli 2019; Biancarelli et al. 2017).

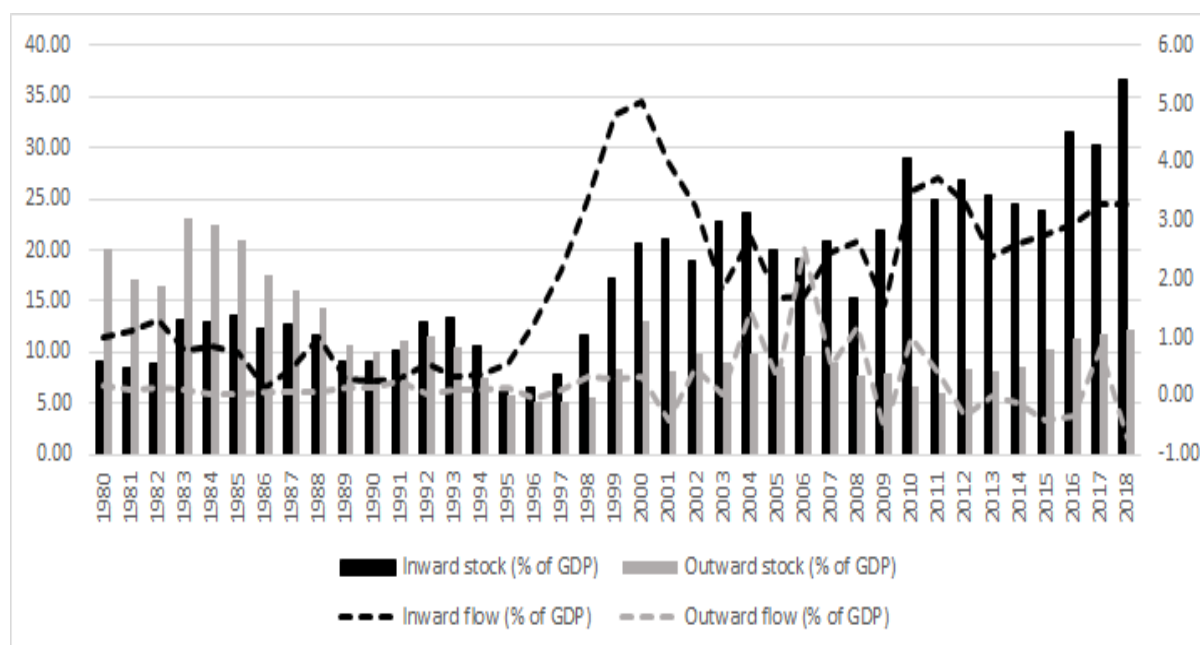
The robust export performance, driven by mineral, agricultural, and livestock products, alongside increasing oil extraction, has resulted in noteworthy trade surpluses. This, along with a substantial accumulation of exchange reserves and reduced external liabilities denominated in dollars, has strengthened the country's external accounts. Despite facing challenging international economic conditions over the past two decades, such as the 2008 Global Financial Crisis, the 2014/15 capital flow reversal in emerging markets, and the early 2020 COVID shock, Brazil has weathered these events with less severe impacts than might be expected based on historical records. Nevertheless, according to Biancarelli's (2019) analogy, the "old lady" (external vulnerability) has not disappeared; she simply dons "new clothes".

The picture indicates that the global situation can indirectly impact the local economy, often negatively, despite favourable balance of payments figures. Among these indirect channels, Biancarelli et al. (2017) have identified a local financial market that is interconnected with the "global financial cycle" (Rey 2015). Additionally, there are indications that local industrial activities are more influenced by a "global productive cycle" than by domestic demand or policies. This latter hypothesis, potentially caused by the extensive presence of multinational corporations in the country, is a fundamental aspect of the research outlined in this paper.

An asymmetric internationalisation in two waves

This section explores the asymmetric internationalisation process of the Brazilian productive structure since the late 20th century, characterised by greater integration with global markets. While financial, technological, and commercial factors also contribute, the primary focus is on the productive dimension. This process forms the basis of our underlying hypothesis: the rising predominance of foreign capital in domestic production has resulted in an increased international impact on domestic investment decisions, structural transformations, and a relative decline in national autonomy.

Figure 1. Foreign Direct Investments, flows (right) and stocks (left), 1980 – 2018.



Source: UNCTAD. Authors' elaboration.

The primary argument pertains to the discrepancy between the increase in Brazilian activities abroad and the expansion of foreign activities in Brazil. As indicated in Figure 1, there has been a divergence since the 1990s in the country's inflow and outflow of foreign direct investments (FDIs), with a notable rise in foreign dominance. The figure indicates that the area between the dashed lines can be interpreted as the extent of denationalisation of the Brazilian productive structure. This extent remained low and consistent until the mid-1990s but subsequently increased despite a slight slowdown in the early 2000s. This asymmetrical internationalisation is reflected in the FDI/GDP stocks, represented by the graph bars.

One can identify two distinct "waves" of asymmetric internationalisation. The first wave, which took place in the 1990s, involved a significant influx of foreign capital resulting from market liberalisation, economic reforms, and the privatisation of industrial sectors (De Paula 2012; Iooty et al. 2004; Laplane and Sarti 1997; Lopreato 2013; Pinheiro et al. 2015). This period witnessed a surge in foreign investment opportunities. The second wave, which began in the 2000s, was characterised by the dominance of foreign direct investment in service

sectors, agribusiness and increased industrial denationalisation, which went beyond the structural reorganisation seen in the first wave (Hiratuka and Sarti 2016). These two phases are differentiated by their temporal and qualitative aspects, particularly regarding the motivations behind capital inflows, the specific sectors affected by privatisation, and their economic impacts.

The push towards economic openness and liberalisation can be seen as the initial phase of asymmetric internationalisation of the Brazilian productive system. It began in the early 1990s following successful efforts to combat persistent inflation and in a climate where liberalising ideas, influenced by the neoclassical synthesis, were dominant (Lopreato 2013). Throughout the decade, the trend of denationalisation gained momentum, driven not only by microeconomic factors but also by macro and short-term considerations: the country needed to attract foreign capital to support the currency overvaluation-based monetary stabilisation plan. The worldwide abundant FDI flows were the best alternative (Sarti and Laplane 2002; Amann and Baer 2000).

On qualitative grounds, it was the most explicit side of a significant transition in the Brazilian economic model. The traditional approach of import-substitution industrialisation, which relied on state-owned companies, private national companies, and foreign companies, was substituted by a greater emphasis on the potential benefits of foreign capital. This shift was driven by the belief that foreign investment could lead to more competition, technological spillovers, improved efficiency, better employment opportunities and increased wealth generation through the operations of multinational companies and external funding sources (Franco 1998; Mendonça de Barros and Goldenstein 1998). Above all, the promise was of a competitive reinsertion into the globalised economy, with much higher imports but also a leap in exports.

The key finding indicates a significant disparity between foreign direct investment (FDI) inflows and outflows, as illustrated in Figure 1. In the 1980s, FDI outflows averaged 0.09% of GDP, while FDI inflows averaged 0.77%. These figures remained relatively constant and low. However, starting in the 1990s, there was a remarkable surge in FDI inflows, reaching 5.02% of GDP in 2000, while FDI outflows remained consistently low at an average of 0.17% of GDP. This pattern reflects the pronounced asymmetrical internationalisation that resulted from economic liberalisation. Additionally, UNCTAD data on international mergers and acquisitions underscores the lopsided nature of Brazilian internationalisation in terms of ownership. After 1995, there was a substantial increase in the total value of divestitures, while the value of acquisitions made outside Brazil remained minimal.

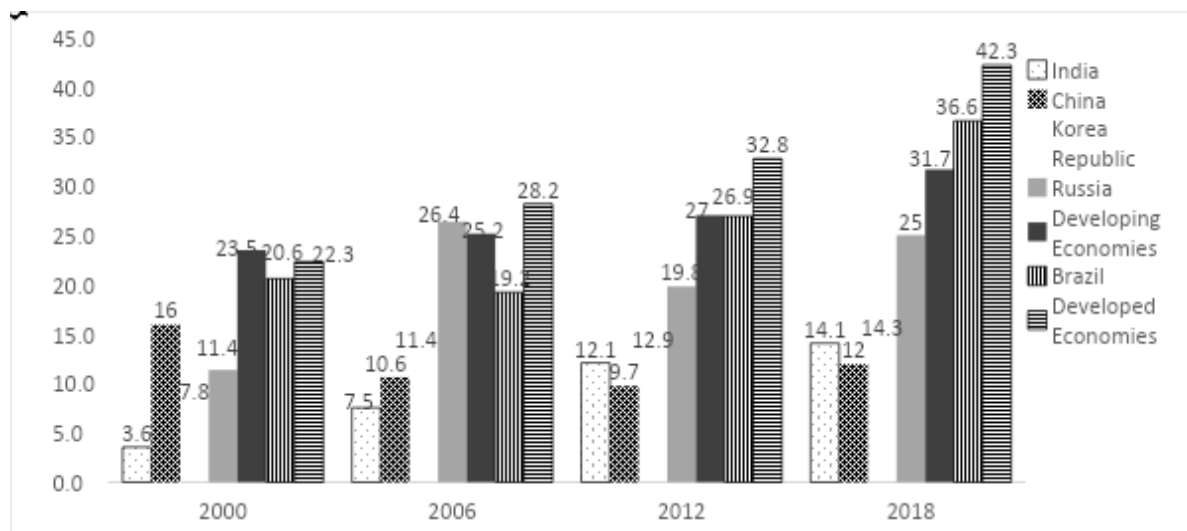
This first wave continued until near the turn of the millennium when the financial crises in Asia, Russia and the US hit the Brazilian economy. This liquidity crisis in global markets diminished the massive capital inflows such as FDIs into Brazil, in parallel with the exhaustion of most of the privatisations and sales of domestic private companies, transforming the process of asymmetric internationalisation that would subsequently come.

Since the beginning of the 21st century, the Brazilian economy has undergone a second phase of global uneven integration, characterised by sustained dominance of foreign capital. This phase differs from the first in terms of its sectoral focus. While the initial phase saw predominantly industrial sector companies selling intermediate goods, as well as companies in the telecommunications, public services, energy, and consumer goods sectors, the second phase is distinguished by foreign investment concentration in private services, a significant yet broader influence in the industrial sector, and increased foreign investment in agribusiness, mainly to satisfy Chinese demand. This ultimately contributed to a process of re-primarisation of the national economy.

During this period, there was a widening gap between the involvement of foreign economic activities in Brazil and the participation of national activities abroad. Figure 1 illustrates that investment inflows have remained consistently high and continue to grow, while outflows have remained relatively low. Concurrently, the country's FDI stock as a percentage of GDP has increased from 20.97% in 2001 to 36.59% in 2018, signifying a substantial rise in foreign capital relative to domestic productive activities. Despite the global crisis of 2008 and the severe internal crisis starting in 2014, capital inflows have shown a consistent upward trend since 2009, maintaining their long-term behaviour. The country was the seventh-largest recipient of foreign direct investments in 2018 but didn't appear among the top twenty economies making investments outside their borders (UNCTAD 2019).

Figure 2 illustrates the increasing influence of foreign capital in the domestic productive framework, particularly in comparison to other nations and regions. Brazil's trajectory exhibits a faster and more substantial trend compared to China, with a ratio of approximately 10 per cent of the GDP; India, with a proportion not exceeding 15 per cent of the GDP; and Russia, with a maximum of 27 per cent of the GDP. Even when compared to developing countries as a whole, which showed a slightly higher dominance of foreign capital in their productive structures on average during the 2000s, the acceleration of Brazil's denationalisation from 2016 onward surpasses them. Only developed countries display a productive structure with a higher dominance of foreign capital, but the internationalisation logic in these cases is significantly different. Therefore, in relative terms, the Brazilian productive structure demonstrates a significant degree of denationalising internationalisation.

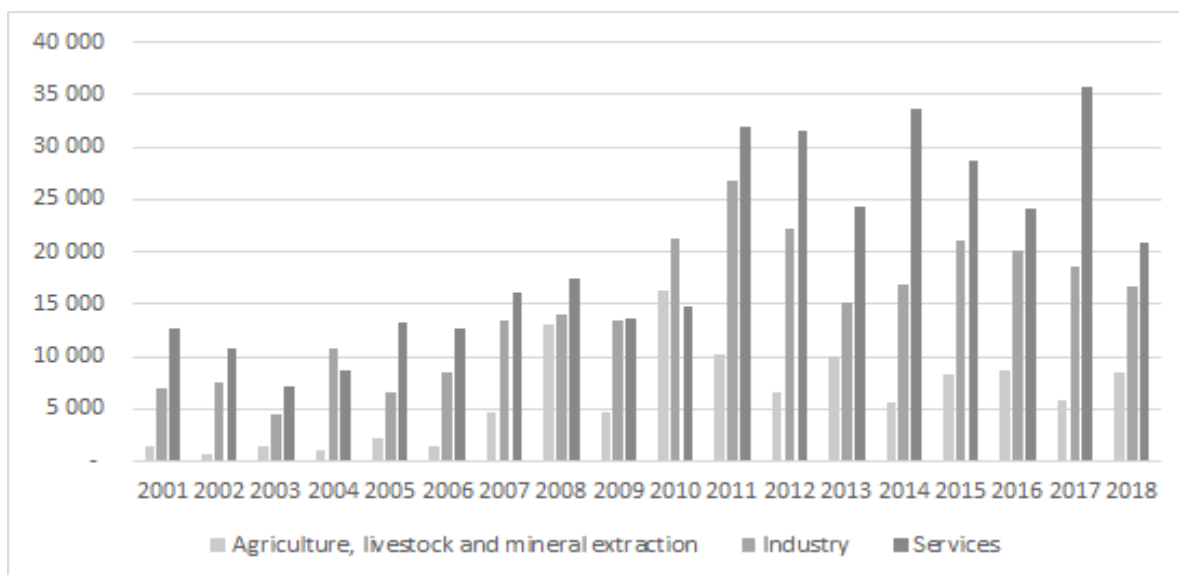
Figure 2. Evolution of FDI stock over GDP in the 2000s, Brazil and selected regions.



Source: UNCTAD. Authors' own elaboration.

Regarding domestic impacts, Figure 3 illustrates a predominant inflow of investments in the services sector, followed by investments in industry and a substantial increase in agriculture, livestock, and mineral extraction investments. In the services sector, the number increased from an average of US\$12.5 million between 2001 and 2009 to US\$27.3 million between 2010 and 2018, while investments in industry increased from an average of US\$9.5 million to US\$19.9 million. Similarly, in agriculture, there was an increase from US\$3.4 million to US\$8.9 million during the same period. Essentially, there was a substantial upsurge in foreign direct investments across all sectors, indicating a broadening of denationalisation within the entire productive structure.

Figure 3. FDI inflows by sector (in US\$ million), Brazil, 2001 – 2018.



Source: Brazilian Central Bank. Authors' own elaboration.

The Brazilian Central Bank (BCB) has been providing more detailed data on the subsectors targeted by foreign direct investments (FDIs) since 2006. Table 1 presents a breakdown of these sectors, confirming this main message. Notably, the primary sector's share of these investments has decreased from an average of 21.6% between 2006 and 2010 to 13.7% between 2011 and 2014 and 14.4% between 2015 and 2018. As shown in Figure 3, the surge in primary sector investments occurred in the early 2000s and remained high in the subsequent years. From 2006 to 2010, investments in metallic mineral extraction dominated, accounting for 11% of FDIs, while from 2011 onwards, investments started to shift towards oil and natural gas extraction, comprising 8.2% of the total. Additionally, the industrial sector continues to attract a substantial portion of FDI inflows, averaging 36% between 2006 and 2018. Investments in metallurgy, food, chemical, and automotive subsectors have been particularly emphasised. Lastly, the service sector has seen a significant impact from FDIs, increasing from 40.2% of the total between 2006 and 2010 to over 50% from 2011 to 2018. Notably, the subsectors of trade, financial services, electricity, gas, and other utilities were the largest recipients of these investments within the service industry.

Table 1. FDI inflows by subsectors (in US\$ million), Brazil, 2006 – 2018

Sector	2006 – 2010	(%)	2011 – 2014	(%)	2015 – 2018	(%)
Agriculture, livestock and mineral	40 145	21,6%	32 436	13,7%	31 373	14,4%
Oil and natural gas extraction	15 229	8,2%	18 945	8,0%	17 841	8,2%
Extraction of metallic minerals	20 420	11,0%	7 013	3,0%	6 145	2,8%
Industry	70 711	38,1%	81 183	34,4%	76 523	35,1%
Metallurgy	20 698	11,1%	16 406	6,9%	6 444	3,0%
Food Products	6 670	3,6%	11 173	4,7%	7 833	3,6%
Chemical products	11 911	6,4%	8 282	3,5%	10 092	4,6%
Pharmaceutical products	1 988	1,1%	3 828	1,6%	2 537	1,2%
Motor vehicles	4 811	2,6%	7 431	3,1%	19 563	9,0%
Machinery and equipment	2 031	1,1%	3 281	1,4%	4 285	2,0%
Electrical machines and appliances	1 428	0,8%	2 971	1,3%	3 002	1,4%
Pulp, paper and paper products	3 145	1,7%	2 202	0,9%	3 587	1,6%
Services	74 621	40,2%	121 478	51,4%	109 317	50,1%
Commerce, except vehicles	11 796	6,3%	23 602	10,0%	19 850	9,1%
Financial services	17 368	9,3%	16 609	7,0%	8 780	4,0%
Insurances	2 790	1,5%	11 015	4,7%	2 261	1,0%
Real estate activities	5 618	3,0%	9 490	4,0%	6 570	3,0%
Electricity, gas and other utilities	6 432	3,5%	9 498	4,0%	21 963	10,1%
Transport	2 449	1,3%	5 190	2,2%	6 203	2,8%
Building construction	4 619	2,5%	3 692	1,6%	2 273	1,0%
Information technology services	2 157	1,2%	3 159	1,3%	4 142	1,9%
Telecommunications	3 181	1,7%	12 277	5,2%	6 321	2,9%

Source: Brazilian Central Bank. Authors' elaboration.

When inflow origin is considered, a predominance of developed countries is evident (Table 2). Although, in some cases, countries act as intermediaries of the original investment to avoid taxation³, the standard source is the core economies. The United States, as a direct investor, presents a majority of operations carried out in Brazil, with almost one-fifth of the total from 2001 to 2018. European countries such as Spain, France and Germany also account for a large share of these investments. Thus, it is possible to note that the fundamental distinction between core and periphery in the world economic system still prevails. In Brazil, asymmetric internationalisation and denationalisation happened in favour not only of foreign capital but mainly of core countries' foreign capital.

Table 2. FDI inflows by national origin (in US\$ million), Brazil, 2006 – 2018

Origin	2001 – 2006	(%)	2007 – 2012	(%)	2013 – 2018	(%)
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Netherlands	21 127	18%	55 780	19%	61 539	19%
United States	22 605	19%	45 386	15%	49 511	15%
Luxemburg	3 168	3%	25 982	9%	32 446	10%
Spain	7 902	7%	22 117	8%	24 035	7%
France	7 260	6%	14 974	5%	14 514	4%
Japan	4 380	4%	17 782	6%	12 246	4%
Germany	5 232	4%	7 850	3%	14 878	5%
Switzerland	3 231	3%	14 060	5%	8 874	3%
United Kingdom	1 998	2%	8 535	3%	11 097	3%
British Virgin Islands	2 749	2%	4 875	2%	13 922	4%
Cayman Islands	9 792	8%	5 889	2%	3 895	1%
Total	118 494	100%	293 127	100%	324 255	100%

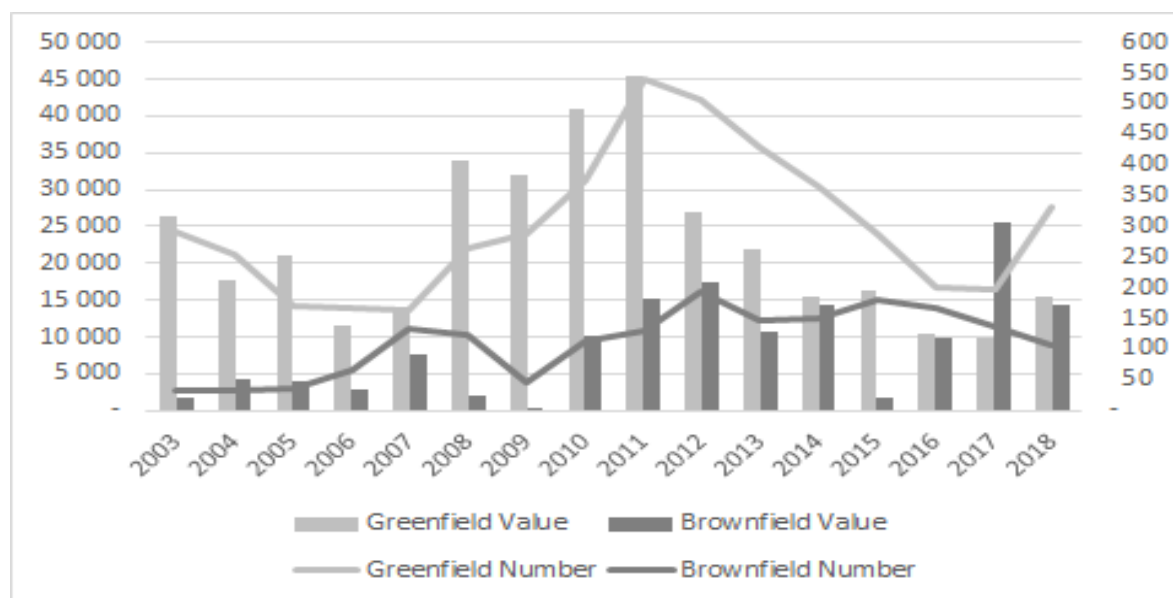
Source: Brazilian Central Bank. Authors' elaboration.

The differentiation of FDI into greenfield and brownfield investments also matters⁴. Figure 4 illustrates the trends of these subgroups received by Brazil from 2003 to 2018. Until 2011, greenfield operations dominated both in terms of the number of transactions and total monetary value, reaching a peak of \$45 million in 539 operations. However, this trend shifted from 2012 onwards, partly due to changes in internal economic policies. Greenfield investments decreased significantly, while brownfield soared. This shift suggests a move away from increasing domestic productive capacity and resources and towards asset restructuring in favour of foreign control.

In a nutshell, denationalisation has been one of the most notable trends in the Brazilian economy over the past three decades. Foreign capital now holds extensive sway across various sectors, exerting increasing control over domestic production and investment. Despite common arguments to the contrary, the Brazilian economy's high degree of openness becomes evident when considering the substantial inflow and stock of foreign direct investments. In public and specialised discussions, there's a widespread assumption that the low ratios of exports and imports to GDP indicate a close commercial relationship or even isolation of the Brazilian economy (e.g., Franco 1998). However, looking at it from a different perspective, the situation appears more complex: Brazil has a productive structure that is deeply and asymmetrically integrated with global production and companies, yet it is primarily focused on domestic

markets rather than external trade. This not only affects external accounts but also has significant macroeconomic implications, to which we will now turn our attention.

Figure 4. FDI Greenfield and Brownfield (in number of operations, right, and US\$ million, left), Brazil, 2003 – 2018.



Source: UNCTAD. Authors' elaboration.

Empirical assessment: Global Productive Fluctuations and Brazilian industrial investment

Considering the asymmetric internationalisation process outlined in the previous section and echoed by Sarti and Hiratuka (2017), along with the indications of new forms of indirect vulnerabilities proposed in Biancarelli (2019), the underlying hypothesis can be succinctly summarised as follows: the Brazilian economy is increasingly influenced by external factors, affecting its domestic dynamics. Domestic industrial production and investments are susceptible to global production fluctuations, an entirely exogenous variable. The Global Production Fluctuation (GPF) signifies two main aspects. Firstly, it is rooted in empirical observations of global production, which, over time, demonstrates oscillatory patterns characterised by peaks and troughs. Secondly, we posit that the GPF is influenced by Keynesian

and Kaleckian principles (Keynes 1937; Kalecki 2013). In essence, we believe that the oscillatory nature of global production is a consequence of fluctuations in productive investments, shaping the effective demand at the global level. In a globalised world dominated by Global Value Chains (GVCs), investments in the industrial sector have a far-reaching impact on productive operations, posing challenges for overall economic development.

It is assumed that GPF operates as follows: during periods of global industrial expansion, increased competition among international corporations leads to higher levels of direct investment in countries like Brazil, particularly in the industrial sector. This encourages overall investment in the industrial sector. Conversely, foreign direct investments diminish during global production contractions, dampening domestic industrial investments. Domestic production levels also follow this trend. This impact has gained significance due to the rise in foreign capital within the domestic framework. Consequently, the domestic industry, crucial for development, becomes partially insulated from national industrial policies and domestic macroeconomic conditions as it increasingly responds to global influences.

On the one hand, this channel represents a new and indirect form of external vulnerability (Biancarelli 2019). In addition to macroeconomic policies heavily influenced by global finance (Rey 2015) and the subordinate status in the hierarchy of currencies (Conti et al. 2014), the production influence channel impacts the Brazilian economy through production structures dispersed globally, known as global value chains. On the other hand, it is a potential explanation for Brazilian production's unexpected and unsatisfactory performance before and after the global financial crisis.

Based on Bielschowsky et al. (2015), leading up to the 2008 crisis, despite a significant surge in demand for consumer and intermediate goods, domestic industrial investment did not appropriately respond. A portion of the demand was addressed through increased import reliance, while another remained unmet. This implies a discrepancy between domestic demand

and investment, partially attributable to the misalignment of foreign and domestic investment interests. After the crisis, from 2011 to 2014, domestic demand remained relatively robust, with investment and production costs being influenced by various government policies, alongside a more devalued exchange rate compared to the preceding period. Nonetheless, it appears that the primary factor driving the decline in industrial investment and activity was a form of "arbitrage of idle capacities," where the production and investment decisions of multinational companies were significantly impacted by underutilised productive capacities worldwide, leading to a concentration of industrial production in Asian countries and, specifically for the automotive industry, in Mexico.

The following empirical exercises aim to assess the significance and scale of these potential effects. Firstly, we will explore the extent of integration and long-term coordination between worldwide production fluctuations and local industrial investments. Subsequently, we will conduct an econometric analysis to pinpoint the mechanism through which this relationship might manifest.

Cointegration and Granger Causality

We initially conducted tests to assess the cointegration between global productive fluctuations and domestic industrial investment. The results demonstrated a strong connection between the Brazilian economy's high level of openness and its synchronised performance with the oscillations of global production. Furthermore, we analysed Granger causality to determine the leading variable in this relationship, discerning whether domestic industrial investment responds to global productive fluctuations or vice versa. This approach enabled us to identify the hypothesis of the indirect vulnerability of national industrial investment to the factors influencing foreign markets.

Firstly, unit root tests are carried out to verify the stationarity of the variables. The augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were used for the models with intercept, with intercept and trend, and without intercept and without trend. Furthermore, the Schwartz and Akaike information criteria and the Bartlett Kernel spectral estimation method (with Newey–West Bandwidth selection) were adopted to determine the lags and the existence and degree of unit root.

Later, we assess the cointegration between global productivity fluctuations and Brazilian industrial investment using the methodology proposed by Johansen (1988). The variables were kept at level, and a model with quadratic intercept and trend was assumed. While this model is not commonly used in the literature, it seems to be the most suitable for this case, considering the nature of the variables and the dispensability of projection exercises. The cointegration test was validated using trace and maximum eigenvalue tests. Subsequently, the Granger causality test was utilised to determine the precedence of behaviour between the variables, considering various lag possibilities.

In these first tests, global productive fluctuations and domestic industrial investment are taken between January 2000 and December 2019. Monthly data was utilised to enhance the analysis's robustness, resulting in a total of 240 observations for each variable. To illustrate global production fluctuations, we utilised the value of merchandise exports from the world's major countries (WX), derived from OECD data. These figures were sourced from the International Trade Dataset (MEI) and represent the total value of goods exported by all OECD member countries, as well as the exports of goods by nonmember countries that have significance in global markets⁵. Given the limited range of potential variables, this particular variable appears to be the most suitable for identifying global production fluctuations. It can reflect the impacts of fluctuations in aggregate domestic production on the international economy, which is of greater interest in this context than global production itself.

For domestic industrial investment, we follow Freitas and Dweck (2013) and take the apparent consumption of capital goods (ACCG) as a good proxy for investment in machinery and equipment, with the advantage of monthly data availability. The apparent consumption of capital goods index (average 2012 = 100)⁶ corresponds to Brazilian domestic industrial production plus imports and minus exports. Thus, ACCG was chosen as the best representative variable for the behaviour of Brazilian industrial investment.

Concerning the unit root test, the findings indicate that both ACCG and WX exhibit only one unit root, meaning they are integrated of order one. These results are consistent across all the information criteria used and for all the models tested, including those with intercept, intercept and trend, and without intercept and trend. The variables are integrated at the same order, so we can consider their potential cointegration using the Johansen test. The cointegration test, which also considers variables at their original levels, indicates that we cannot reject the null hypothesis of cointegration between the variables at a 5% level of statistical significance. Therefore, we can apply the model with a quadratic intercept and trend.

Therefore, we can infer that from January 2000 to December 2019, there is evidence of cointegration between the apparent consumption of capital goods and the value of exports of goods among the world's leading economies. This suggests that domestic industrial investment and global production fluctuations are interconnected in the long term. Despite short-term shocks, their trends tend to converge over a longer time span.

In addition to demonstrating the long-term temporal relationship between the variables, the Granger causality test aims to determine the causal direction of that relationship over time. The test results indicate that, across the various lags assessed (a total of eight), WX Granger-causes ACCG. This suggests that, beyond their joint behaviour in the long run, the domestic industrial investment responds to global productive fluctuations rather than vice versa, which

would not be economically feasible. The fluctuations in global production precede the behaviour of Brazilian industrial investment.

Thus, these tests suggest a contribution to one of this article's main hypotheses. In the new configuration of productive globalisation, a new type of indirect influence arises in the periphery through the partial loss of domestic autonomy over investment. As a result of global production fluctuations, domestic industrial investment partly aligns with the trends in core economies: it expands with global production upswings and contracts with downturns. Accordingly, subordination to global production partially reduces the possibility of national economic policy determining its own courses, especially considering autonomy over industrial investment as a key element for industrialisation and development.

Macroeconomic determinants of Brazilian industrial investment

Having signalled the relative subordination of Brazilian industrial investment to global productive fluctuations, this section aims to suggest the channel through which this interference may occur: foreign direct investment (FDI) in the country. As argued, FDIs have grown significantly in Brazil and hold an increasing share of domestic economic activities. When the global productive fluctuations grow, the suggested hypothesis is that foreign capital assumes increasing influence over total domestic industrial investments that follow the expansion of global production. In other words, when global production expands, firms in core countries take more risks because of increased competition and greater confidence in investing to increase their profits. Therefore, this becomes one factor determining the increase in FDI in Brazil through foreign productive projects. The opposite also happens: if the global productive fluctuations are in retraction, competition and confidence in the core decrease, and the production projects in the periphery follow the retraction. Our analysis will focus exclusively on greenfield and brownfield FDIs, excluding intercompany loans due to their microeconomic

and indirect nature, uncertain conversion into investment, and more volatile and financialised characteristics.

To test this hypothesis, the econometric analysis in this section examines the macroeconomic factors that determine Brazilian industrial investment. Drawing inspiration from Feijó et al. (2018), the analysis not only includes traditional variables but also incorporates foreign direct investment (FDI) as one of the explanatory factors. This approach allows us to identify foreign investments' potential impact, direction, and magnitude on Brazilian industrial investment. If a statistically significant correlation in the same direction is observed, it suggests that Brazilian industrial investment may, at least partially, be influenced by global economic fluctuations through foreign capital.

The analysis is based on monthly data from January 2000 to December 2019, comprising 240 observations during the "second wave" of asymmetric internationalisation outlined in section II. Initially, unit root tests were conducted to assess the level of integration and stationarity of the chosen variables. Subsequently, due to the nature of the data, the Dynamic Ordinary Least Squares (DOLS) technique developed by Stock and Watson (1993) was selected for modelling. This estimator is well-suited for the task, as it allows for the regression of both integrated variables of order one, $I(1)$, and order zero, $I(0)$.

Three models were estimated. The first, with all variables in level, allows the comparison of the effects of the explanatory variables on domestic industrial investment. The second, with the explained variable in their logarithmic form, evaluates the effects of percentages of the absolute variations of the explanatory variables. The third one, with the variables mostly in logarithmic form, evaluates the elasticities of each variable on investment. In sum, the estimation was made according to the following function:

$$I = f(u, r, e, e^2, fdi)$$

where I is the domestic industrial investment (represented by ACCG), u is the capacity utilisation rate in the industry, r is the real interest rate of the economy, e is the real exchange rate, e^2 is the real exchange rate in its quadratic form, and fdi is the FDI inflows excluding intercompany loans.

The variable used to measure Brazilian industrial investment (I) is the apparent consumption of capital goods (ACCG). As previously indicated, this variable effectively represents domestic investment and is specifically employed here to gauge Brazilian industrial investment due to its relevance to the demand for machinery and equipment.

Following the post-Keynesian literature (Lavoie 2014), the capacity utilisation rate in industry⁷, u , was chosen as an important way to measure demand: the higher the utilisation rate, the better the entrepreneurs' expectations and the higher the investments made. Therefore, it is expected that the higher the capacity utilisation rate in industry is, the higher the industrial investment will be.

Additionally, according to Keynesians and post-Keynesians (Blecker and Setterfield 2019), the economy's real interest rate, r , is another important variable in determining investment. It sets limits on the risk taken by investors and their return expectations. The series was prepared based on data taken from the Brazilian Central Bank on the referential interest rate of prefixed DI swap (s_DI), with maturity of 360 days (average of the period), and the national index of broad consumer prices (IPCA), with accumulated expectation in twelve months (θ_ep), following Feijó et al. (2018) with the following formula:

$$r = \{[(1 + s_DI/100)/(1 + \theta_ep/100)] - 1\} * 100$$

Following Oreiro et al. (2015), the real exchange rate of the economy is considered a crucial factor in explaining investment, particularly in the industrial sector. The authors posit that, on the one hand, a significantly appreciated exchange rate lowers the competitiveness and profitability of domestic productive activities, leading to reduced investment. On the other

hand, a substantially devalued exchange rate raises the costs of importing machinery and equipment, also leading to reduced investment. Thus, we incorporate both the original form, e , and the quadratic form, e^2 , of the real exchange rate to capture its impact on investment. The historical series of the real exchange rate has been obtained from the Brazilian Central Bank (11752), indexed at 100 from June 1994 onwards.

Finally, as a new and indirect form of external impact, we propose the hypothesis that Foreign Direct Investments (FDIs) act as a channel of influence on domestic industrial investment. Our analysis found that FDIs have not positively influenced the Brazilian productive structure from a macroeconomic and strategic perspective. Furthermore, due to their responsiveness to global productive fluctuations, they have limited alignment with internal economic policies. Our hypothesis suggests that while FDIs may align with domestic industrial investment, they do so in a manner that is not favourable. Instead of enhancing investment autonomy and strengthening the domestic productive structure, they do not significantly improve productivity and dynamic efficiency. The data for this variable was sourced from the historical series provided by the Brazilian Central Bank, which records FDI inflows in US\$ million.

The unit root tests show that some variables have unit roots at level, but none present unit roots in their first difference form. For all models tested and using ADF and PP tests, with Schwartz, Akaike and Bertlett Kernel criteria, we found I with a unit root, $I(1)$, as had already been tested in the first exercise, u with a unit root $I(1)$, and e and e^2 also $I(1)$, r with a unit root $I(1)$, and only fdi stationary at level $I(0)$.

To estimate the DOLS models, the Phillips-Ouliaris cointegration test was performed for the level series. The result indicated rejection of the hypothesis of noncointegration between variables, which validates the application of this type of estimation. Based on this, three models were estimated, described by the following equations:

$$(1) \quad I = \beta_1 u + \beta_2 r + \beta_3 e + \beta_4 e^2 + \beta_5 fdi$$

$$(2) \quad \log(I) = \beta_1 u + \beta_2 r + \beta_3 e + \beta_4 e^2 + \beta_5 \log(fdi)$$

$$(3) \quad \log(I) = \beta_1 \log(u) + \beta_2 \log(r) + \beta_3 e + \beta_4 e^2 + \beta_5 \log(fdi)$$

Model 1 is estimated from all variables at the level to identify absolute effects; model 2 shows the percentage effects that the explanatory variables cause in I; and model 3 measures the elasticities among variables, except for the real exchange rate, to avoid problems with the singular matrix. The constant and the trend were excluded in all equations, as these proved to be statistically insignificant. The following tables show the results obtained.

Table 3. DOLS: Model 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDICP	0.001908	0.000813	2.346802	0.0198
R	-3.233980	0.470607	-6.871936	0.0000
U	2.543842	0.288230	8.825723	0.0000
E	-2.010526	0.412142	-4.878236	0.0000
E2	0.008403	0.002002	4.196289	0.0000
R-squared	0.836435	Mean dependent var		73.33859
Adjusted R-squared	0.822113	S.D. dependent var		22.63331
S.E. of regression	9.545969	Sum squared resid		19774.24
Long-run variance	330.5198			

Source: Authors' elaboration.

Table 4. DOLS: Model 2.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(FDICP)	0.186749	0.033132	5.636481	0.0000
R	-0.040930	0.005809	-7.045973	0.0000
U	0.046497	0.004101	11.33903	0.0000
E	-0.012737	0.005126	-2.484708	0.0137
E2	5.64E-05	2.50E-05	2.254780	0.0251

R-squared	0.874087	Mean dependent var	4.246055
Adjusted R-squared	0.863062	S.D. dependent var	0.317242
S.E. of regression	0.117396	Sum squared resid	2.990654
Long-run variance	0.046439		

Source: Authors' elaboration.

Table 5. DOLS: Model 3.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(FDICP)	0.132500	0.037960	3.490546	0.0006
LOG(R)	-0.236020	0.034179	-6.905454	0.0000
LOG(U)	1.234648	0.115915	10.65135	0.0000
E	-0.028748	0.006038	-4.760971	0.0000
E2	0.000107	2.78E-05	3.840025	0.0002

R-squared	0.884543	Mean dependent var	4.249336
Adjusted R-squared	0.871411	S.D. dependent var	0.315154
S.E. of regression	0.113012	Sum squared resid	2.694839
Long-run variance	0.041467		

Source: Authors' elaboration.

The data in the tables shows that, across all the models tested, the variables are statistically significant at a 5% significance level. Additionally, they demonstrate strong explanatory power, as evidenced by the high R-squared values of 86%, 87%, and 88% for models 1, 2, and 3, respectively. While these high R-squared values may raise concerns about spurious regression, the robustness tests confirm the validity of the results. The substantial R-squared values can be attributed to the comprehensive nature of the explanatory variables, which effectively encompass the most plausible economic factors that determine aggregate investment.

In qualitative terms, these findings confirm the expected results. For the three models, while the utilised capacity of industry and the real exchange rate in quadratic form assume directions following domestic industrial investment, the real interest rate and the exchange rate

in level move opposite to industrial investment in the long run. The main hypothesis is also confirmed: FDI inflows influence domestic industrial investment and behave in the same direction, that is, when FDI increases, *I* increases, and when FDI decreases, *I* also decreases, a fact that suggests the effect of the global productive fluctuations on Brazilian industrial investment through FDI.

Quantitatively, it's important to note the significant impact that the utilisation of installed industrial capacity had between 2000 and 2019. A one-point increase in the industrial capacity utilisation rate led, on average, to a 2.54-point increase in the apparent consumption index of capital goods (model 1) or a 0.04% increase (model 2). In model 3, it's shown that for every one per cent increase in utilisation, there was a 1.23% increase in consumption. This indicates that demand continues to be a major driver of domestic industrial investment, although it is gradually being overshadowed by foreign direct investment due to increasing asymmetric internationalisation.

The real interest rate significantly and negatively impacts domestic industrial investment. In model 1, it is evident that over the long term, a one-point increase in the interest rate leads to an average decrease of 3.23 units in the apparent consumption index of capital goods. In model 2, the same interest rate increase results in a decrease of 0.04 per cent in the ACCG index. Model 3's elasticities reveal that a one per cent increase in the interest rate (not a one percentage point increase) corresponds to a 0.23 per cent decrease in Brazilian industrial investment. These findings indicate that Brazilian companies rely heavily on credit and loans for project execution and prefer financial investments when they are as profitable as productive investments.

The real exchange rate reflects the realities of the Brazilian industry, which relies on imported machinery and equipment. A one-point increase in the real exchange rate index leads to a 2.01-unit decrease in the capital goods apparent consumption index (model 1) or a 0.002%

decrease (model 2), with a negative elasticity of 0.02% on industrial investment. However, in its quadratic form, the results show a slightly positive trend, indicating the ambiguous nature of the exchange rate. It should be in an intermediate position and align with other economic policies to facilitate the import of capital goods while promoting growth in the domestic industrial sector.

Finally, foreign direct investment (FDI) inflows significantly impact domestic industrial investments. According to Model 1, a one-billion-dollar increase in FDI leads to an almost 2-point rise in the apparent consumption of capital goods index. Meanwhile, Model 2 shows that a one million dollar increase in FDI results in a 0.18% uptick in domestic industrial investment, and a one per cent rise in this variable corresponds to a 0.13% increase in the apparent consumption index of capital goods. Although these results are lower than those for domestic demand, they still carry significant weight, indicating a degree of reliance of a portion of the Brazilian productive framework on external economic forces.

Conclusion

The primary finding of the research outlined in this article is relatively straightforward. Since the 1990s, the Brazilian economy has experienced a significant process of asymmetric internationalisation, leading to new forms of indirect vulnerability through international financial movements. In addition to the monetary and strictly financial perspectives, our aim was to enhance comprehension of the productive aspect of this issue. The hypothesis was that this serves as a crucial conduit through which economic policy autonomy is partially eroded. This aligns with the structuralist literature on the subject, pinpointing a substantial external challenge in a country with a favourable Balance of Payments situation in recent years.

Initially, we show that the Brazilian economy has suffered an intense process of denationalisation of its productive sectors without an equivalent expansion of its activities

abroad. The first wave of internationalisation shifted economic institutions toward openness and liberalisation, especially through uncontrolled FDI inflows, which resulted in widespread privatisation of public companies and denationalisation of private companies. A second wave, beginning in the 2000s, continued the process, extending denationalisation beyond the industrial sector and reaching mainly the services and technology sectors but also expanding to energy, agriculture and mining. Contrary to what is commonly assumed, the Brazilian economy can be seen as highly open if examined from the FDI perspective and the share of foreign capital in the domestic economy.

This process led to new impacts of global productive fluctuations on peripheral economies. We aim to clarify how the dominance of foreign capital in a peripheral country's national production could indirectly diminish its economic policy autonomy, even if the direct effects on the balance of payments do not pose an immediate issue. Global productive fluctuations reflect the dynamics of a globalised world economy, predominantly characterised by global value chains and the activities of multinational corporations.

In the third part of this article, we demonstrated that the impact of this GPF on the Brazilian economy was significant and strongly indicates that long-term industrial investment is influenced by FDI inflows. In essence, industrial investment, a crucial factor for development, is to some extent influenced by foreign interests that do not align with the necessary policies for sustainable growth, consistent productive improvement, and equitable income distribution. On the other hand, the prevalence of foreign capital in domestic activities increasingly exposes local investment to global fluctuations, thus undermining the coherence, stability, and strength of the required industrial policies for economic development.

In a broader sense, the proposition of a GPF as an indirect form of vulnerability appears to be a fundamental factor for understanding the long-term economic dynamics of peripheral countries, and thereby, their current difficulties in overcoming underdevelopment. Following

a historical-structural method, this suggests that the changes in the global economy have not only transformed underdevelopment itself but also redefined the systems of subordination. If liberal economic policies persist, the trajectory of an uncontrolled domestic economy highlighted in this article will become increasingly significant, further complicating efforts to reverse underdevelopment.

Hence, although it represents an initial and tentative line of inquiry, it appears useful to comprehend the fundamental issues and trends of the Brazilian economy. Promoting development involves overcoming productive vulnerability and requires national autonomy in economic policy. In addition to identifying the problem, it is necessary to advance the establishment of domestic economic strategies that can enjoy the new context of productive globalisation and the increasing international flows of foreign capital in favour of development. In this sense, it would be interesting to add new types of tests, investigate other types of impacts, expand the empirical analysis to other countries and find ways to set a better management of the GPF effects.

Declaration of interest statement

No potential conflict of interest was reported by the author(s).

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¹ These ideas, partially influenced by the work of Cardoso and Faletto (1973), diverged from the "Marxist Dependence Theory", another important strand inside the structuralist literature (see Martins 2022). This perspective maintained and in fact deepened the critical perspective on the role of foreign capital in peripheral development.

² In recent times, the ECLAC'S "integrated approach" has been focused on the concept of structural change for equality, with an increasing emphasis on environmental issues (ECLAC, 2012). The role of foreign capital in general, and FDI in particular, is not a primary concern, within the context of a lower degree of external vulnerability in the region.

³ Netherlands, Luxembourg, Cayman Islands and Virgin Islands.

⁴ According to UNCTAD (2009), greenfield FDIs are those related to projects involving the establishment and creation of new offices, buildings, facilities, plants, or factories from the outset. Brownfield investments or mergers and acquisitions (M&As) are FDIs involving the acquisition or incorporation of capital, assets, or liabilities of existing companies.

⁵ Argentina, China, Costa Rica, India, Indonesia, Russia, Saudi Arabia, South Africa and Brazil itself.

⁶ Calculated by the Instituto de Pesquisa Econômica Aplicada (IPEA) - Institute for Applied Economic Research.

⁷ This variable was collected from the statistics of industrial indicators prepared by the Confederação Nacional da Indústria (CNI) - National Industry Confederation - of Brazil.