

The Amazon region at the heart of the Brazilian economy's commodity-export model: the case of the State of Pará

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Abstract

The Brazilian economy has undergone far-reaching changes, related especially to the loss of industrial capacity as deindustrialization has spread and commodity-export production has expanded. The Brazilian Amazon region forms part of the expansionary logic of the agro-industry and mining sectors. This article analyses the economic reproduction model of one of the main federative units located in that region, the State of Pará. It uses the specialization coefficients and location quotients of Brazil's 27 subnational federative units, to make a case study of that State. The findings reveal a declining industrial structure, particularly in manufacturing industry, accompanied by growth in the mining and metallurgical sector. Economic activity has become increasingly concentrated in the production of raw materials and semi-finished industrial inputs, of low technological content.

Keywords

Economic development, regional development, industrialization, manufacturing and mining industries and products, agroindustry, productivity, production specialization, structural adjustment, Brazil

JEL classification

O14, O18, R11

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I. Introduction¹

Capitalist development is founded on specific requirements regarding the use of geographical space at each point in time; and these have repercussions on the economic, social and environmental relations of the territory in question. This implies understanding the significance of production in the different regional spaces, not only in relation to the dynamic of national capital but also, as a capitalist world economy, in the context of the global capitalist accumulation process. In the case of the Amazon region, one of the defining features of its economic and social formation has been the extraction of natural resources and their export in commodity-form, and that remains the case today (Santos, 1980; Leal, 2010; Trindade and Oliveira, 2011 and 2017).

In the last three decades, the deindustrialization of the Brazilian economy in the different subnational areas has wrought major changes in production structures, especially in the less industrialized ones. Changes become established in the regional model, as the peripheral-regional economies assume a new reproductive condition of commodity-export specialization that impacts the economic dynamics of the national model, further weakening the more diversified industrial linkages (Trindade, Cooney and Oliveira, 2016; Bruno, 2021; Almeida, Pires and Cunha, 2022; Morais, 2019; Persona and Oliveira, 2016).

This article considers the adequacy of the regional economic structure of the State of Pará (one of the largest territorial units and the chief economic centre of the Brazilian Amazon), the current commodity-export dynamic of the national economy, and the resulting implications for the process of regional capitalist development. To this end, it presents and analyses empirical data, compiled and processed methodologically, and puts forward theoretical arguments to interpret the current model of capital reproduction in the Brazilian economy, which is classified as commodity-exporting with productive specialization.

The purpose of studying the Amazon region, using widely recognized indicators of regional analysis — the specialization coefficient and the location quotient — is to broaden economic knowledge of this important region of Brazil and, at the same time, to make a more in-depth analysis of the current difficulties and limits of the regional development model.

The text is divided into five sections including this introduction. Section II deals with the historical aspects of the economic formation of the Brazilian Amazon region, specifically the State of Pará. Section III uses statistical indicators to study the profile of Brazil's subnational (State) economies, and defines the analytical parameters to be used. Section IV, which is the core of the study, presents and analyses the configuration of the commodity-export logic of Pará's economy; and section V presents final thoughts.

II. Modalities of reproductive organization of capital in the Brazilian Amazon

The economic trajectory of the Brazilian Amazon region in the last four decades (1980–2020) has adhered to the aim of satisfying international market demand, through economic relations in which it acts as a supplier of commodities and semi-processed products (fruits, minerals, timber, meat and soybeans). In the case of the State of Pará, its participation in the international division of labour has involved supplying commodities, mainly minerals but also beef and, more recently, cereals. This indicates the existence of forms of productive organization with their own dynamics and relationships, but mediated by structural factors that steer their path through time (Costa, 2012; Mesquita and Junior, 2019; Trindade and Oliveira, 2011; Trindade and Ferraz, 2023).

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The Amazonian economy has been based on commodity exports since colonial times, renewed and modernized from the mid-twentieth century onward with the consolidation of the process of occupation and physical, social and economic integration of its territory into the national economic space (Santos, 1980; Loureiro, 2009; Schmink and Wood, 2012; Leal, 2010; Trindade and Oliveira, 2011; Bunker, 2003).

The Amazon region integrated directly into the international accumulation circuit during the rubber cycle of the late nineteenth century; and it participated in the international division of labour as a supplier to industries of the United States and Europe that sought rubber for various production circuits (Leal, 2010; Santos, 1980).

The Brazilian economy's transition to an industrial model — which occurred in the second quarter of the twentieth century and displaced the national economy's dynamic centre of accumulation— ignored the Amazonian economy. This was despite the economic parallel that existed between the latter's rubber economy and the coffee economy of São Paulo, both of which were founded on an outward-looking growth structure based on commodity production for export (Furtado, 1998).

The problem of regional development did not start to receive serious attention from the political authorities until the Brazilian national State became consolidated, and a federative order was established as from the 1930s. Until the early 1950s, the regional problem in Brazil was addressed only marginally in the federal government's political agenda. It was more confined to political discourse and assistance actions —especially those related to drought in the Northeast region— rather than being raised as a national development policy issue in its own right (Cano, 2007; Oliveira, Trindade and Fernandes, 2014).

As Guimarães (1997, p. 42) notes, the establishment and consolidation of regional inequalities was a very complex process in which the articulation and integration of the regions arose from a single hegemonic one. However, heavy pressure exerted by regional social and political demands, gradually altered this trend —initially through an institutional framework to support regional development established by the federal government as an instrument of planned action. Emblematic examples include the creation of the Superintendency of the Plan for Economic Valorization of the Amazon in 1953, which became the Superintendency for the Development of the Amazon in 1966; and, in the Northeast, the Superintendency for the Development of the Northeast, founded in 1958 (Ianni, 1986; Silva, 2002; Oliveira, Trindade and Fernandes, 2014).

In their analysis of the impact of changes in the interregional division of labour in Brazil resulting from the rapid industrialization of the Southeast between the early 1940s and late 1960s, Oliveira and Reichstul (1973) argued that the North (Amazon) region was not affected greatly by this process and remained partially isolated from the domestic market. Difficulties in transportation, communications and linkages with the foreign market might explain this isolation, which initially prevented an integration dependent on the Southeast region, as happened with the economy of the Northeast.

Starting in the mid-1960s, implementation of the State-led development strategy, which combined fiscal and financial incentives with public investments in infrastructure and productive activity (especially mining), would definitively alter the regional production structure and hasten the growth of industrial economic activity in the 1970s and 1980s (Ianni, 1986; Buarque, Lopes and Rosa, 1995; Guimarães, 1997).

In this new phase, mercantile and commercial capital, linked to the traditional extractive economy that predominated in the region, is displaced by industrial and financial capital, driven by the national State. In this new context, commercial interaction gives way to a process of national productive integration, which reinforces the heavy presence of large State-owned enterprises, transnational groups and much of national private capital, with investments that are protected by regional policies providing tax and financial incentives (Marques and Trindade, 2014; Costa, 2012; Guimarães, 1990).

Buarque, Lopes and Rosa (1995) estimate that the economic, social and environmental transformation process in the region occurred in a spatially very uneven manner. The actions in question differed greatly in intensity, form and determinants, in addition to concentrating a significant part of the region's dynamism. They also established a general model of economic exploitation that differed greatly from what had pertained historically in the region, as exemplified by establishment of the Manaus Free Trade Zone in the State of Amazonas and the Grande Carajás Programme in the State of Pará.

The international economic crisis of the late 1970s, compounded by the effects of the oil shock, had a huge impact on industrial production costs in the central countries, leading them to reorganize their production apparatus and transfer their energy-intensive industries to peripheral economies such as Brazil. In a context of recession and slowdown in the Brazilian economy, the federal government defined its objectives for the Amazon region through the second National Development Plan. This integrated the region's economy definitively into national capital accumulation and, first and foremost, established a natural resource frontier, particularly as a supplier of mineral products (Loureiro, 2009; Leal, 2010; Trindade, 2001; Marques and Trindade, 2014).

The industrial valorization of Amazonian mineral resources, that is their extraction and conversion into merchandise, began in the 1950s with the manganese mining project in Amapá (then federal territory), from which the first ore exports were shipped in 1957. However, it was not until the second half of the 1970s, amid the international energy and economic-financial crisis mentioned above, that the mining industry received a major boost to its production and exports, with the aim of generating foreign exchange to shore up the country's balance of payments (Warren, 1973; Monteiro, 2005; Leal, 2010; Coelho, Monteiro and Cota, 2007; Marques, 2012).

This State intervention was decisive for organizing the institutional framework, creating infrastructure and raising the financial resources needed to develop mining in the Amazon region. Through centralized policies, and engaging both national and foreign capital, the State created favourable conditions for capital expansion in the region, with the aim of modernizing it. Industrial mining was one of the main vectors of this process. In the 1980s, as an important part of the strategy to boost development of the Brazilian Amazon, with the establishment of the agricultural and agro-mining poles, the federal government created the Grande Carajás Programme, with the aim of accelerating the installation and start-up of mining and metallurgical projects² (Coelho, Monteiro and Cota, 2007; Marques, 2012).

As noted, the 1990s saw more intensive application of liberal economic policies, which redefined the conditions of the Brazilian economy's international integration and the role of the State itself in the economy, which had repercussions on the financial and production domains. In this context, integrated regional development policies gave way to increasing reliance on integration and interaction with the international market, and the dynamic of transnational corporations (Furtado, 1992; Cano, 2008; Cruz, 2007; Carneiro, 2002).

In the last few decades, the course of the Amazonian economy has been based much more on the commodity-export logic than steered by a regional national development policy. Even given the changes in the Brazilian political landscape that occurred in the early 2000s and enabled a partial recovery of the State's capacity for intervention and the rescue of the National Policy for Regional Development, the structural moorings of the neoliberal period of Fernando Henrique Cardoso remained intact (Barbosa, 2012; Gonçalves, 2013; Trindade and Oliveira, 2017).

The final balance of these economic shifts reveals a model of productive specialization oriented towards the foreign market that differs from the previous export model (of the late nineteenth and early twentieth centuries). Not only is it based on new segments of accumulation, whether agricultural,

² The Grande Carajás Programme included execution of the Ferro Carajás Project, the construction of Alumínio Brasileiro S.A. and Alumina do Norte do Brasil S.A., Consórcio de Alumínio do Maranhão S.A. and the Tucuruí Hydroelectric Power Plant, in addition to several other prospective projects. For a full discussion of the Programme, see Pandolfo (1994), Lobo (1996) and Trindade (2001).

mineral or assembly industries (maquila), but the new exported products make greater use of machinery and tools, in addition to bringing large swathes of land under exploitation (Osorio, 2012a and 2012b; Trindade and Oliveira, 2017).

Thus, the concentration and persistence of primary activities in peripheral subnational regions, as in the case of the State of Pará, tend to reflect specific production models, which can only be understood in the light of historical and structural conditions that go beyond the objective determinants of production. This problem must be analysed through the connections and relationships established with the global and national economies and their shifts in time and space, as discussed in the following section.

III. Production model of Brazil's subnational economies: an empirical approach

1. Spatial and sectoral indicators and databases

To address the relevant aspects of the structural change empirically and analyse the reproductive model in the context of the economy of the State of Pará, two approaches were used: one spatial and the other sectoral. Regional indicators were chosen to analyse the problem posed by the structural changes that have occurred in the State (Haddad, 1989; Delgado and Godinho, 2011; Krugman, 1991; Monastério, 2011; Isard, 1960). It should be noted that these indicators are treated as providing empirical and analytical support, and serve as descriptive statistics for the treatment of the economic regionalization that is established.

The regional reproductive model is evaluated using the specialization coefficient, which measures an economy's degree of specialization or diversification, with values ranging from 0 (minimum) to 1 (maximum). A value equal to or close to zero indicates that the territorial unit (State) has the same sectoral composition as the benchmark space (Brazil), so there is no specialization in that territorial unit; in other words it is diversified. At the opposite extreme, a coefficient equal to or close to one indicates that the territorial unit has a specialized structural profile (associated with a specific sector) compared to the structure of the benchmark space.

The specialization coefficient (CE_i) is a relative and synthetic measure of a territorial unit's specialization or diversification. It compares the sectoral distribution of the variable in territorial unit i (in this case, the States) with the sectoral distribution of the variable in the benchmark space (in this case, Brazil). The specialization coefficient is calculated using the following equation:

$$CE_i = \frac{1}{2} \sum_{k=1}^k \left[\frac{X_{ik}}{X_i} - \frac{X_k}{X} \right] \quad (1)$$

As a complement to analysis of the specialization coefficient, the production structure can also be evaluated in terms of the sectoral composition and concentration of industrial activities through the location quotient. This indicator measure the relative concentration of a given industry (or sector) in a territorial unit (in this case, the States) compared to the proportion of that same industry in the benchmark space (in this case Brazil). Thus, a high location quotient for an activity in a given territorial unit indicates the extent to which the regional or local production structure is concentrated in that industry.

The value of the location quotient does not have a reference interval and can be greater than or equal to zero. However, according to Delgado and Godinho (2011), a location quotient greater than one in a given sector indicates that the territorial unit in question is relatively specialized in that sector; and, on the contrary, if the location quotient is less than one it is not considered specialized. If the location quotient results are very high, the mean value can be used as a benchmark.

The location quotient (QL_{ik}) evaluates the degree to which territorial unit X is specialized in one of the K categories of activities analysed relative to the benchmark space (Brazil). It compares the importance of category (or class) K in territorial unit i (a State) relative to the benchmark. The location quotient is given by the following formula:

$$QL_{ik} = \frac{\frac{X_{ik}}{X_i}}{\frac{X_k}{X}} \quad (2)$$

The main database used to calculate the regional analysis indicators and most of the other measures of structural change and regressive specialization was the Annual Survey of Industry – Enterprise (*PIA-Empresa*) of the Brazilian Institute of Geography and Statistics (IBGE). This survey collects economic and financial data on industrial firms and their local units. It is implemented by adopting two strata as criteria: a mandatory inclusion stratum and a random stratum. The mandatory stratum consists of a census of firms with 30 or more employees. The random stratum is formed by firms with five or more employees selected at random without repetition. Since the results for most federal units are published at the division, or two-digit, level of the National Classification of Economic Activities, it was decided to use the statistics of industrial firms with five or more employees at the division level.

The starting year for the survey was chosen as 1996 because this was when IBGE reorganized the Annual Survey of Industry (PIA) to adapt it to the parameters of the new model of economic statistics production. In addition, as from 1996, *PIA-Empresa* replaced the industrial census, which until then had been used as the main data source for analysing national industry, thus launching a new statistical series (IBGE, 2004).

From a sectoral perspective, the aim was to measure the effects of structural changes in the industrial structure of the State federative units, driven by their economies' new requirements in terms of external engagement. To this end, indicators and variables were used to explain the degree of structural change (Carneiro, 2008; UNIDO, 1997), as well as the structural characteristics (Midelfart-Knarvik and others, 2000) that form the basis for the industrial sectors' economic performance (Midelfart-Knarvik and others, 2000). This aimed to relate the regressive shift in the State's production structure to the organization of a new reproductive model centred on the mining and metallurgy sector.

2. The heterogeneity of Brazil's subnational economies

In an attempt to identify the pattern of industrial specialization and concentration, the spatial dimension was addressed firstly by constructing a typology of the industrial structure present in Brazil's different States and regions, based on the results of the regional analysis indicators. The variable used for this purpose was the industrial transformation value (VTI),³ which is considered an indirect indicator of the industry's value added. It is reported in *PIA-Empresa*, classified in 17 sectors of economic activity within general industry (extractive and manufacturing) spanning 1996–2016.

To gauge the degree of heterogeneity in regional production structures and their distribution across national territory, the values of the specialization coefficient were grouped in quartiles. This made it possible to derive a typology for the different production models in the industrial structures, classified as: high diversification (first quartile), medium-low diversification (second quartile), medium-high specialization (third quartile) and high specialization (fourth quartile). The aim of this technique is merely to provide an approximate reading of the production model of the different subnational regions, prior to

³ VTI is the difference between the gross value of industrial production (VBPI) and the costs of industrial operations. The gross value of industrial production comprises the sum of sales of industrial products and services (net industrial income), the variation in stocks of finished goods and work-in-process, and own production for fixed assets.

analysing the specific case of the State of Pará. Table 1 shows the results of the specialization coefficient for Brazil's 27 subnational entities and indicates the productive structure and the sectoral importance of industrial employment in 1996–2016.

Table 1

Brazil: specialization coefficient and production model of subnational units, 1996 and 2016

Federative unit	1996				2016			
	Coefficient of specialization	Production structure model	Sectoral density and share in State employment (Percentages)		Coefficient of specialization	Production structure model	Sectoral density and share in State employment (Percentages)	
São Paulo	0.136	High diversification	2 119 567 formal jobs	42.00	0.160	High diversification	2 406 696 formal jobs	32.98
Rio Grande do Sul	0.174	High diversification	485 420 formal jobs	9.62	0.195	High diversification	640 136 formal jobs	8.77
Paraná	0.251	High diversification	312 415 formal jobs	6.19	0.232	High diversification	622 588 formal jobs	8.53
Pernambuco	0.287	High diversification	124 730 formal jobs	2.47	0.228	High diversification	206 261 formal jobs	2.83
Minas Gerais	0.293	High diversification	503 491 formal jobs	9.98	0.237	High diversification	791 331 formal jobs	10.85
Santa Catarina	0.340	High diversification	340 065 formal jobs	6.74	0.292	High diversification	638 575 formal jobs	8.75
Rio de Janeiro	0.341	High diversification	398 546 formal jobs	7.90	0.384	Medium-low diversification	416 621 formal jobs	5.71
Bahia	0.355	Medium-low diversification	100 758 formal jobs	2.00	0.328	Medium-low diversification	213 760 formal jobs	2.93
Goiás	0.387	Medium-low diversification	79 631 formal jobs	1.58	0.314	High diversification	225 025 formal jobs	3.08
Paraíba	0.447	Medium-low diversification	39 331 formal jobs	0.78	0.500	Medium-high specialization	71 364 formal jobs	0.98
Amazonas	0.450	Medium-low diversification	59 283 formal jobs	1.17	0.389	Medium-low diversification	92 419 formal jobs	1.27
Ceará	0.476	Medium-low diversification	109 687 formal jobs	2.17	0.389	Medium-low diversification	223 367 formal jobs	3.06
Federal District	0.502	Medium-low diversification	14 998 formal jobs	0.30	0.475	Medium-high specialization	29 283 formal jobs	0.40
Maranhão	0.518	Medium-low diversification	21 240 formal jobs	0.42	0.480	Medium-high specialization	40 002 formal jobs	0.55
Espírito Santo	0.523	Medium-high specialization	68 756 formal jobs	1.36	0.529	High specialization	122 967 formal jobs	1.69
Mato Grosso	0.538	Medium-high specialization	35 911 formal jobs	0.71	0.473	Medium-high specialization	94 307 formal jobs	1.29
Piauí	0.542	Medium-high specialization	14 086 formal jobs	0.28	0.430	Medium-high specialization	28 105 formal jobs	0.39
Mato Grosso do Sul	0.553	Medium-high specialization	25 840 formal jobs	0.51	0.379	Medium-low diversification	99 842 formal jobs	1.37
Sergipe	0.556	Medium-high specialization	18 516 formal jobs	0.37	0.399	Medium-low diversification	43 010 formal jobs	0.59
Alagoas	0.572	Medium-high specialization	61 840 formal jobs	1.23	0.448	Medium-high specialization	72 963 formal jobs	1.00
Rio Grande do Norte	0.581	High specialization	39 289 formal jobs	0.78	0.323	Medium-low diversification	63 028 formal jobs	0.86
Pará	0.602	High specialization	52 758 formal jobs	1.05	0.677	High specialization	96 089 formal jobs	1.32
Tocantins	0.638	High specialization	2 731 formal jobs	0.05	0.525	High specialization	16 021 formal jobs	0.22
Rondônia	0.663	High specialization	13 478 formal jobs	0.27	0.592	High specialization	32 799 formal jobs	0.45
Acre	0.664	High specialization	1 519 formal jobs	0.03	0.626	High specialization	5 000 formal jobs	0.07
Roraima	0.665	High specialization	692 formal jobs	0.01	0.653	High specialization	2 246 formal jobs	0.03
Amapá	0.741	High specialization	2 198 formal jobs	0.04	0.662	High specialization	2 878 formal jobs	0.04

Source: Prepared by the authors, on the basis of Brazilian Institute of Geography and Statistics (IBGE), Pesquisa Industrial Anual – Empresa (PIA-Empresa) 1996 and 2016.

A review of variations in the values of the specialization coefficients in all States between 1996 and 2016 shows that production structures in the first quartile were less affected by the structural change process in the Brazilian economy, despite the reduction in the share of industrial employment, as can be seen by comparing the data in the respective formal jobs columns. The exception in this group was the State of Rio de Janeiro, which, by adopting a less diversified production model, dropped back to the second quartile. This is explained largely by the loss of the relatively more diversified and integrated production structure of this State's economy (Bruno, 2021; Gonçalves, 2013; Libânio, 2012).

The condition of increasing specialization, extended to a larger territorial area in the country (75% reflect low diversification and high specialization), shows that the logic of the productive specialization reproduction model is gradually becoming generalized, producing two combined effects. The first of these is the steadily declining share of industrial employment, along with a reduction in formal employment; and the second is the strengthening of hyper-specialization in some parts of the country, such as the eastern Amazonian States (Pará and Amapá).

Tables 2 and 3 show the States with the highest concentration of VTI by economic activity, relating the national average value and the value of the location quotient in each sector, in 1996 and 2016, respectively. The results show that States with specialized production structures tend to concentrate in sectors requiring a large volume of natural resources and traditional low-tech industries. In contrast, subnational units with diversified productive structures report activities that are more widely distributed across the sectors of the economy, or even specialize in high-tech activities, as seems to be the case in Rio Grande do Sul, Paraná and Santa Catarina.

Table 2

Brazil: location quotient of subnational unit with the most concentrated industrial transformation value and national average, by sector of economic activity, 1996

National average location quotient		Federative unit with the highest location quotient	Location quotient	Production model	
1	Oil and natural gas	1.016	Rio G. do Norte	10.209	High specialization
2	Extraction of metallic minerals	3.167	Amapá	35.806	High specialization
3	Extraction of non-metallic minerals	2.129	Rio G. do Norte	11.522	High specialization
4	Food and beverages	1.760	Mato G. do Sul	3.670	Medium-high specialization
5	Textiles, leather and footwear	1.225	Ceará	5.403	Medium-low diversification
6	Wood products	4.122	Rondônia	47.593	High specialization
7	Pulp and paper	0.839	Amapá	6.722	High specialization
8	Chemicals	0.642	Bahia	2.822	Medium-low diversification
9	Rubber and plastics	0.596	Acre	2.995	High specialization
10	Manufacture of non-metallic mineral products	1.894	Tocantins	6.297	High specialization
11	Metallurgy	1.021	Maranhão	9.298	Medium-low diversification
12	Metal products	0.588	Tocantins	1.780	High specialization
13	Machines and tools	0.397	Santa Catarina	2.219	High diversification
14	Electronics and electronic products	0.462	Amazonas	5.984	Medium-low diversification
15	Motor vehicles	0.222	Minas Gerais	1.629	High diversification
16	Other transport equipment	0.609	Amazonas	9.265	Medium-low diversification
17	Furniture and miscellaneous products	0.914	Federal District	3.600	Medium-low diversification

Source: Prepared by the authors, on the basis of Brazilian Institute of Geography and Statistics (IBGE), Pesquisa Industrial Anual – Empresa (PIA-Empresa) 2016.

Table 3

Brazil: national average and value of location quotient of subnational unit with the highest concentration of industrial transformation value, by sector of economic activity, 2016

National average location quotient		Federative unit with the highest location quotient	Location quotient	Production model	
1	Oil and natural gas	0.945	Sergipe	6.946	Medium-high specialization
2	Extraction of metallic minerals	0.855	Pará	12.746	High specialization
3	Extraction of non-metallic minerals	1.774	Rio G. do Norte	9.626	Medium-low diversification
4	Food and beverages	1.553	Acre	3.465	High specialization
5	Textiles, leather and footwear	1.235	Paraíba	7.157	Medium-high specialization
6	Wood products	4.632	Amapá	61.457	High specialization
7	Pulp and paper	0.956	Maranhão	7.709	Medium-high specialization
8	Chemicals	0.654	Bahia	2.258	Medium-low diversification
9	Rubber and plastics	0.604	Bahia	1.660	Medium-low diversification
10	Manufacture of non-metallic mineral products	1.944	Federal District	6.620	Medium-high specialization
11	Metallurgy	0.790	Maranhão	4.636	Medium-high specialization
12	Metal products	0.783	Rio G. do Sul	1.862	High diversification
13	Machine tools	0.508	Rio G. do Sul	1.818	High diversification
14	Electronics and electronic products	0.598	Amazônas	6.385	Medium-low diversification
15	Motor vehicles	0.387	Paraná	1.984	High diversification
16	Other transport equipment	0.564	Amazônas	5.384	Medium-low diversification
17	Furniture and miscellaneous products	0.909	Mato G. do Sul	4.741	Medium-low diversification

Source: Prepared by the authors, on the basis of Brazilian Institute of Geography and Statistics (IBGE), Pesquisa Industrial Anual – Empresa (PIA-Empresa) 2016.

In States that have more specialized productive structures, primary activities predominate, serving the specific needs of the national and international division of labour. In all Brazilian States, the indicators reveal not only a historical process of unequal economic expansion, but, above all, the formation of specific reproductive models that reveal the economic profile of each State.

As the capitalist economic space has been based historically on uneven development, the interregional peripheral model shapes the spatial characteristics of the Brazilian economy. Thus, there is a mosaic of regional inequalities in addition to “fragmentation”; but there has also been an evolution in the last two decades (1996–2016) in which productive specialization has increased and industrial diversity has declined. In the current economic context, this explains industrial structure regression and its counterpart in the increasing specialization of the peripheral-regional economies. The next section of this article analyses this in detail, through a case study of the economy of the State of Pará.

IV. Structural change and commodity-export specialization in the economy of the State of Pará

1. The regressive specialization of the economy of the State of Pará

The premise adopted in this study is that, in developing countries and peripheral subnational economies, the phenomenon of deindustrialization — as a structural change process — tends specifically to involve regressive specialization. The production structure regresses, with consequent labour precarity and an increase in the production of commodities destined mainly for the foreign market. To support this argument and classify the nature of change in the industrial structure of the State of Pará, variables and indicators identified in the literature are deployed to measure and classify the structural change and the regressive specialization process (Carneiro, 2008; Monastério, 2011; Botelho, Souza and Avellar, 2016).

To measure the trend towards regressive specialization, Carneiro (2008) proposes to test the following processes empirically: (i) the reduction in the share of industry in the State's GDP; (ii) the reduction in the densification of production chains, measured as the ratio between VTI and the gross value of industrial production (VBPI); and (iii) the increase in the share of lower-tech sectors in the industrial structure. To contribute to these indicators, the following variables are added as measures of deindustrialization: (i) the share of manufacturing in total formal employment, based on data obtained from the annual social information report; and (ii) labour productivity, measured through the ratio between VTI and the number of persons employed, using data from the IBGE Annual Industrial Survey, following Botelho, Souza and Avellar (2016).

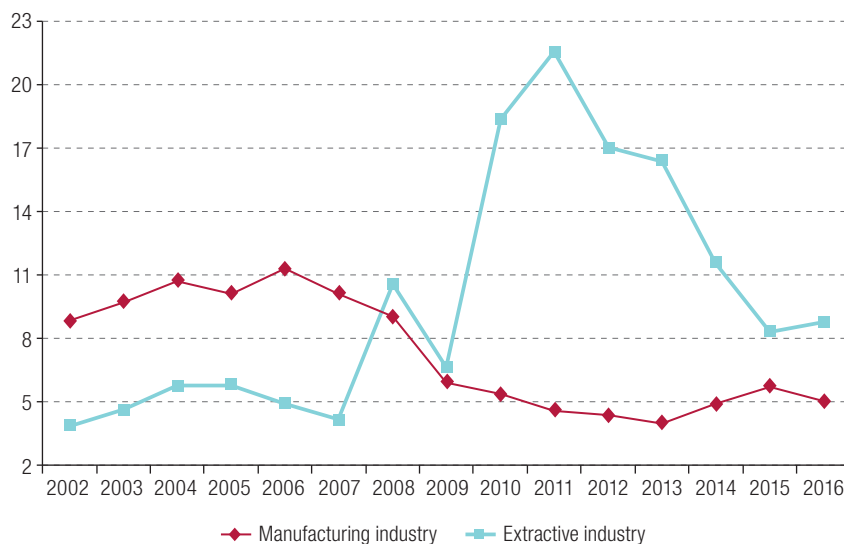
(a) Reduction in the share of industry in GDP and trend in industrial employment

In the State of Pará, the reduction in the GDP share of manufacturing industry, particularly since 2006, has gone hand in hand with an increase in share of mining, which amounted to 21.53% in 2011, as shown in figure 1.

Moreover, owing to the impact of the 2008 crisis, manufacturing industry was overtaken by the extractive industry and has been unable to regain its position. The increase in the share of agriculture in total value added, from 8.82% in 2008 to 12.43% in 2016, also contributed to the decline of manufacturing industry.

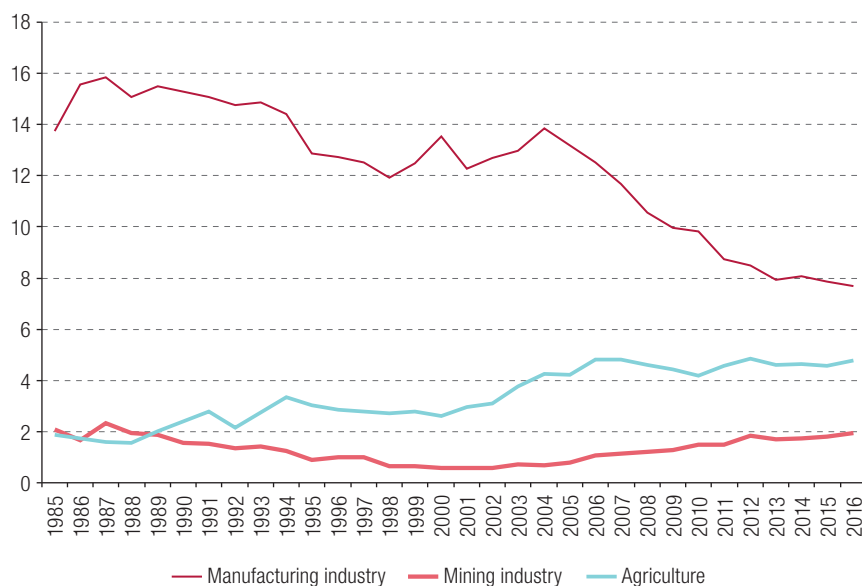
Figure 2 shows the trend of formal employment in the main sectors of Pará's economy (extractive industry, manufacturing industry and agriculture) between 1985 and 2016. It shows clearly that the manufacturing share of total employment in the economy fell steeply from 15.83% in 1987 to 7.68% in 2016. This was accompanied almost simultaneously by an increase in employment in agriculture since 1988, and by a slight increase in the extractive industry share of employment since 2002.

Figure 1
State of Pará, Brazil: share in value added of extractive and manufacturing industries, 2002–2016
(Percentages of GDP)



Source: Brazilian Institute of Geography and Statistics (IBGE), Contas Regionais do Brasil, 2002–2016.

Figure 2
State of Pará, Brazil: share of formal employment in total employment in manufacturing industry and selected economic sectors, 1985–2016
(Percentages)



Source: Prepared by the authors, on the basis of Ministry of Labour and Employment of Brazil, *Relação Anual de Informações Sociais (RAIS)*, 1985–2016.

The growth of manufacturing employment in the first few years of the 2000 decade can be explained mainly by the national economic policy of boosting the domestic market, which also allowed for income growth (Carvalho, 2018). In the economy of Pará, this was reflected particularly in the wage good sectors (the food and beverage industry).

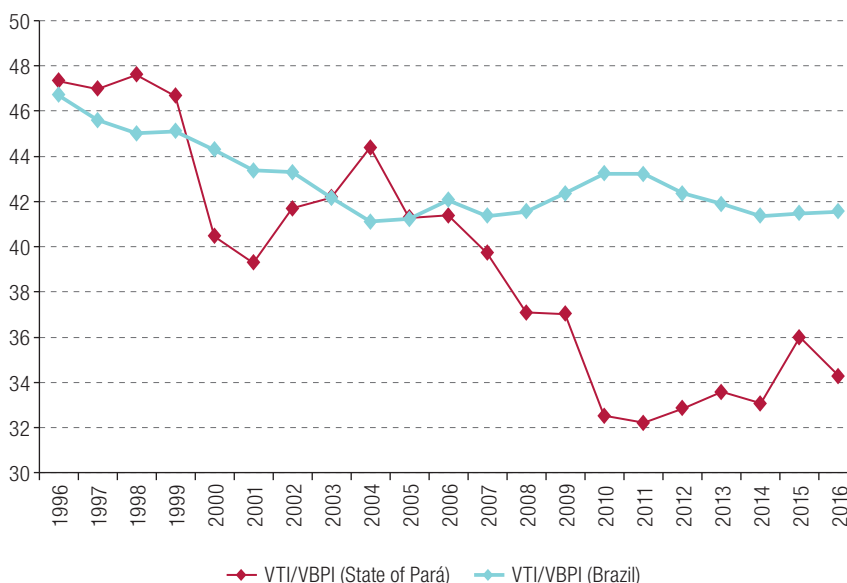
However, the downtrend in industrial employment precedes a more serious structural problem, namely the declining share of manufacturing industry in GDP, which is one of the symptoms of regressive specialization noted by Carneiro (2008). Moreover, its performance is similar to that of national manufacturing industry, which in 1986 accounted for 27.1% of formal jobs in the Brazilian economy but then fell continuously to reach 15.5% in 2016.

(b) Reduction in industrial density

The second measure used to verify the regressive specialization process is the industrial density index (or coefficient of industrialization). This is measured as the ratio between VTI and VBPI and is used to gauge the densification of production chains. The higher this coefficient, the greater the industrial density and, consequently, the greater the value added by the production chain or sector in question.⁴

Figure 3 shows that the density of Pará's manufacturing industry fell sharply by 23.96% between 1996 and 2016, whereas for Brazil as a whole the index decreased by 11.20% in the same period. In 1996, the Pará State and national VTI/VBPI ratio started from similar levels; but from 2004 onward, following a brief period of recovery, the densification of Pará's industry declined rapidly until 2011, when the indicator recorded its lowest value (32.20%).

Figure 3
Brazil and State of Pará: manufacturing industry density index, 1996–2016
(Percentages)



Source: Prepared by the authors, on the basis of Brazilian Institute of Geography and Statistics (IBGE), Pesquisa Industrial Anual – Empresa (PIA-Empresa) 1996–2016.

Note: The industrial density index is measured as the ratio between industrial transformation value (VTI) and gross value of industrial production (VBPI).

⁴ According to Almeida, Feijó and Carvalho (2007, p.1), a fall in this ratio means that greater use is being made of imported inputs, which for the industry as a whole represents a transfer abroad of output and its respective value added, as happens in the mining and metallurgical sector in the State of Pará.

Since then, the performance of manufacturing industry in Pará has fluctuated without signs of progressive recovery, as can also be seen in figures 1 and 2, which show a reduction in industrial density, and a consequent loss in capacity to create jobs and improve incomes among the population. In the case of extractive industry, growth has been associated with a larger share of VTI in industrial production, which rose from 59.62% in 1996 to 72.47% in 2016.

This fall in the VTI/VBPI ratio signifies a weakening of the productive links of industry in both Pará and Brazil as a whole, subjecting the economy's production structure to a pattern of regressive specialization (Carneiro, 2002; Filgueiras, 2013; Almeida and Santos, 2015; Trindade and Oliveira, 2017). However, in the case of Pará, the sharp fall in the coefficient indicates that the reduction in the share of industry was also accompanied by a significant increase in production by natural resource-intensive sectors.

This development has occurred more intensively in regions viewed as frontiers of capital accumulation, with a robust expansion of commodity production (Rivero and Cooney, 2011; Loureiro, 2009; Marques, 2012; Trindade and Ferraz, 2023). However, this relationship conceals the most troubling feature of Pará's economy, namely the rapid growth of the extractive industry combined with the relative decline of manufacturing. This is revealed by the rise in VTI, which involves an increase in labour productivity associated with the mining of metallic minerals, mainly iron ore, copper, aluminium and manganese (Monteiro and Cruz, 2012; Trindade and Oliveira, 2017).

(c) Larger share of low-tech sectors in the industrial structure

The third measure proposed by Carneiro (2008) is the technological coefficient, for which the economics literature establishes various sector taxonomies. These seek to categorize branches of industry according to their technological coefficient, in terms of both products and production processes. However, owing to the specific characteristics of the production structure in each economy, none manages to represent the technological profile of industry satisfactorily (Urraca-Ruiz, Britto and Souza, 2013).⁵

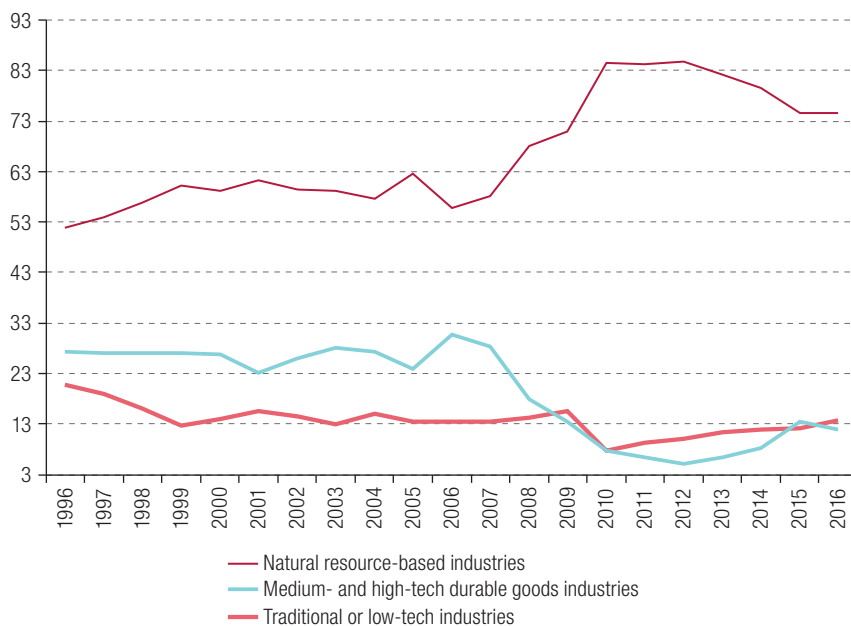
Considering the profile of the economic structure of Pará, this study uses a classification that encompasses both manufacturing and extractive industries. The sector taxonomy proposed by Ferraz, Kupfer and Haguenaer (1996) is particularly interesting, because it combines different industrial classification criteria, resulting in four groups: (i) resource-intensive industries; (ii) traditional industries; (iii) durable goods industries and their suppliers; and (iv) industries that disseminate technical progress.

For the purposes of this study, a number of adjustments were made to take account of the sector structure of industry in Pará. Moreover, given the negligible presence of industries that disseminate technical progress, the corresponding activities were added to the durable goods industries and suppliers group, leaving three industry groupings, classified as follows: (i) natural resource-based industries; (ii) traditional or low-tech industries; and (iii) medium and high tech durable goods industries.

Figure 4 shows the performance of these three industry groupings in 1996–2016, using the share in VTI as a benchmark variable. The natural resource-based group of industries diverges increasingly as from 2006, coinciding with the fall in industrial value in the other two groups. This result correlates positively with these sectors' share in GDP and negatively with their capacity to create jobs and densify the State economy.

⁵ Firstly, the pre-established classifications in sectors of greater and lesser technological efficiency may underestimate the innovative performance of sectors that traditionally do not innovate, but which can incorporate technical progress through intersectoral relationships. Secondly, the specifics of the technological level assumed by the economy stems from the historical circumstances that led to the formation of its productive capacity. Lastly, such classifications do not adequately take into account the capacity of the different sectors to foster the productive development of the economy through chain effects (Urraca-Ruiz, Britto and Souza, 2013).

Figure 4
State of Pará, Brazil: share in industrial transformation value of industrial sectors
by technological coefficient, 1996–2016
(Percentages)



Source: Prepared by the authors, on the basis of Brazilian Institute of Geography and Statistics (IBGE), Pesquisa Industrial Anual – Empresa (PIA-Empresa) 1996–2016.

Among industries that make intensive use of natural resources, the growth in metallic mineral mining is positive, while the performance of the wood products industry is negative. The performance of low-tech (traditional) industries was sustained exclusively by the food and beverage sector. The medium- and high-tech industry group, which in Pará consists mainly of supply industries, was driven by the growth of the metallurgical sector.

2. Nature and direction of the structural change in industry in the State of Pará

As noted above, owing to the changes that have occurred in the last four decades, Pará's production structure has come to be centred mainly around the mining economy, to the detriment of other industrial activities, thereby creating a new reproductive dynamic in the regional economy. The expansion of the mining and metallurgical industry has therefore served as the vector of the State's GDP growth path in recent decades. However, this industry has been unable to forge closer linkages with the State's economic structure, as noted by Hirschman (1961), since it relies essentially on a commodity-export model in which growth is driven mainly by the foreign market (Furtado, 1998 and 2000; Mello, 1990; Mollo and Amado, 2010).

The effects of this production logic on the economy of the State and region worsened in the second half of the 1990s, owing to the liberalizing policy measures adopted by the federal government. In particular, export tax exemptions had a direct effect on the State's tax revenues and discouraged investment policies since it was impossible to increase public spending (Trindade, Portugal and Brandão, 2017).

Thus, the changes that have occurred in Pará's industrial structure in recent decades are explained largely by the vigorous expansion of the mining and metallurgy industry. Table 4 reports selected indicators of the trend of industry in the State in the last two decades (1996–2016). The extractive and manufacturing industries reflect opposing trends in employment, industrial transformation value, and labour productivity.

Table 4
State of Pará, Brazil: industry performance in terms of employment, industrial value and productivity, by sector of activity, 1996 and 2016
(Percentages and thousands of reais)

Industrial sectors	1996			2016		
	Employment (Percentages)	Industrial transformation value (Percentages)	Productivity (Thousands of reais) ^a	Employment (Percentages)	Industrial transformation value (Percentages)	Productivity (Thousands of reais) ^a
General industry	100.00	100.00	14 714	100.00	100.00	29 403
Extractive industry	7.67	31.41	60 222	20.87	68.20	96 089
Manufacturing industry	92.33	68.59	10 931	79.13	31.80	11 818
Oil and natural gas	0.00	0.00	490	0.00	0.00	0
Extraction of metallic minerals	6.91	30.10	64 148	19.91	67.83	100 169
Extraction of non-metallic minerals	0.77	1.31	25 057	0.96	0.37	11 340
Food and beverages	22.17	15.67	10 396	35.08	11.95	10 014
Textiles, apparel, leather and footwear	4.47	1.26	4 156	3.02	0.46	4 444
Wood products	41.82	15.05	5 295	10.36	1.85	5 248
Pulp and paper products	3.70	10.03	39 917	2.11	0.87	12 076
Chemicals and pharmaceuticals	2.94	2.80	14 026	3.69	1.81	14 454
Rubber and plastics	1.01	0.39	5 714	2.03	0.28	4 024
Non-metallic minerals	3.18	2.68	12 383	7.58	2.62	10 147
Metallurgy	4.79	15.92	48 932	4.59	8.97	57 496
Metal products, excluding machinery and tools	1.15	0.64	8 224	2.73	0.65	6 979
Machines and tools	1.09	0.77	10 362	3.55	1.51	12 524
Computers, electronics and electricity	0.29	0.04	2 115	0.29	0.04	3 779
Automobiles, trailers and bodyworks	0.87	0.17	2 870	0.42	0.03	2 070
Other transport equipment	0.34	0.46	20 042	0.76	0.37	14 444
Furniture and miscellaneous products	4.52	2.71	8 813	2.93	0.41	4 118

Source: Prepared by the authors, on the basis of Brazilian Institute of Geography and Statistics (IBGE), Pesquisa Industrial Anual – Empresa (PIA-Empresa) 1996 and 2016.

^a Figures updated to 2016 by the General Price Index – Domestic Availability (IGP-DI).

In the case of extractive industry, growth is due mainly to the evolution of metallic mineral production, in which productivity increased by more than 50% during the period. In contrast manufacturing industry saw reductions in employment (-14.2%) and in VTI (-53.6%), while productivity grew by just 8.1%, owing partly to productivity gains in the metallurgical industry (17.5%).

In 1996–2016, the mining and metallurgy sector increased its share of VTI by 1.6 times, driven especially by metallic mineral production, which more than doubled its share from 30.10% in 1996 to 67.83% in 2016, accompanied by a large productivity gain, as shown in table 4.

This result only partially reflects the robust growth of commodity production in Brazil in the decade of 2000, driven by the sharp rise in international prices associated with the “China effect” (Figueiras, 2013; Serrano, 2013). In the case of mineral commodities, the international flow intensified greatly in response to burgeoning Chinese demand as from the early years of that decade; and it maintained high growth rates despite the 2008–2009 crisis.

A large portion of Brazil's supply of metallic mineral products is produced and exported by the State of Pará, which generates 6% of the country's total exports. In 2018, the State recorded the third largest trade balance of Brazil's subnational units, with an export value of some US\$ 14.4 billion, of which iron ore accounted for more than 60%.

In recent decades, the State of Pará has traded intensively in basic industrial inputs and semi-finished products of mineral origin (metallic minerals), destined almost exclusively for the foreign market. Throughout the decade of 2000, the metallic mining sector generated between 75% and 85% of Pará's total exports and amounted to some US\$ 8.9 billion in 2016, as shown in table 5.

Table 5
State of Pará, Brazil: total and metallic mining sector exports and growth rate, 1997–2016
(Thousands of dollars and percentages)

Year	Value of exports (Thousands of dollars)				Relative variation (Percentages)		
	Extractive industry (A)	Metallurgy (B)	Metallic mining industry (C)	Total exports (D)	A/D	B/D	C/D
1997	951 746	781 132	1 732 878	2 263 399	42.0	34.5	76.6
2000	975 084	863 119	1 838 203	2 439 752	40.0	35.4	75.3
2005	2 289 694	1 500 779	3 790 474	4 756 257	48.1	31.6	79.7
2010	8 378 392	2 636 518	11 014 910	12 833 142	65.3	20.5	85.8
2016	6 918 804	2 080 568	8 999 373	10 511 067	65.8	19.8	85.6
Average annual growth rate (Percentages)							
1997–2016	96	35	71	64			

Source: Prepared by the authors, on the basis of Ministry of Development, Industry, Trade and Services of Brazil, Comex Stat [online database] <http://comexstat.mdic.gov.br/es/home>.

Between 1997 and 2016, the sector's exports grew an average of 71% per year, more than quintupling their dollar value (measured free on board (FOB)). This outstripped the performance of total exports, which grew by an annual average of 64%. Extractive activity also outpaced the manufacture of metal products. The way in which this economic dynamic is progressing —gradually reducing and destroying the few manufacturing activities installed in the State, while intensifying the mining-metallurgical matrix— tends to reinforce the economic model of commodity-export specialization, and thus assumes new functional characteristics of peripheral dependency (Osorio, 2012a; Martins, 2011; Trindade and Oliveira, 2017; Bruno, 2021).

V. Final thoughts

The structural changes that have taken place in the Brazilian economy, owing both to the subordinate and passive external integration of the 1990s and to the macroeconomic adjustments of the last three decades, have affected the various subnational economies in different ways. Nonetheless, their main effect has been to accentuate the dependent and commodity-exporting nature of the State economies. The analysis presented in this article focuses on the specific case of the State of Pará.

The starting point is a theoretical approach that treats the course of capitalist development as a historically unequal process, subjected to structural shifts, not necessarily progressive, which, from a regional standpoint, show how capital relates and acts in different territorial economic spaces. This dynamic unfolds among countries with different levels of development, but also between national subspaces that reflect very pronounced structural and social asymmetries, as exemplified by Brazil.

Brazil reflects varying levels of territorial economic development: some subnational regions have highly diversified production structures while others, located in the peripheral zones of the country, are highly specialized. The structural change involving economic reprimarization is a trend that has been observed generally in the Brazilian economy in recent decades; but, in the subnational units, it tends to reflect specific features owing to the characteristics of each production structure and its mode of external engagement, as demonstrated throughout the article.

The Pará economy has become increasingly specialized, accompanied by a loss of industrial diversity, specifically in manufacturing industry, combined with growth of the mining sector, as revealed by the indicators analysed. The production structure has become concentrated increasingly in the production of raw materials and semi-finished industrial inputs —that is, in low-tech items.

The observed trend entails a shift of production towards the mining and metallurgy sector, especially in the extractive industry, which has its counterpart in the decline of manufacturing industry. The fact that this dynamic has intensified in the last twenty years would suggest that the explanation goes beyond the rise in commodity prices in the foreign market. This needs to be analysed further in future studies, especially in terms of the effects of the Brazilian taxation model.

Salient features of the mining and metallurgical sector include highly concentrated technological progress, the way in which it operates internationally, and the fragile linkages it establishes with the rest of the regional production structure.

Based on the theoretical and empirical analysis, the current commodity-export model of the economy of the State of Pará can be represented in general by the following three key characteristics. However, this attempted synthesis does not pretend to be the last word on the subject.

- (i) Intensive use of imported machinery and technology. This is undoubtedly the most salient characteristic of the new commodity-export model. It makes it possible to establish production with a high capital-labour ratio, which in turn determines and fosters high labour productivity. In addition, the use of modern technologies makes it possible to reduce production costs —either through the introduction of machinery and new production processes or by increasing the scale of production through a more efficient and flexible use of the transport system— in the face of profitability gains and the cyclical expansion of the international market.
- (ii) Production and marketing that are highly integrated in global markets and under the financial control of large transnational corporations. This is an aspect that usually differentiates commodity production, whether mineral or agricultural: the high degree of capitalization and integration with demand-side sectors in the global production chain. Global integration, meanwhile, raises the issue of the transfer of rents abroad, which is part and parcel of the peripheral economies' dependency logic.
- (iii) Continued environmental degradation, resulting from increasing pressure on forests and the plundering of nature, which translates into intensive but unequal economic and social use of natural resources, as happens mainly with mining.

These are some of the determinants of the new phase of capital reproduction in the Amazon region, whose main pillars of accumulation (cattle ranching, agriculture and mining) maintain domestic and external relations and interactions that give rise to the current commodity-export productive specialization model.

Bibliography

- Almeida, J., C. Feijó and P. Carvalho (2007), “Mudança estrutural e produtividade industrial”, São Paulo, Institute of Studies for Industrial Development (IEDI).
- Almeida, L., P. Pires and A. Cunha (2022), “Relações comerciais com a China e a desindustrialização brasileira entre 2000 e 2014: um estudo baseado na análise inter-regional do insumo-produto”, *Revista da Sociedade Brasileira de Economia Política*, No. 63, Niterói, Fluminense Federal University.
- Almeida, N. and P. Santos (2015), “The pattern of capital reproduction in Brazil”, *World Review of Political Economy*, vol. 6, No. 3, London, Pluto Journals.
- Barbosa, R. (2012), “A Política Nacional de Desenvolvimento Regional: a ‘letra da lei’ ao sentido do texto”, *Revista de Políticas Públicas*, vol. 16, No. 1, São Luís, Federal University of Maranhão.
- Botelho, M., G. Souza and A. Avellar (2016), “A incidência desigual do processo de desindustrialização nos estados brasileiros”, *Revista de Economia*, vol. 43, No. 3, Curitiba, Federal University of Paraná.
- Bruno, M. (2021), “Os governos Dilma Rousseff: da ‘nova matriz macroeconômica’ ao golpe de 2016”, *A economia brasileira de Getúlio a Dilma: novas interpretações*, V. Araújo and F. Mattos (coords.), São Paulo, Hucitec Editora.
- Buarque, S., A. Lopes and C. Rosa (1995), “Integração fragmentada e crescimento da fronteira norte”, *Desigualdades regionais e desenvolvimento*, R. Afonso and P. Silva (coords.), São Paulo, Fundação Editora Unesp.
- Bunker, S. (2003), “Da castanha-do-pará ao ferro: os múltiplos impactos dos projetos de mineração na Amazônia brasileira”, *Novos Cadernos NAEA*, vol. 6, No. 2, Belém, Federal University of Pará.
- Cano, W. (2008), *Desconcentração produtiva regional no Brasil: 1970-2005*, São Paulo, Fundação Editora Unesp.
- (2007), *Desequilíbrios regionais e concentração industrial no Brasil: 1930-1970*, São Paulo, Fundação Editora Unesp.
- Carneiro, R. (2008), “Impasses do desenvolvimento brasileiro: a questão produtiva”, *Texto para Discussão*, No. 153, Campinas, State University of Campinas.
- (2002), *Desenvolvimento em crise: a economia brasileira no último quarto do século XX*, São Paulo, Fundação Editora Unesp.
- Carvalho, L. (2018), *Valsa brasileira: do boom ao caos econômico*, São Paulo, Todavia.
- Coelho, M., M. Monteiro and R. Cota (2007), “Introdução: mineração industrial em questão”, *Mineração e reestruturação espacial da Amazônia*, M. Coelho and M. Monteiro (coords.), Belém, Federal University of Pará.
- Costa, F. (2012), “Mercado de terras e trajetórias tecnológicas na Amazônia”, *Economia e Sociedade*, vol. 21, No. 2, Campinas, State University of Campinas.
- Cruz, S. (2007), *Trajatórias: capitalismo neoliberal e reformas econômicas nos países da periferia*, São Paulo, Fundação Editora Unesp.
- Delgado, A. and I. Godinho (2011), “Medidas de localização das actividades e de especialização regional”, *Compêndio de economia regional: métodos e técnicas de análise regional*, vol. 2, J. Costa, T. Dentinho and P. Nijkamp (coords.), Parede, Príncipia Editora.
- Ferraz, J., D. Kupfer and L. Haguener (1996), *Made in Brazil: desafios competitivos para a indústria*, Rio de Janeiro, Editora Campus.
- Figueiras, L. (2013), “A natureza do atual padrão de desenvolvimento brasileiro e o processo de desindustrialização”, *Novas interpretações desenvolvimentistas*, I. Castro (ed.), Rio de Janeiro, International Celso Furtado Center for Development Policies.
- Furtado, C. (2000), *Teoria e política do desenvolvimento econômico*, São Paulo, Paz e Terra.
- (1998), *Formação econômica do Brasil*, São Paulo, Companhia Editora Nacional.
- (1992), *Brasil: a construção interrompida*, Rio de Janeiro, Paz e Terra.
- Gonçalves, R. (2013), *Desenvolvimento às avessas: verdade, má-fé e iusão no atual modelo brasileiro de desenvolvimento*, Rio de Janeiro, LTC Editora.
- Guimarães, L. (1997), “Desigualdades e políticas regionais no Brasil: caminhos e descaminhos”, *Planejamento e políticas públicas*, No. 15, Brasília, Institute of Applied Economic Research (IPEA).
- (1990), “Questão regional no Brasil: reflexões sobre processos recentes”, *Cadernos de Estudos Sociais*, vol. 6, No. 1, Recife, Joaquim Nabuco Foundation.
- Haddad, P. (1989), “Medidas de localização e de especialização”, *Economia regional: teorias e métodos de análise*, Fortaleza, Bank of Northeast Brazil.

- Hirschman, A. (1961), *Estratégia do Desenvolvimento Econômico*, Rio de Janeiro, Editora Fundo de Cultura.
- Ianni, O. (1986), *Estado e planejamento econômico no Brasil*, Rio de Janeiro, Editora Civilização Brasileira.
- IBGE (Brazilian Institute of Geography and Statistics) (2004), “Indicadores conjunturais da indústria: emprego e salário”, *Série Relatórios Metodológicos*, vol. 27, Rio de Janeiro.
- Isard, W. (1960), *Methods of Regional Analysis: An Introduction to Regional Science*, Cambridge, MIT Press.
- Krugman, P. (1991), *Geography and Trade*, Cambridge, MIT Press.
- Leal, A. (2010), “Uma sinopse histórica da Amazônia (uma visão política)”, *Revista de Estudos Paraenses*, J. Trindade and G. Marques (coords.), Belém, Institute of Economic, Social and Environmental Development of Pará (IDESP).
- Libânio, G. (2012), “Quem tem medo da China? Análise e implicações para os principais estados brasileiros”, *Revista de Economia Contemporânea*, vol. 16, No. 2, Rio de Janeiro, Federal University of Rio de Janeiro.
- Lobo, M. (1996), *Estado e capital transnacional na Amazônia: o caso da Albras-Alunorte*, Belém, Federal University of Pará.
- Loureiro, V. (2009), *A Amazônia do século XXI - novas formas de desenvolvimento*, São Paulo, Empório do Livro.
- Marques, G. (2012), “Amazônia: uma moderna colônia energético-mineral?”, *Universidade e Sociedade*, vol. 21, No. 49, Brasília, National Union of Teachers of Higher Education Institutions (ANDES).
- Marques, G. and J. Trindade (2014), “Para Além da SPVEA: elementos para uma interpretação da intervenção estatal na Amazônia”, *Seis décadas de intervenção estatal na Amazônia: a SPVEA, auge e crise do ciclo ideológico do desenvolvimentismo brasileiro*, J. Trindade (coord.), Belém, Editora Paka-Tatu.
- Martins, C. (2011), *Globalização, dependência e neoliberalismo na América Latina*, São Paulo, Boitempo.
- Mello, J. (1990), *O capitalismo tardio*, São Paulo, Editora Brasiliense.
- Mesquita, B. and J. Junior (2019), “As agroestratégias do capital e o redesenho de territórios agrários na Amazônia”, *Problema ambiental: naturezas e sujeitos em conflitos*, J. Neto and others (coords.), São Luís, Editora da Universidade Federal do Maranhão (EDUFMA).
- Midelfart-Knarvik, K. and others (2000), “The location of European industry”, *Economic Papers*, No. 142, Brussels, European Commission.
- Mollo, M. and A. Amado (2010), “Desenvolvimento hacia fuera e desenvolvimento hacia dentro: erros e acertos da política econômica brasileira”, *Série Textos para Discussão*, No. 334, Brasília, University of Brasília.
- Monastério, L. (2011), “Indicadores de análise regional e espacial”, *Economia regional e urbana: teorias e métodos com ênfase no Brasil*, B. Cruz and others (coords.), Brasília, Institute of Applied Economic Research (IPEA).
- Monteiro, M. (2005), “Meio século de mineração industrial na Amazônia e suas implicações para o desenvolvimento regional”, *Estudos Avançados*, vol. 19, No. 53, São Paulo, University of São Paulo.
- Monteiro, M. and A. Cruz (2012), “A superioridade do desempenho da indústria extrativa mineral sobre a de transformação na região Norte: 1996-2010”, *Papers do NAEA*, No. 291, Belém, Federal University of Pará.
- Morais, P. (2019), “Indústria 4.0 e a atual desindustrialização brasileira: a relevância do foco na inovação social”, *O futuro do crescimento com igualdade no Brasil: ensaios vencedores do concurso em comemoração aos 70 anos da CEPAL* (LC/TS.2019/13-LC/BRS/TS.2019/2), M. Chiliatto, C. Mussi and C. Gramkow (coords.), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Oliveira, F. and H. Reichstul (1973), “As mudanças na divisão inter-regional do trabalho no Brasil”, *Estudos CEBRAP*, vol. 4, São Paulo, Brazilian Center of Analysis and Planning (CEBRAP).
- Oliveira, W., J. Trindade and D. Fernandes (2014), “O planejamento do desenvolvimento regional na Amazônia e o ciclo ideológico do desenvolvimentismo no Brasil”, *Seis décadas de intervenção estatal na Amazônia: a SPVEA, auge e crise do ciclo ideológico do desenvolvimentismo brasileiro*, J. Trindade (coord.), Belém, Editora Paka-Tatu.
- Osorio, J. (2012a), “Padrão de reprodução do capital: uma proposta teórica”, *Padrão de reprodução do capital: contribuições da teoria marxista da dependência*, C. Ferreira, J. Osorio and M. Luce (coords.), São Paulo, Boitempo.
- _____(2012b), “América Latina: o novo padrão exportador de especialização produtiva – estudo de cinco economias da região”, *Padrão de reprodução do capital: contribuições da teoria marxista da dependência*, C. Ferreira, J. Osorio and M. Luce (coords.), São Paulo, Boitempo.
- Pandolfo, C. (1994), *Amazônia brasileira: ocupação, desenvolvimento e perspectivas atuais*, Belém, Editora Cejup.
- Persona, H. and M. Oliveira (2016), “Structural changes in Brazilian industry (1995-2009)”, *CEPAL Review*, No. 120 (LC/G.2694-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).
- Rivero, S. and P. Cooney (2011), “A Amazônia como fronteira da acumulação do capital”, *Desafios e potencialidades para a Amazônia do Século XXI*, M. Bentes (coord.), Belém, Editora Paka-Tatu.

- Santos, R. (1980), *História econômica da Amazônia (1850-1920)*, São Paulo, Queros.
- Schmink, M. and C. Wood (2012), *Conflitos sociais e a formação da Amazônia*, Belém, Federal University of Pará.
- Serrano, F. (2013), “A mudança na tendência dos preços das commodities nos anos 2000: aspectos estruturais”, *OIKOS*, vol. 12, No. 2, Rio de Janeiro, Federal University of Rio de Janeiro.
- Silva, N. (2002), *Modernização autoritária do Nordeste*, Aracaju, Editora UFS.
- Trindade, J. (2001), *A metamorfose do trabalho na Amazônia: para além da Mineração Rio do Norte*, Belém, Federal University of Pará.
- Trindade, J., P. Cooney and W. Oliveira (2016), “Industrial trajectory and economic development: dilemma of the re-primarization of the Brazilian economy”, *Review of Radical Political Economics*, vol. 48, No. 2, Thousand Oaks, SAGE Publications.
- Trindade, J. and L. Ferraz (2023), “Acumulação por espoliação e atividade agropecuária na Amazônia brasileira”, *Revista da Sociedade Brasileira de Economia Política*, No. 67, Niterói, Brazilian Society of Political Economy.
- Trindade, J. and W. Oliveira (2017), “Padrão de especialização primário exportador e dinâmica de dependência no período 1990-2010, na economia brasileira”, *Ensaio FEE*, vol. 37, No. 4, Porto Alegre, Siegfried Emanuel Heuser Economics and Statistics Foundation.
- _____(2011), “Especialização produtiva primária e meio ambiente em período recente na Amazônia”, *Novos Cadernos NAEA*, vol. 14, No. 2, Belém, Federal University of Pará.
- Trindade, J., R. Portugal and P. Brandão (2017), “Dívida pública estadual e contradições federativas: análises do Pará, Amazonas e Mato Grosso no período de 2000-2012”, *Redes*, vol. 22, No. 3, Santa Cruz do Sul, University of Santa Cruz do Sul.
- UNIDO (United Nations Industrial Development Organization) (1997), *Industrial Development Global Report*, New York.
- Urraca-Ruiz, A., J. Britto and K. Souza (2013), “Qualificando o caráter ‘regressivo’ da especialização industrial do Brasil”, *Revista Econômica*, vol. 15, No. 1, Niterói, Fluminense Federal University.
- Warren, K. (1973), *Mineral Resources*, New York, Wiley.