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FOREIGN TRADE AND THE CHALLENGES OF BUILDING A STRATEGY FOR NEO-INDUSTRIALIZATION IN BRAZIL

Tagore Villarim de Siqueira
Economist at the National Bank for Economic and Social Development (BNDES). Master's degree in Economic Theory from the Federal University of Pernambuco (UFPE).
http://lattes.cnpq.br/0578604562174801

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Abstract: Over the last 15 years, several strategic industries for national development have shown high and continuous trade deficits, highlighting the strong dependence on imports in industries in which the country could have a better competitive position, such as: chemicals (especially fertilizers and medicines), machinery and electrical equipment, telecommunications, transport equipment, plastics and rubber, and optical and precision instruments and apparatus. These are important industries for the energy and ecological transition in the 21st century, in which the country could become a global player, given the availability of raw materials and the potential to increase the importance of the national innovation system. With this in mind, this article reflects on the challenges of promoting the country's development in the 21st century, using data from Brazil's Trade Balance over the last 15 years as a reference and highlighting the importance of building a national development strategy based on stimulating investment in these industries.
Keywords: Trade balance. Neo-industrialization. Energy and ecological transition. Foreign direct investments and global value chains

INTRODUCTION

Brazil's economic history, since the colonial period, can be told as a result of the successful exploitation of primary export activities, such as the sugar cane cycle in Pernambuco, the gold cycle in Minas Gerais and the coffee cycle in São Paulo. In recent decades, this experience has not been very different, with new economic cycles driven by exports of traditional goods making a significant contribution to Brazilian development, with exports of agricultural and mineral commodities stimulating growth in income, employment and taxes in the country.

In export agribusiness, expansion in recent decades has been led by products such as soybeans (grain, bran and oil), corn, sugar, ethanol, citrus fruits, cotton, coffee, cocoa and meat (beef, chicken and pork), as well as pulp and paper and wood. With the expansion of these crops, the occupation of Brazil's territory and regional development has been redesigned.

In mining, the exploitation of iron ore and oil drove national development from the middle of the 20th century, with these activities leading the country's major economic transformation and redefining the profile of Brazilian industrialization. The major impetus for national development in this period began with the creation of Brazil's first major steel plant, Companhia Siderúrgica Nacional - CSN, in Volta Redonda-RJ, in 1941, created to meet the demand for steel from the Allied countries in World War II and the domestic demand from Brazilian railroads for steel rails and plates, and the construction and metallurgy sectors. The following year saw the creation of Companhia Vale do Rio Doce, founded in 1942 to extract iron ore in Itabirito, Minas Gerais. In 1952, Petrobras was founded in Rio de Janeiro to explore and refine oil in the country. In 1954, the National Bank for Economic and Social Development (BNDES) was created in Rio de Janeiro to finance the modernization of the country's infrastructure and industrialization. With , this set of initiatives created an institutional benchmark in the country capable of generating a major impetus for a new cycle of expansion in the national economy, ranging from iron ore extraction to the steel and metallurgical industries and related segments of finished goods, machinery and equipment in the following decades. While the boost given by oil extraction and refining led to a huge increase in the production of fuels and petrochemicals in the country. In this way, the development of major industrial

sectors, such as intermediate goods, capital goods and food, have largely shaped national development over the last 85 years.

However, the technological transformations of recent decades have led to the emergence of new industries and new challenges in order to guarantee a competitive position for the national economy on the world stage in the 21st century. A development strategy needs to be defined that is capable of generating new impetus to qualify the Brazilian economy to participate in global technology-intensive production chains, with the country moving from being a mere importer of machinery and components to an important *player* in the production and export of these goods. This requires defining strategies to encourage Brazilian companies to enter these sectors, attracting *players* from these new technology--intensive industrial segments to the country and strengthening the national innovation system, made up of universities, research, development and innovation (R,D&I) institutes, technology parks and startups.

Thus, based on an analysis of the country's trade balance performance, broken down by industry group, over the last 15 years, we could say that one of the main challenges facing the country today, in the face of the major technological transformations that are redesigning world geopolitics, would be to define a strategy capable of making this new impetus viable in order to consolidate a competitive position in the new industrial segments, This strategy would be capable of creating the financial funds, with national and international capital, needed to finance the investments in the country's new green and technology-intensive industry, which are needed to trigger the new cycle of modernization of the national economy and provide the competitiveness gains needed to position the country as a global *player* in the various value chains of the new industry.

However, basic challenges still need to be overcome if the country is to achieve greater prominence in industries that are leading the changes in the first decades of the 21st century, such as increasing the importance of business investment in innovation, entering sectors with more technology-intensive goods and greater added value, increasing productivity gains, and achieving greater efficiency in the logistics of distribution and storage of goods, among others. Challenges and opportunities that need to be addressed within the framework of concepts such as the "Knowledge Age" and "Climate Change", which encompass dimensions such as increasing the importance of education and innovation in all activities and environmental, social and economic sustainability to promote sustainable development for current and future generations.

A new world dominated by the big techs from the United States (Alphabet (Google), Amazon, Meta, Microsoft, Nvidia and Tesla) and the big moguls from China (Alibaba, Tencent, Xiaomi, NetEase, Baidu, Huawei and BYD), accompanied by other tech giants such as TSMC from Taiwan and Samsung from South Korea and many other tech companies from developed countries, which are defining the global production chains that will lead the world economy in the 21st century, such as artificial intelligence - AI, semiconductors, electric batteries, solar energy, satellite constellations, smartphones, notebooks, the aerospace industry, supercomputers, data centers, smart cities and quantum computing.

Brazil, however, is still only in the early stages of operating in several of these strategic industries, and still needs to go a long way towards building technical and production capacities to move away from the position of being a major importer of goods and services related to these industries and become a more relevant global *player*.

In this sense, the energy transition is providing opportunities that the country could take better advantage of to achieve a significant share in these new industries. Mineral activities, for example, are experiencing a new cycle of investment in the extraction of various ores, stimulated by the search for critical minerals related to the new industries, such as minerals used in the manufacture of magnets for wind generators, photovoltaic panels for generating solar energy, the miniaturization of electronic components, screens for smartphones, monitors and TVs, and batteries for electric cars. Among these ores are copper, nickel, lithium, cobalt and rare earths, critical ores that have changed world geopolitics, provoked wars and international disputes, and put Brazil back in the area of interest of large international mining groups, initiating a new major investment cycle in the country.

However, despite the various initiatives carried out in the country to promote investment in these industries, Brazil's trade balance figures over the last 15 years show that dependence on imports of goods from these industries is still very high, with the country living with continuous and high sectoral deficits. It is therefore necessary to strengthen initiatives to build a development strategy capable of reversing this situation, stimulating investment to consolidate this new industry in the country, with emphasis on industries such as: chemicals (especially fertilizers and medicines), machinery and electrical equipment, telecommunications, transport equipment and plastics and rubbers.

The high degree of complexity of the national economy, which produces everything from low-complexity goods to high-complexity goods such as airplanes, with global competitiveness, and the considerable size of the Brazilian domestic market justify this aspiration. The trade deficits observed in recent decades show that domestic demand is large enough to make it feasible to set up new factories in many of these industries. In addition, the factories to be set up in Brazil could export part of their production to neighboring South American countries, a market with 499 million inhabitants, equivalent to the population of the European Union, and with great potential for growth in personal income. In this way, we could think of an import substitution policy calibrated to zero trade deficits and with the capacity to create export capacity in these new industries.

In this way, the long cycle of expansion of Brazilian agribusiness in recent decades represents a unique opportunity that could be better used to leverage investments in the country's non-traditional goods sector, through more efficient policies to stimulate the implementation of industrial projects to replace imports and build industrial export platforms.

In this sense, analyzing the performance of the Brazilian trade balance broken down by sector of activity over the last 15 years helps to identify the strengths and weaknesses, opportunities and threats of the Brazilian economy. This analysis helps us reflect on how much still needs to be done to promote the development of non-traditional sectors in the country and reduce trade deficits.

On the other hand, this analysis also shows that even in traditional sectors, the results in the trade balance could be better if investment opportunities were better used along the production chains. In agriculture, for example, there is still a lot of room for cost reduction and efficiency gains in transportation, storage and distribution logistics, for example by increasing the share of the railways in transporting the harvest, as well as increasing storage and port capacity for transporting the harvest.

With this in mind, this article reflects on the challenges of promoting sustainable development in Brazil in the 21st century. The article consists of three sections, in addition

to the introduction, final considerations and bibliographical references. Section 2 presents a reflection on the trade balances of industry groups with trade deficits and the challenges of choosing an alternative economic development strategy for the country; Section 3 presents a reflection on neo-industrialization and the challenges of choosing an effective strategy that generates effective results to promote Brazilian development; and section 4 presents some initiatives in the country in these new industries, showing that there is a light at the end of the tunnel for neo-industrialization in the country in the coming decades, with emphasis on foreign direct investments - FDIs, the participation of Brazilian companies in the new industries and the strengthening of the national innovation system.

IN SEARCH OF AN ECONOMIC DEVELOPMENT STRATEGY FOR THE COUNTRY

The performance of the Brazilian trade balance over the last 15 years has been characterized by large trade surpluses in traditional sectors and continuous and significant deficits in non-traditional sectors, revealing a strong dependence on imports from sectors that include technology-intensive industries necessary for the modernization of the economy and fundamental for guaranteeing productivity and quality gains in national production (TABLE 1). The data presented in this section was collected from the official Brazilian foreign trade database "Comex Stat" of the Ministry of Industrial Development and Trade - MDIC (comexstat.mdic.gov.br). This data is grouped into 21 Sections of economic activity organized according to the Uniform Classification of International Trade (CUCI) methodology and is in line with Mercosur Standards and the Standard Industrial Classification of All Economic Activities (ISIC) methodology, thus enabling international comparisons. The data is clear: the non-traditional sectors showed constant and high trade deficits over the period observed, with some of them even showing an upward trend in deficits when the national economy grew. These industries included chemicals (especially fertilizers and medicines), machinery and electrical equipment, telecommunications, transport equipment, plastics and rubber, and precision instruments.

Over the last few decades, the growth of primary export activities has been decisive for national development, generating significant impacts in all regions of the country. However, this development model, dependent on technology-intensive industrial imports, has been insufficient to bring about substantial improvements in social indicators and quality of life, with the country living with high unemployment rates and the population living below the poverty line (IBGE, Synthesis of Social Indicators), as well as to position the country more competitively in the international division of labor in the 21st century, in a scenario marked by major technological transformations and many technology-intensive start-up industries, such as artificial intelligence - AI, quantum computing, semiconductors, the space industry, biotechnology and nanotechnology. As such, there is a need to identify a better adaptation of public policies for the country to face these challenges, with emphasis on initiatives focused on stimulating an increase in the production capacity of new technology-intensive industries. The Brazilian economy's excessive focus on traditional goods and significant dependence on imports of non-traditional goods, such as chemicals, machinery and components, leaves the country in a vulnerable position in strategic industries in which the country could play a greater role, such as: industry 4.0, chips, robotics, biotechnology, photonics, telecommunications, satellites, Internet of Things - IoT,

5G, batteries for electric vehicles, components for solar and wind power generation, green hydrogen, among others. These are therefore technology-intensive sectors that require major investments to strengthen the national innovation system, from elementary school to university, and including the areas of research, development and innovation (R&D&I), technology parks and start-ups [(ERBER & CASSIOLATO, 1998), (OECD, 2023), (FREEMAN & SOETE, 2008), (KIM & NELSON, 2005) and (NELSON, 2006)].

In 2024, the trade balances of the industries analyzed in this article (chemicals, machinery and electrical equipment, telecommunications, transport equipment, plastics and rubber and precision instruments) reached a warning level, due to the risks related to dependence on the continued increase in imports to promote the country's economic growth, with the trade deficits of these industries reaching the highest levels in the historical series in most cases, namely: US$ 54 billion in the Machinery, electrical equipment and parts industry; US$ 41.53 billion in the Chemicals industry; US$ 10.64 billion in the Plastics, rubber and articles thereof industry; and, US$ 10.89 billion in the Transportation equipment industry. These results show the great vulnerability of the Brazilian economy, with a strong dependence on imports from non-traditional, technology-intensive and high value-added sectors. These are sectors in which the country would be fully capable of producing more. However, this situation also shows the importance of the size of the Brazilian domestic market for these industries, revealing great opportunities for new investments in the country, in sectors that are important for modernizing the economy, increasing economic competitiveness and contributing to the generation of quality jobs (TABLE 1).

In 2025, New Industry Brazil (NIB), a federal government program based on the triple helix, a partnership between the federal government, civil society and the productive sector, completed one year of implementation, accumulating significant impacts in terms of industrial production, investments and job creation in the country, but the profile of the trade deficits of the sectors observed in this study has not yet changed. During this period, industrial production grew by 3.1%, with the capital goods sector growing by 9.1%, the consumer goods sector by 3.5% and durable consumer goods by 10.6%. The program leveraged investments of R$3.4 trillion (public and private investments) in the following segments: agro-industry, automotive, bioeconomy and renewable energy, civil construction, health industry, paper and cellulose, steel and defense, aerospace and nuclear (MDIC. NIB completes 1 year with R$ 3.4 trillion in investments and industrial growth, 12/02/2025)

Thus, this situation demands the attention of *Police Makers* on the choice of a strategy to promote Brazil's development in the 21st century capable of positioning the country more competitively in the international division of labor, enabling it to host industries in non-traditional sectors, with high and continuous trade deficits, technology-intensive industries and based on factors such as innovation and sustainability.

Code Section	Section Description	Export (X)	Import (M)	Trade Balance (X - M)
I	Live animals and animal products	27,12	3,25	23,87
II	Products from the plant kingdom	67,06	6,47	60,59
III	Animal or vegetable fats and oils;	2,33	1,88	0,45
IV	Food industry products;...	41,88	3,97	37,91
IX	Wood, charcoal, wooden works;...	3,66	0,16	3,50
V	Mineral products ...	93,31	35,74	57,56
VI	Products from the chemical or allied industries...	12,73	54,26	-41,53
VII	Plastics and articles thereof; Rubber ...	4,88	15,53	-10,64
VIII	Raw hides and skins, furskins and articles thereof; ...	1,33	0,73	0,59
X	Wooden or paper folders and their articles ...	13,15	1,33	11,82
XI	Textiles and textile products ...	6,08	6,66	-0,58
XII	Footwear, hats and accessories ...	1,08	0,71	0,38
XIII	Stone, plaster, cement, asbestos, ...	1,94	1,82	0,12
XIV	Natural or cultured pearls, precious or semi-precious stones ...	4,45	0,79	3,66
XIX	Arms and ammunition; parts and accessories...	0,53	0,26	0,27
XV	Common metals and their works ...	18,00	17,71	0,29
XVI	Machinery, electrical equipment and parts thereof; ...	17,78	72,12	-54,33
XVII	Transport equipment ...	17,01	27,89	-10,89
XVIII	Optical instruments and apparatus, ...	1,25	8,72	-7,48
XX	Goods and various products...	1,20	2,83	-1,63
XXI	Art, collectables and antiques	0,28	0,04	0,24
	Total	337,05	262,87	74,18

Note: 1. Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Table 1. Brazil. Trade Balance by Sector of Activity. Exports, Imports and Trade Balance - 2024 Value US$ FOB Billion

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

Code	Section Description
I	Live animals and animal products
II	Products from the plant kingdom
III	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes
IV	Products of the food industries; Beverages, spirits and vinegar; Tobacco and manufactured tobacco substitutes
IX	Wood, charcoal and articles of wood; Cork and articles of cork; Manufactures of straw, of esparto or of basketware
V	Mineral products
VI	Products from the chemical or allied industries
VII	Plastics and articles thereof; Rubber and articles thereof
VIII	Raw hides and skins, furskins and articles thereof; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut
X	Pulp of wood or other fibrous cellulosic material; Paper or paperboard for recycling (waste and scrap); Paper and paper products
XI	Textiles and textile products
XII	Footwear, headgear, umbrellas, sun umbrellas, walking sticks, whips, riding-crops and parts thereof; prepared feathers and articles made of feathers; artificial flowers; articles of human hair
XIII	Articles of stone, plaster, cement, asbestos, mica or similar materials; Ceramic products; Glass and glassware
XIV	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; jewelry; coins
XIX	Arms and ammunition; parts and accessories thereof
XV	Common metals and their works
XVI	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories thereof
XVII	Transport equipment
XVIII	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments; parts and accessories thereof
XX	Miscellaneous goods and products
XXI	Art, collectables and antiques

Table 2. Section Description

Source: COMEX STAT -MDIC (Own elaboration).

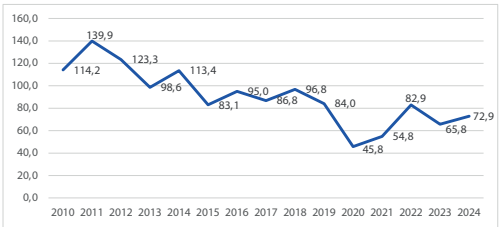
TRADE DEFICITS IN SUBSECTORS OF THE MANUFACTURING INDUSTRY AS GUIDELINES FOR BUILDING A POLICY TO PROMOTE THE COUNTRY'S NEO-INDUSTRIALIZATION IN A COMPETITIVE MANNER

In recent decades, the large and continuous trade balance deficits in important subsectors of the manufacturing industry have shown that there is an excessive dependence on imports of technology-intensive, high value-added goods. These are goods that could be produced in Brazil by industrial units focused on supplying the domestic market and with the capacity to export. These performances show the importance of the size of Brazil's domestic market, exceeding US$ 1 billion/year in several sub-sectors, with these results showing opportunities in strategic segments of industry, such as: chemical products, especially fertilizers and medicines; machinery and equipment; transport equipment; plastics and rubber; and electrical and electronic goods.

This pattern of foreign trade is a reflection of an economic structure that is struggling to modernize, dependent on imports of technology-intensive goods, which are necessary for modernizing the national economy and for guaranteeing productivity and quality gains for national production. These are goods that could be produced in the country, given the size of the domestic market, the availability of raw materials and the degree of complexity that the economy has already reached. These are segments of the new global industry, in which Brazil could qualify to set up production platforms integrated into global value chains, being able to supply the domestic market, regional demand in South America and other continents.

The performance of these industries' trade balances also shows that the initiatives carried out in recent decades to stimulate industrial activity and innovation in the country have not yet been enough to end or even reduce the heavy dependence on imports in technology-intensive sectors necessary for the modernization of the national economy. On the contrary, the performance of Brazil's trade balance has shown no signs of changing the trend of high and growing deficits in important subsectors of the manufacturing industry, including the fact that these deficits are elastic in relation to GDP growth, with deficits tending to increase when the economy grows. In the last three years, for example, the country's GDP growth has averaged 3.1% (3.0% in 2022, 2.9% in 2023 and 3.4% in 2024), while trade deficits in this group of industries have increased (CHART 2 to CHART 21).

In the same period, FDIs to Brazil, an important source of resources for technology-intensive industries, showed two distinct phases, one with a strong downward trend between 2011 and 2020, and the second with a slow recovery between 2021 and 2024, after reaching a low of US$ 45.8 billion in 2020, during the period of the COVID-19 pandemic (CHART 1). These figures reinforce the urgency to strengthen initiatives to increase the attraction of FDIs to the country, especially focused on industries with trade deficits and that will lead the transition and green in the 21st century.



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 1. Brazil. Foreign Direct Investment (FDI) - 2010 - 2024 US$ Billion (Constant prices 2024)

Source: Central Bank of Brazil - BCB-DSTAT (Own elaboration)

Alternative development strategy for Brazil focused on sectors with chronic trade deficits

In the machinery and electrical appliances industry, for example, 17 industrial segments accounted for trade deficits of more than US$ 1 billion in 2024, with the group's total deficit totaling US$ 54.3 billion. The other 22 segments of this industry had individual deficits of less than US$ 1 billion, with the combined deficit totaling US$ 8.90 billion. This is the group of industries with the largest trade deficit in Brazil. In second place was the group made up of the chemical industries, in which manufacturers of fertilizers and human and veterinary medicines stood out, whose deficit reached US$ 41.53 billion in 2024 (TABLE 3 and CHART 2 to 8).

SECTION VI - PRODUCTS OF THE CHEMICAL OR ALLIED INDUSTRIES

Section VI includes 35 groups of chemical or related industries, including eight with deficits of more than US$ 1 billion in 2024, such as: chemical fertilizers; medicines and pharmaceutical products, except veterinary products; organo-inorganic compounds, heterocyclic compounds, nucleic acids and their salts, and sulphonamides; and other medicines, including veterinary products. Between 2010 and 2024, the flow of trade in this section reached the impressive mark of US$ 939.5 billion, equivalent to almost half of Brazil's GDP, of which US$ 205 billion was in exports and US$ 734 billion in imports, thus generating an accumulated deficit of US$ 529 billion. The continuous deficits over the last 15 years show the strong dependence of the Brazilian economy on imports of chemical goods from suppliers of large global chains, located in China, the United States and the European Union. Between 2010 and 2024, exports showed a declining trend, with an average value of US$ 14 billion and a growth rate of -8% p.a., while imports showed a strong upward trend, rising from US$ 37.72 billion in 2010 to US$ 55.67 billion in 2024, after reaching a maximum of US$ 78.5 billion in 2022, with growth of 48% between 2010 and 2024. This performance generated continuous deficits, rising from 23.49 billion in 2010 to 42.61 billion dollars in 2024, an increase of 81% (TABLE 3 and CHART 2 to 8).

Trade deficits exceeded US$ 1 billion in eight industrial groups, led by fertilizers (-US$ 13.27 billion), followed by medicines and pharmaceutical products (-US$ 7.42 billion) (TABLE 3 and CHART 2 to 8).

In the following positions, there were 16 segments with deficits of less than US$ 1 billion, which together showed a deficit of US$ 4.7 billion, among which the following stood out, with deficits of more than US$ 400 million: Other miscellaneous products of the chemical industries; Salts and peroxosalts of inorganic acids and metals; Pigments, paints, varnishes and related materials; Inorganic chemical elements, oxides and salts of halogens; Other organic chemical products; and, Lubricating preparations, additives for mineral oils and the like, hydraulic transmission fluids, antifreeze preparations.

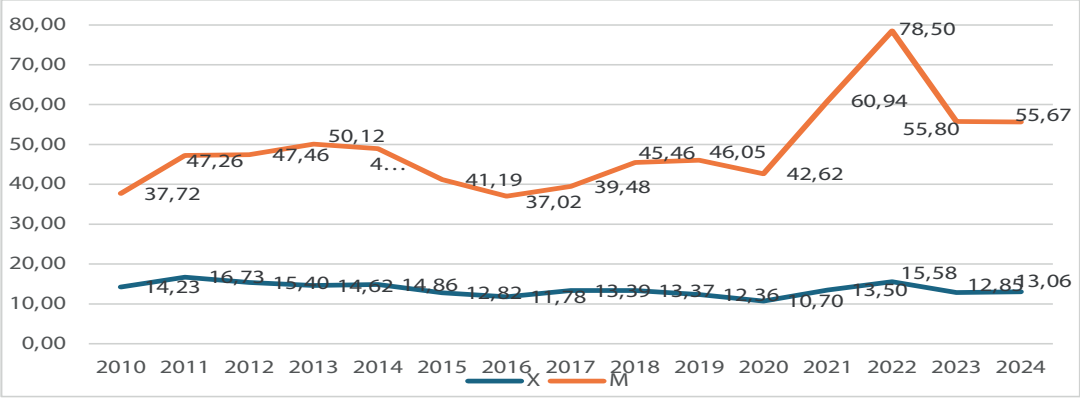
Brazilian imports of products from the chemical or related industries were concentrated in a small number of countries between 2010 and 2024, with the top five and ten suppliers accounting on average for 50% and 66% of imports of goods from this industry. In 2024, the top five countries of origin of these imports, with a 54% share, were: China US$ 10.78 billion (20%), the United States US$ 7.52 billion (14%), Germany US$ 4.14 billion (8%), Russia US$ 3.77 billion (7%), and India US$ 3.10 billion (6%) (CHART 4).

Description CUCI Group	Export	Import	X - M
Fertilizers or chemical fertilizers (except raw fertilizers)	0,28	13,55	-13,27
Medicines and pharmaceutical products, except veterinary products	0,48	7,89	-7,42
Organo-inorganic compounds, heterocyclic compounds, nucleic acids and their salts, and sulfonamides	0,23	6,83	-6,60
Other medicines, including veterinary medicines	0,84	6,03	-5,19
Insecticides, rodenticides, fungicides, herbicides, plant growth regulators, disinfectants and the like	0,47	4,79	-4,33
Nitrogen function compounds	0,37	2,21	-1,84
Alcohols, phenols, phenol-alcohols, and their halogenated, sulphonated, nitrated or nitrosated derivatives	0,30	1,38	-1,08
Carboxylic acids and their anhydrides, halides, peroxides and peracids and their derivatives	0,24	1,31	-1,07
Others			
Total	**12,73**	**54,26**	**-41,53**

Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Table 3. Brazil. Chemical and Related Industries. Trade Balance - 2024. Segments with Trade Deficits Greater than US$ 1 Billion. Value US$ FOB Billion

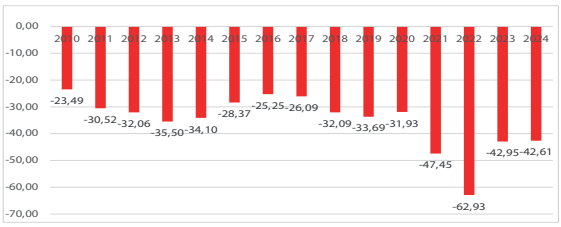
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 2. Chemical or related industries. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

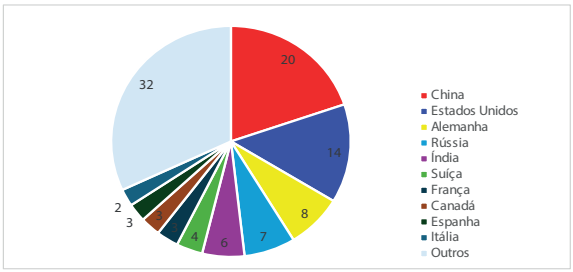
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 3. Chemical or related industries. Trade Balance (X-M) - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

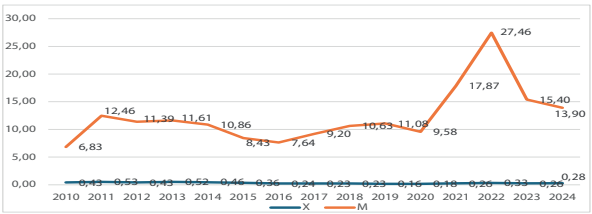


Graph 4. Brazil. Products from the chemical or allied industries. Main Countries of Origin of Imports - 2024 (%)

Source: COMEX STAT - MDIC

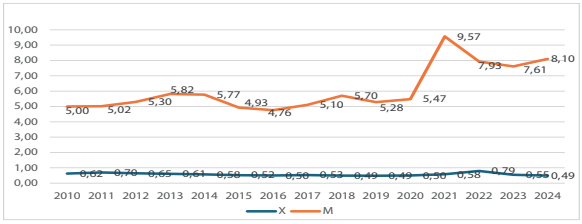
Between 2010 and 2024, Brazil's fertilizer imports were concentrated in a small number of countries, with the top five and ten countries of origin accounting for 58% and 67% of Brazil's fertilizer imports, respectively. In 2024, the top ten countries of origin of imports under this heading, with a share of 82%, were Russia (27%), China 14%, Canada 10%, Morocco (9%), the United States (4%), Nigeria (4%), Saudi Arabia (4%), Oman (4%), Israel (3%) and Egypt (3%) (COMEX STAT - MDIC).

In the same period, Brazilian imports of medicines followed the same profile of concentration in a few countries, with the top five and ten countries of origin accounting for 57% and 79% of imports of medicines respectively. In 2024, the top ten countries of origin of medicine imports to Brazil, with a 78% share, were Germany (14%), the United States 13%, Switzerland 10%, Ireland (10%), China (8%), Italy (6%), France (5%), Puerto Rico (5%), Austria (4%) and Belgium (3%) (COMEX STAT - MDIC).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index. Graph 5. Chemical fertilizers (except raw fertilizers). Exports and Imports - 2014 - 2024 US$ Billion FOB (Constant 2024 Values)

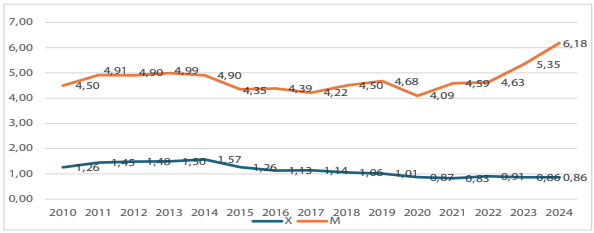
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

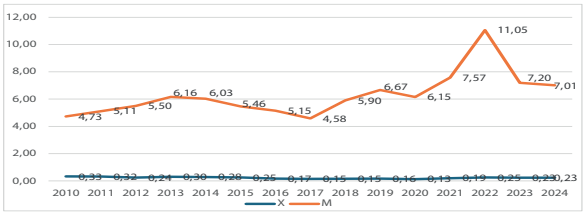
Graph 6. Chemical industry. Medicines and pharmaceutical products, except veterinary products. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.Graph 7. Chemical industry. Other medicines, including veterinary medicines. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 8. Chemical or related industries. Organo-inorganic compounds, heterocyclics, nucleic acids and their salts, and sulfonamides. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

SECTION VII - PLASTICS AND ARTICLES THEREOF; RUBBER AND ARTICLES THEREOF

Section VII includes the plastics and rubber industries, with manufacturers of goods such as: Other plastic materials in primary forms; Polymers of ethylene, in primary forms; Other articles of plastics; Plastic plates, sheets, film, foil and strip; Rubber tires, interchangeable treads, flaps and tubes for wheels; Polyacetals, other polyethers and epoxide resins; polycarbonates, alkyd resins and other polyesters; in primary forms; Polymers of vinyl chloride or of other halogenated olefins, in primary forms; and, Other articles of rubber. Between 2010 and 2024, this section generated a trade flow of US$ 317.4 billion, of which US$ 97.97 billion were exports and US$ 219.39 billion imports, thus providing an accumulated deficit of US$ 121.42 billion. Between 2010 and 2024, exports showed a declining trend, falling from a peak in the period of US$ 8.70 billion in 2011 to US$ 5.15 billion in 2024, while imports, after the period of decline between 2010 and 2016, entered a trend of rapid growth, rising from$ 10.7 billion to a level of US$ 16 billion from 2021, reaching US$ 15.93 billion in 2024, with the deficit rising from US$ 7.37 billion in 2010 to US$ 10.78 billion in 2024, an increase of 46% (TABLE 4 and CHART 9 and 10).

Between 2010 and 2024, Brazilian imports of products from the plastics and rubber industry and their articles remained concentrated in a small number of countries, with the average share of the top five and ten countries of origin reaching 53% and 65%. In 2024, the five countries of origin, with a 58% share, were: China US$ 3.62 billion (23%), the United States US$ 3.44 billion (22%), Germany US$ 798.6 million (5%), Argentina US$ 636.9 million (4%) and Colombia US$ 536.6 million (3%) (CHART 11).

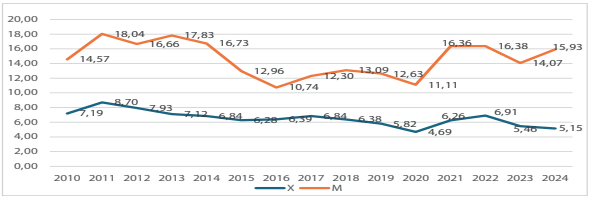
Description CUCI Group	Export	Import	X - M
Other plastics in primary forms	0,71	2,87	-2,16
Polymers of ethylene, in primary forms	0,88	2,34	-1,46
Other plastic articles	0,53	1,69	-1,16
Plastic plates, sheets, film, foil and strip	0,48	1,45	-0,97
Rubber tires, interchangeable treads, flaps and inner tubes for wheels	1,17	2,05	-0,87
Polyacetals, other polyethers and epoxide resins; polycarbonates, alkyd resins and other polyesters; in primary forms	0,23	0,99	-0,75
Polymers of vinyl chloride or other halogenated olefins, in primary forms	0,03	0,72	-0,68

Other rubber articles	0,22	0,90	-0,68
Others	0,63	2,52	-1,90
Total	4,88	15,53	-10,64

Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Table 4 - Brazil. Section VII - Plastics and Rubber Industry. Trade Balance - 2024. Segments with Trade Deficits Greater than US$ 0.5 Billion. Value US$ FOB Billion

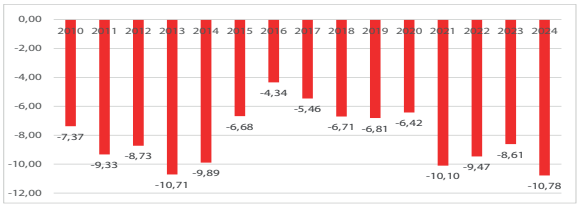
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 9. Plastics and articles thereof; Rubber and articles thereof. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

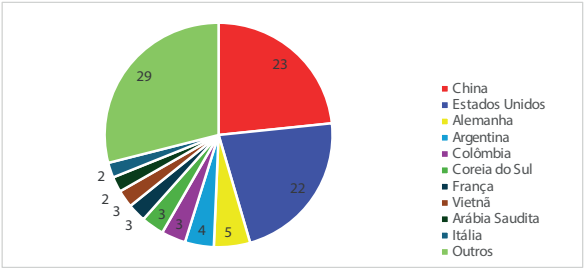
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 10 - Brazil. Section VII - Plastics and articles thereof; Rubber and articles thereof. Trade Balance (X-M) - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Graph 11 - Brazil. Products from the Plastics and articles thereof; Rubber and articles thereof industries. Main Import Countries of Origin - 2024 (%)

Source: COMEX STAT - MDIC

SECTION XVI - MACHINERY, ELECTRICAL EQUIPMENT AND PARTS THEREOF

Section XVI includes the following industries: machinery and equipment, electrical equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories thereof. Between 2010 and 2024, this section generated a foreign trade flow of US$ 896.6 billion, of which US$ 207.1 billion were exports and US$ 689.30 billion imports, thus providing an accumulated deficit for the period of US$ 482.2 billion. This performance of continuous deficits generated an accumulated deficit over 15 years of almost half a trillion dollars, with this performance showing the strong dependence of the Brazilian economy on imports of capital goods from suppliers of large global chains located mainly in China and other Asian countries, the United States and the European Union. Between 2016 and 2024, exports remained stagnant at US$ 18.2 billion, while imports grew by 52%, from US$ 48.7 billion to US$ 73.99 billion, with this performance increasing the deficit from US$ 30.48 billion to US$ 55.74 billion, an increase of 83%.

This negative performance confirms the opportunities that exist in Brazil for setting up industrial units to supply domestic demand in these sub-sectors of activity, by attracting foreign direct investment (FDI) and domestic companies that can enter or expand their respective production capacities in these value chains.

Section XVI is made up of 43 industry groups, five of which accounted for trade deficits of over US$ 2 billion in 2024, with accumulated deficits totaling US$ 28.2 billion, 52% of the section's deficit, with such performance showing that these industries could be encouraged to expand production capacity in the country, namely: Thermionic, cold cathode or photo-cathode valves and tubes, diodes, transistors; Non-electric motors and machinery and parts thereof (except piston engines and generators); Telecommunications equipment, including parts and accessories; Electrical machinery and apparatus; and, Electrical apparatus for connecting, protecting or wiring circuits (TABLE 5 and CHART 12 to 17).

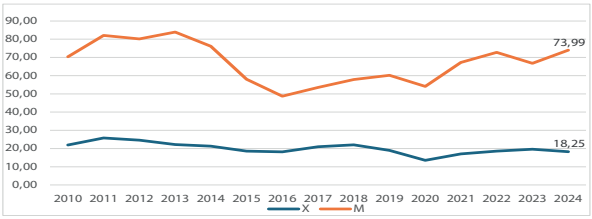
In the Telecommunications Equipment industry, despite the downward trend in deficits over the period observed, deficits still remained at high levels until the end of the period, standing at over US$ 6 billion in 2023 and 2024.

In machinery and electrical appliances, the trend has also been downwards, but with deficits remaining above US$ 2.5 billion over the last ten years.

In thermionic, cold-cathode or photo-cathode valves and tubes, diodes and transistors, the trend was for deficits to grow rapidly until 2022, when the maximum value was reached, at - US$ 12.7 billion; from then on, a downward trend began in the following two years to a level of - US$ 9 billion.

In Non-electric motors and machinery and parts thereof (except piston engines and generators) the trend was for deficits to grow rapidly, reaching a maximum of 8.18 billion dollars in 2024.

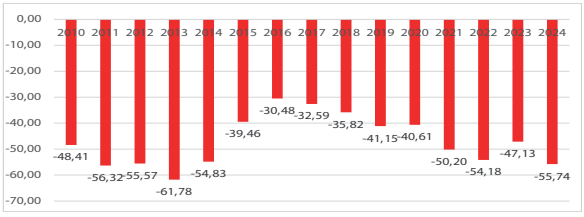
Finally, the performance of the trade balances of these industrial sub-sectors shows that there are great opportunities in the country to set up factories to supply the domestic market in these respective industries.



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 12: Brazil. Machinery, electrical equipment and parts thereof. Exports and Imports - 2010 - 2024 US$ Billion

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 13 - Brazil. Machinery and equipment, electrical equipment and parts thereof (...). Trade Balance (X-M) - 2010 - 2024

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

Description CUCI Group	Export	Import	X - M
Thermionic, cold cathode or photo-cathode valves and tubes, diodes, transistors	0,09	8,96	-8,88
Non-electric engines and machinery and parts thereof (except piston engines and generators)	0,51	8,49	-7,98
Telecommunications equipment, including parts and accessories	0,34	6,02	-5,68
Electrical machines and appliances	0,91	3,80	-2,89
Electrical apparatus for wiring, protecting or connecting circuits	0,59	3,36	-2,77
Other specialized machinery and equipment for certain industries and parts thereof	0,73	2,69	-1,95
Pumps, centrifuges, air compressors, fans, exhaust fans, filtering or purifying apparatus and parts thereof	1,42	3,17	-1,75
Heating and cooling equipment and its parts	0,69	2,40	-1,71
Automatic data processing machines and their units for recording data, magnetic or optical readers	0,15	1,84	-1,69
Musical instruments and their parts and accessories, records, tapes and other sound or similar media	0,09	1,77	-1,68
Drive shafts and cranks, gears, friction wheels, flywheels, pulleys, clutches, articulated links and their parts	0,55	2,14	-1,59
Piston engines and their parts	2,08	3,53	-1,44
Electrical and non-electrical household equipment	0,16	1,44	-1,28
Mechanical equipment for handling, lifting, winches and their parts	0,33	1,61	-1,28
Taps, valves and similar devices for pipes, boilers, tanks, vats and other containers	0,65	1,91	-1,25
Liquid pumps, liquid elevators and their parts	0,44	1,61	-1,17
Parts and accessories (except cases, covers and the like) for data processing machines or office machines	0,03	1,14	-1,10
Others	15,35	41,49	-26,14
Total	17,78	72,12	-54,33

Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Table 5: Brazil. Machinery, electrical equipment and parts industry. Trade Balance - 2024. Segments with Trade Deficits greater than US$ 1 Billion. Value US$ FOB Billion

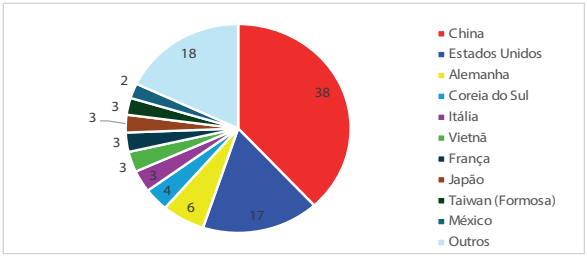
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

Description CUCI Group	Export	Import	X - M
Automotive parts and accessories	3,29	8,23	-4,95
Passenger cars	4,29	8,29	-4,00
Goods vehicles and special-purpose vehicles	2,53	4,55	-2,02
Motorcycles, motorized or non-motorized bicycles and vehicles for invalids	0,15	1,20	-1,06
Others	6,75	5,62	1,13
Total	17,01	27,89	-10,89

Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure

Table 6. Brazil. Transport equipment industry. Trade Balance - 2024. Segments with Deficits greater than US$ 1 Billion. Value US$ FOB Billion

Between 2010 and 2024, Brazilian imports of products from this industry were concentrated in a small number of countries, with the top five and ten countries accounting for average shares of 66% and 80%. In 2024, the five countries of origin, with a 68% share, were: China US$ 27.6 billion (38%), the United States US$ 12.2 billion (17%), Germany US$ 4.47 billion (6%), South Korea US$ 2.6 billion (4%) and Italy US$ 2.4 billion (3%) (CHART 14).

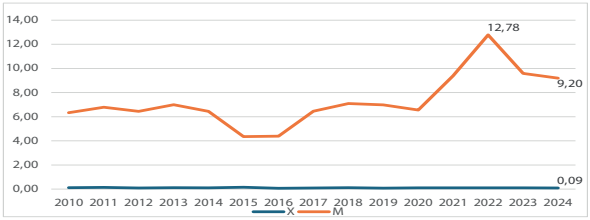


Graph 14 - Brazil. Machinery, electrical equipment and parts thereof. Main Countries of Origin of Imports - 2024 (%)

Source: COMEX STAT - MDIC

Between 2010 and 2024, Brazilian imports of thermionic valves and tubes, diodes and transistors were concentrated in a small number of countries, with the top five and ten countries of origin accounting for, respectively, average shares of 79% and 92% of Brazilian imports in this group of industrial goods. In 2024, the top ten countries of origin of these imports, with a 97% share, were China (51%), South Korea (16%), Taiwan (12%), Vietnam (8%), Malaysia (4%), Singapore (2%), Japan (2%), the United States (1%), Hong Kong (1%) and Thailand (1%) (COMEX STAT - MDIC).

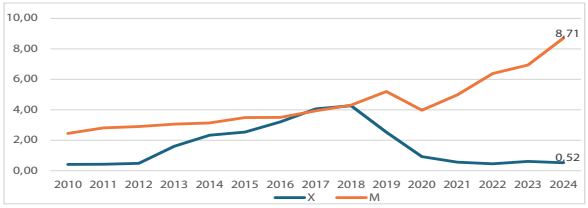
In the same period, Brazilian imports of non-electric motors and machinery and their parts showed a similar profile, with a strong concentration in a few countries, with the top five and ten countries of origin accounting for an average share of 93% and 95% of imports in this product group, respectively. In 2024, the top ten countries of origin for these items, with a 97% share, were the United States (73%), France (13%), Canada (3%), Germany (2%), Turkey (2%), China (2%), Italy (1%), Mexico (1%) and Malaysia (0.5%) (COMEX STAT - MDIC).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 15: Thermionic, cold cathode or photocathode valves and tubes, diodes, transistors. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



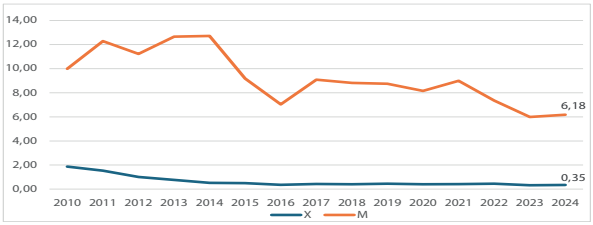
Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 16. Non-electric engines and machinery and parts thereof (except piston engines and generators). Exports - and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

Brazilian imports of telecommunications equipment showed the same profile, with a high concentration in a small group of countries suppliers, with the top five and ten countries of origin accounting for an average of 77% and 92% of imports in this product

group, respectively. In 2024, the top ten countries of origin of these imports, with a 93% share, were: China (57%), Vietnam (15%), the United States (9%), Mexico (3%), Taiwan (2%), South Korea (2%), Malaysia (2%), Germany (2%), Thailand (1%) and Japan (1%) (COMEX STAT - MDIC).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

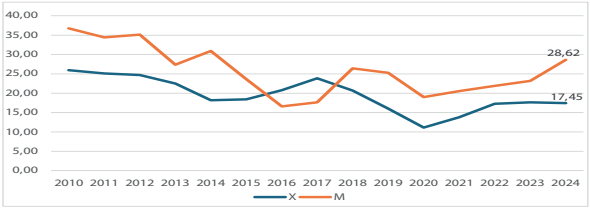
Graph 17. Telecommunications equipment, including parts and accessories. Exports - and Imports - 2014 - 2024 US$ Billion FOB (Constant 2024 Values) Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

SECTION XVII - TRANSPORT EQUIPMENT

Section XVII includes 15 industry groups, such as: Parts and accessories of motor vehicles; Passenger motor vehicles; Motor vehicles for the transport of goods and special uses; Motorcycles, motorized or non-motorized bicycles and invalid carriages; Railway vehicles; Tractors; Vessels; and Aircraft. The first four groups stood out with deficits of over US$ 1 billion in 2024, with the accumulated deficit reaching US$ 12 billion. The deficits of the group Parts and accessories of motor vehicles and Passenger cars exceeded US$ 4 billion in 2024 (TABLE 5 and CHART 18 to 22).

Between 2010 and 2024, the Transportation Material industry generated a trade flow of US$ 680.82 billion, of which US$ 293.39 billion in exports and US$ 387.44 billion in imports, thus providing an accumulated deficit of US$ 94 billion. Imports of this industry are led by Argentina and China, followed by the United States, Mexico and the countries of the European Union and Asia. In 2016 and 2017, surpluses of US$ 4.2 billion and US$ 6.2 billion were achieved, with these results showing that it is possible to reverse the deficits in this group of industries (TABLE 5 and CHART 18 to 22).

Between 2010 and 2024, exports showed a downward trend, falling from US$ 25.93 billion to US$ 17.45 billion, a drop of 26.8%, while imports went through two distinct phases: after a period of decline between 2010 and 2016, they experienced an upward trend, rising from US$ 17.65 billion in 2017 to US$ 28.62 billion in 2024, an increase of 62%. In this second phase, deficits increased from US$ 5.74 billion in 2018 to US$ 11.17 billion in 2024, an increase of 95% (TABLE 6 and CHART 18 to 23).

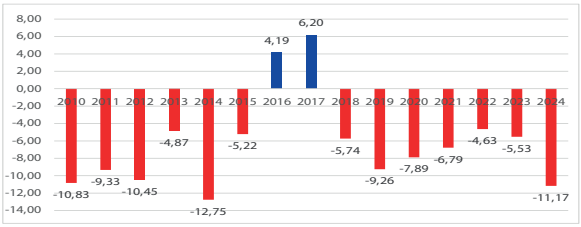


Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 18. Transport equipment. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

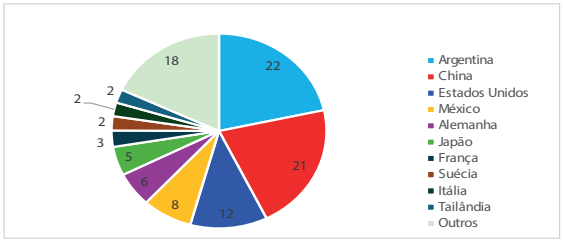
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

Between 2010 and 2024, Brazilian imports of products from the transport equipment industry were concentrated in a small number of countries, with the average share of the top five and ten countries of origin reaching 62% and 79%. In 2024, the five countries of origin, with a 67% share, were as follows: Argentina US$ 6 billion (22%), China US$ 5.89 billion (21%), the United States US$ 3.23 billion (12%), Mexico US$ 2.1 billion (8%), and Germany US$ 1.59 billion (6%) (CHART 20).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 19. Brazil. Transport equipment. Trade Balance (X-M) - 2010 - 2024 US$ Billion FOB (Constant 2024 Values) Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

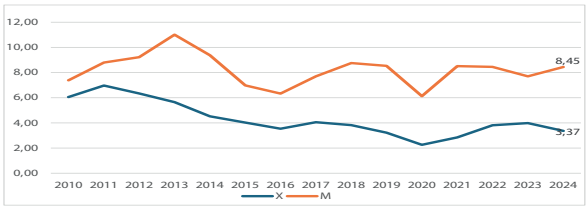


Graph 20. Brazil. Transport equipment. Main Countries of Origin of Imports - 2024 (%)

Source: COMEX STAT - MDIC

Between 2010 and 2024, Brazilian imports of automotive parts and accessories were concentrated in a small number of countries, with the top five and ten countries of origin accounting for, respectively, average shares of 46% and 78% of Brazilian imports in this group of industrial goods. In 2024, the top ten countries of origin of imports in this heading, with a 96% share, were China (17%), Japan (12%), Mexico (10%), Germany (9%), the United States (6%), Sweden (6%), South Korea (6%), Argentina (5%), Italy (4%), and Thailand (4%) (COMEX STAT - MDIC).

During this period, imports of passenger cars were also concentrated in a few supplier countries, with the top five and ten countries of origin showing average shares of 77% and 85% of Brazilian imports in this group of goods. In 2024, the top ten countries of origin for passenger car imports, with a 96% share, were China (38%), Japan (29%), Mexico (9%), Germany (7%), the United States (3%), Sweden (3%), South Korea (2%), Argentina (2%), Italy (2%) and Thailand (1%) (COMEX STAT - MDIC).

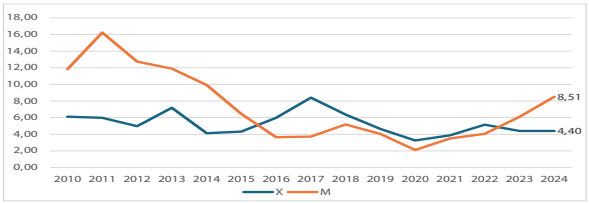


Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 21. Brazil. Transportation equipment. Parts and accessories of motor vehicles. Exports and Imports - 2014 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

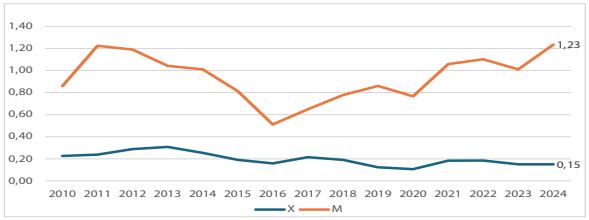
In the same period, imports of motorcycles, motorized or non-motorized bicycles and vehicles for invalids showed the same profile of concentration in a small group of countries, with the participation of the five and ten main countries of origin reaching averages of 74% and 94% of Brazilian imports in this group of industrial goods. In 2024, the top ten countries of origin for imports of these items, with a 95% share, were China (48%), India (11%), Japan (8%), Thailand (7%), Indonesia (6%), Taiwan (4%), Vietnam (4%), Germany (3%), the United States (3%) and Italy (2%) (COMEX STAT - MDIC)



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 22. Brazil. Transportation equipment. Passenger cars. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 23 - Brazil. Transport equipment. Motorcycles, motorized or non-motorized bicycles and invalid carriages. Exports and Imports - 2010 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).

SECTION XVIII - OPTICAL, PHOTOGRAPHIC, CINEMATOGRAPHIC, MEASURING, CHECKING, PRECISION, MEDICAL AND SURGICAL INSTRUMENTS AND APPARATUS; CLOCKS AND WATCHES; MUSICAL INSTRUMENTS.

Section XVIII includes the medical, precision and photographic equipment industries, among others, such as: Measuring, checking, analyzing and controlling instruments and apparatus; Instruments and apparatus for medical, surgical, dental or veterinary uses; Electrodiagnostic apparatus for medical, surgical, dental or veterinary uses, and radiological apparatus; Other miscellaneous manufactured articles; Optical lenses and items; Meters and counters; Clocks and watches; Musical instruments and their parts and accessories, records, tapes and other sound or similar media; Optical instruments and apparatus; and, Photographic apparatus and equipment. Between 2010 and 2024, this section generated a foreign trade flow of US$ 96.54 billion, of which US$ 12.51 billion were exports and US$ 84.03 billion imports, thus providing an accumulated deficit for the period of US$ 71.52 billion. This performance shows Brazil's dependence on imports of goods from the optical instruments and devices industry, from suppliers in large global chains, especially the United States, China and Germany. Between 2010 and 2024, exports remained stagnant at a level of US$ 1 billion, while imports fluctuated between US$ 9 billion in 2010 and a minimum of US$ 8.35 billion in 2016, and then showed an upward trend, except for 2020, reaching US$ 8.95 billion in 2024. During this period, exports grew by 16.5%, while imports and the deficit rose by 41% and 46% respectively, with the deficit rising from US$ 5.25 billion to US$ 7.67 billion (TABLE 7 and CHART 24 to 26).

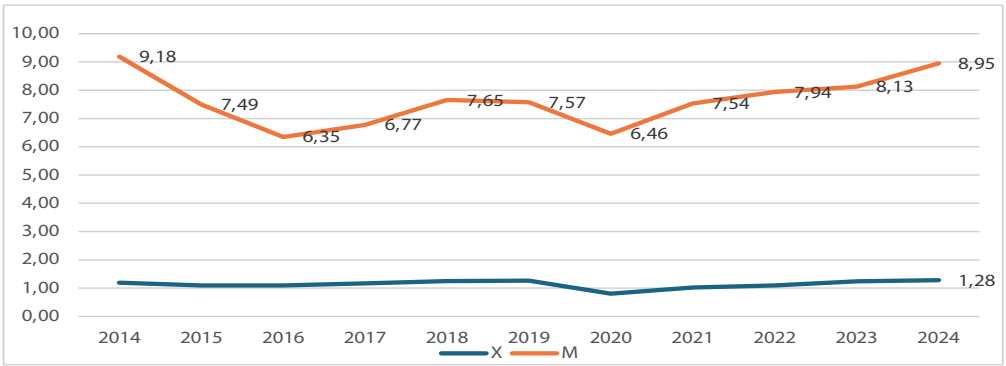
Between 2010 and 2024, Brazilian imports of products in this industry group were concentrated in a small number of countries, with the top five and ten countries accounting for average shares of 64% and 77%. In 2024, the top five countries of origin, with a 62% share, were: the United States US$ 1.89 billion (22%), China US$ 1.65 billion (19%), Germany US$ 942.7 million (8%), Japan US$ 461.5 million (5%), and Mexico US$ 429 million (5%) (CHART 27).

Description CUCI Group	Export	Import	X - M
Instruments and apparatus for measurement, verification, analysis and control	0,58	4,32	-3,74
Instruments and apparatus for medicinal, surgical, dental or veterinary uses	0,23	1,71	-1,48
Electrodiagnostic apparatus for medicinal, surgical, dental or veterinary uses, and radiological apparatus	0,05	0,82	-0,77
Other miscellaneous manufactured goods,	0,24	0,83	-0,59
Lenses and optical items	0,08	0,37	-0,30
Others	0,06	0,67	-0,61
Total	1,25	8,72	-7,48

Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Table 7. Brazil. Section XVIII - Optical instruments and apparatus, (...). Trade Balance - 2024. Value US$ FOB Billion

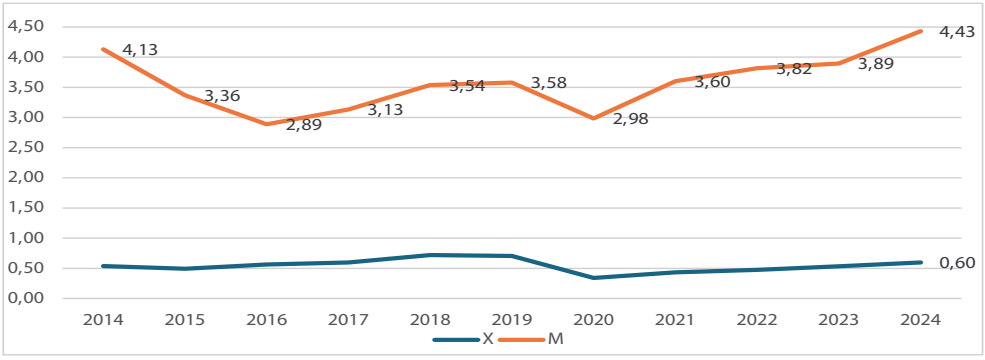
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Graph 24. Optical instruments and apparatus, (...). Exports and Imports - 2014 - 2024 US$ Billion FOB (Constant 2024 Values)

Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

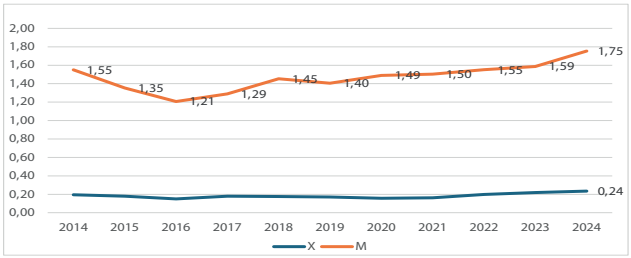
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 25. Measuring, checking, analyzing and controlling instruments and apparatus. Exports and Imports - 2014 - 2024 US$ Billion FOB (Constant 2024 Values)

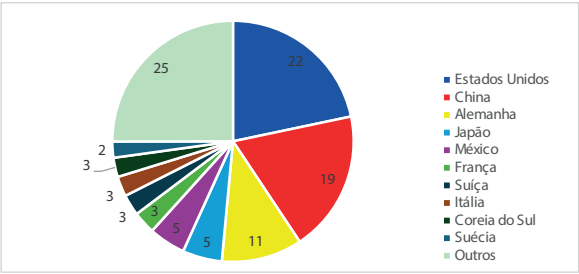
Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Note: Figures at 2024 prices, updated by the US Personal Consumption Expenditure (PCE) price index.

Graph 26. Instruments and apparatus for medicinal, surgical, dental or veterinary uses. Exports and Imports - 2014 - 2024 US$ Billion FOB (Constant 2024 Values)

Source: COMEX STAT - MDIC and Bureau of Economic Analysis (BEA) (Own elaboration).



Graph 27. Brazil. Optical, photographic, cinematographic, measuring, checking, precision, etc. instruments and apparatus (...). Main Countries of Origin of Imports - 2024 (%)

Source: COMEX STAT - MDIC

NEOINDUSTRIALIZATION: CHALLENGES FOR CHOOSING AN EFFECTIVE STRATEGY TO PROMOTE BRAZILIAN DEVELOPMENT BASED ON INNOVATION, DIGITAL TRANSFORMATION AND SUSTAINABILITY.

The crisis in global value chains that began during the Covid-19 pandemic, marked by difficulties in guaranteeing the global supply of various types of inputs, has led to the start of a new trend to reduce the risk of a collapse in the supply of items such as medicines, semiconductors and components, among other items, for various industries. Since then, a broad movement has begun to reduce the concentration of production of the main value chains in Asia, and especially in China, with various incentives being applied so that part of the production is relocated to new production hubs on the other continents. Thus, in this process of new regionalization of the world economy, Brazil could take advantage of this new wave of foreign direct investments (FDIs), in search of a new geographical location, to better position itself to attract some of this capital and take on a greater role in the energy and ecological transition in the 21st century, becoming, for example, a global supplier of goods from these industries in a sustainable way, focused on domestic customers and its area of influence in Latin America.

Brazil has the potential to attract FDIs in a number of industries, especially those that have large trade deficits, industries that will lead world development in the 21st century, such as the chemical industry (especially fertilizers and medicines), machinery and electrical equipment, transport equipment, plastics and rubber, and medical and precision instruments.

In this sense, the energy and ecological transition represents a great opportunity for the country that could be better used to consolidate a position of greater international prominence in the machinery and components industries for wind and solar power generation, for example; sectors in which the country has competitive advantages to attract FDIs, due to the size of the domestic market and the conditions for generating wind and solar power, due to the quality of the winds and solar incidence in the national territory. This is an opportunity that the country could take better advantage of to consolidate a competitive position in the global supply chain, to supply the domestic market and export surpluses.

Development strategies for countries can be summarized in four main alternatives: balanced growth; growth based on exports of traditional goods; growth based on exports of non-traditional goods; and import substitution (Williamson, 1989). Nowadays, it would not be realistic to propose a balanced growth model, as advocated by economists such as Paul Rosenstein-Rodan and Ragnar Nurkse, with the country producing all the goods it needs, nor would it be necessary, given that many intermediate goods and modern capital goods, as well as final goods, necessary for the development of countries can be easily acquired at competitive prices in international trade. However, it would be reasonable to propose at least one of the other alternative development strategies for the country, or even to support a combination of these three alternative development strategies, namely: strengthening traditional exports; developing new non-traditional export sectors, such as new technology-intensive industries, for example, which are not yet active in the country or which are not very significant, but which could be encouraged to set up new manufacturing units in the country; and stimulating import substitution by supporting new industries focused on the domestic market. Considering the size of Brazil's domestic market and the possibility of exporting to neighboring countries, locating in Brazilian territory could become very attractive for companies from the European Union, the United Kingdom, Asia, the United States and Canada, for example. Remember that South America has a population of 499 million inhabitants, equivalent to that of the EU, thus representing a large consumer market with great potential for growth in GDP and personal income over the coming decades.

The combination of development strategies would allow for better competitive integration of the national economy into international trade. This strategy would make it possible to take advantage of opportunities in the domestic market, allowing Brazil to better position itself in the current reorganization of global value chains. Such a strategy would meet domestic demand in various markets, reducing dependence on imports of technology-intensive goods with higher added value and reducing excessive dependence on national exports of agricultural and mineral commodities. In addition, this strategy could lead to the creation of millions of jobs with higher professional qualifications and better salaries, thus contributing to an increase in personal income in the country, and a better positioning of the national economy in the knowledge era, dominated by new technologies, especially information technology, nanotechnology and biotechnology.

In this sense, it would be necessary to support strategies capable of reducing or even reversing the trade deficits in the various segments of industrial goods in which the country has had chronic and high deficits for several years, which show that the Brazilian domestic market for such items is relevant and therefore justifies support for the installation of new factories in the country to meet domestic demand and exports.

Thus, one way of tackling the problem would be to propose new incentive programs for investments in industries with chronic and high trade balance deficits, with the aim of: 1. stimulating investments to expand competitive production capacity; 2. stimulating investments in R,D&I; 3. supporting startups, technology parks/incubators/accelerators; and, 4. identifying/stimulating potential national unicorns to scale up operations in these sectors, innovative companies capable of scaling up innovations and acting in an integrated and competitive manner with global value chains. A national program to encourage startups, capable of creating millions of startups,

which in turn would provide better conditions for the emergence of thousands of unicorns, a program set up to support the expansion of R&D&I infrastructure, the production of new researchers and venture capital and financing for innovative companies.

Import substitution is a path that presents many opportunities for the country and for Brazilian companies, given the high trade deficits in sectors such as chemicals, medicines, machinery and equipment and transport equipment, sectors in which domestic companies could enter or in some cases expand their operations competitively. These new markets are made up of items that Brazil demands in order to modernize its economy and which are heavily dependent on imports. These are items produced by technology-intensive global value chains, in which Brazilian companies still have little or no productive integration.

In this sense, a Brazilian development project could have as one of its goals to make the country a world leader in logistics within ten years, making the country a world leader with world-class logistics, in terms of scope, the various modes of transportation in the national territory, and efficiency and quality; seeking world leadership in terms of transportation and storage costs, productivity, quality in cargo handling and transportation of goods and passengers throughout the national territory.

This goal would meet the demands of traditional sectors, which have major bottlenecks in logistics and storage costs that need to be overcome, and would also cover the need to replace imports in various supplier industries, including construction, steel, transport equipment, machinery and equipment, electronics, telecommunications, chemicals, plastics and rubber, and capital goods in general related to economic infrastructure services, such as railroads, highways, waterways, ports and airports etc.

A relevant point about Brazil's foreign trade is that exports are concentrated in agricultural and mineral commodities, well-structured sectors in the country with high competitiveness in foreign markets, and are responsible for large trade surpluses, while imports are concentrated in technology-intensive and high value-added goods, with an adverse exchange ratio for the country, having to export increasingly large quantities to import high value-added industrial goods necessary for the modernization of the Brazilian economy.

Therefore, given the size of the domestic market and the high degree of complexity of the country's economic structure, it would be reasonable to propose a development policy to stimulate Neo-industrialization, focused on meeting domestic demand and exports, prioritizing support for industrial segments that have trade deficits, are technology-intensive and critical to the energy and ecological transition; a strategy capable of decarbonizing the Brazilian economy, meeting the requirements of the UN's 2030 Global Development Goals (SDGs) and the Paris Agreement, thus contributing to climate warming not exceeding 1.5°C by 2050 (United Nations, Brazil. https://brasil.un.org/pt-br/sdgs)

The current state of the Brazilian economy represents an opportunity for major Brazilian and global *players* in various segments of industry, from inputs to final goods in several of these industries with trade deficits, with global suppliers that can set up and/or expand their operations in the country to manufacturers of products in various production chains, in areas such as electrical machinery, electronics, telecommunications and vehicles. This is a great opportunity to attract FDIs to the country, with special emphasis on the opportunity to set up R&D&I centers for large global economic groups in Brazil, in addition to manufacturing units and distribution centers.

Import substitution represents an investment opportunity for entrepreneurs looking to exploit markets with revealed opportunities, due to demands for goods that are met by imports of items that could be produced in Brazil. On the other hand, it is worth highlighting the positive effects of this industrial policy on the exchange rate and inflation rate, as well as on the country's balance of trade and payments. As domestic demand began to be met by domestic producers, the demand for dollars to import goods from abroad would fall, generating a positive effect on the exchange rate, appreciating the national currency as a result of the reduction in demand for foreign currency. Remembering that the demand for foreign currency, especially dollars, has the effect of devaluing the national currency and making imports more expensive, which in turn has an impact on the costs of inputs and final products demanded on the domestic market, thus affecting prices in general in the economy, it is no exaggeration to say that large and constant trade deficits, while surpluses strengthen the national currency, increase the purchasing power of the national currency on the foreign market and therefore generate a deflationary impact, thus contributing to the stabilization of domestic prices and sustainable economic growth in a floating exchange rate regime.

This dynamic could generate increases in the country's trade surplus, which in turn would have a positive impact on the balance of payments, with trade surpluses helping to increase the country's foreign exchange reserves. This virtuous cycle would help to improve the rating of foreign investments in the country by international rating agencies such as Moodys and Fitch, which would help to further expand the country's capacity to attract FDIs.

In this case, it is worth highlighting the possibility that part of the country's foreign exchange reserves could be used to set up a Sovereign Fund to finance investments in the country, especially to increase the systemic competitiveness of the national economy, thereby expanding the country's economic growth potential and increasing the attraction of more FDIs to industrial sectors in which the country has large trade deficits. In this way, it could be proposed, for example, to use something like 20% of foreign exchange reserves to set up a Sovereign Fund to finance investments in strategic areas for the country, such as increasing production capacity in specific sectors of industry and modernizing economic and social infrastructure and the national innovation system, with emphasis on the areas of education, science and technology and sectors of technology-intensive industry.

Thus, stimulating import substitution and exporting industries is an initiative that should be supported because it contributes to increasing the diversification of Brazilian industry, especially in technology-intensive and higher value-added sectors.

In addition, increasing production capacity and reducing trade deficits helps to make the national currency more stable and valued on the world financial market, inhibiting potential inflationary pressures, and even allowing the country to set lower import tariffs, following a policy based on reciprocity with other countries and economic blocs.

In this sense, it is worth noting that the competitiveness of the national industry should always be sought in productivity and quality gains along the production chains, encompassing production units and distribution logistics up to the final consumption destination, through greater efficiency in processes, innovation and greater qualification of the workforce, also considering the potential gains related to systemic competitiveness, co-

vering all sectors of economic and social infrastructure, as well as reducing bureaucracy and the tax burden. In this way, it could be a priority to reduce the inefficiencies presented by the Brazilian transport matrix, with a high concentration on road transport, which imposes costly freights and a high environmental impact due to the strong dependence on fossil fuels, circumstances that place the country, with a continental territory such as Brazil, in a vulnerable position, in terms of high freight costs and sensitive to price changes in the barrel of oil, which in turn leaves the country susceptible to inflationary risks systematically.

OPPORTUNITIES IN THE COUNTRY FOR ATTRACTING FDIS: FERTILIZERS, MEDICINES AND CRITICAL MINERALS AND RELATED INDUSTRIES

The following are some of the initiatives underway in the country that could help reverse the trade balance deficits in the coming years in some of the industry groups presented in this study, thus signaling a possible light at the end of the tunnel.

In this sense, we highlight the strategic role of attracting FDIs to the country, such as structuring a national policy to encourage the attraction of FDIs and trade agreements with countries and economic blocs, as well as local initiatives to support infrastructure in industrial districts and access to services from the national innovation system to projects that will help reduce the sectoral trade deficits presented in section 3.

The policy to improve the attraction of FDI could, for example, cover the main stages of the process of internationalization of companies, including support for companies that export to the country, providing incentives for those that set up distribution centers (DCs) and industrial units in Brazilian territory. With the FDI incentive policy, focusing especially on attracting technology-intensive industries, manufacturers of goods with the greatest potential to reduce trade deficits, modernize the national economy and provide competitiveness gains for Brazilian products in the domestic and foreign markets. A second dimension of this FDI attraction policy could be tax exemption for up to 15 years for new industrial projects aimed at competitive import substitution in segments of the new technology-intensive industry and necessary for the energy and ecological transition, as well as focused on exports, in addition to offering access to areas with suitable infrastructure for industrial facilities, such as industrial-port complexes and EPZs - Export Processing Zones, and financial support for making investments in the country and financing lines for sales on the domestic market and for exports.

In this case, the country's trade opening policy would not need to be altered, maintaining the principle of reciprocity and working with the lowest possible tariffs. Thus, the incentives to promote an increase in the importance of the flow of international trade for GDP growth would be preserved, with the country's foreign policy remaining consistent with the principles of free competition, multilateralism and economic globalization, which have guided world development since the post-war period, reducing the unequal disputes between countries, inefficiencies and losses for all, which sometimes lead to armed conflicts. A trade policy strategy that is more coherent with a world development project based on peace, democracy and prosperity, capable of tackling the major challenges of the 21st century, such as inequalities, poverty, hunger, unemployment, decarbonization and the energy and ecological transitions.

In this sense, recent research into Brazil's position in relation to innovation and competitiveness serves as a warning of the challenges that need to be overcome if the country is to

achieve a more competitive position on the international stage. Recent figures released by the IBGE on investments in innovation in Brazil show that investment opportunities in various production chains are not being fully exploited. The IMD World Competitiveness Ranking 2024 ranked Brazil 62nd out of 67 countries, with the country coming third in Latin America behind Mexico and Colombia; the ranking was led by Singapore, Switzerland, Denmark, Ireland, Hong Kong, Sweden, the United Arab Emirates, Taiwan, the Netherlands and Norway in the top ten. This result consolidated a trend of decline in the country's competitiveness index over the last five years, from 2020 to 2024. The main challenges for the country, pointed out by the study, that need to be addressed are improving basic education, professional qualification and retraining to meet the dynamics of technological substitution, improving infrastructure and logistics, reducing social inequalities, improving organizations' capacity for innovation (IMD, 2024).

In 2025, the study on competitiveness by the National Confederation of Industry (CNI) also placed Brazil in an uncomfortable position, ranking it last out of 17 countries. With these results showing the great challenges that need to be overcome, both in sectors with revealed opportunities, such as those that live with continuous and high trade deficits, and the various sectors of economic and social infrastructure, which for decades have lived with investments well below what is necessary to replace capital, such as rail transportation, storage and industrial-port complexes, with this situation compromising the competitiveness of Brazilian production and making it difficult to overcome bottlenecks for the flow of national exports.

According to the IBGE, in 2023, the innovation rate of industrial companies with 100 or more employees in Brazil was 64.6%. This result meant a decline for the second year running. The rate reached 68.1% in 2022 and 70.5% in 2021. This percentage refers to those companies that have introduced a new or substantially improved product and/or incorporated a new or improved business process for one or more of their business functions. A trend that has followed the fall in the economy's investment rate in recent years, 17.9% in 2021, 17.8% in 2022 and 16.4% in 2023.

The most innovative sectors in terms of product and/or business process in 2023 were the following: Manufacture of chemical products (88.7%), Manufacture of machinery and equipment (88.0%), Manufacture of computer, electronic and optical products (85.3%) and Manufacture of pharmaceutical and pharmaceutical products (82.4%). The lowest rates of innovative companies were in the Manufacturing of tobacco products (38.7%) and Manufacturing of wood products (31.2%) (IBGE, PINTEC 2024).

In the breakdown by type of innovation implemented in 2023, 34.4% of companies innovated in both product and business process; 16.6% innovated only in business process and 13.6% innovated only in product

Below are some initiatives in the country in recent years that could help reduce trade deficits in the coming years in some of the industries presented in this article.

MEDICINES

The implementation of the Hemobrás project began in 2010 and the first stage was completed in 2011, with investments of R$1.4 billion. Currently, Hemobrás is involved in the first stage of drug production and then sends the raw materials for the second stage to accredited laboratories in Europe (G1.Globo.com, 2024). Hemobrás could be qualified to carry out all stages of the production of these medicines, adding value to its activity and replacing imports. Such an initiative would give

an additional boost to the Brazilian pharmaceutical industry and to the development of the Northeast region.

There are four medicines produced by the company: Albumin, for the treatment of burns, severe bleeding and heart surgery; Immunoglobulin, used by patients with immune problems and inflammatory diseases; and Coagulation Factor VIII and Coagulation Factor IX, for the treatment of hemophiliacs.

NOVA NORDISK - MONTES CLAROS-MG

In 2025, Nova Nordisk announced investments of R$6.4 billion to expand its industrial unit in Montes Claros-MG, with the aim of increasing production of the drug Ozempic, for the treatment of diabetes and obesity. This unit is strategic because it meets Brazil's demand for insulin and GLP-1 analogues, as well as exporting part of the volume produced to 70 countries (Valor Econômico, 2025).

These two cases are examples of the opportunities for investment in the country's pharmaceutical industry, which in the last three years has seen an average trade deficit of US$7.3 billion, 54% higher than the average deficit in the ten years prior to the pandemic. In addition, the global market presents opportunities for national players to export part of their production. According to estimates by Evaluate, a British company specializing in the pharmaceutical sector, global sales of pharmaceuticals are expected to exceed US$ 1.7 trillion by 2030, with sales of drugs to treat obesity exceeding US$ 100 billion. These scenarios therefore reveal opportunities for industrial investment focused on import substitution and exports (EVALUATE, 2024 World Preview Report July 10, 2024).

FERTILIZERS

According to the National Union of Fertilizer Raw Material Industries (Sinprifert), Brazil's fertilizer imports account for an average of 85% of domestic demand, reaching 90% by 2021. A situation that has attracted the interest of manufacturers to expand their operations in the country. According to Sinprifert, the Brazilian fertilizer industry is planning to invest R$21 billion over the next four years to expand production capacity and thus reduce Brazilian agriculture's external dependence on inputs. This plan includes setting up new plants, expanding and reactivating existing structures in various regions of the country [(Forbes, 2025) and Valor Econômico, 2025)].

A high-profile project in the fertilizer sector announced in recent years was Brazil Potash in Autazes, in the state of Amazonas. Potássio do Brasil is planning to start producing fertilizers in the Amazon, with investments of US$ 2.5 billion expected. This project could make Brazil less dependent on fertilizer imports. Currently, Brazil imports 13 million tons of potassium a year, making it the world's largest consumer of this fertilizer due to the huge expansion of agribusiness in recent decades (Brazil Journal, 2025).

Potash imports account for more than 90% of domestic demand, with the main suppliers being Canada and Belarus. The project in Autazes could supply 40% of national demand by 2032, when it will reach production of 5 million tons per year. Reducing the dependence of Brazilian agribusiness on imported inputs that can be produced here competitively.

Another important initiative in the fertilizer sector was the announcement of the resumption of Petrobras' fertilizer plants as of 2025: in 2024, Petrobras announced investments of R$ 6 billion in the fertilizer segment for the five-year period 2025-2028, related to the reactivation of the Araucária Nitrogenados

S. fertilizer plant in Paraná.A. fertilizer plant in Paraná (Agência Petrobras, 16/08/2024); and, at the beginning of 2025, an agreement was announced with Proquigel, a subsidiary of the Unigel economic group, to restart the fertilizer plants in Bahia and Sergipe (Agência Petrobras, 09/05/2025).

In this context, the approval of Law No. 15.070 on December 23, 2024 (Bioinputs Law) also stands out as an important initiative to stimulate the production and consumption of biofertilizers in the country, thus promoting sustainable environmental practices and representing a relevant contribution to the substitution of fertilizer imports by agriculture. The production of biological fertilizers on rural properties is an incentive for sustainable agriculture and the preservation of biodiversity (Law 15.070 of 23/12/2024 and EMBRAPA, 2024).

According to a representative of the US multinational Corteva (a former Du Pont subsidiary), the global bio-inputs market is expected to rise from US$ 12 billion in 2025 to US$ 26 billion over the next decade, while the Brazilian market is expected to rise from R$ 18 billion to R$ 40 billion over the same period. Among the company's main highlights in Brazil in the area of biological inputs is the nitrogen fixer Utrisha N, launched in 2023, for corn and soybean crops. The company's R&D&I investments exceed US$ 1.4 billion per year (AGFEED, 09/06/2025).

According to the Markets and Markets website, a market research platform specializing in sector trends, the global market for biological inputs for agriculture is expected to rise from US$ 14.7 billion in 2023 to US$ 31.8 billion in 2029. This market, with huge investment opportunities in Brazil, is broken down by type (Biocontrol, Biostimulants and Biofertilizers), by Source (Microbes, Macrobes, Semiochemicals and Natural products), by Mode of Application (Foliar spray, Seed treatment and Soil treatment) (MARKETS AND MARKETS, AUGUST, 2024).

CRITICAL MINERALS

According to the International Energy Agency (IEA), demand for critical minerals is expected to triple by 2040, and Brazil could take advantage of this new global mining cycle, both in extraction and processing. If the country manages to take advantage of the opportunities related to the minerals of the energy transition, an additional R$ 243 billion could be added to the Gross Domestic Product (GDP) over the next 25 years, according to estimates presented by the Deloitte & AYA Earth Partners study Critical minerals of the future and Brazil's strategic role in the transition to a low-carbon economy (Brasil Mineral, 2025).

Brazil has 10% of the world's reserves of minerals critical to the energy transition, such as niobium, graphite, nickel, rare earths, manganese, lithium and cobalt. These minerals are essential for the low-carbon economy (they are part of goods such as wind turbines, solar panels, smartphones, notebooks, electric vehicle batteries, satellites, supercomputers, data centers, robotics and smart city systems, etc.) and are essential in various value chains in industry, agriculture and services.

The world's reserves of rare earth elements (REEs) are concentrated in eight countries, accounting for 98% of total reserves. China leads the ranking (49%), followed by Brazil in second place with 23% and India in third place with 7.7%. However, despite the large reserves of ETRs, Brazil is still not among the major producers of total rare earth oxides equivalent (OTR), nor among the leading countries in refining and magnet production, rankings led, respectively, by China with a large lead over the runners-up, accounting for more than 85% in refining and 90% in magnet production. In refining, Malaysia (> 5%) and

Estonia (> 3%) were in 2nd and 3rd place; and in magnet production, Japan (5%) and the European Union (~1%) were in 2nd and 3rd place (TABLE 7).

Position	Booking	Mt	%	Production	kt	%
1º	China	44	49	China	270	69
2º	Brazil	21	23	USA	45	12
3º	India	6,9	7,7	Buma	31	7,9
4º	Australia	5,7	6,3	Australia	13	3,3
5º	Russia	3,8	4,2	Nigeria	13	3,3
6º	Vietnam	3,5	3,9	Thailand	13	3,3
7º	USA	1,9	2,1	India	2,9	0,74
8º	Greenland	1,5	1,7	Russia	2,5	0,64
9º	Others	1,7	1,9	Others	~0	~0
Total	...	90	100		390	100

Table 7. World Reserve of Rare Earth Elements - 2024

Source: Brasil Mineral, Brazil is second in rare earth reserves in the world, 19/02/2025. https://www.brasilmineral.com.br/noticias/brasil-e-o-segundo-em-reservas-de-terras-raras-no-mundo

It is worth noting that critical minerals such as Cobalt, Lithium, Manganese and Nickel are essential for the electric car industry and that minerals such as Gallium, Copper and Silicon are essential for the photovoltaic panel industry used in power generation. In other words, Brazil's reserves of rare earths provide a great opportunity for the country to build a competitive position in these two essential industries for the energy transition and become an important world *player*, just as happened with iron ore reserves and the structuring of the country's steel and metallurgical industries, as well as various segments of the manufacturing industry, from the middle of the 20th century onwards. In other words, this is an opportunity for the country to take advantage of its strengths and boost these new, technology-intensive industries, which are fundamental to the energy and ecological transition in the 21st century.

According to the Global E-Waste Monitor 2024, global e-waste production reached a record 62 million tons in 2022, an increase of 82% compared to 2010. The forecast for 2030 is to increase e-waste production to 82 million tons, an increase of 32%. However, the waste of critical minerals is still very high, with only 1% of the world's demand for critical minerals being met by e-waste recycling (The Global E-waste Monitor 2024).

In this sense, the European Union's definition that at least 25% of the EU's annual consumption of critical minerals by 2030 should come from recycling in the EU serves as a benchmark of good practices for countries to expand e-waste recycling and strengthen the circular economy. The other targets set by the European Union to achieve self-sufficiency in critical minerals by 2030 were as follows: extraction carried out in the Member States must provide at least 10% of the economic bloc's annual consumption; at least 40% of the EU's annual consumption must come from processing carried out in the EU; a maximum of 65% of the EU's annual consumption of each critical mineral, at any relevant stage of processing, must be supplied by a single country outside the bloc (European Critical Raw Materials Regulation: a legislative act for the future of EU supply chains).

The new cycle of investments in these minerals in Brazil so far totals US$ 68.4 billion between 2025 and 2029, putting the country in a better position to take advantage of the potential in the sector and consolidate a position as a global *player* in the energy transition, strengthening Brazil's aspiration to build competitive capacity to act in more advanced stages of various global production chains of the new industries. These investments are broken down by ore as follows: iron ore 28.7%, copper 10.7%, fertilizers 8.2%, nickel 5.6%, other substances 3.2%, rare earths 3.2%, gold 3.1%, bauxite 1.9%, lithium 1.7%, titanium 1.2%,

and zinc 0.1%. Socio-environmental projects account for 16.6% and logistics for 15.9% (Brasil Mineral, 2025).

According to the International Energy Agency (IEA), global demand for critical minerals is expected to more than double by 2030, to over 30 million tons, due to the growth in the production of batteries for electric vehicles and components for clean energy generation, such as wind and photovoltaic (IEA. Critical Minerals Market Review 2023, July 2023).

According to Bloomberg estimates, the demand for metals from the energy transition is expected to triple by 2050, exceeding US$10 trillion (BLOOMBERG, January 18, 2023).

According to the IEA report "GLOBAL CRITICAL MINERALS OUTLOOK 2025", investments in the mining of critical minerals for the energy transition continued their upward trend in 2024, reaching US$ 54.6 billion, an increase of 5.2% compared to 2023. However, the activity of refining these metals is still geographically concentrated in a few countries, with Indonesia accounting for 91% of the world *market share* in nickel and China leading in the other minerals, namely: Copper 83%, Lithium 73%, Cobalt 97%, Graphite 98% and Rare Earths 96% (IEA. GLOBAL CRITICAL MINERALS OUTLOOK 2025, May 2025). This scenario shows that Brazil could seek a more relevant position in the production and refining of these minerals, intensifying initiatives to attract FDIs and national investors for projects at the various stages of the value chain for the production of minerals for the energy and ecological transition.

FINAL CONSIDERATIONS

The strength of the Brazilian economy is the high trade surpluses in traditional sectors, such as agricultural and mineral commodities, and the weakness is the high trade deficits in non-traditional sectors, such as technology-intensive industries. However, this situation also reveals great opportunities for setting up new industries in the deficit sectors, given that the size of the deficits would justify attracting new industries to meet domestic demand.

It is worth noting that the initiatives taken to stimulate investment in these industries over the last few decades have not been enough to change the trend of high and growing trade deficits in these industries, with the exception of the telecommunications industry, which has shown a downward trend in trade deficits over the last 15 years. The other loss-making industries have continued to show high and growing deficits, with some of them even showing increases in deficits during periods of economic growth, as has happened in recent years. Even in the telecommunications industry, after a period of decline, the deficit has stagnated at US$ 6 billion in the last two years.

On the other hand, this situation reveals an opportunity that could be seized to promote sustainable development and ensure a better position in the international division of labor, given that the country has relevant opportunities in several of these industry subsectors that are necessary for the modernization of the national economy and for the energy and ecological transition in the 21st century.

One aspect of trade deficits that should be highlighted is that they are related to possible currency vulnerabilities due to the need to finance imports, which can become excessive at times. In other words, access to imports of machinery and equipment needed to modernize the Brazilian economy or even access to medicines, including those for veterinary use, depend on generating foreign currency through exports, so it is important, when possible, to replace imports and turn trade deficits into surpluses, generating positive foreign exchange balances capable of increasing the country's foreign exchange reserves and therefore buil-

ding a strategy capable of improving the country's balance of payments.

In addition, Brazil's current development model, which is highly dependent on traditional sectors, limits the country's development possibilities, leaving the national economy vulnerable, due to factors such as: the declining trend in the terms of trade, with imports of technology-intensive goods requiring ever greater commodity exports in order to import the same quantities of non-traditional goods; and the food safety policies of each country, especially large importers such as China and the European Union, which represent a limit or at least a permanent potential threat to Brazilian food exports. This situation serves as a warning of the importance of diversifying the Brazilian economy and encouraging the growth of technology-intensive industries in the country.

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