



INSTITUTE FOR ENERGY AND THE ENVIRONMENT

THE BRAZILIAN AUTOMOTIVE INDUSTRY TRANSITION

Challenges and prospects for a
conversion in line with inclusive and
low-emissions urban mobility

APRIL, 2021

THE BRAZILIAN AUTOMOTIVE INDUSTRY TRANSITION: CHALLENGES AND PROSPECTS FOR A CONVERSION ALIGNED WITH AN INCLUSIVE AND LOW-EMISSIONS MOBILITY

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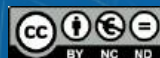
About the IEMA

The Institute of Energy and Environment (IEMA), founded in 2006, is a Brazilian non-profit organization recognized for its role as a producer and disseminator of technical and scientific knowledge on environmental issues. The institute aims at qualifying the decision-making processes to ensure the sustainable use of natural resources in Brazilian transport and energy systems, aligned with social and economic development.

Review: Manuela Kropp, project manager Rosa-Luxemburg-Stiftung Brussels

This material is part of a broader study, organized by the Rosa Luxemburg Foundation in Brussels, that also covers the following countries: Czech Republic, Hungary, Italy, Mexico, Serbia and Slovakia – countries where the automotive sector plays an important role with regard to industrial production and employment.

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In partnership with the Rosa Luxemburg Foundation, Instituto de Energia e Meio Ambiente [Institute for Energy and Environment] (IEMA) presents this study regarding the transition that the Brazilian automotive industry is experiencing. Its aim was to identify the challenges that the industry will have to overcome in order to contribute to an inclusive, low-emission mobility, preserving, creating and improving jobs, as well as maintaining and developing domestic production capacity. The focal aspect of the inclusive, low-emission urban mobility on which this work focuses is the prioritization of public transport over private individual transport, as well as the application of technologies with lower environmental impacts.

The study was conducted from January to March 2021 through document research and interviews with key representatives of the sector¹, including several segments of the automotive industry, the public transport equipment and services industry, public managers of urban mobility, workers, researchers, NGOs and specialized journalists. The first part of the document provides a brief characterization of the Brazilian automotive industry, with a special focus on the production of supplies for public transport. The second part discusses the challenges and perspectives within the context of a desirable conversion of the industry aligned to inclusive, low-emission mobility.

This material is part of a broader study, organized by the Rosa Luxemburg Foundation in Brussels, that also covers the following countries: Serbia, Czech Republic, Slovakia, Hungary, Italy and Mexico – countries where the automotive sector plays an important role with regard to industrial production and employment.

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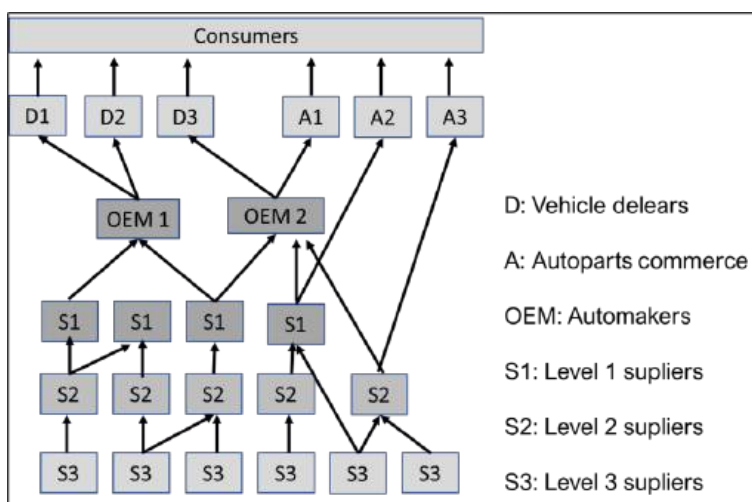
¹ See attached list.

I. Brief industry characterization

The automobile industry is characterized by the participation of large economic groups, which concentrate global production in a few groups of automakers. The sector has high and constant investments in research and development (R&D) of new products, advertising, and production infrastructure. The economy of scale is the sector's main and emblematic strategy. The vast majority of companies are transnational, operating on a global scale or serving regions of countries. The companies' manufacturing is commonly distributed internationally, in order to serve the various end markets and the needs of subsidiaries².

The automotive production system has undergone major transformations since the 2000s, characterized by the creation of condominiums and industrial consortia (bringing together parts suppliers and automakers), with lean, modularized and flexible production, representing the transition from "Fordism" to "Toyotism". A production organization in levels can be observed, in which the automakers transfer to 1st, 2nd and 3rd level suppliers the responsibility for the supply of parts and components for vehicle assembly. Another aspect that stands out is the globalization of the supply chain with greater integration between countries, with two types of strategies. The first is *follow sourcing*, encouraging suppliers to set up their production units close to the automakers, and the second is *carry over*, where the same project is used in several countries with suppliers distributed around the globe. Level 1 and part of level 2 are formed by multinational suppliers, while level 3, usually of parts with lower value and aggregate knowledge, is formed by small and medium-sized national companies³.

Figure 1. Value chain model of the automotive industry



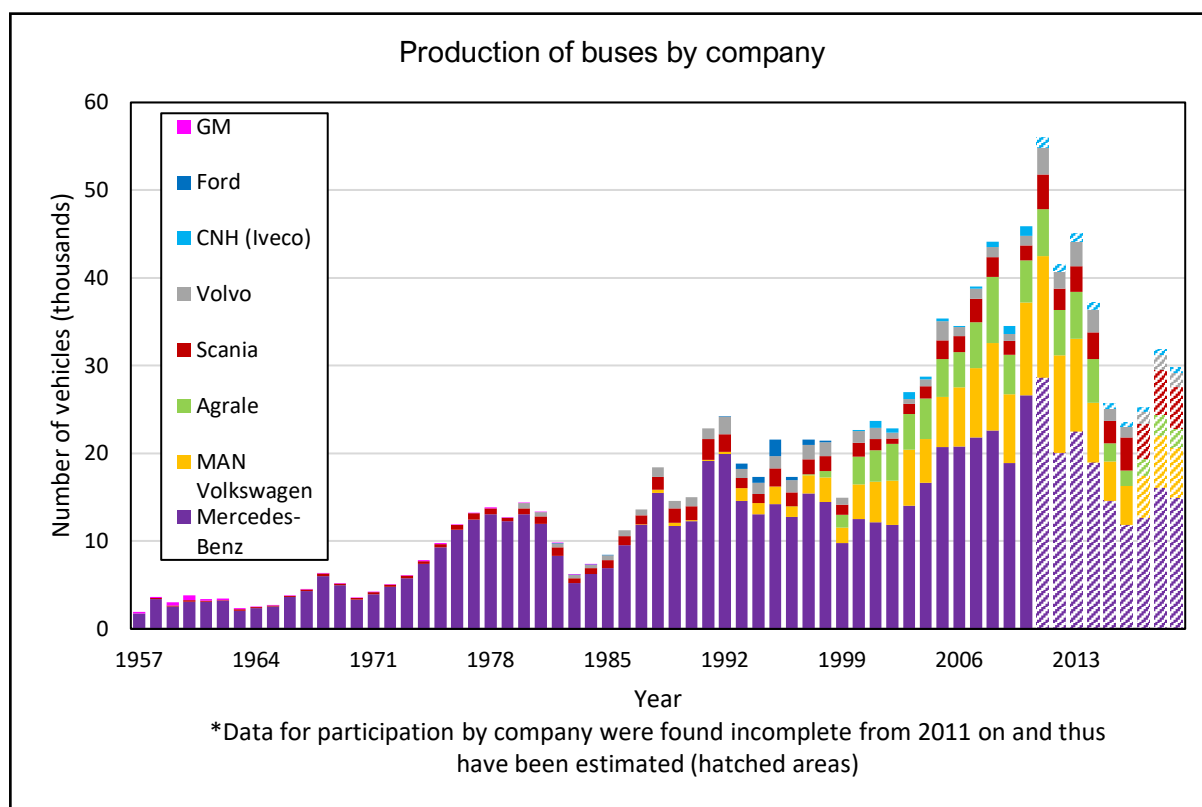
Source: Adapted from Torres (2011) apud De Toni and França 2014

Beginning in the 1950s, Brazil developed and structured a vehicle and transportation equipment industry with large installed production capacity. Unlike many Latin American countries, Brazil is served by locally installed factories, despite the fact that almost all the companies are subsidiaries of automakers headquartered in the northern hemisphere. The country has 26 manufacturers of automotive road vehicles, of which 23 produce vehicles for passenger transport (3 manufacturers produce exclusively agricultural machinery). Currently, only 6 manufacturers produce bus chassis (CNH-Iveco, Volvo, Scania, Agrale, Man Volkswagen and Mercedes), of which Agrale is the only company headquartered in Brazil. The main numbers of Brazilian industry can be observed in Graphics 1 and 2.

² Ministry of Economy – Automotive Sector. Available at <https://www.gov.br/economia>

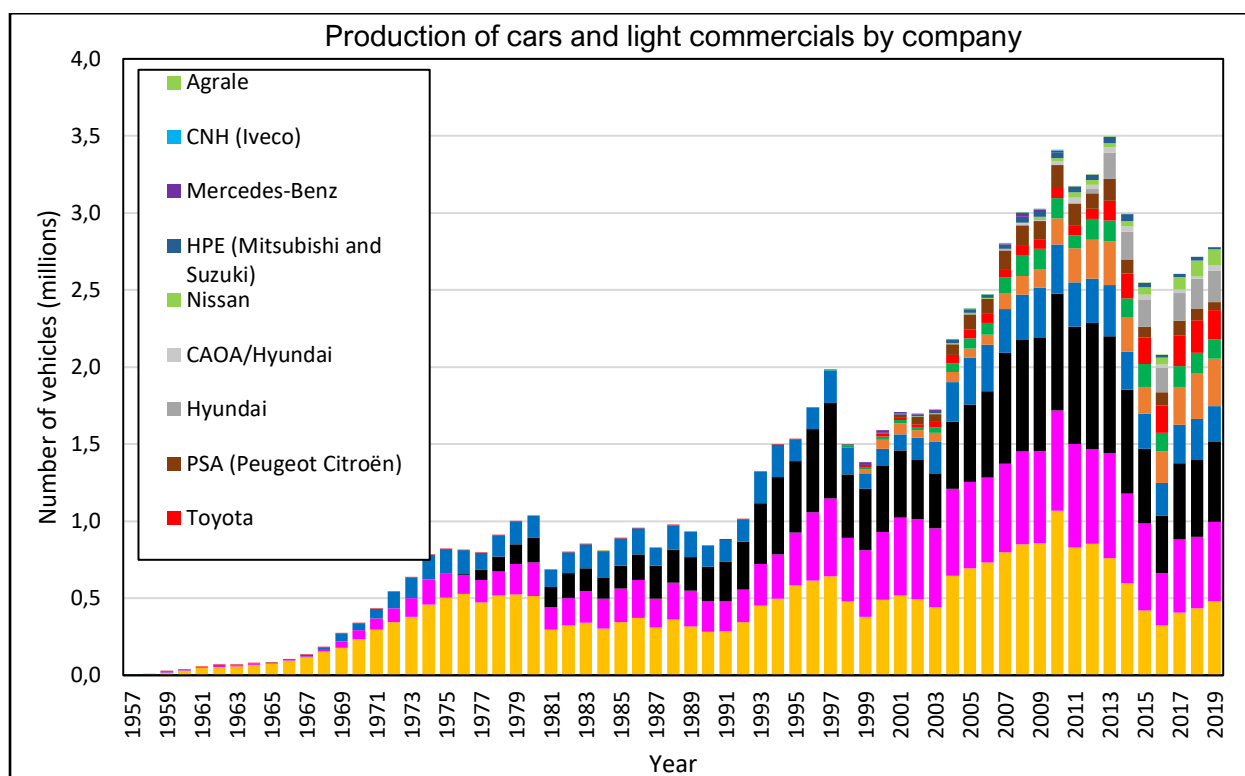
³ DE TONI, Jackson. FRANÇA, Luis C. A política industrial brasileira para o setor automotivo: desafios & perspectivas [Brazilian industrial policy for the automotive sector: challenges & perspectives]. 2014

Chart 1. Production of buses by company



Source: Own preparation based on ANFAVEA data

Chart 2. Production of cars and light commercials by company



Source: Own preparation based on ANFAVEA data

In the period from 2000 to 2013, Brazil increased its installed capacity for vehicle production, including the entry of new automakers in the country, and recorded a large increase in the production of new vehicles, from about 1.3 million units per year to about 3 million, becoming the 6th largest producer in the world in 2009. In this period there was also an increase in the registration of new vehicles, which added to the imports, culminating in the 4th largest consumer market in the world in 2013. In recent years, the licensing of new cars has decreased with the slowdown of the economy. With the Covid-19 pandemic, the year 2020 has intensified the downward trajectory in Brazilian production. The industry will only operate at about 50% of its installed capacity (around 5 million cars/year) to meet the estimated demand for new vehicles in 2021.

Like other countries, Brazil is currently experiencing a moment of large idle capacity in its automobile industry, which may lead to the closure of other production lines in the short term, besides the recent cases of Mercedes, Audi, and Ford. The announcement of the closing of Ford's production activities in the country was the change in strategy that had the greatest repercussion in the press and in political circles. In a press release⁴ issued on January 11, 2021, Ford announced the end of vehicle production in Brazil and that the market will be served by imports, including SUVs, pickups and commercial vehicles, produced mainly in Argentina and Uruguay. The changes are in line with the global strategy of "expanding connected services and new autonomous and electrification technologies in South American markets," which includes the launch of a "plug-in" hybrid vehicle, as well as investing to achieve "an 8% EBIT⁵ corporate margin and generating strong and sustainable cash flow". The price adjustment has been adopted by many automakers in Brazil throughout 2020 as a way to increase profitability.

Box: Motorcycles

The production of motorcycles also had a significant growth in the period from 2000 to 2011, from about 635 thousand units to 2.3 million units in 2008, with a drop in 2009 and a slight recovery in 2011, when it reached about 2.1 million units. Although this mode of transport deserves special attention due to its participation in the mobility of the Brazilian population, this study did not focus on the issue of motorcycles.

Bus industry

Transit systems operated by bus is present commonly in Brazilian cities with more than 60 thousand inhabitants, with a total fleet of urban buses in circulation of about 150 thousand vehicles, one of the largest in the world. The system of the city of São Paulo stands out, where approximately 14 thousand buses operate, one of the largest municipal fleets of public transport in the world. The system of exclusive bus lanes, known as BRT (*Bus Rapid Transit*) was developed in the Brazilian city of Curitiba in the 1960s/1970s and is now present in several countries and, in many cases, implemented with the support of engineering consultants and a bus fleet of Brazilian origin. The importance of public transport by bus in Brazil is supported by a bus industry with international respectability and performance, constituting itself as a major exporter of these vehicles. In 2020, about 18% of Brazilian bus production was for export⁶, mainly to Mercosur countries. However, since 2011, we have observed a sharp drop in the licensing of new buses. In 2011, production peaked at about 50,000 buses produced, plummeting to less than 20,000 in 2016. For 2021, the expectation is for a production that will not reach the 20 thousand vehicles again, from which we can denote an idle capacity of around 60%.

A characteristic of the country is that the production of buses is divided into chassis and bodywork. The chassis for diesel vehicles are manufactured by multinational automakers installed in the country, mainly Mercedes Benz, responsible for more than a half of the market, Volvo, Scania and MAN (Volkswagen Trucks

⁴ <https://media.ford.com>

⁵ "Earnings Before Interest and Taxes" is the profit earned before discounting taxes and financial expenses

⁶ Source: Associação Nacional dos Fabricantes de Ônibus [National Association of Bus Manufacturers] - FABUS. Mapa de Produção de Carroçarias – Associadas [Bodyworks Production Map - Associates]. January to December 2020 available at <https://www.fabus.com.br>

and Buses), which recently announced new investments⁷ in Brazil for the manufacture of trucks and buses. Mercedes-Benz do Brasil is Daimler's worldwide competence center in bus chassis development⁸.

Box: Electric Buses

There are currently about 300 trolleybuses and almost 50 battery-electric buses circulating in the country.⁹ Eletra¹⁰ is a Brazilian company founded in 2010 and produces electric buses in trolleybus (aerial network), hybrid (motor-generator group + batteries) and pure electric (batteries) versions. The main supplier of battery electric buses is BYD¹¹, which established itself in the country in 2015 with a factory in the city of Campinas (SP).

The bus bodyworks are manufactured by Brazilian companies, mainly Caio-Induscar (founded in 1946), Marcopolo (founded in 1949), Comil (founded in 1985) and Mascarello (founded in 2003) groups. The bus bodywork manufacturers employed about 25,000 workers in 2009, but currently, with a weakened market, the employment of approximately 16,000 workers is estimated.

The Caio-Induscar group is made up of the companies Busscar (bus manufacturer), CPA (Aluminum Processing Center), Fiberbus (fiber parts manufacturer), GR3 (aluminum distribution center), Inbrasp (manufacturer of automotive plastic parts), and Tecglass (manufacturer of tempered glass). Currently the bus bodywork manufacturer has about 3.1 thousand workers and the group has about 5.3 thousand workers in total.

Marcopolo¹² is the largest company in the sector in Brazil and one of the largest in the world. In addition to the headquarters installed in Brazil, it has controlled companies to manufacture bodyworks in South Africa (MASA), Argentina (Metalsur), Australia (Volgren), China (MAC) and Mexico (MP Mexico) and affiliates in Colombia (Superpolo) and India (TMML). In its 2019 management report¹³ the company reports having a workforce of nearly 14,200 workers of which 9,100 are in Brazil. In addition to the bodywork factory, the group operates through Marcopolo Parts, which supplies parts for the buses and since 2019 with Marcopolo Next, a developer of technology, projects and new products.

Marcopolo Next, in turn, is active in the development of vehicles (Marcopolo Next Mobility), complete mobility systems and turnkey solutions for projects that involve infrastructure and complex financing models, complementary services for public transport (Marcopolo Next Services) and new concepts in collective mobility, acting in information management, preventive maintenance and specific innovations for the development of intelligent cities (Marcopolo Next Labs). Marcopolo Next incorporated Marcopolo Rail for the development of rail transport projects and the first product was the Light Rail Vehicle - Prosper VLT, totally national, launched at the end of 2020. The equipment can be used in tourism, urban and interurban transport. Marcopolo's perspective is to produce 60 to 100 LRVs per year¹⁴.

⁷ Truck and bus manufacturers will invest BRL 6.8 billion in Brazil by 2025. O Estado de São Paulo – Estradão. Edition of February 23, 2021

⁸ Karl Deppen, CEO of Mercedes-Benz, says Brazil needs urgent reforms. O Estado de São Paulo – Estradão. Edition of Wednesday, March 3, 2021

⁹ Ebusradar.org

¹⁰ <https://www.eletrabus.com.br/empresa/>

¹¹ <https://www.byd.ind.br>

¹² <https://www.marcopolo.com.br>

¹³ Marcopolo S.A. Income Statement for Fiscal Year 2019 - Management Report. February 2020

¹⁴ Source: Marcopolo Rail launches first fully national LRV. Valor Econômico Newspaper. Edition of January 25, 2021.

Metro-rail industry

Urban passenger transport on rails is present in few Brazilian cities, when compared to the transport operated by buses. The largest system is in the São Paulo metropolitan region, both in length and number of passengers carried. The São Paulo city subway network is formed by 6 lines, totaling 101.1 km in length and 89 stations, serving about 5 million passengers/day. The Companhia do Metropolitano de São Paulo (Metro Company)¹⁵, which is a company of the São Paulo state government, operates Line 1-Blue, 2-Green, 3-Red and the Monorail of Line 15-Silver, totaling 69.7 km in length, 62 stations and about 4 million passengers/day. The public network is complemented by the private company Via Quatro, which operates Line 4-Yellow (11.4 km long and 10 stations) and by the private company Via Mobilidade, which operates Line 5-Lilás (20 km long and 17 stations).

The metropolitan train system is operated by Companhia Paulista de Trens Metropolitanos (CPTM)¹⁶, also owned by the São Paulo state government, with 271 Km of lines and 94 operational stations, serving 23 cities, carrying an average of 3 million passengers/day. The rail transportation is also present in the cities of Rio de Janeiro (RJ), Porto Alegre (RS), Belo Horizonte (MG), Brasília (DF), Salvador (BA), Recife (PE), Teresina (PI), Fortaleza (CE), João Pessoa (PB), Maceió (AL) and Natal (RN). There are Light Rail Vehicle systems in Santos (SP), Sobral (CE) and Cariri (CE). Brazil also has Aeromobile¹⁷, technology operated by a pneumatic propulsion system, and has been working on the development of the Maglev Cobra, a magnetic levitation train technology¹⁸.

Brazil has railroad equipment factories, both for passenger and freight transportation. Unlike the case of buses, in which Brazil produces 100% of the new vehicles for the expansion and renovation of its fleets, the passenger metro-rail sector suffers international competition. The Brazilian production of “cars”, as rail cars for passenger transportation are known, has had a strong oscillation in the last 10 years. Despite the installed capacity of 1200 cars/year, production peaked with only 473 units in 2016, and the worst consolidated result was in 2019 with 99 units. Subsequently, the decline continues, with the projection for 2020 closing with 72 units produced and the expectation for 2021 of only 43 units produced¹⁹.

Among the reports collected in the interviews that composed the findings of this study, is that the manufacturers of metro-rail vehicles for passenger currently stopped their production practically and, thus, seek to keep only those workers who are highly specialized and have the structural knowledge of the company because, if they are demobilized, there is a risk of loss of capacity and know-how. It was pointed out the risk of this industry ending in the country because there is no interest from the government or the private sector for the passenger rail transport.

Importance in job generation

The transport industry segment has an important participation in the generation of jobs and in the industrial GDP in Brazil, although this participation has been decreasing in the last years. Industry as a whole (Manufacturing, Extractive and Construction) participated with 19.5 million occupations in 2018, a year in which the agricultural and livestock sector generated 13.4 million occupations and the service sector generated 71.5 million occupations.

When looking only at the activities of the Manufacturing Industry, in which the transport industry is inserted (automotive, buses, trucks and other transport equipment manufacturing) it is possible to observe that the transport sector was responsible for the generation of almost 547 thousand labor occupations in 2018,

¹⁵ <http://www.metro.sp.gov.br/>

¹⁶ <https://www.cptm.sp.gov.br/>

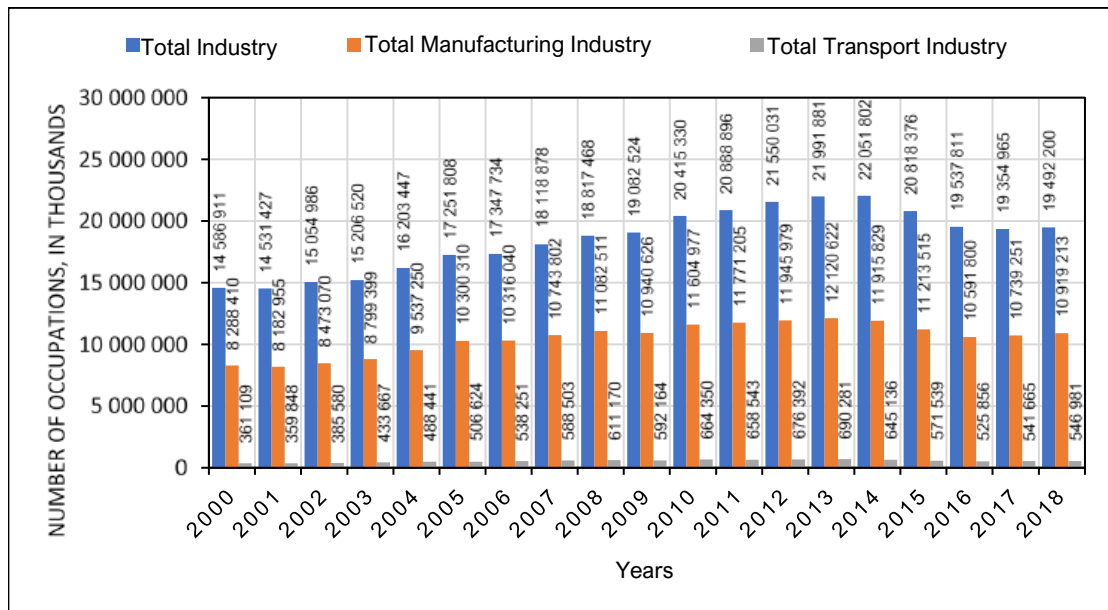
¹⁷ <http://www.aeromovel.com.br/>

¹⁸ <http://www.maglevcobra.coppe.ufrj.br/>

¹⁹ Source: Sindicato Interestadual da Indústria de Materiais e Equipamentos Ferroviários e Rodoviários [Interstate Union of the Railway and Highway Materials and Equipment Industry] - SIMEFRE. Desempenho Ferroviário de Passageiros [Passenger Railroad Performance]. Meeting of 12/14/2020

accounting for 1.42% of CLT²⁰ [pursuant to the Labor Relations Code] jobs in Brazil. The evolution of occupations generated in the period 2000 to 2018 can be observed in as shown in Chart 4.

Chart 3. Total occupations in Industry according to activities (2000-2018)

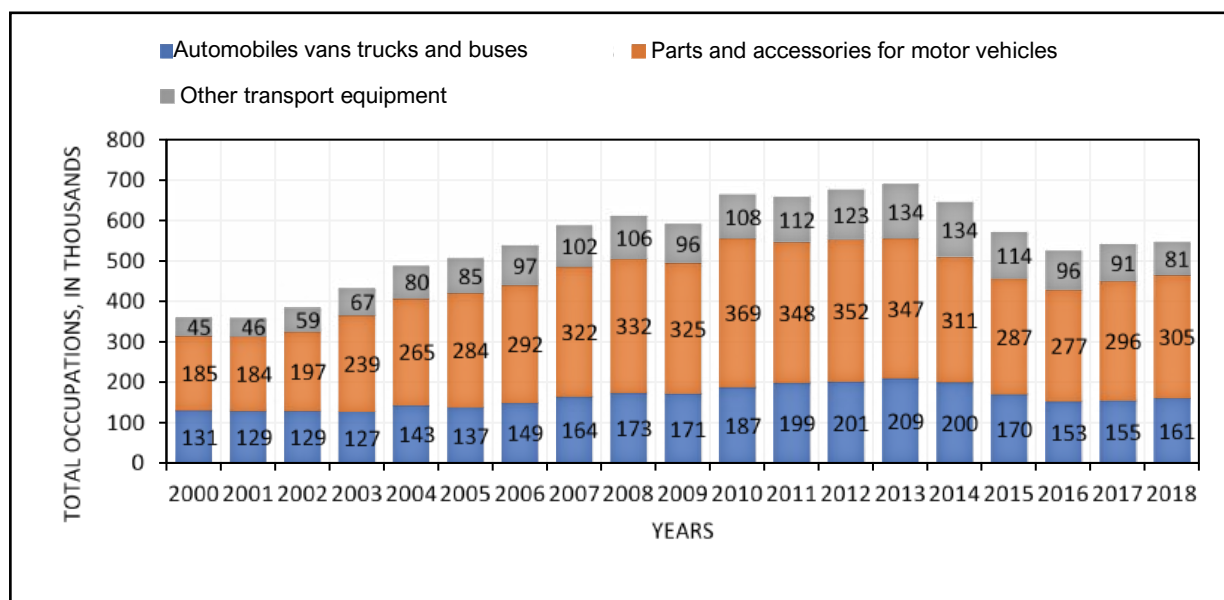


Source: Own preparation based on IBGE data: <https://www.ibge.gov.br/estatisticas/economicas/contas-nacionais>

In turn, the occupations of the Transport Industry, according to IBGE data in 2018, are divided into “Automobiles, pickup trucks and buses” (160,623 occupations), “parts and accessories for motor vehicles” (305,030 occupations) and “other transport equipment” (81,368 occupations). The evolution of occupations generated in the period 2000 to 2018 can be seen in Chart 4.

²⁰ There is in Brazil a specific federal Code to regulate the relationship between workers, employers and unions. It was established in 1943 and is known as Consolidation of Labor Laws (CLT in Portuguese). All the contracted workers under this Code have labor rights like annual vacations and extra salary. These benefits have been under attack by recent neoliberal governments and the last modification of this legislation was in 2017.

Chart 4: Evolution of occupations in the transport industry



Source: Own preparation based on IBGE data: <https://www.ibge.gov.br/estatisticas/economicas/contas-nacionais>

Brazil also has a strong industrial park of auto parts suppliers. The 2020 report from Sindipeças²¹, the industry's main association, recorded 592 member companies in 2019, accounting for a total of 167,014 formal jobs in the members, which represented a 4.5% drop over 2018. ANFAVEA, in turn, estimates that each job in vehicle and machinery automakers generates 8 jobs in the production chain, involving sectors such as rubber, metal, glass, and marketing²². According to data in the entity's 2020 Yearbook²³, the sector employed 1.3 million workers between direct and indirect jobs in 2019.

Importance on GDP

The industry in general and the manufacturing industry in specific, in which the transportation industry is inserted, has lost participation in the Brazilian GDP in the period from 2000 to 2018. The peak of industry participation was in 2004, with 24.3%, and the lowest participation was in 2017, with 18.2%.

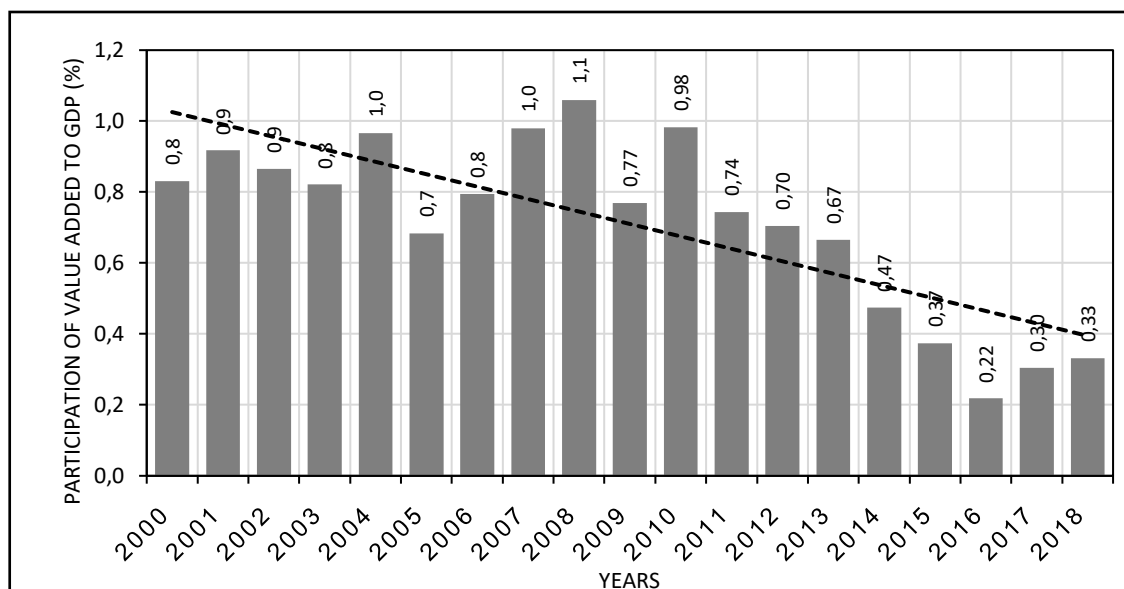
When it comes to the automobile, pickup truck, truck and bus industry segment, its participation in the Brazilian GDP has also been increasingly smaller, when analyzing the same period. It is possible to observe a peak in 2008, when the participation of these items reached 1.1% of the country's GDP, decreasing to 0.3% in 2018. The evolution of this participation can be seen in Chart 5.

²¹ Sindipeças. Anuário da Indústria de Autopeças 2020 [Auto Parts Industry Yearbook 2020].

²² Associação Nacional dos Fabricantes de Veículos Automotores [National Association of Automotive Vehicle Manufacturers] – ANFAVEA. Performance of the Brazilian Automobile Industry. Study: Tax burden x Incentives. São Paulo. February 2021

²³ ANFAVEA. Anuário da Indústria Automobilística Brasileira [Brazilian Automobile Industry Yearbook]. São Paulo 2020

Chart 5: Participation of value added to GDP – Cars, vans, trucks and buses.



Source: IBGE/TRU data compiled by Juliana Trece FGV/IBRE.2021

Incentives and tax revenues

The transportation industry is characterized by high and constant investment in research and development of new products, which results in skilled jobs and high added value to the products. The size of Brazil's domestic market allows it to implement industrial policies that would be impossible in a smaller country, such as the establishment of local content rules and tax incentives. Given its importance to the GDP and the creation of skilled jobs, the sector has been the target of its own nationwide policies in recent decades, known as automotive regimes, which count on tax exemptions, mainly the Industrialized Product Tax (IPI), which is the Federal Government's responsibility. The most recent ones were the Program to Encourage Technological Innovation and Increase of the Production Chain of Motor Vehicles (Inovar-Auto), which was in effect between 2013 and 2017, and Rota 2030, which is still in effect.

Rota 2030 aims to “support technological development, competitiveness, innovation, vehicle safety, environmental protection, energy efficiency, and the quality of cars, trucks, buses, motor chassis, and auto parts.”²⁴ According to the Ministry of Economy, the structure of the Program is formed by three components, being (i) the establishment of mandatory requirements for the commercialization of new vehicles produced in the country or the importation of new vehicles, related to corporate goals of vehicle labeling and energy efficiency and structural performance and assistive technologies for driving, (ii) tax benefit to the company that spends on research and development (R&D) in the country and (iii) exemption from import tax on auto parts without equivalent national production, in exchange for importers spending 2% of the customs value on research, development and innovation projects and priority programs to support industrial and technological development for the automotive sector and its chain.

In the law that created Rota 2030, a Program Monitoring Group was also established, which must publish an annual evaluation report with its impacts on production, employment, investments, innovation, and adding value to the automotive sector. There have been two meetings of the Monitoring Group with minutes made available (June 26 and December 6, 2019), but no published follow-up report has been located to date. There are also no records of meetings of the National Observatory of Industries for Mobility and Logistics²⁵

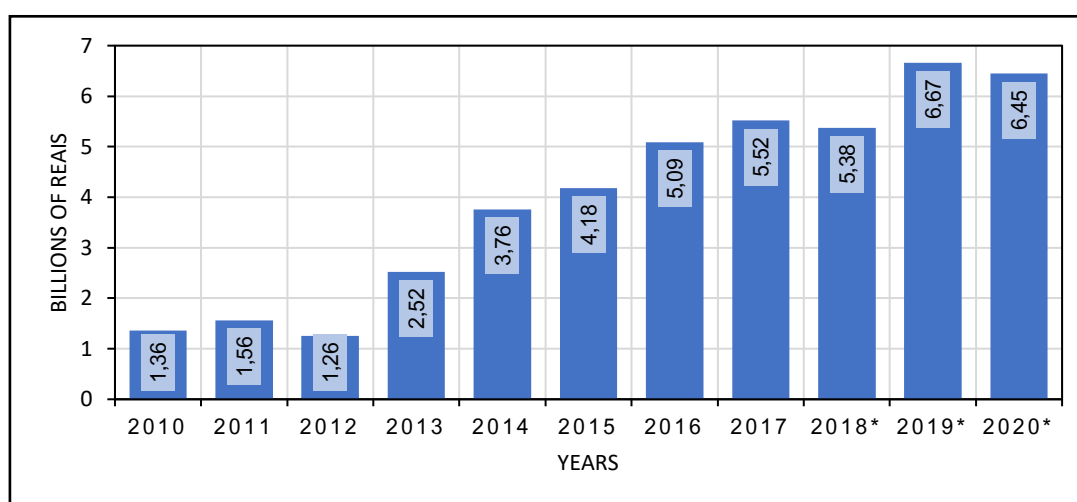
²⁴ BRAZIL. Federal Law No. 13.755. December 10, 2018.

²⁵ The National Observatory of Industries for Mobility and Logistics was established through Ordinance No. 2.203-SEI, dated December 28, 2018 from the Ministry of Industry, Foreign Trade and Services

In addition to the nationwide federal initiatives, there have been state and federal initiatives aimed at certain regions of the country. The state of São Paulo launched IncentivAuto²⁶, a program that authorized special financing for companies, providing a 25% discount on ICMS²⁷ for those investing at least BRL 1 billion and creating 400 jobs in São Paulo. In October 2020, the Federal Government sanctioned a law²⁸ that extended tax incentives for automakers and auto parts manufacturers in the Northeast, North, and Midwest regions, which are less industrialized areas of the country.

The tax exemption for the auto industry has been the subject of discussion and criticism for many years in Brazil, mainly because it is a sector that works with high value products, targeted to the higher income brackets of the population, because it happens in periods of high sales of vehicles and not only in times of economic crisis. Data from the Ministry of Economy indicate that tax breaks for car manufacturers, also called tax expenditures, will reach BRL 43.7 billion between 2010 and 2020²⁹. The evolution of tax breaks for the sector can be seen in Chart 6.

Chart 6. Federal Government Tax Expenditure on the Automotive Sector



Source: own preparation based on ANFAVEA data - 2018, 2019 and 2020 are projections

According to information released by the press, these values are aggregated and take into account the incentives for all the companies in the sector, “*since the individual data is confidential*”³⁰, i.e., it is not possible to identify, from public information, the tax break that each automaker received.

Another aspect that raises debates is the effectiveness of sector tax incentive policies or general policies. Porsse and Madruga (2014) concluded that “*the tax incentive for the automobile sector proves to be more regressive from a distributive point of view than the general tax incentive, benefiting higher income classes. Therefore, in the case of the IPI,*³¹ *tax relief policies with general scope seem to improve income distribution*”

²⁶ Law 17.185/2019

²⁷ Tax on Goods Commercialization (ICMS in Portuguese): all the trade companies pay taxes according to the type and price of goods they sell.

²⁸ Law originated in Provisional Measure 987/2020.

²⁹ Until 2017 the incentives accounted for BRL 25.24 billion, correspond to the effective base, and for the period from 2018 to 2020 the data are projections.

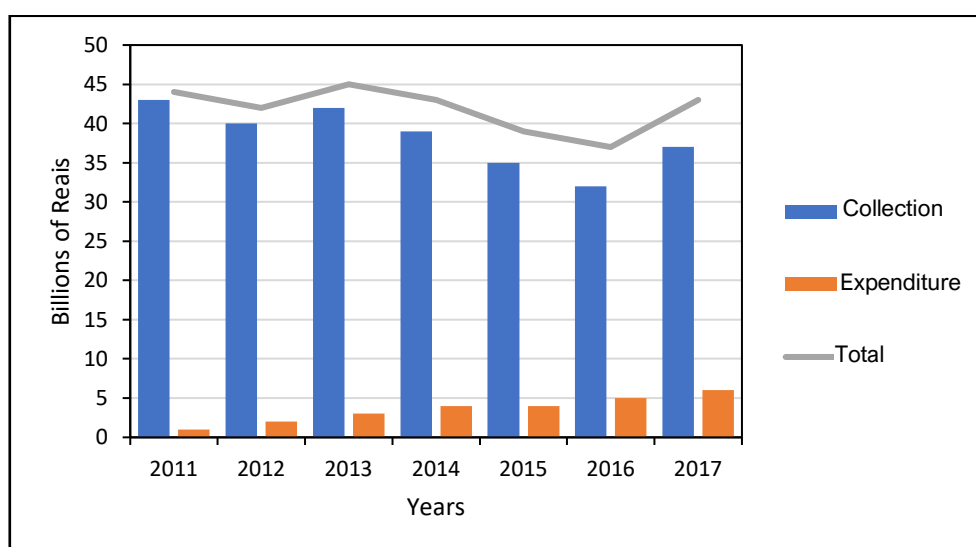
³⁰ Newspaper “O Estado de São Paulo”. Government talks about reallocating the 5 thousand workers that will lose their jobs with Ford leaving the country. Caderno Economia. Edition of Tuesday, January 12, 2021.

³¹ Taxes over industrialized products (IPI in Portuguese): all the manufacturing industries pay taxes according to the type of their products.

to the detriment of sector-specific policies.³² But there are also those who defend the IPI tax breaks^{33 34}, since the increase in vehicle sales increases the collection of PIS and COFINS³⁵ in amounts higher than the amount that is no longer collected. This theme has returned to the center of discussions, especially in the press, due to the closure of FORD's production activities in Brazil, announced by the automaker in January 2021. The automaker received tax incentives for its installation in the state of Bahia in the early 2000s, after disagreements with the state government of Rio Grande do Sul.

The National Association of Automotive Vehicle Manufacturers (ANFAVEA) released in February 2021 a brief presentation³⁶ entitled "Tax burden x Incentives" in which it argues that the sector is one of the highest tax payers in the country and, proportionally, the one with the lowest tax break, also called tax expenditure, which, in this case, corresponds to the reduction of taxes due to sector or regional policies to stimulate industrialization or investments in research and development. In the period from 2011 to 2017, the sector provided a collection of about BRL 292 billion and the tax break was about BRL 25 billion. Thus, the sector presented, according to ANFAVEA, the best ratio among all sectors of the economy, with BRL 11.1 collected for every BRL 1 exempted by the government.

Chart 7. Federal Tax Collection and Tax Breaks of the Automotive Sector



Source: own preparation based on data from ANFAVEA

The implementation of the automotive regimes, associated with other incentives such as the granting of loans in state-owned banks, the donation of areas for the implementation of automakers by municipal administrations and the reduction of state taxes are not a matter of consensus among various segments that study the sector. One of the questioned situations occurred in the most recent period of expansion in the production of the automobile industry (2000/2013). According to Sarti and Borghi (2015)³⁷ "from 2008, when the international financial crisis began, until 2014, profit and dividend remittances reached the level of US\$

³² PORSSE, Alexandre A. and MADRUGA, Felipe G. Efeitos Distributivos de Políticas Tributárias Anticíclicas: Análise da Desoneração do IPI sobre o Setor Automobilístico [Distributional Effects of Countercyclical Tax Policies: Analysis of the IPI Tax Break on the Automotive Sector]. Universidade Federal do Paraná [Federal University of Paraná]. 2014

³³ AMARAL, Gilberto L., OLENIKE, João E., AMARAL, Letícia M. F. Desoneração de do IPI para veículos leves [IPI tax break for light vehicles]. Instituto Brasileiro de Planejamento e Tributação [Brazilian Institute of Planning and Taxation]. Curitiba. 2014

³⁴ IPEA Nota Técnica Impactos da Redução do Imposto sobre Produtos Industrializados (IPI) De Automóveis [Technical Note Impacts of the Reduction of the Tax on Industrialized Products (IPI) from Automobiles]. Diretoria de Estudos Macroeconômicos/Dimac [Board of Macroeconomic Studies/Dimac]. Brasília. 2009

³⁵ Programa de Integração Social e de Formação do Patrimônio do Servidor Público e Contribuição Social para o Financiamento da Seguridade Social (PIS/COFINS) [Program for Social Integration and Training of Civil Servants' Equity and Social Contribution for Social Security Financing (PIS/COFINS)]

³⁶ Associação Nacional dos Fabricantes de Veículos Automotores [National Association of Automotive Vehicle Manufacturers] – ANFAVEA. Performance of the Brazilian Automobile Industry. Study: Tax burden x Incentives. São Paulo. February 2021

³⁷ SARTI, Fernando and BORGHI, Roberto A.Z. Evolução e desafios da indústria automotiva no Brasil: contribuição ao debate [Evolution and challenges of the automotive industry in Brazil: contribution to the debate]. Friedrich Ebert Stiftung Brasil. 2015

24.6 billion, while the new flows of foreign investments made by automakers were only US\$ 11 billion. While promoting high profit and dividend remittances to their Corporations, the automobile companies took voluminous loans at very favorable rates from BNDES³⁸ to finance their investments. Although the participation of the automobile sector in the total disbursements of BNDES has been reduced in the period from 2008 to 2014, the automakers obtained loans of around BRL 37.8 billion, equivalent to US\$20 billion” (page10).

The period from 2000 to 2013 was one of expressive sales growth in the automotive sector in Brazil, the result of a combination of improved macroeconomic conditions, improvements in the labor market, better credit conditions, increased income and incentives to the industry. There have been investments in production expansion, resulting in recent years in an installed capacity of 5 million cars. The growth in sales resulted, as was to be expected, in an increase in the fleet circulating in Brazil and in the motorization rate, the result of dividing the fleet by the number of inhabitants. In this period the total number of vehicles in circulation went from 22 million to 52 million. The bus fleet went from 230,000 to 382,000. And the truck fleet went from 970,000 to 1.7 million.

It is worth noting that the automobile industry introduced important technological innovations in recent decades, such as the development of the “flex” engine, which allows the use of gasoline and ethanol in a mixture of any proportion. In the case of diesel oil, the country started to count on S10 fuel (10 ppm of sulfur) as of 2010. Brazil also has, since 1986, the Program for the Control of Air Pollution from Motor Vehicles (PROCONVE)³⁹, under the responsibility of the federal government, which establishes gradually more restrictive emission limits for new vehicles. In the case of heavy vehicles, where buses are included, Proconve followed the emission standards established in Europe, with some delay. Implemented in 2014 in Europe, the Euro VI standard is scheduled to enter Brazil in 2022, but there is a request for postponement on the part of automakers based on the impact that the Covid-19 pandemic has brought to the sector.

Box: Biofuels

Another characteristic in Brazil is the relatively high use of biofuels. Biodiesel⁴⁰ has a mandatory mix with petroleum diesel, 13% in volume as of 2021. Brazil is well known for its ethanol industry fueling passenger cars, also with a mandatory mix of more than 25% with petrol. Both biofuels are produced from commodity crops (ethanol from sugarcane and biodiesel from soy) influenced by international markets. The production of biodiesel was firstly stimulated by a social program for small producers but most of biodiesel is now produced from plantation soy-based oil. Today the RenovaBio⁴¹ program is the main program in the country to encourage biofuels.

³⁸ National Bank for Economic and Social Development

³⁹ PROCONVE was instituted through the Resolution of the National Council for the Environment – CONAMA - no. 18, of June 6, 1986.

⁴⁰ The national policy to introduce Biodiesel in Brazil was established by Federal Law nº11.097/2005

⁴¹ RenovaBio is the National Policy of Biofuels established by Federal law nº 13.576/2017

II. Industry challenges and perspectives for a conversion

This second part of the paper brings the results of the document research and interviews conducted with experts to obtain the challenges and prospects of the industry in the context of a desirable conversion aligned to inclusive, low-emission mobility in the country. As a premise of this conversion, the production of vehicles for public transport is boosted and qualified, including the adoption of low environmental impact technologies, while the production of cars for individual travel is no longer strategically prioritized. The findings of the survey and the interviews is structured on the following points (i) Redesign of the mobility model in Brazilian cities, (ii) Conversion of the industrial park, (iii) Impact on jobs, and (iv) Digital transformation and electro-mobility.

As reported in Chapter I, Brazil has a structured, well installed and nationwide transportation industry, including the production of vehicles for public transport (buses and equipment for metro-rail systems). The industries can supply the country's demand but currently present a large production idleness. Its participation in the GDP has been decreasing over the last years, but it still presents an expressive participation in industrial employment. Its economic and political significance has led to the creation of automotive regimes and tax incentives that are questioned by economists, due to their regressive character. The automobile market is supplied by automakers installed in the country but with foreign headquarters, and a small part of their production is exported to Latin American countries. In the case of the bus industry, the bodywork companies are almost all Brazilian companies with a presence in other countries, through controlled or affiliated companies. In the case of the metro-rail industry, although Brazil has factories (of foreign origin) installed in the country, the market suffers strong foreign competition.

The question that arises is how the future of this industry is going to be shaped up considering major trends in the global automotive industry and the needs for job creation, income and improved mobility in the country.

Redesigning the mobility model in cities

We observed a consensus among the visions captured in the interviews that a conversion of the industry, aligned with inclusive, low-emission mobility, will not occur from the industry's own vision alone. The creation of such a mobility scenario would not happen only by force of the industry, but from mobility policies, which demand transformation in the production offered by the segments of the transportation industry. Without external guidelines that draw the contours of inclusive urban mobility, there is a lack of guarantees and incentives for automakers to properly implement a change in the equipment market in this direction. The transformation advocated would depend not only on the availability of products, but also on the relationship between passenger demand for individual or collective public transport, on how urban populations are organized spatially to move around in the city. The growth of the public transportation equipment market accompanies public policies that stimulate the expansion of public transportation services.

However, the diagnosis is that there is not enough political will to carry out this structural transformation of mobility. The mass transit sector is going through a crisis period, one of the main reasons being the exhaustion of the financing model for operational costs based on the payment of the fare by users, a situation aggravated by the pandemic. The overview is that there is, at the moment, no concern with public transportation on the part of the majority of political forces. And that practically the entire political agenda has focused on short-term emergency issues, without long-term plans. It is perceived that only a social commotion demanding solutions by the governments could get the necessary attention for the sector. The federal government is seen as having a key role in the recovery of the sector.

It was pointed out that the future will most likely be marked by rising unemployment, tax difficulties for the federal government, extended to states and municipalities, low investment in infrastructure, a funding crisis for operational costs, and pressure for deregulation of the public transportation market. There are those who observe a tendency for the complete disruption of the mass transit systems in the coming years and, until January 2023, there is a permanent risk of regression, since the necessary new regulation by the State will

not come from the current federal government. The risk is the return of clandestine transportation⁴², as is already happening in the city of Rio de Janeiro, in a framework similar to that of the 1990s.

The car as a mode of transportation historically prioritized in Brazilian public policies would need to be repositioned in the inclusive mobility scenario. To this end, two structural elements emerged prominently in the reading and listening of this study. The first is the need to change the “car dependence culture”, which is widespread among Brazilians. The second element is the fact that the automobile has been elevated to a symbol of development by the State, which has conferred the subsidies and privileges once given to this mode.

For a more inclusive mobility, it would be necessary to improve public transportation through the implementation of medium and high capacity systems (BRTs and subways), exclusive bus lanes, bus fleet renewal policy and adoption of zero emission vehicles in the long term, fare reduction, and travel management tools (TDM). Brazil already has a legal and technical framework to stimulate this development as the National Policy of Urban Mobility (PNMU)⁴³, knowledge about minimum requirements for mobility plans and the National Policy on Climate Change. But only social demand could drive such structural changes.

In the overview, public policy instruments should be effectively applied and directed to expand the participation of mass transit in urban modal share and its industry to create new jobs and income. There would be a greater need for command and control instruments, which establish legal requirements, as well as the use of economic instruments that favor public transportation, both for the renewal and qualification of the fleet and cost reduction costs for the users. Tax reductions or exemptions and financial incentives could be used to increase the demand for buses, trains and subways and, consequently, the number of workers employed in the manufacturers.

Conversion of the industrial park

As seen in the previous items, the country is going through a moment of generalized economic crisis with strong setbacks for the country’s development and, specifically, for its automotive industry. From the readings and interviews, it appears that Brazil is going through a process of deindustrialization, with little structure for industrial policy and environmental policy.

The “flagship” of the automotive industry, the automobile, despite the popularization it underwent in the 2000s, has become more inaccessible in recent years. It was pointed out that the sale of vehicles as we know it today depends on there being buyers who can commit a significant portion of their income for the payment of a vehicle bought on credit. A certain stability in employment and a wage level that allows the purchase of durable goods is therefore necessary. But since 2012, workers have lost purchasing power and the capacity for consumption has stagnated. The successive economic crises have resulted in an increase in unemployment, and the economic recovery has generated a very large amount of informal work, including people with a high level of education. It was observed that the market will tend to concentrate its offer to the wealthiest bracket of the population, in a scenario similar to Mexico, where only a small privileged portion of the population buys new vehicles. As can already be seen from the profile of new cars licensed in the country, the trend is the predominance of higher value models, with a growing participation of medium SUVs and the prospect of the entry of small SUVs in 2021/2022.

The “Brazil cost” is an argument widely used by manufacturers to characterize their business difficulties. They often blame the wage and tax burden. However, a contradiction is revealed here with the low wage levels in Brazil. It was reported that the Brazilian industry had competitive advantages that were being lost, such as

⁴² Clandestine or informal transportation means the services provided by operators without local or state authorization, obtained after a legal and public concession process. For more information about this problem in Brazil see BOARETO, Renato. *Leva e Traz Project: The fight against the clandestine transportation through the supplementary operation system in Ribeirão Preto, SP, Brazil*. X CODATU. Lome, Togo Republic. 2002

⁴³ The National Policy on Urban Mobility (PNMU) was instituted through Federal Law 12.587/2012

the increased cost of energy. Thus, the Brazilian industry loses production scale compared to other countries, not taking advantage of the opportunities created with Mercosur.

As for the segment of vehicles for collective public transport, it is recognized that Brazil already has a structured, quality and internationally competitive equipment industry. It is technologically developed and presents supply capacity, being able to meet large internal and external demands, including the most restrictive environmental requirements. Brazil has a strong presence in the Latin American bus market, with businessmen preferring Brazilian bodyworks. Currently, however, the country is losing space to manufacturers from other countries, mainly Chinese suppliers. But due to the strong consolidation of the bus industry, the specialists indicate that, so far, there is no threat of Brazilian manufacturers losing the domestic market to manufacturers from other countries.

The information gathered indicates that decisions of structural transformations by the car industry would be very difficult to be made in Brazil, because the virtual totality of the automakers' capital is foreign. The investment decision-making process in these large automotive conglomerates is dictated by the companies' headquarters, with a restricted degree of autonomy granted to a subsidiary. The focus is on profitability and investments return, which are perceived as very uncertain in Brazil, since there are variables such as the dollar price, taxation, and market opening, which make decisions difficult. Thus, projects with smaller contributions of foreign knowledge, such as those associated with flex vehicles, have more chances of being made viable by the parent company.

The location of the strategic decision and R&D centers in the countries where the parent companies are based is a fundamental characteristic of the automobile industry.⁴⁴ According to a document from the BNDES⁴⁵, which deals with the agenda for the automobile industry in Brazil, if the current structure of the sector is maintained, automakers *“will seek to sell their new products to the large national/regional consumer market and advance in the accumulation of competencies in engineering, but not necessarily to develop the most strategic technologies locally. This aspect will be restricted to the foreign headquarters, since Brazil does not have large automakers with national capital. The technological development that can be done in Brazil tends to be limited, in spite of the good skills already accumulated in engineering and the broad base of companies installed in the country. Thus, Brazil is likely to remain a follower in the development of disruptive technologies”*.

It should be added that, from the automakers' point of view, a car factory does not simply become a factory for buses or other public transportation equipment. The production and assembly line characteristics are quite different, as well as the specialization of the labor force. A more plausible conversion would be from a truck factory. Even the transformation of a diesel bus assembly line to electric buses would also imply structural adaptations. The eventual increase in demand for buses/VLTs/subways/trains, in a first moment, would be more readily met through an expansion of the manufacturing companies already dominant in the segment in the country.

Impact on jobs

The statements collected in the interviews indicated that there is no expectation of substantial growth in the vehicle market in the coming years and that the number of jobs at the automakers may not necessarily accompany the growth in production, given the automation of the assembly lines, as already observed historically. The loss of jobs is a current reality and remaining job positions are threatened even without major structural transformations directed at the automakers. There were no reported indications that an industry aligned with inclusive, low-emission mobility will create additional jobs. With regard to the production of electric vehicles, a global trend, the perceptions are that less labor is required compared to the production of current vehicles with internal combustion engines. This is partly because fewer parts are needed to assemble an electric vehicle.

⁴⁴ Same as 3

⁴⁵ DAUDT, Gabriel Marino; WILLCOX, Luiz Daniel. Automotive industry. In: PUGA, Fernando Pimentel; CASTRO, Lavinia Barros de (Org.). Visão 2035 : Brasil, país desenvolvido : agendas setoriais para alcance da meta. 1. ed. Rio de Janeiro : Banco Nacional de Desenvolvimento Econômico e Social – BNDES. 2018. p. 183-208.

In addition, the implementation of an accelerated pace of electrification in Brazil, uncoupled from the increase in Brazilian production capacity and supported by electric vehicles importation, can generate even more unemployment in the assemblers installed here and the transfer of jobs to other countries. Part of this effect could be offset by the increase in job positions in the bus chassis and bodywork automakers, but numerically it is difficult to imagine a scenario that absorbs all the workers. For each worker in the bus industry it is estimated that 4 indirect jobs are generated, and it is estimated that the number of jobs in the manufacture of electric buses is similar to the manufacture of those powered by diesel.

The technological change and the disruption of the automotive chain that is happening globally, which will be better discussed in the next section, requires reflection on the issue of jobs. The perception is that the number of automakers, parts suppliers, retailers, and service stores also tends to be reduced in the inclusive, low-emission mobility scenario, leading to a reduction in the number of conventional jobs. The adoption of transformative policies for this new mobility can face resistance from workers, in case of fewer job vacancies caused by reduction of automobile production and the prevalence of imported vehicles. One way out would be to prepare and relocate the auto industry workers to another branch of industry or another sustainable chain, for example wind and solar energy, which would also contribute to distributing the jobs in other regions of the country, such as the northeast region.

Digital transformation and electro-mobility

A technological race is on in the automotive industry worldwide, and the idea is widespread that in the future vehicles will be electrified, autonomous, shared, connected, and with periodically updated software⁴⁶. This has already led to the formation of different partnerships and company acquisitions, merging the information technology industry and the automotive industry, leading to a very different design of vehicle production control and the way people will move around than today. The establishment of Stellantis Group recently, the alliance between Renault - Nissan and Mitsubishi⁴⁷ and the news about Hyundai, Apple and Uber partnership can be cited as examples of this new commercial arrangements. To illustrate this perspective, an analysis of the evolution of automaker groups and mobile/tech & web/digital companies⁴⁸ shows that the top 15 technology companies, which include those already active in urban mobility, are 5 times larger in market capitalization than the 50 most traditional automakers.

Important changes are coming associated with business models, in which the offer of transportation services must gain more attention in comparison to the sale of products (vehicles), demanding a close connection between the vehicle (hardware) and the use of communication and information systems (software) and the rental of vehicles or subscriptions for certain periods⁴⁹. One of the main effects is the emergence of services that mainly affect public transportation, known internationally as Mobility as a Service (MASS). Thus, it is in the business model associated with the individual transport vehicle that different scenarios of economic relations between automakers and information technology and connectivity companies are envisioned, resulting in different possible market arrangements, with impacts on workers in the sector⁵⁰. Automakers are preparing for a new market, with a large share of services such as rental, subscription, and app-based transportation. New business cores are being created to complement the sale of vehicles and these services are being competed for by “big techs” and Transport Network Companies (TNC), which are travel management platforms. There is the concept of CaaS (Car as a Service) through which the user does not buy the car but pays a monthly fee and receives a new car every year. In Brazil, this activity has recently started to count with the participation of CAO, Fiat, Renault, and Volkswagen. According to information

⁴⁶ PWC. EASCY: five trends transforming the automotive industry.2018

⁴⁷ <https://www.alliance-2022.com>

⁴⁸ KPMG. Global Automotive Executive Survey 2020. Page 44. Available at automotive-institute.kpmg.de

⁴⁹ McKinsey. Reimagining the auto industry's future: It's now or never. October 2020

⁵⁰ Deloitte. The Future of the Automotive Value Chain - 2025 and beyond. 2017

disclosed by Renault, the size of the market is not yet known, but in some capitals, such as Madrid and Paris, they are already profitable operations and account for 25% to 30% of the brand's sales⁵¹.

These technological changes will deeply modify interactions in urban mobility systems, both passenger and cargo transportation, new and different types of vehicles, reasons for travel, available services, relative costs and income levels, which will result in positive and negative externalities⁵² always differently distributed throughout society. The conventional automotive industry, with cars powered by fuels (mainly fossil), has become a risk for investors, because society is beginning to stigmatize it negatively, just like the tobacco industry. The global trend is the simultaneous coexistence of several types of powertrains in the same country, with the use of a common vehicle platform for different energy sources, in different automakers and countries. The production of the new vehicles resulting from this technological race also has impacts on the auto parts supply chain. The leaving of parts suppliers that will become unnecessary due to technological development and the predominance of a given energy source is likely, as well as the entry of new manufacturers of parts and components for the vehicles.

It was observed that the country still lacks, in general, to decide its path for future technological development. The country experienced its last major technological transformation with flex technology for cars and today is facing the beginning of a disruptive change that is the electrification of mobility which is beginning to occur strongly in the world. Without an industrial readjustment, the country runs the risk of becoming an importer country of these vehicles.

Reports and readings indicate that there is a tendency for long continuity in the production of internal combustion vehicles, given the country's socioeconomic situation and the absence of major movements in the domestic industry toward electrification. A highly probable scenario that has been reported is the option for the national hybrid-ethanol car and electrification of the luxury and premium segment via imports. In this sense, a criticism that is made is the importance of increasing transparency in subsidies for the industry and that programs such as Inovar-Auto and Rota 2030 failed to charge more in technological development. In addition, any tax benefits for the purchase of electric cars will favor the small, higher income segment of the population.

With respect to buses, there is demand for diesel substitution, but a national strategy for its implementation is still lacking. It was observed that Brazil could be inspired by the experience of Mexico, where there is a strategy, including a concern with job creation, for the creation of a market through the granting of strong initial incentives and subsequent gradual withdrawal. China has also emerged as a success story. It has established a policy of developing its automobile and public transportation industry by focusing on electrification⁵³. Subsidies were established on local production and consumption rather than on the import of electric vehicles, with the participation of the central government, the provinces, and the cities.

The evaluation is that Brazil, by constituting an international reference in the technological development and production of buses, would be able to expand this market internationally, unlike its automobile industry. It was argued that the country should, therefore, have a policy like China, with stimulus to local development. It was pointed out that it is important to observe the international competition because, while Brazil produced a total of about 20 thousand buses in 2020, China has companies that alone can produce 70 thousand buses a year.

In Brazil there is still a dispute over the technological route for replacing diesel in buses, with different proposals among chassis manufacturers (batteries, biofuels, gas, hybrid). With the focus on zero emission, the opinions indicate that the electrification of the fleet with batteries should prevail. However, there is the

⁵¹ Source: Renault é a sexta montadora a lançar serviço de locação de carros [Renault is the sixth automaker to launch a car rental service]. O Estado de São Paulo. Edition of Wednesday, January 20, 2021

⁵² Externalities are costs or benefits that a given activity imposes on other economic agents without the valuation of these costs or benefits being properly incorporated into the price of the original activity. Source: GOMIDE, Alexandre A. and MORATO, Renato. Instrumentos de desestímulo ao uso do transporte individual motorizado: lições e recomendações [Instruments to discourage the use of individual motorized transport: lessons and recommendations]. IEMA. São Paulo. 2011. Available at <http://www.energiaeambiente.org.br/wp-content/uploads/2015/09/DesestimuloTransIndiv.pdf>

⁵³ MAZZOCCO, Ilaria. Electrifying: How China Built an EV Industry in a Decade. Wednesday, July 8, 2020. Available at <https://macropolo.org/analysis/china-electric-vehicle-ev-industry/>

perception among some interviewees that the replacement of diesel by electric buses, without strong government incentives for the change, will fail because the diesel bus industry is very well consolidated. The energy transition is not interesting to the manufacturer, given the risk of betting on a market that is not consolidated, and they perceive the need for the adoption of public policy instruments by the administrations and the federal government in a medium and long term plan. The Brazilian chassis manufacturers are currently unable to meet the pressure of demand for electric buses, which would result in the importation of chassis from, most likely, Chinese suppliers who dominate this market worldwide. On the other hand, the bodywork factories are beginning to prepare for electrification, already developing their own bodyworks for the electric bus and signing partnerships with foreign manufacturers of electric chassis. Today, in Brazil, several Chinese manufacturers can dispute the market (mainly via importation), but it was pointed out that the supply capacity and the price of electric chassis of the automakers that dominate the bus market in Brazil, such as Mercedes, Volkswagen, Scania and Volvo, are still unknown.

The need for regulatory change in public transportation and in the energy sector to allow the entry of new players and to generate jobs was highlighted. The mass transit sector needs a new business model. The bus operator should not be worried about what to do with the battery after the end of its useful life. Regarding Rio de Janeiro, there is a proposal to create a fund to guarantee bus companies operational cost remuneration. Brazil still compensates the operation by passengers or km traveled, but it is necessary to change the model given the exhaustion of the financing of operational costs based on the payment of the fare by users. There are international proposals to pay, for example, by the number of seats offered per hour/direction. In this sense, Chile was cited as an example to be followed, where a new bus service contracting model has been developed by separation between services operators, fleet owners/providers, and electric power suppliers for the vehicles.

It was also remembered that the use of new energy sources can increase the operational costs and drive people further away from public transportation, aggravating the existing crisis. It would be necessary that the players involved in public transportation are aware of the technological changes and the obligation to replace the fleet so that there are no opportunistic price increases benefiting only the suppliers' profits, especially in a moment of crisis that the sector is going through. It was alerted that fare levels are already high and the risk that, as in other countries, using public transportation will become more expensive than using a car, in addition to the advent and expansion of mobility by applications such as Uber.

With the deepening of the economic crisis in the country, and also with a possible reduction of the population's trips on public transportation due to a change in habits after a long period in the Covid-19 pandemic, public transportation enters an even more challenging moment. At the same time that it requires increased subsidies, there is a drop in government revenues, which materializes the risk of loss of quality and demand, in a vicious cycle. We already see concessions (bus contracts) to operate mass transit being returned in several cities, with the use of expressions such as "wasteland".

III. Concluding remarks

This report presents IEMA's observations about the subject studied, based on the perspectives that were pointed out in the documents researched, and in the interviews conducted. We see, firstly, that the transformations in urban mobility can occur through planning, predictability and coordinated evolution, with the presence of the State in the functions of regulation and defense of the public interest, in the midst of a process of technological evolution; or through the disaster caused, mainly, by the free arrangement and dispute of the political forces and economic interests involved.

The study strengthens the perception that the future of the automotive industry, public transportation and its workers should not be treated in an isolated manner, making it necessary to consider the relationships and transformations that will occur in various dimensions, going through the visions behind redesigning urban mobility, the structural conditions of the installed industrial park and the strong digital and technological transformations underway. The technological development of vehicles focused on electrification, automation, connectivity may contribute to the necessary reduction of pollutant emissions and greenhouse gases, but it has not yet been shown as a solution to face the unequal and unfair use of road space, for accessibility and to promote the right to the city.

Therefore, there are multiple simultaneous changes underway, involving the use of technology, the emergence of new services, new players, new institutional relations, economic and market interests, and social changes. We observe that the trend is a change in the level of business with a strong interest in the improvement and expansion of individual transportation, with major threats for an inclusive urban mobility, which make solutions more complex. It doesn't seem that these changes, due to market forces, are moving in the direction of improving public transportation, increasing its share in trips while substituting its energy source. There is a risk of a certain "conservative modernization," in which the injustices that weigh on urban mobility in the country are maintained or deepened, if only cleaner individual transportation and associated services form the main economic and political alternative are pursued.

If the country continues to give priority to individual transportation and new services based on information technology and banking services, which are not understood or used by a large part of society, there may be a radicalization and deepening of the current gap between the highest and lowest income brackets, with the poorest having even more inaccessibility. Investments in public transportation should also be looked at to contribute to job and income generation in the transportation vehicle industry, in civil construction, and in the operation of the systems, especially in a post-pandemic scenario. Structural improvements in the cities are urgent, implementing urban environmental policies in an integrated way, including the improvement of air quality and mitigation of greenhouse gases. That is all dependent on the signaling of the country's development model and policy, where the political principles associated with Mobility as a Right (MAAR) and the guarantee of public transportation as a social and universal right should be defended, along with the principles of a Just Energy Transition.

Appendix – List of Interviews Conducted

Entities

- Vicente Abate – President of Brazilian Association of Railroad Industry
- ABVE – Adalberto Felício Maluf – President (BYD Marketing Director)
- ANFAVEA – Henry Joseph Jr. – Director
- C40 – Ilan Cuperstein - Vice Director for Latin America (ZEBRA Project - Zero Emission Bus Rapid-Deployment Accelerato)
- DIEESE – Fausto Augusto Junior – Technical Director
- SIMEFRE – Paschoal de Mario – Technical Director and Carlos Gomes – Corporate Affairs Manager and Henrique Pedroso de Morais

Specialists

- Alexandre Pelegi – Journalist specialized in articles on urban mobility – Diário do Transporte
- Fernando Araldi – Ministry of Regional Development, Directorate of Mobility and Urban Services
- Margarete Maria Gandini – General Coordinator for Implementation and Inspection of Automotive Regimes at the Ministry of Economy
- Fernando Sarti – Researcher at the Center for Industrial Economics and Technology at UNICAMP
- Matias Cardomingo – Economist
- Marilane Oliveira Teixeira – PhD in Economic Development. Institute of Economics of UNICAMP
- Nazareno Stanislau Affonso – He was Secretary of Transport of Porto Alegre and the Federal District – President of the MDT Institute
- Rafael Ting Sun Guimarães – Caio-Induscar Product Engineer
- Simão Saura Neto – São Paulo Transportes (SPTrans)

