

Logistics Overview in Brazil 2008



Instituto de Logística
e Supply Chain



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EXECUTIVE SUMMARY

Brazil is a country of continental dimensions, and Latin America's largest country in territory, with an area of 8.5 million square kilometers. Although it borders almost all the countries within South America, there are challenges when it comes to accessing most of its neighbors because of two important natural barriers: the Amazon rain forest and Andes mountain range. Its 188 million inhabitants are strongly concentrated in a 400 kilometer strip from the east coast to the west, making it the world's fifth most populated country in the world. Its weather is mostly tropical, and the official language is Portuguese.

The developing economy has a gross domestic product (GDP) of \$1.3 trillion US (2007). During the 1990s, the country underwent major economic transformation characterized by strong infrastructural privatization and by economic stabilization through the creation of several regulatory agencies. The first years into the new millennium were marked by strong growth in international trade. From 2002 to 2007, export growth was 166%, reaching about \$161 billion US in 2007. The Brazilian economy is well diversified, and from the GDP generated in 2007, about 66% came from the service sector, 29% from the industry sector, and 5% from agricultural activities. In the manufacturing segment, the main industries are chemicals, petrochemicals, steel and metal industry, construction, transport material and food and beverages.

A. Cargo Transportation

Although strongly dependent on transportation due to the country's enormous size, Brazil has a limited network that is strongly concentrated in the southern and southeastern reaches. The transportation infrastructure was built based on public investments and underwent privatization in the second half of the 1990s. More than a decade later, significant improvements in the transportation system are easily detected, in particular within the port and railroad sectors. In spite of these improvements, the quality and size of the network are still far from ideal. Further, the high capital costs and regulatory uncertainties make private investment a risky undertaking. In order to overcome these challenges, the government launched the "*Programa de Aceleração do Crescimento – PAC*" (Program for Accelerated Growth).

Highway system: The Brazilian transportation system strongly depends on its highway system, which is responsible for about 56% of the total tonnage-per-mile moved in the country. According to surveys from the Agência Nacional de Transportes Terrestres (Terrestrial Transportation Agency or ANTT), Brazil has about 1.79 million cargo transportation vehicles, and 56% of them belong to self-employed truck drivers.

The enduring market share of road transportation in Brazil lies in its low price and a lack of other equivalent and reliable modes of transportation, particularly rail and waterborne services. Some of the aggressive and potentially unfair business practices are also observed in highway transportation: excessive, uninterrupted driving hours; excessive speed; and uncontrolled vehicle and cargo weight.

In 2008, Brazilian economic growth, along with increasing quality transportation demand and implementation of some regulatory barriers, has been changing the highway system in the country. This landscape has been setting a pace of an increase in efficiency and soaring prices.

Railroad system: The Brazilian rail network is small considering the country continental dimension (about 29,000 km of rail), with the strongest concentration (a total of 50%) in the four major states: São Paulo, Minas Gerais, Rio de Janeiro, and Rio Grande do Sul. The main products transported by rail are iron ore, agricultural products, steel



products, and coal. A big chunk of the transported volume is export related, particularly when it comes to iron ore. One of the challenges in working within the Brazilian railroad system is low connectivity among the lines, due to the existence of two different gauge widths (1.60 meters and 1.10 meters). In addition, regulations do not promote incentive programs facilitating collaboration among railway companies. The transported volume of cargo has been growing from 2001 to 2007, railroad cargo transportation grew 59%, from 161.8 billion TKUs to 257.4 billion TKUs.

Waterways: Brazil enjoys about 7.4 thousand kilometers of Atlantic coast and 43 thousand kilometers of navigable rivers. Brazil moved through its ports system 754 million tons in 2007 (comparing to 2004, there was a growth of 22%). Waterway transportation is strongly concentrated on the movement of solid bulk (457 million tons). Concerning inland transportation, in spite of the potential, rivers are rarely used for cargo transportation and it represents only 1% of all the cargo transported in the country.

Air: Air transportation in Brazil was, until recently, regulated and controlled by the Departamento de Aviação Civil (Department of Commercial Aviation or DAC) and investment in airport infrastructure was performed and operated by Infraero, a state owned company linked to the Federal government. Recently a regulatory agency (ANAC) was created specifically for the oversight of the civil aviation sector, taking over the responsibilities of the DAC. In addition, it is important to note that major Brazilian companies use airfreight for their foreign trade activities.

Intermodal: The use of intermodal transportation can be considered very limited, even though container movement enjoys a strong growth index. In regards to solid bulk products, and especially mineral and agricultural products, the numbers change towards a significant increase in use of multiple modes in very modern and highly productive terminals. Examples are the ocean terminals Vale, company specialized in ore mining, and Cargill's terminal in Santos harbor, focused on bulk agricultural products. In 2005 the government's strongest move in promoting multimodal development was exercised through the creation of new legislation establishing the category of operador de transporte multimodal (multimodal transportation operator or OTM)—with special tax and regulatory benefits. By early 2006, a total of 92 companies had obtained approval to operate as an OTM.

B. Warehousing

Public warehousing infrastructure is still very limited in Brazil, particularly for industrial use. Only the smaller, public warehouses for imported products (dry ports) are the exception. In case of bulk and agricultural products, the situation is a little bit different, since there is a wide network of bulk warehouses financed through public funding. Most industrial and commercial companies will only use their own warehouses—meaning they are operated by them or by a contracted 3PL. It is still rare to see different shippers sharing warehousing space. However, the fast growth experienced in the third party logistics (3PL) market has begun to impact this preference.

Warehousing management is becoming more and more complex due to the growing number of SKUs, and to the growing need for split and frequent orders. As a consequence, companies are using larger warehouses, with a higher number of stacking levels, and more modern equipment such as flow rack trans-elevators, sensor picking, and WMS. Deciding on the location of a warehousing facility in Brazil can be highly influenced by tax legislation, which permits material tax gains depending on the location. This often makes for a less efficient and more expensive location from an operating point of view, but does result in a lower total cost because of the tax gains.

C. Third Party Services Provider Development

The 3PL industry in Brazil has been experiencing accelerated growth for the last five years. This growth can be observed on multiple levels such as sector turnover volume, variety of services offered, sectors served, and average revenues. The 3PL market is shared by some of the largest, most well-known international players (such as Ceva, DHL and Ryder) as well as major national players (such as Vale and ALL Logística), and medium size national operators (such as Cesa, Rapidão Cometa and Wilson Sons). Cesa and Rapidão Cometa first began providing road



freight transportation services, ALL Logística provided rail services, and Wilson Sons originated in ocean support services. The small-package delivery market is ruled by Empresa Brasileira de Correios, a Brazilian state-owned company of mail delivery.

By far, the logistics activity with the highest amount of outsourcing is transportation, due to the ease of service accessibility and low costs. Customs dispatch and risk management of transportation activities come next as the second and third most outsourced elements. The major increase in outsourcing took place between 2001 and 2004; in 2008 the trend is of a surge in the demand for service efficiency. The infrastructure deficiencies, complex tax system, and absence of a specialized labor force act to slow down the implementation of more sophisticated logistics solutions.

D. Logistics and supply chain management opportunities and Trends

The application of concepts such as integrated logistics and supply chain management are quite recent in Brazil. They first emerged in the 1990s, during the privatization and stabilization of an economy which had suffered, hyper inflation, for almost a decade. The early adopters of the new concepts were the distributor wholesalers, large supermarket networks, car makers, and manufacturers of packaged consumer goods. Considering the little time elapsed since these concepts first arrived in Brazil, the opportunity for improvement is very high, particularly for the implementation of information technology and collaboration processes. Improvements for transportation and warehousing infrastructure, as well as improved, specialized human resources will certainly contribute to the strengthening and continued progress of the improvements already in place. Today, the state of the art in use of logistics and supply chain management techniques lies with companies that belong to those early adopters' sectors.

One of the main trends for logistics and supply chain management is the growing concern about tracking and improving the quality of logistics services. As customer service garners interest and improvements, logistics performance increases as well. The second important trend among Brazilian companies is the attempt of large shippers to change the mix of modes used, moving from the strongly concentrated road transportation system, instead increasingly favoring the use of rail and waterborne modes, with particular attention to ocean freight. In order to do that, Brazil has to face the challenges of developing logistics infrastructure quality and availability.

Section I. Country and Regional Characteristics

I.1. Country Overview

Brazil enjoys unique challenges being the largest country in Latin America, and fifth in the world in total area (8.5 million km²). It boasts a 14,691 km border facing almost all of the other Latin American countries except for Chile and Ecuador. There are, however, certain transportation challenges associated with a territory of this size, such as the challenges accessing a number of countries due to geographic features like the Amazon rainforest located in the North.

The capital of the country is Brasília, and the largest cities are: São Paulo (population of 10.9 million), Rio de Janeiro (population of 6.1 million), Salvador (population of 2.9 million), and Belo Horizonte (population of 2.4 million). Its 187.5 million inhabitants¹ are concentrated in the Southeast, South, and Northeast corners of the country, with the Northern and West-Central regions being the least populated.

The prevailing climate throughout most of the country is tropical, equatorial in the Northeastern region, and subtropical in the Southern region. Despite the great geographic, economic, and social diversity presented, the country displays extraordinary national unity based on the official language, Portuguese, which is spoken throughout the regions. Annual GDP is \$1.314 trillion US, with approximately 58% concentrated in the Southeast.

1.2. Business and Regulatory Environments

The country is made up of 26 states, in addition to a federal district. The government is a presidential republic. Despite the large number of political parties, there is traditionally weak political party loyalty, as there is no legal mechanism which protects it.

In the early 1990s, the state’s role in the economy underwent revision. In 1995, constitutional changes allowed private companies the possibility to offer public services. The opening of infrastructure sectors to private companies gave the entrepreneurial state the role of controller, establishing a new institutional structure comprised of regulatory agencies. These agencies attempt to frame the market so that newly privatized operations follow predefined rules, stimulate competition, and ensure citizens the services envisaged in the Constitution.

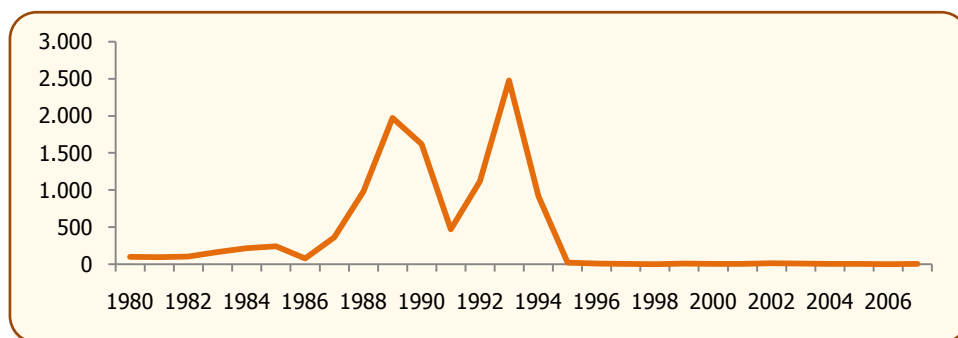
The agencies focus on a variety of elements such as concession and inspection; establishment of rules and procedures; judgments; penalty enforcement; and contracting and obligation interpretation. The two main regulating agencies in the transportation sector were set up in 2001: Agência Nacional de Transportes Terrestres (The National Land Transport Agency or ANTT) and Agência Nacional de Transportes Aquaviários (The National Waterborne Transport Agency or ANTAQ). ANTT performs a regulatory and inspection role for the land modes (railroad and highway), implements the policies formulated by the Ministry of Transportation, and qualifies multimodal transport operators (OTMs). On the other hand, ANTAQ is in charge of regulating and inspecting navigation and ports. Air transport is regulated by Agência Nacional de Aviação Civil (The National Civil Aviation Agency or ANAC), and pipelines are controlled by the Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (National Petroleum, Natural Gas, and Biofuels Agency or ANP).

1.3. State of the Economy

Brazil is one of the few emerging countries which presents favorable conditions for growth in the coming decades. In addition to having the largest and most modern industrial park in Latin America, it also boasts iron and manganese reserves, enormous agricultural potential (soy, sugar cane, etc.), and one of the highest levels of meat production in the world (beef and chicken). Its economy is fifteenth in the world and the largest part of its 2007 exports (66%) was comprised of manufactured and semi manufactured products.²

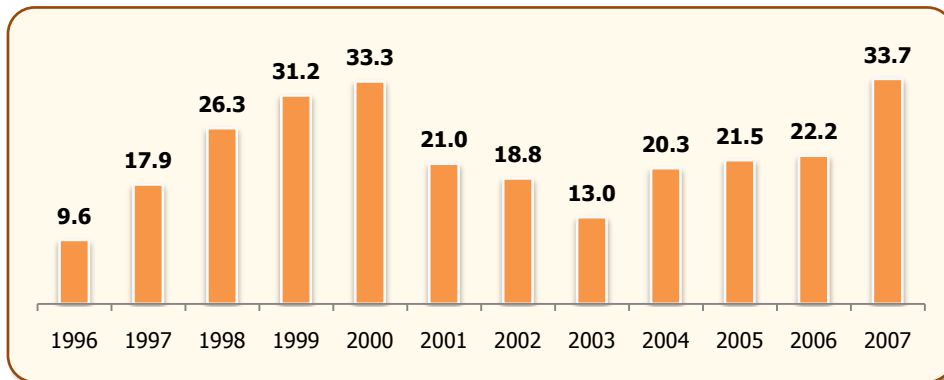
A major economic benchmark was the Plano Real implementation of 1994, which promoted economic stability with a significant decrease in inflation rates, leading to mass optimism ushering in investment buy-backs (to meet consumer demand growth) and expanded foreign capital investment.

Figure I.1: Brazil’s Inflation (IPCA) – Annual (%)



Source: Instituto de Pesquisa Econômica Aplicada (Institute of Applied Economic Research or IPEA)

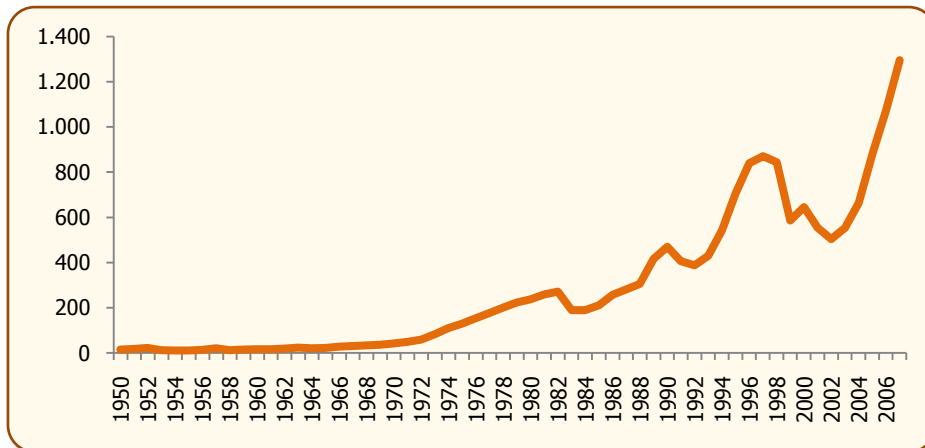
Figure I.2: Foreign Investment in Brazil (billion US\$)



Source: Banco Central do Brasil (BCB)

The economy in 2004 displayed the first signs of balancing out. The GDP was at \$750 billion US and presented a growth of 5.2% over the previous year. This increase was led by the industrial sector (with growth at 6.4%) and was marked by a strong uptake in domestic demand. In 2007 the GDP was \$1.314 trillion US and presented a growth of 5.4% over the previous year.

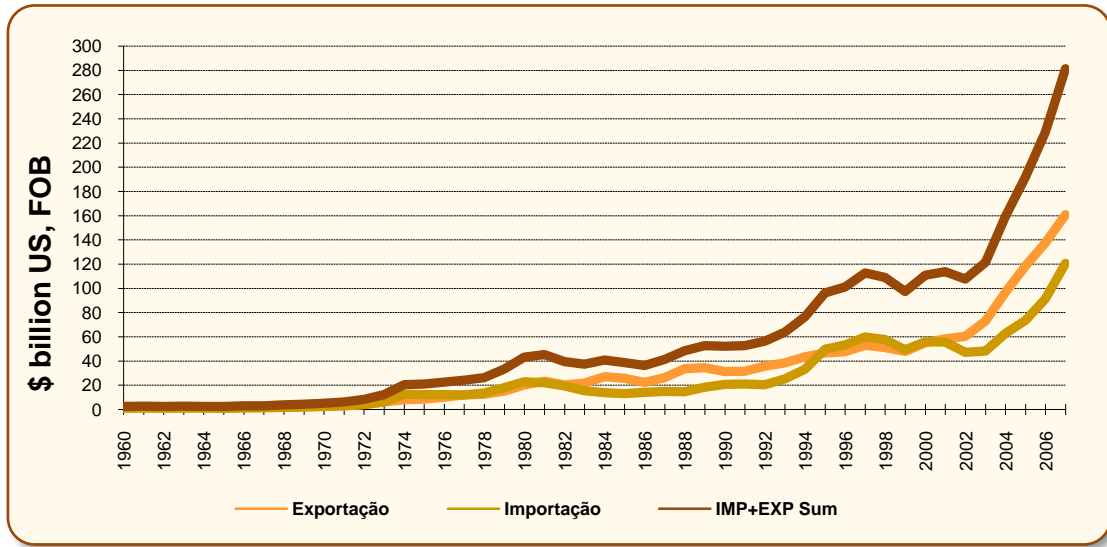
Figure I.3: Brazil's Annual GDP



Source: Ministério do Desenvolvimento, Indústria e Comércio Exterior (Ministry of Development, Industry, and Foreign Trade or MDIC)

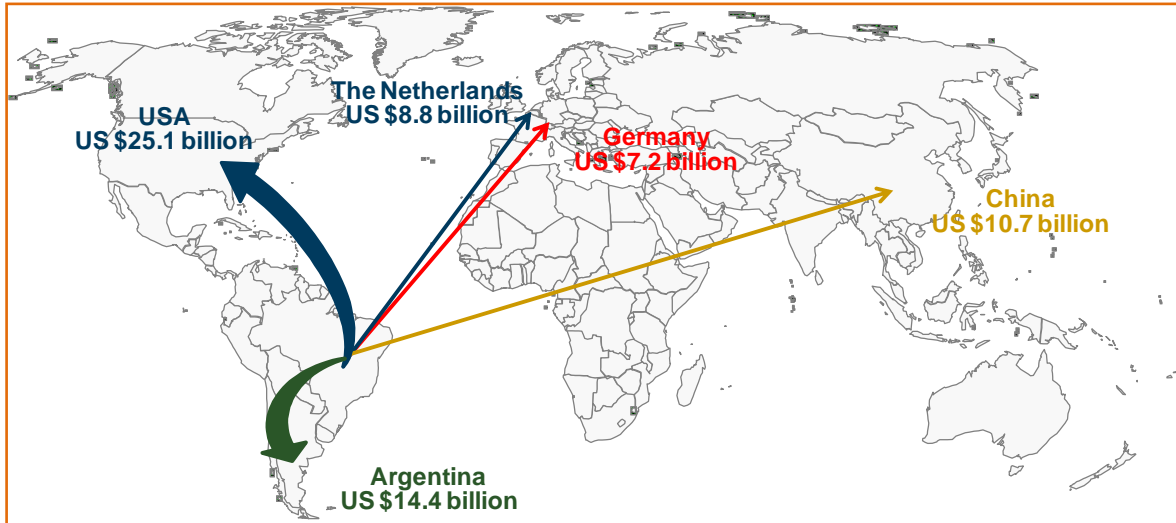
Regarding external performance, the surplus was \$40.0 billion US in 2007 and total trade flow was \$281 billion US in 2007, demonstrating the improved foothold that the Brazilian economy has been acquiring in the world market. Foreign trade growth has quickened its pace in the last few years. From 1999 to 2004, Brazil increased exports by 101% whereas growth reached 166% from 2002 to 2007, for a total of \$161 billion US in 2007.⁴

Figure I.4: Brazilian Trade Flow from 1960 to 2004 (in billion dollars, FOB)



Source: Ministério do Desenvolvimento, Indústria e Comércio Exterior (Ministry of Development, Industry and Foreign Trade or MDIC)

Figure I.5: Major Destinations of Brazilian Exports in 2007



Source: Ministério do Desenvolvimento, Indústria e Comércio Exterior (Ministry of Development, Industry, and Foreign Trade or MDIC)



Section II. Logistics and Supply Chain Infrastructure

II.1. Transportation Infrastructure

Despite Brazil being a continent-sized country, its transportation network is limited and is concentrated in the Southern and Southeastern regions along the coast of the country. This is due to the fact that the Brazilian population and, therefore, the largest cities and urban centers in the country, are mostly concentrated in these same regions. The river network, however, has especially developed in the Amazon region, making use of the area's extensive water resources and the lack of road and rail in the region.

The fast growth of Brazilian exports and economic growth in the recent years has made critical the issue of freight transportation infrastructure, which is at capacity and has already begun to hinder the international competitiveness of Brazilian products. Without a strong and immediate investment program, the transport system runs the risk of collapse.

The current transportation infrastructure was built in the mid-19th century and has begun to expand during the last few decades. Highways, waterways, harbors, and airports were installed by the public sector. In the case of rail, it was initially installed by the private sector and later absorbed by the government, until it was again transitioned to the private sector in the second half of the 1990s. Privatizations have brought improvements to the infrastructure and transportation sector, especially to harbors and railroads.

In addition to these privatization-related improvements, there are more improvements expected as a result of the recent initiative passed by the Brazilian Congress, known as a public-private partnership (PPP). The partnership consists of an investment portfolio provided by the Brazilian government performed in collaboration with private initiatives. The government is responsible for the economic feasibility of the sector, through subsidies from the national treasury. The first sectors to benefit are transportation, waterways, and irrigation.

II.1.1. Highways

Highway transport showcases a series of positive features such as flexibility, availability, and speed. However, when compared to other modes, it bears limitations such as low productivity, low energy efficiency, and low safety indices.

According to the last surveys by ANTT in 2008, Brazil had a fleet of 1.82 million cargo vehicles, averaging 16 years of age. About 56% of this fleet belonged to self-employed truck drivers, explaining the large fragmentation of the sector and the generalized predatory practices (such as excessive vehicle weight, excessive speed, poor vehicle maintenance, and continued use of depreciated vehicles).

Figure 3.1 presents the general evaluation of federal highways, according to the Confederação Nacional do Transporte (National Transportation Council or CNT). Only 26% of the highways are in excellent or good condition, these are mostly concentrated in the Southeast—the region with the greatest rate of development.

The government views the maintenance of the existing network as a priority, to assure its good working condition and allow the continued, fast, and safe circulation of goods. Although repair work is expected on existing highways, budget cuts often restrict and even prevent the execution of the planned investments. Such situations can be greatly improved through PPP investment.

Figure II.1: Map of Brazilian Highways



Source: 2007 CNT Highway Research Analysis

II.1.2. Rail

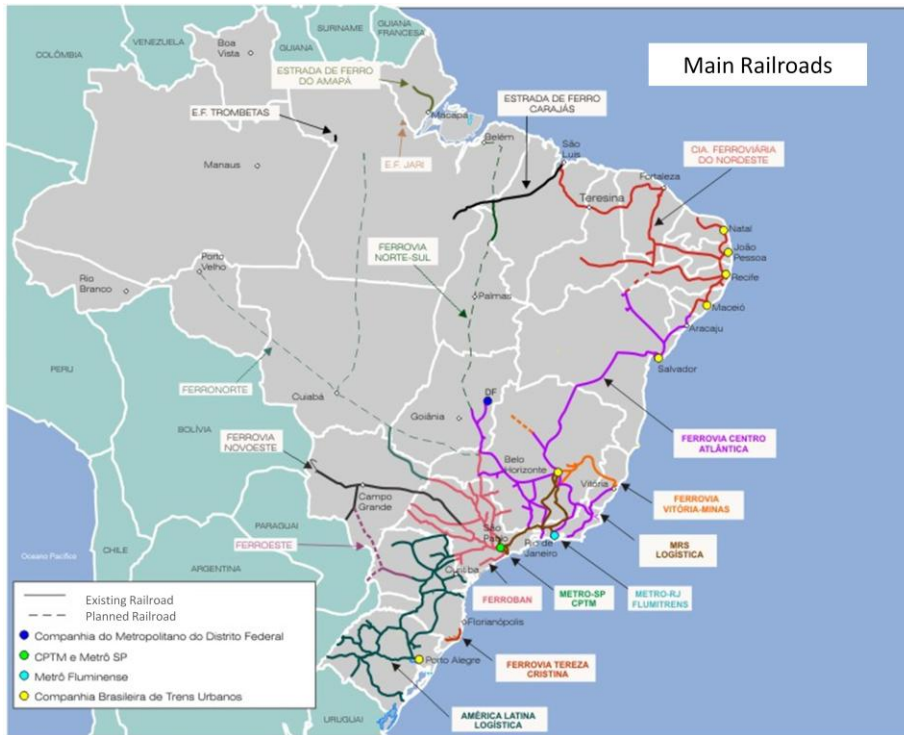
Brazilian railroads purport about 29,000 kilometers of traffic lines. Almost half of the railroad network is concentrated in three states: São Paulo, Minas Gerais, and Rio Grande do Sul. These lines essentially move raw materials: iron ore, petrochemicals, grains, and steel products. Although the predominant railway gauge is 1.0 meter, there are also 1.6 meter gauges, hindering the integration of traffic between railroad stretches.

Brazil has 12 railroad networks handled by 11 concession holders, which translates into 96% of the total rail network. After privatization, statistics pointed to important improvements through concession holder investments.

From 2001 to 2006, the freight volume carried by railroads grew by 47%, from 162 billion to 238 billion ton-kilometers. In the same period, the number of accidents reduced by 52%.⁵

The number of wagons and locomotives has also increased considerably in this period. The challenge now, however, is to improve the quality and enlarge the railroad network, that need to be duplicated and expanded in order to support the Brazilian economic growth.

Figure II.2: Map of Brazilian Railroads

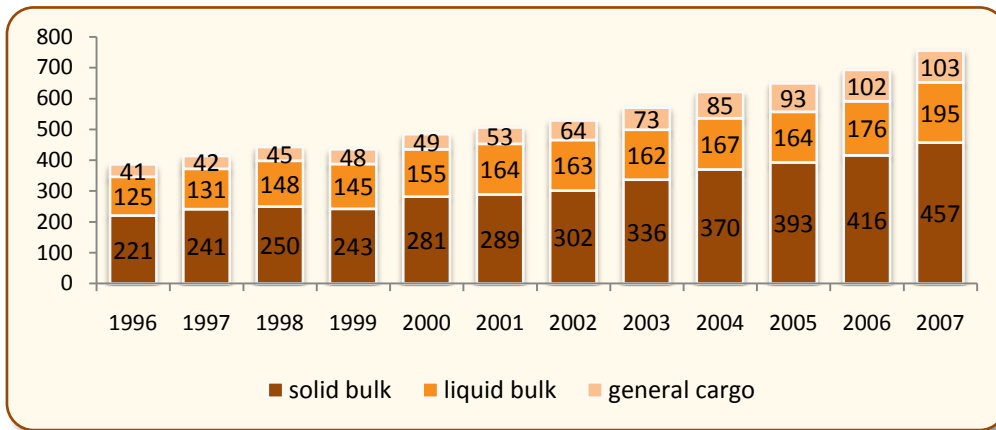


Source: Ministry of Transportation—Brazil

II.1.3. Water

Brazil is a very rich country in terms of water resources. The Brazilian Atlantic coast boasts 7,367 kilometers in addition to 43 thousand kilometers of navigable rivers. Brazil bears a vast hydrographic network subdivided into a series of basins. There are 26 thousand kilometers of internal navigable waterways, with a potential for use of an additional 17 thousand kilometers. In spite of having plenty of waterways, inland navigation represents only 1% of the total cargo moved in the country, pointing to potential far beyond what is currently being utilized. The Amazon basin is the most important water body in volume. Concerning maritime navigation, Brazil moved through its ports system 754 million tons in 2007 (103 million tons of general cargo, 195 million tons of liquid bulk and 457 million tons of solid bulk). Comparing to 2004, there was a growth of 22%, mostly solid bulk. Specifically in the coastal navigation, the general cargo segment displays strong growth: in the period ranging from 2004 to 2007, only container transport displayed an increase of 25% in the total tonnage moved with this type of mode.

Figure II.3: Cargo Movement in Brazilian Ports (million tons)



Source: ANTAQ

In Brazil, there are 46 ports and 124 private terminals.

Figure II.4: Map of Main Brazilian Harbors



Source: ANTAQ

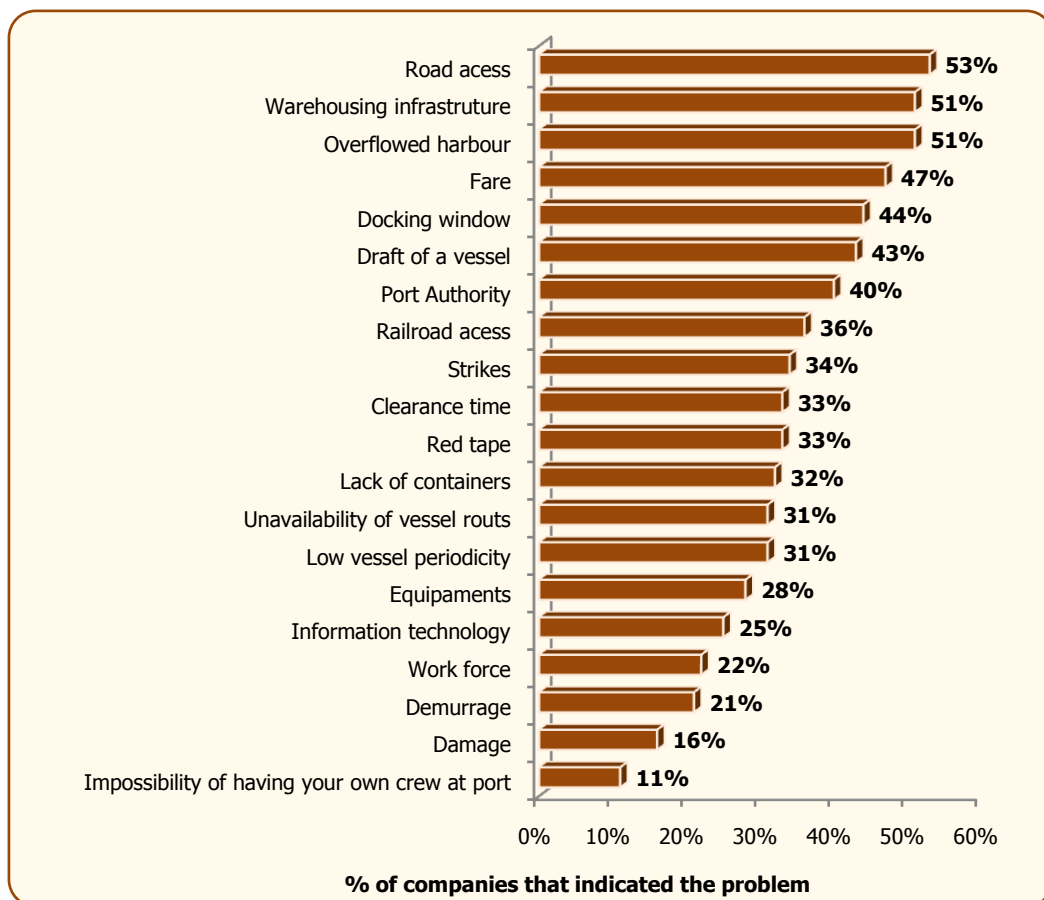
Until the beginning of the 1990s, the Brazilian port sector was controlled, either directly or indirectly, by the federal government. This centralization generated a highly bureaucratic and low-efficiency environment, leading to high costs.

The process of leasing part of the harbor terminals to private interests started in 1997, thereby generating competition between and within the harbors as the cargo and ship owners began to enjoy a wider selection of terminals to operate from.

As a consequence of the harbor modernization effort, an improvement in total volume throughput and better performance indicators in harbors were evident.

Harbor operations displayed significant improvements following privatizations, but there is still a lot of improvement needed. Shipping companies point to road access to harbor and warehousing infrastructure as two of the main port problems in Brazil.

Figure II.5: Brazilian Major Harbor Problems



Source: Logistics Panorama – Analysis and Evaluation of Brazilian Ports 2008 – CEL/COPPEAD

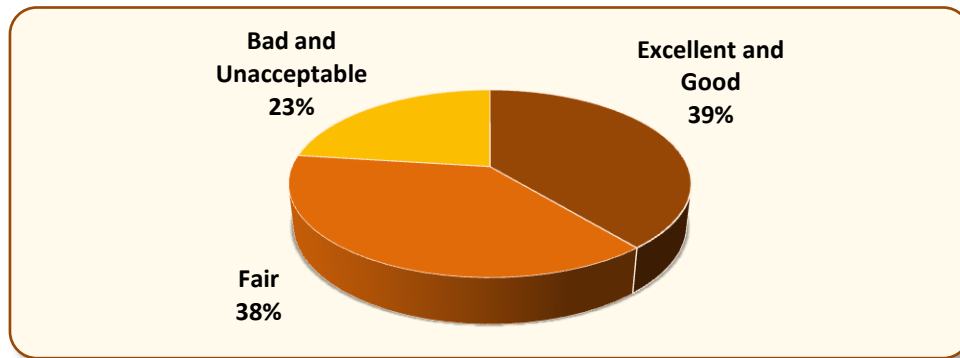
II.1.4. Air

Guarulhos airport, in the city of São Paulo, is the busiest one in the country regarding cargo transportation: this airport transported about 500 thousand tons in 2007.

Infraero is a public agency responsible for managing, renovating, building, and equipping the major Brazilian airports.

Research carried out by CEL/COPPEAD in 2005 found out that 68% of the largest Brazilian companies importing and exporting goods use airborne cargo. The opinion of those companies on the current situation of the airborne modal is shown in Figure 3.5.

Figure II.6: Opinion about the quality of cargo airports in Brazil (% of answers)



Source: Logistics Panorama – Logistics and International Trade 2005 – CEL/COPPEAD

Figure II.7: Major Air Cargo Terminals (INFRAERO operated)



Source: Infraero and CEL/COPPEAD



II.2. Warehousing

Brazilian warehouses are mostly dedicated to the operation of a single company either through direct ownership or through a lease.

Despite being initially few, modern warehouses featuring advanced physical structures and technology have been growing very quickly. Such warehouses are structured with robust information systems, operating in conjunction with modern cargo-handling equipment such as trans-elevator systems and automatic sorting equipment. These warehouses tend to be of exclusive use to the industrial and commercial enterprises which have invested in them, and are comparable to international state-of-the-art expectations.

The use of mixed or public warehouses, instead of owned warehouses, is not as common in Brazil. This type of shared warehousing occurs more frequently for goods intended to or coming from international trade, where the products are stored in customs facilities at the ports or dry ports.

Brazil has 63 dry ports, particularly in the Southeast,⁶ the region with highest rates of economic development. The total warehousing area corresponds to about 6 million square meters.

Finally, it can be noted that mixed warehousing is mainly serviced by logistics operators acting within Brazil. The country's 3PLs, or at least a very high percentage of them, have at least one warehouse of their own, be it indoor or outdoor facilities, refrigerated or not, or with customs facilities (dry port) or not.⁷

II.3. Foreign Trade

In the last few years, Brazil has considerably increased the volume moved in international trade, particularly exports. This increase in external sales also increases the demand for logistics infrastructure used for the outflow and reception of goods traded. This accelerated increase highlights the logistics bottlenecks that cause consequences such as delays in outflow and increase in transportation costs.

When evaluating what the main logistics challenges in the country are, the largest exporting and importing companies acting in Brazil indicated that worker strikes and bureaucracy are the main bottlenecks to efficient foreign trade.⁸ This also has an important impact to efficiency levels for the transportation of products in the international market through Brazilian ports, many of which are in dire need of infrastructural improvements.

It is important to note that the different companies profiled in the survey face different challenges depending on where they are in the country. Companies that transport bulk products deal with large amounts of goods and need solid infrastructure to keep up with the outflow of production, both in internal transportation and in ports. On the other hand, companies transporting products in containers need agility to keep costs in check and to provide added value to the products in stock. These differences are reflected as critical challenges on the road to international trade.

II.4. Third Party Development

Outsourcing of logistics activities is an alternative that allows a company to focus on its core business, and at the same time achieve effective cost reduction and improved customer service.

Transportation is the most outsourced of the logistics activities among Brazilian companies, at a rate greater than 92.3%. Other activities, such as customs dispatch and risk management of transportation activities, although at lower rates, present a significant outsourcing rate at just over 79%. Logistics services providers still has to bear threats such as transportation and warehousing bottlenecks, as well as integration difficulties between the various modes.

Correios, the Brazilian Post Office, is the main body responsible for national and international postal services in the country. Its service network is present in all 5,561 municipalities across the country with branches serving over 99% of the population through further sub-structures that supply about 80% of Brazilian homes.

The diversity and flexibility of services supplied by the post office categorize it as an ever improving logistics operation. The company offers products such as Sedex 10 (express service) and the Exporta Fácil (export service).

Section III. Decision-Making Rules

III.1. How the Country’s Logistics Infrastructure Impacts Decision Making

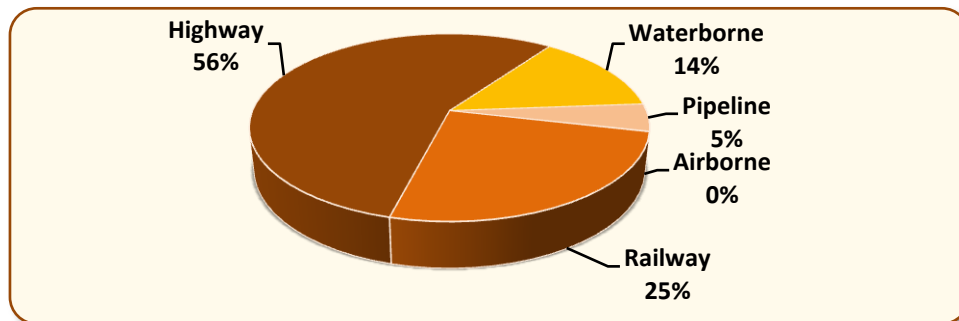
Companies operating in Brazil strive to adapt their logistics decisions to infrastructure conditions, the economy, and the Brazilian political and regulatory environments.

III.1.1. Transportation decisions

Brazil is a country strongly dependent on its road infrastructure. The first option for most of the companies hiring transport services is usually road freight, and it is easy to see why: high availability, low costs, and insufficient supply of other modes.

Historically, the integration of the country was based on the construction of highways, while the construction of railroads and development of waterways was instead aimed at meeting specific projects for out flowing cargo, particularly towards moving exports from the ports. Currently the paved highway network is around 5 times larger than the railroad network. When considering all types of highways, the size is over 50 times as large as the rail system. In its turn, the waterway system is underused due to a lack of needed investment to improve navigability.

Figure III.1: Brazilian Transportation Matrix (TKU)



Source: Logistics Panorama–Logistics Cost in Brazil 2008/2006

Besides the expansive difference between the highway network and the other modes of transportation, the high supply of highway transportation services is another factor which has greatly contributed to the increase in availability of this transport mode over all the others. There is a very high number of self-employed truck drivers who, together with the transportation companies, increase total supply of road freight services. In a country where the minimum monthly wage is of about \$300 US, this type of occupation becomes attractive due to the ease with which one can enter into it.

In order to survive among the numerous competitors, many self-employed drivers sometimes charge for only a portion of the total freight cost, such as fuel and tires, disregarding certain fixed costs such as depreciation of vehicle and the cost of capital. In order to recover a portion of the total cost, the practice of driving for periods longer than

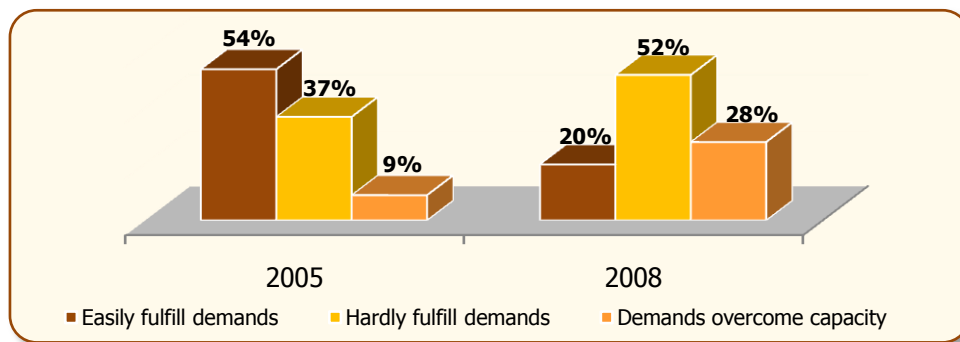
12 hours is common in addition to transporting cargo at weights well above legal limits. All these practices, together with the poor conditions of alternative modes like railroads, lead to predatory competition and to the decrease in quality and safety of highway transportation.

Although one could view low cost as an advantage to competition, it has started to promote practices such as low fleet renewals, reduced truck maintenance, illegally overloaded vehicles, and excessive driver overtime.

From the viewpoint of shipping companies, however, the high availability and the low prices make the choice of road freight the most advantageous decision among the different modes, with potential for further price reductions when negotiating and leveraging bargaining power.

However, in 2008, this landscape of high offer and low prices in roadway transportation, has been changing in Brazil. The economic growth has increased the demand for transportation services, boasting the pressure for a raise in roadway freight price to the fact that the transportation companies are starting to lose capacity to fill their client orders.

Figure III.2: Can The Carrier Fulfill All Demands?



Source: CEL/COPPEAD research 2008 (65 important carriers)

Another important issue that should be highlighted is about taxes in Brazil. From the 74 tax-funded government programs that exist in the country, four of them directly affect logistics decisions: The Contribution for the Financing of Social Security (COFINS), Social Integration Program (PIS), Tax on Services of Any Nature (ISS), and Tax on Circulation of Goods and Services (ICMS). The last one is also the one that affects logistics operations the most.

Since ICMS has 27 different versions, one for each state, and specific to different products, the Brazilian tax system directly influences logistics networks. Many times this translates into “circling” freight, or driving around with the freight to increase freight costs but to lower total cost, since it results in lower taxes.

When it comes to highway transportation, it is also relevant to approach the safety issues. According to the National Association of Cargo Transportation (NTC), in 2006 there were 11.4 thousand reports of theft taking place on highways and urban areas, generating losses estimated at \$326 million US. In order to avoid theft, risk management companies and insurance, escort and GPS services have emerged and are being increasingly used. The need to reduce and even avoid thefts and robberies—especially those affecting high value cargo—has boosted the use of satellite tracking systems on trucks and of tracking support equipment in order to improve the tracking of logistics flows throughout the order cycle.

The Brazilian government created a commission charged with the reduction of highway cargo thefts, and as a result of their efforts several groups, specialized in this sort of illicit activity, have been apprehended. Besides the



prevention of cargo theft, the reduction in roadway accidents has become a big concern to the companies. In Brazil 36% of the roadway accidents involve trucks.

When it comes to particular segments, such as bulk cargo (including ores such as iron, and grains such as soy) that enjoy large export volumes, the use of railroads and waterways becomes a priority over highway transportation. The reason is clearly the high volume these sectors generate, rendering the railroad and waterway modes far more competitive. One should remember that Brazilian railroads were built to connect the interior with ports that were mostly dedicated to export. In case of one throughput, the existing railroad network is quite appropriate. There are partially dedicated lines as well as flow integration with harbors and ships, that create an extremely efficient and controlled environment. When it comes to the transportation of grains and other kinds of bulk goods—products that would theoretically better lend themselves to railroads and waterways—we can observe a move to the highway system, even in long-distance routes, and especially during harvest periods when volume is at an all time high.

Coastal navigation has grown substantially in recent years, and yet it is facing some serious challenges in its development. Brazil has a large Atlantic coast, but with a strong industrial concentration in the southeast. There is an evident imbalance in the cargo volume transported from the South to the North versus what is transported from the North to the South. Container volume moved to the coast is almost four times greater than that moved from the coast, thereby hindering vessel optimization.

The decision to look for alternatives to the highway mode is becoming more common among shippers. Some shippers are in the process of testing new, specific product offerings, while others have already adopted different modes for outflow to ports or transfers between plants. On the other hand, companies providing railroad and waterway transportation services have been looking to attract new clients and develop new products to increase their market share in the road freight market. An activity that has succeeded in increasing market share for railroad concession holders is the adoption of a pricing structure and policy based on discounts on road freight prices. Other activities include more express trains dedicated to container movement, door-to-door services, online cargo tracking, higher-capacity railroad cars and locomotives, and improved levels of customer service. Regarding coastal navigation, ship owners invest in increased vessel stopovers at ports, and continue their search for new clients. Similarly, harbor terminals show increased investment in equipment and technology, with the main goal of improving operational efficiency.

III.1.2. Inventory decisions

Until 1994, Brazil went through a period of very high inflation which strongly influenced the inventory acquisition and maintenance policies of companies. The high, inflationary prices created great incentives for the speculation on inventory, at the expense of operational efficiency practices. The return on investment from inventory speculation turned out to more than exceed the operational inefficiencies generated by these speculative policies. Merchandise could quickly appreciate in value, at a higher rate than the cost of keeping it in stock. However, the inflation control plan adopted by the government in 1994 changed the economic environment, and companies had to begin to deal with low inflation, high interest rates, and increased opportunity costs. Reduced inventory levels became a constant goal for companies, as they began to face their inventories as a cost-generating factor, instead of a speculative investment.

However, it wasn't only the economic environment pressing companies to reduce their assets. The country's logistics infrastructure and regulatory environment also affected company decisions. In response to the research presented by the COPPEAD Center for Logistics Studies,⁹ 47% of the country's largest exporting companies reported they needed to keep additional inventory as protection against inefficiencies in the transportation sector, some of which include delays, accidents, theft, and strikes.

Thus, Brazilian companies experience contradictory pressures where they are asked to reduce and increase their inventory levels. In 2006 fixed inventory value was \$132 billion US, or 12.3% of the Brazilian GDP.

III.1.3. Warehousing decisions

The country’s companies coexist along with a trend towards increased complexity in warehousing operations. Such a trend stems mainly from the growing diversification of products supplied by companies and a pertinent increase in the number of SKUs to be managed, in addition to changes in order profile (becoming ever smaller and frequent). Research shows that the number of SKUs influences several decisions related to warehousing, among which are warehousing space and staffing. It was further observed that the higher the number of SKUs, the higher the number of stacking levels used. In turn, the number of orders issued per day also increases system complexity, leading companies to search for more robust picking structures and systems, such as the use of flow racks and light-directed picking.

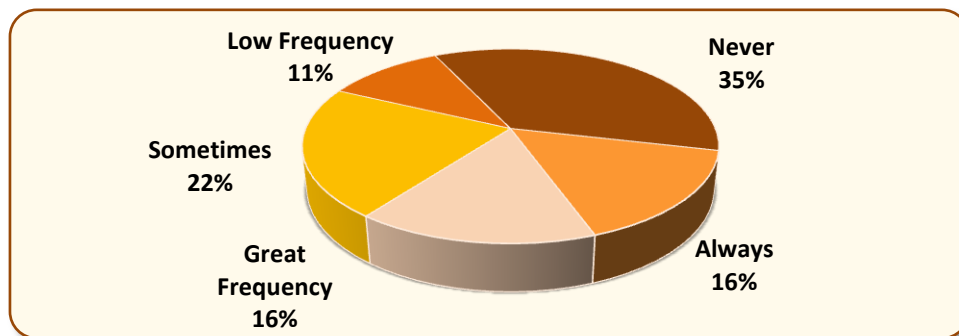
Some of the more evident trends among large Brazilian companies—and more so in the retailing sector—have been a reduction in the number of warehouses and the centralization of inventories in large distribution centers. With these, central warehouses, operations have become much more complex, triggering the adoption of leading edge technology in both equipment and warehousing management systems (WMS). When some distribution centers started processing over 15,000 orders a day, WMS were implemented and advanced equipment was added to increase agility in handling products.

Although WMS use is prevalent among larger companies, depending on the complexity of the operation, only basic routines are typically implemented. Therefore, the most common decision among large companies is the use of pallet-bearing structures in 4 stacking levels. These have become popular due to land costs being as low as they are in the country, in relation to the cost of technology or the cost of capital used as fixed assets in equipment.

Another interesting example that relates to warehousing decisions is the fuel distribution market. The major players in this sector share warehousing to optimize the use of tanks and generate gains for all participating companies.

Also related to the use of public or mixed warehouses is the use of dry ports by companies involved in international trade. The chart below shows that 50% of the largest importer and exporter companies use dry ports, of which 45% consider the service to be good or excellent, 43% regular, and 12% poor or very poor. In general, dry ports are more often used in importing operations (70%) than exporting operations (30%)¹⁰. One of the main advantages for importers is the gradual nationalization of the products acquired from foreign countries. In this case, the taxes are paid in installments as the products get picked up from the warehouse.

Figure III.5: Frequency of Dry Ports Use (% of answers)



Source: Logistics Panorama – Logistics and International Trade 2005 – CEL/COPPEAD

Finally, it is important to highlight that the more challenging aspects of warehousing are increasingly being outsourced by shippers. Statistics already prove this as 64% of large Brazilian companies outsourced in whole or in part their warehousing in 2008, and estimate that 22% will increase participation of 3PLs in warehousing operations in the next 3 years.¹¹

III.1.4. Selecting the location for factories and distribution centers

When it comes to company decisions on where to locate factories and distribution centers, it is important to point out that there is a high concentration of population and industrial areas in the southeast. São Paulo alone is responsible for approximately 38% of domestic production, and is where most industries locate their headquarters.

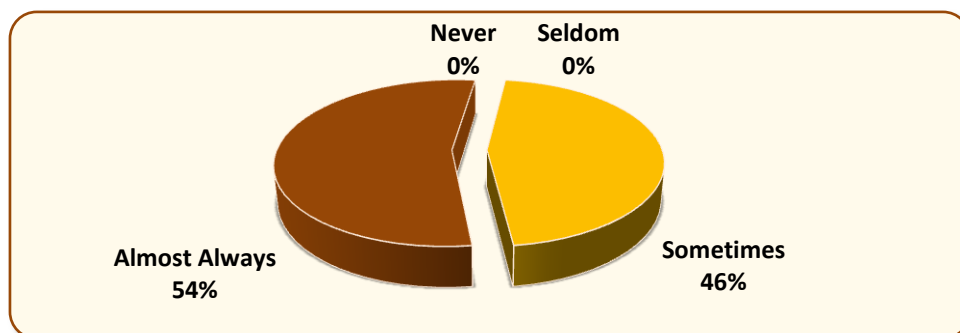
Some government policies encourage investment in less developed regions. This can lead to suggesting plant and distribution center locations in areas which would not make for efficient logistics. Tax reductions influence company decisions, and this is very evident in the Zona Franca de Manaus (the Manaus Free Trade Zone), in the capital of the State of Amazonas. In this area, exemptions and discounts are granted on the major taxes that are typically levied on production and marketing. Currently the region is close to 10,000 square kilometers and hosts several plants, particularly electronics.

However, what should be an incentive to development in certain regions of the country frequently brings losses with the so-called tax war among states. Such is the case with the ICMS tax (value added tax on sales and services), which varies depending on which state you are in and on whether the transaction was inter-state or intra-state. The difference between rates encourages companies to spend more on transportation via merchandise “rides” through states that are not the final destination. Depending on the origin and on the final destination of the goods, the additional expenditures are more than compensated with the reduction in total ICMS taxes owed.

The government has looked into the implementation of a new tax structure that would help prevent such practices. Although discussion and proposals for alternatives are being offered, there is no timeline for adoption due to resistance from state governments, which rely on the incentives to attract new investments.

In short, the fact that the tax issue exerts strong influence on logistics decisions is further reinforced by the fact that companies have made routing and location decisions, which resulted in higher operational costs, with the sole purpose of securing tax advantages. The following chart reveals how logistics projects are modified to receive tax benefits.

Figure III.6: How Tax Benefits Change Logistics Projects

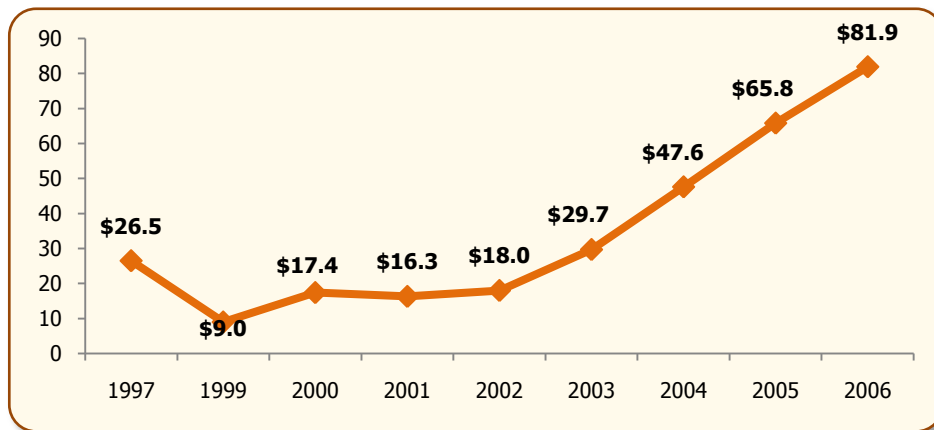


Source: Logistics Panorama – Logistics and International Trade 2005 – CEL/COPPEAD

III.1.5. Outsourcing decisions

Research¹² conducted on major industrial and commercial companies in Brazil has shown that an average of 63% of logistics expenses is directed to logistics service providers. For the last seven or eight years, the logistics services supply has been marked by the accelerated increase and development of logistics service providers (3PLs).

Figure III.8: Gross Average Revenue per year by Brazilian 3PLs (million US\$)



Source: Tecnológica (years 1997, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006 e 2007); Analysis CEL/COPPEAD

The logistics activity with the greatest rate of outsourcing is transportation. Ninety four percent of shippers delegate entirely or partially their transportation activities to third parties. One of the main reasons for the high rate of outsourcing is the great supply and the low prices of truck freight. Another important factor is the need for greater return on capital through the reduction of investment in self-owned vehicles.

The degree of use of outsourcing services for import and export is also very high. Eighty two percent of the largest exporters and importers in the country use logistics service providers to help in foreign-trade related activities, such as customs clearance and contracting of international transportation.¹³ One of the major reasons for this amount of outsourcing is the complexity of Brazilian bureaucracy and international requirements.

Endnotes

- 1 Brazilian Geography and Statistics Institute (IBGE) estimate
- 2, 3, 4 Ministry of Development, Industry and Foreign Trade (MDIC)
- 5 National Land Transport Agency (ANTT)
- 6 Revista Tecnológica (2008)
- 7 National Land Transport Agency (ANTT)
- 8, 9 Logistics Panorama (2005). Logistics and International Trade. CEL/COPPEAD.
- 10 Revista Tecnológica (May 2005). CEL/COPPEAD.
- 11 Logistics Panorama (2008). Logistics Outsourcing in Brazil. CEL/COPPEAD.
- 12 Revista Tecnológica (May 2005). CEL/COPPEAD.
- 13 Logistics Panorama (2008). Logistics Outsourcing in Brazil. CEL/COPPEAD.



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