Tax elimination on terminal handling charges of the sectoral importers: assessing the economic effects in Brazil

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Abstract

In Brazil, the terminal handling charges (THC) or wharfage services at destination for import cargo occurs between the unloading of the goods in the national territory and the customs clearance. This rate inflates the customs value of imported products and the basis for charging all imports on Brazilian imports. Incompatible with the rules of the World Trade Organization (WTO), this practice distorts the competitive trends of Brazilian sectors in the domestic and foreign markets, whose concern is recurrent of the Brazilian commercial policy. Our study contributes to this debate in course and analyzes the economic impacts of THC in the calculation basis for the incidence of taxes. We estimated the annual average THC and simulate their removal in Brazilian import values from a SAM and R&D based computable general equilibrium (CGE) model. With policy change, the main findings indicate the Brazilian economy would become more industrialized and with greater technological intensity in the long run. Investment in physical capital and R&D would grow, while the export and foreign trade agenda would become more diversified in manufactured goods, even with the greater penetration of imports. The expansion of the private sector would ease future dependence on the public sector in the generation of knowledge and physical capital.

Keywords: Tax policy; Imports; Brazilian ports; Economic Impacts; dynamic CGE model.
JEL Code: C68; H25; R40; R48.

1 Background

In the last five decades, trade liberalization, the development and diffusion of new communication technologies and the improvements and modernization of logistical processes have reduced the natural barriers of international trade and enabled the global fragmentation of production processes. These transformations in the world scenario have driven greater productive and commercial integration between certain world

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economies and increased the spatial coverage of public and private decision-making. In the same way, productive globalization and the expansion of foreign trade contributed to the development of an extensive and complex network of supply and goods chains, which connect distant production sites with various points of demand throughout the world (Athreye et al. Cantwell, 2007; Betarelli Junior et al., 2020; Harvey, 1989; Lam and Shiu, 2010; Mallidis et al., 2012; Meersman et al., 2016; Meersman and Van de Voorde, 2013). Trade relations between world economies have come to depend not only on the levels of competitiveness of domestic productive activities and on trade agreements that permeate tariff and non-tariff changes (e.g. sanitary, phytosanitary and customs measures), but also on functionality, efficiency and of the tariff costs charged in maritime and port cargo operations in the face of growing logistical requirements. Evidence, such as de Sánchez et al. (2003) point out, for example, that small changes with port costs and the productivity of the sector can make a difference to competitiveness in the world market.

In this scenario of business globalization, the issue of trade facilitation emerges in a worldwide trend of reducing tariff and non-tariff barriers, which encompasses all direct and indirect costs generated in the import and export operations of a port system. The Trade Facilitation Agreement (FTA) itself, negotiated by more than 150 countries at the IX Ministerial Conference of the World Trade Organization (WTO), between December 3 and 7, 2013, is evidence of the recurrent concern to sign commitments that can reduce the costs associated with the trade of goods through customs offices around the world, such as simplifying and reducing bureaucracy of procedures and eliminating measures that distort the competitiveness of traded products (Dong and Meyers, 2014). In less developed countries, such as Brazil, an elimination of policies that can remove these barriers on imported goods, especially in port operations, can enable the production of domestic sectors, generate productivity gains by reducing the costs of imported inputs and even even absorb and diffuse advanced technologies. Some economic sectors, more intensive in technology and imported inputs, would start investing more in physical capital and research and development (R&D), contributing to an improvement in private participation in the composition of the country's technological core. In countries with insufficient domestic supply of inputs to meet the process of physical capital formation, the facilitation of imports would also meet part of the domestic demand and complement the national supply.

In Brazil, the customs duty charged by ports between the unloading of goods in the national territory and customs clearance forms the basis for calculating taxes on imports, perhaps the only one in the world. The inclusion of this tax inflates the cost of importation and, when transmitted through direct and indirect channels in the production and consumption links established in the Brazilian production system, affects business conditions and sectorial competitiveness in the country's domestic and foreign markets, as well as contradicts the global trend of trade facilitation. With the objective of collecting taxes on the purchase of goods abroad,

the justification of this policy defines an import operation at the time the goods are moved. However, the World Trade Organization (WTO) describes that the import operation takes place before the goods are unloaded, whose article VII of the General Agreement on Customs and Trade Tariffs (GATT) and the Brazilian tax code determine that only expenses incurred until importation, fact generator of taxes, can be included in the customs value (Brazil, 1966; WTO, 2017). This incompatibility is a concern in course of the National Confederation of Industry (CNI), which, since 2013, has been calling for the horizontal removal of the foreman tax from the tax base of all imports and would have an effect corresponding to a mini opening of trade. The Brazilian government signals that it can assess this change in the tax base at the end of 2021 or in subsequent years.

The elimination of this tax distortion of wharfage services has impacts on the structure of relative prices and production operations, especially in those sectoral activities that are more intensive in imported inputs and with greater technological intensity. In addition, this tax policy directly impacts the formation of physical capital and knowledge by altering the rate of return on sectoral investments in the Brazilian production system. This article contributes to this debate and analyzes the economic effects of an exclusion of the port forecourt fee from the basis for calculating the import tax in the Brazilian economy, taking into account the redistributive effects on the country's productive composition and technological base. This study carries out an assessment of medium and long-term economic impacts if the change in the tax base of imported goods occurred in 2021. To accommodate this task, the analysis proceeds from a recursive dynamics computable general equilibrium (CGE) model. This model recognizes a social accounting matrix (SAM), a new explicit stock-flow relationship between R&D investments and knowledge capital, and investment absorption matrix (Betarelli Junior et al., 2020; Proque et al., 2020; Proque, 2019). In addition to this introduction, this article consists of four other sections. The second section makes a brief characterization of the Brazilian port system and presents statistics on the port capacity rate by productive sector. In turn, the third section presents the dynamic EGC model based on R&D and SAM, as well as the simulation designs for policy analysis. The fourth section discusses macroeconomic and sectoral projections. Finally, the fifth section summarizes the conclusive results and points out some policy implications for the Brazilian economy.

2 The port sector and THC in Brazil

The port system in Brazil is made up of 34 organized public ports and 147 private use terminals (TUPs), spread over a coastline of 7367 kilometers (Antaq, 2020a). Of the public ports, 18 are under the responsibility of state and municipal governments and public consortia, while the rest are under the administration of the federal government, in the case of Companhias Docas (19 ports). The main organized ports in the country are Santos-SP (29%), Paranaguá-PR (13%) and Itaguaí-RS (12%) (Antaq, 2020a). In turn, a Private Use Terminal

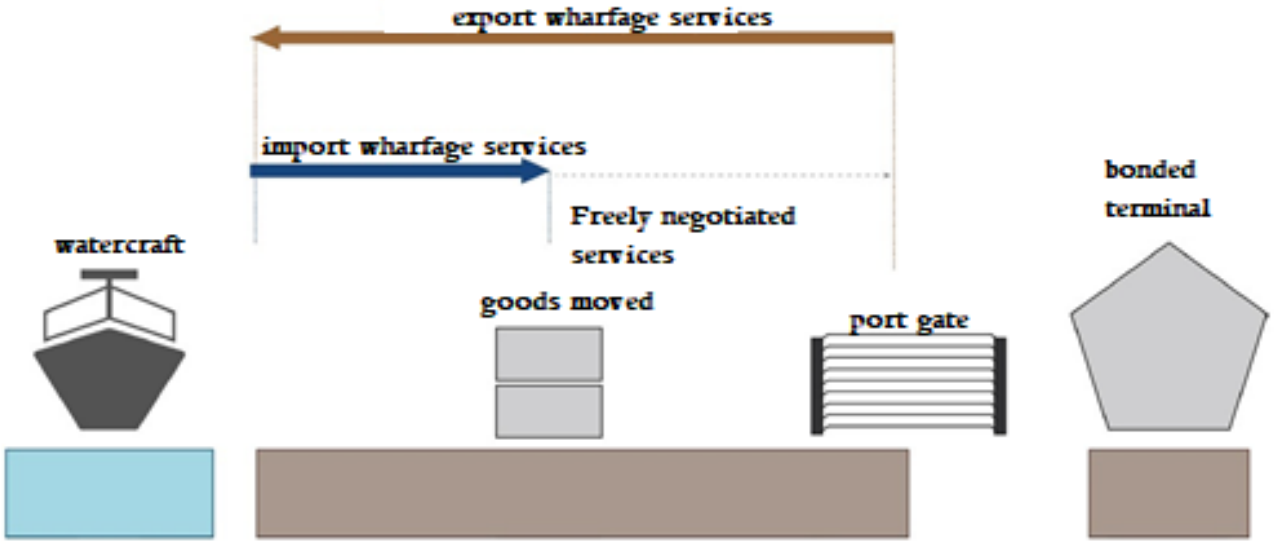
(TUP) is a port facility operated with authorization and located outside the organized port area (Brasil, 2016). Terminals such as Ponta da Madeira-MA (Vale), Tubarão-ES (Vale), Tebig-RJ (Petrobras) and Tebar-SP (Petrobras) stood out in 2019 (Antaq, 2020a).

Private terminals predominate in the Brazilian port system. In 2019, for example, TUPs represented 66% of the total volume handled in the sector, while the remaining portion was handled by public ports in the country. Of the total cargo handled in each of these two types of port facility, the specialty is different. TUPs, in general, handle mainly solid mineral bulk (88%), liquid bulk (77%) and loose general cargo (65%), while the cargo handled in public organized ports mainly involves agricultural solid bulk (61%). and containerized cargo (71%). Both public and private facilities showed a significant growth rate in the last 10 years, that is, between 2010 and 2019, cargo handling in public ports and private terminals reached an average annual growth of 2.5% and 3, 4%, respectively (Antaq, 2020a).

The regulatory framework for the sector underwent significant changes after the creation of the Ministry of Infrastructure in 2019. Since then, the regulatory framework for the sector has been centralized in the National Secretariat of Ports and Waterway Transport (SNPTA). so that, among its responsibilities, the National Waterway Transport Agency (Antaq), linked to the SNPTA, inspects the contracts and monitors the operational performance of the Brazilian port system. For organized public ports, ANTAQ also establishes criteria for revisions and readjustments of port tariffs in the country in order to allow a financial balance between the expenses arising from the services offered and the registered revenues (Brasil, 2020a). According to Antaq (2019a), the handling charge at the port terminal (Terminal Handling Charge – THC) is defined as the price charged for cargo handling services between the port terminal gate and the vessel's side, including guarding transitory cargo for the period contracted between the maritime carrier, or its representative, and the port facility or port operator, in the case of exports, or between the side of the vessel and its placement in the port terminal stack, in the case of imports.

This definition is linked to the meaning of the customs clearance fee by law nº 12.815/2013, which defines all stages of activity of moving goods in the facilities inside the port, such as receiving, checking, internal transport, opening of volumes for customs checking , handling, storage and delivery, as well as the loading and unloading of vessels, when carried out by port equipment (Brasil, 2013). Under the terms of the regulations, the service is provided by the port operator, who effectively performs the provision of the movement service between the ship's side and the cargo pile, that is, it is the port operator that handles, checks and internally transports the merchandise (Figure 1). Amateurs freely and directly negotiate and pay the port expense of permanence and cargo movement with the operators, but then charge this expense to the importer of the goods (i.e. consignee of the goods) (Antaq, 2019b; Fernandes, 2016).

Figure 1 – Services charged by THC on import and export



Source: adapted from Fernandes (2016).

However, this port foreman expense is not included in the calculation of customs taxes (port operator services), but added to the basis for the collection of all taxes levied on importation into the country. This practice is significant and creates distortions on the value of imported goods, as in 2019, 151.4 million tons (t6) were unloaded by long-distance shipping, which represented an accumulated growth of 14% compared to 2010. period, the volume of Brazilian imports originated mainly from the United States (39.3 t6), China (12.4 t6), Argentina (10.5 t6), Russia (7.9 t6) and Colombia (7.1 t6).

This inclusion of the port foremanship cost in the tax base is supported by the definition in which any import operation is carried out after the cargo handling activities carried out by the operators within a port. The WTO's GATT defines the import until the moment of attraction of ships for the landing of cargo. According to the WTO concept, port operations would not be included in the tax base, as the Brazilian tax code itself prevents the inclusion of any expense after the import operation (Brasil, 1966; WTO, 2017). There is great difficulty in assessing the effects on the Brazilian economy if the WTO concept were implemented, as there is no statistical and public information to assess the relative weight of THC expenditure on the country's import tax base. In this variant, this study contributes by estimating the share of port operations in imports landed by long-distance navigation within the Brazilian foreign trade agenda. The procedure for this estimation is described in Appendix A and involved the compilation of a large volume of statistical data in a historical series between 2010 and 2017 from several different sources. For example, spreadsheets with annual tables per gross tons reached, on average, more than 100 thousand lines and 20 columns and mathematical operations started to be performed via computer programs.

According to these estimates of the Brazilian port system, between 2010 and 2017, physical handling grew 29.5%, while the nominal unit cost (R$/ton.) expanded 70%, that is, an average annual growth of 7.9% . Therefore, the upward trajectory of the estimated port cost is higher than that of physical movement. Cargo unloaded in the Brazilian port system is relatively more expensive, but the average growth rate of this cost per unloading is lower, that is, around 7.1% against 9.0% for goods shipped. The average difference between unloading and loading costs reached R$ 9.2 per ton between 2010 and 2017. Of the total handled in Brazilian ports, unloaded goods represented 32% on average in the same period. Long-distance navigation was the main unloading route at the ports, representing 45.8% of the tons landed for the type of cargo handling operation. It is, therefore, the main route of entry of imported products into the country. According to Table 1, the movement of unloaded cargo of agricultural and industrial goods in Brazilian ports by long-distance navigation showed an average annual growth of 1.9% between 2010 and 2017. This expansion was accompanied by an annual increase of 5.5% % on the unit cost of the foreman on imports in ports.

Table 1 – Costs of wharfage services and port indicators of imports

Indicators	Unit of measure	2010	2011	2012	2013	2014	2015	2016	2017	Annual average	Variation (%)	
											Total	Annual
Physical imports (A)	Millions of tons.	127	137	139	148	159	140	133	145	141.0	14.3	1.9
Wharfage's cost (B)	BRL million	1849	2690	2923	3937	4122	3686	3353	3070	3203.7	66.0	7.5
Average cost of wharfage (B/A)	BRL/ton	14.5	19.6	21.1	26.6	26.0	26.3	25.3	21.1	22.7	45.2	5.5
Imports (I)	BRL billion	348	407	469	552	573	596	516	532	498.9	52.7	6.2
Portion of the wharfage (B/I)	%	0.53	0.66	0.62	0.71	0.72	0.62	0.65	0.58	0.642	8.7	1.2

Source: research estimates.

With an annual growth of 7.5% in the period, the cost of importing the port system represented, on average, 0.64% of the current value of net imports - defined by the difference between the monetary value of imports and the port cost estimated value of agricultural and industrial goods. This is the corresponding share of the port foreclosure in relation to net imports in Brazil. The annual fluctuations of this indicator depend on several factors such as variations in the composition of cargo unloaded in Brazilian ports, changes in the choice of ports of departure, changes in prices charged, variations in the companies operating in the port system, as well as the economic situation each year.

Among the imported goods, the extractive industry products would be those with the highest cost of port foreclosure on an annual average in the period between 2010 and 2017 (Table 2). Imported inputs, generally required in the gross formation of fixed capital in the country or in the production of domestic industrial goods, also exhibited a relatively high production cost such as capital goods products (0.10%) and intermediate inputs (0.75%). Intermediate inputs, in turn, reached almost 46% of total imports of industrial and agricultural goods during the period evaluated. On the other hand, imports of consumer goods faced, on average, the highest average cost of port operations (R$ 31.34). However, the share of this warehouse in relation to net imports is one of the smallest, since, in general, consumer goods exhibit a high value/imported volume ratio. This assertion also extends to cases of imports of food, consumer goods and some durable goods for long-distance navigation.

Table 2 - Annual average of port import indicators (2010-2017)

Product group	(A) Imports (BRL billion)	(B) Port wharfage (BRL billion)	(B/A) Portion of the wharfage (Part.%)
Agriculture	12.06	132.95	1.10
Extractive Industry	43.96	1067.20	2.43
Foods	20.21	121.52	0.60
Consumer goods	54.07	48.67	0.09
Durable goods	38.00	16.56	0.04
Intermediate inputs	220.03	1707.98	0.78
Capital goods	110.60	108.78	0.10
Overall average	498.93	3203.67	0.64

Source: research estimates.

The annual estimates of the foreman's share of imports are broken down in greater detail by products in each group reported in Table 2. These estimates are heterogeneous among themselves and are listed in Table 3. For example, in the group of agricultural products, which represent 1.1% of net imports, imports of oranges and corn in grain would be those with the largest share of the foreman, with 5.03% and 1.88%, respectively. Typically, these are products landed as solid bulk. Among the products imported from the extractive industry, non-metallic minerals (17.58%) and mineral coal (5.25%) would be the most prominent. Together, this group of industrial products account, on average, for almost 8.8% of net imports.

Table 3 - Portion (%) of port wharfage on imported goods (2010 - 2017)

Products	Annual average	Products	Annual average
Rice, wheat and other cereals	1.88	Manufacture of paper	1.18
Corn in grain	0.85	Printing and reproduction	0.59
Herb cotton and other fibers	1.22	Oil refining and coking plants	1.95
Soy beans	0.14	Ethanol and other biofuels	0.68
Other temporary crop products	1.01	Inorganic chemicals	1.69
Orange	5.03	Fertilizers and fertilizers	2.27
Coffee beans	1.04	Organic chemicals	0.68
Other permanent crop products	0.25	Resins, elastomers and synthetic fibers	0.82
Cattle and other live animals	1.75	Pesticides	0.10
Birds and eggs	0.03	Other chemicals	0.53
Forestry and forestry exploration	0.81	Paints, varnishes, enamels and lacquers	0.41
Fishing and aquaculture	0.15	Perfumery, soaps and cleaning articles	0.09
Mineral coal	5.25	Pharmaceutical products	0.03
Non-metallic minerals	17.58	Rubber articles	0.30
Oil and Gas	1.57	Plastic articles	0.54
Iron ore	0.21	Cement	6.69
Non-ferrous metallic minerals	0.38	Cement, plaster and similar articles	1.64
Bovine meat	0.27	Glass, ceramics and other non-metallic minerals	2.42
Swine meat	0.16	Pig iron and ferroalloys	1.07
Poultry meat	12.40	Semi-finished and steel tubes	0.73
Industrialized fish	0.50	Metallurgy of non-ferrous metals	0.35
Milk	10.56	Castings of steel and non-ferrous metals	3.42
Other dairy products	0.67	Metal products	0.48
Sugar	11.83	Electronic components	0.04
Canned fruits, vegetables and juices	1.08	Office and computer machines	0.00
Vegetable and animal oils and fats	0.66	electronics and communications	0.03
Benefited coffee	0.48	Measuring, optical and electrical equipment	0.04
Derived from wheat, cassava or corn	1.35	Electrical machines and materials	0.11
Balanced pet food	1.00	Home appliances	0.24
Other food products	0.69	Tractors and other agricultural machinery	0.17
Manufacture of beverages	0.27	Machines for mineral extraction	0.15
Manufacture of tobacco products	0.01	Other machinery and mechanical equipment	0.10
Processed yarns and textile fibers	0.49	Cars, vans and SUVs	0.04
Manufacture of tissues	0.29	trucks and buses	0.10
Textiles	0.23	Parts and accessories for motor vehicles	0.07
Clothing and accessories	0.06	Aircraft and other transport equipment	0.09
Footwear and leather goods	0.21	Furniture	0.17
Wood products	1.54	Other industries	0.11
Cellulose	1.36	Total	0.64

Source: research estimates.

On the other hand, the imported volume of products from the manufacturing industry represents, on an annual average, 66% of total monetary imports between 2010 and 2017 (IBGE, 2019). Imports of poultry meat (12.40%), sugar (11.83%), cooled, sterilized and pasteurized milk (10.56%), cement (6.69%), steel castings and non-ferrous metals (3.42%), glass, ceramics and other non-metallic mineral products (2.42%), fertilizers

(2.20%), other petroleum refining products (1.76%), of cement, plaster and similar artifacts (1.64%) and of inorganic chemical products (1.71%) would be the ones that face the most costs of port foreclosure. These port wharfage plots for each product will be used as a benchmark for policy evaluation in a dynamic EGC model to project year-on-year economic effects.

3 Methodology

The quantitative assessment of the economic impacts of eliminating the port foreclosure portion in the Brazilian import agenda proceeds from a recursive dynamics computable general equilibrium (CGE) model, which includes capital accumulation rules, investment allocation and salary adjustments with lag (Horridge, 2012, 2002). Traditionally, EGC models allow variations in relative price, capture substitution effects in certain markets, consider supply and demand side reactions, and recognize the direct and indirect effects of an economic system (Betarelli Junior et al., 2020). The EGC model of this study takes into account a fiscal balance and payment flow module, derived from a social accounting matrix (MCS), as well as an explicit stock-flow relationship between R&D investments and knowledge capital in its structure. theoretical and data.

Called BIM (*Brazilian Intersectoral Model*), this model represents an extension of other models in applied research (Betarelli Junior, A. A., Domingues, E. P., & Hewings, 2020; Betarelli Junior et al., 2021, 2020; Bor et al., 2010; ; Cardoso, 2016; Corong, 2014; Hong et al., 2014; Proque et al., 2020; Proque, 2019) and provides solutions in terms of percentage variation (Johansen, 1960) of systems of simultaneous equations that represent the side of the equation. supply and demand in the markets. The model is calibrated from the 2010 input-output matrix (IBGE, 2019) and comprises 67 sectors that produce one or more of the 137 products, using domestic and imported inputs, and four primary factors (labor, land, physical and knowledge capital) (Betarelli Junior et al., 2017; Proque, 2019). There are five types of end users: investors, households, government, foreign consumer (exports) and stock changes. Typical families are classified between five minimum wage intervals (IBGE, 2010).

In accordance with a standard EGC framework, producers and investors minimize costs to the level of production and capital creation (Dixon et al., 1982). Demand for input compounds occurs in fixed proportions (Leontief). However, each input compound is derived from a constant elasticity of substitution (CES) function. Consequently, changes in relative input prices induce imperfect substitution in favor of relatively cheap inputs within the compound (Armington, 1969). In turn, households maximize utility from a linear expenditure system (LES) (Klein and Rubin, 1947) subject to a budget constraint. In the demand for exports of each domestic product, the hypothesis of small economy for international trade is adopted, so that variations in Brazilian foreign trade do not influence international prices. The external demand for traditional goods changes inversely

to the average price in foreign currency of exports, being the exogenous (cash) exchange rate. In addition, government consumption is exogenous and inventories accumulate as production changes.

The choice of the recursive dynamics version of the model is because it allows any analysis of a set of policies with different temporalities, including monthly, quarterly and annual analyses. In addition, this type of version takes into account the deviations in the growth rates of economic indicators in relation to the reference scenario of the economy. These aspects contribute to an analysis of the temporal trajectory of the economic impacts by eliminating the distortions of the tax incidence on the port foreclosure of imports in the country. For EGC models of recursive dynamics, which consider sequential solutions over a pre-established time interval, two types of economic simulation environments are used: a reference scenario and a policy scenario. The simulation of baseline scenarios serves as a control path so that deviations are measured to analyze the effects of a policy shock in subsequent periods (Dixon and Rimmer, 2002). The impacts of a specific policy represent the differences between a scenario with the policy and a counterfactual scenario, which shows how the Brazilian economy would have evolved if the examined policy had not occurred.

In the economic environment of the baseline scenario, the main macroeconomic variables are generally exogenous to accommodate observed and prospective variations in annual solutions. Actual variations by period for the main macroeconomic indicators in the baseline scenario are divided between observed and predicted (Table 4). Between 2011 and 2020, the observed variations are applied according to statistical information from the IBGE (2021, 2019). The use of these observed data serves as a reference for the counterfactual analysis between 2011 and 2020, as well as aims to update the numerical structure of the model for the implementation of prospective shocks between 2021 and 2040.

n turn, the prospective changes after 2020 are based on the forecast of the federal development strategy for Brazil (Brazil, 2020b). The forecast scenario between 2021 and 2040 takes into account an average annual growth (a.a.) of GDP of 2.2%, according to the Federal Government's reference scenario (Brazil, 2020b), Investments represent 17.5% of GDP, while the trade flow reaches 29.9% of GDP. The underlying hypothesis is a balance of trade in relation to GDP (in % of GDP) and a variation in household consumption according to the endogenous change in income. In addition, the baseline scenario adopts the forecast of the government spending ceiling until 2027. Finally, the underlying hypothesis is a balance of trade in relation to GDP (in % of GDP), with no restriction on the supply of labor factor and a variation in household consumption according to the endogenous change in income.

Table 4 - Changes (%) of the main macroeconomic indicators

Indicators	Historical										Prospective	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021-2027 in year	2028-2040 in year
GDP	3.97	1.92	3.00	0.50	-3.55	-3.28	1.32	1.32	1.14	-4.06	2.20	2.20
Household demands	4.82	3.50	3.47	2.25	-3.22	-3.84	1.98	2.05	1.84	-5.45	-	-
Government demanc	2.20	2.28	1.51	0.81	-1.44	0.21	-0.67	0.36	-0.44	-4.68	0.00	2.20
Exports	4.81	0.71	1.83	-1.57	6.82	0.86	4.91	4.00	-2.54	-1.76	-	-
Investment	6.98	0.78	5.86	-4.02	-14.35	-12.42	-2.56	3.91	-0.44	-0.78	-	-
Current employment	1.47	1.41	1.56	2.86	-3.34	-1.56	1.25	1.20	1.20	-7.94	-	-
Trend employment	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Population	0.88	0.87	0.85	0.86	0.87	0.83	0.80	0.85	0.85	1.00	1.00	1.00

Source: IBGE (2019, 2020) and forecast of the Federal Development Strategy for Brazil (Brasil, 2020c).

Note: * Hidden values ("-") denote that the variables are endogenous in the period.

Based on the reference scenario, this study implemented annual shocks from a policy of reducing the customs duty rate on the price of imported goods, which determines the tax base for imports in the country between 2021 and 2040. import price per physical unit handled in the Brazilian port system, whose variable changes the basis for the incidence of demand taxes, the strategy of this study consisted of applying a reduction shock (% ad-valorem) on the price of imported goods in the tax base for policy simulation. For example, the tax base of a typical imported good presents 3% of port wharfage on import value, that is, the tax base registers (B=1.03). In this way, the elimination of 3% of port wharfage would translate into a negative variation of 2.91% in the value of the tax base. Thus, the variation in the tax base (ΔB_i) of each typical imported product is calculated by:

$$\Delta B_i = \left[\left(\frac{P_i^M}{P_i^M + C_i^M}\right) - 1\right] x100 \quad (1)$$

which is equivalent

$$\Delta B_i = \left(\frac{C_i^M}{P_i^M + C_i^M}\right) x100 \quad (2)$$

where C_i^M is the port wharfage 's share and $P_i^M + C_i^M$ is the tax base with the portion of the wharfage.

The policy closure classifies the price of imported goods as an exogenous variable, so that Brazil is supposedly treated as a small economy in international trade. The annual averages of the shares (%) of the port foreclosure of imported goods are applied as annual shocks to the prospective analysis between 2021 and 2040 (Table 3). This type of analysis will point out how much the Brazilian economy would benefit from the elimination of the distortion of the import value associated with the capatazia in the next 20 years. In practice,

this type of strategy is very similar to simulations of reducing tariff barriers in foreign trade based on changes in the "power of the tax" in EGC models.

Furthermore, at policy closure, government expenditure is defined as exogenous, and exports respond only to endogenous changes in the relative price structure with an exchange rate as cash. The BIM model is national and therefore does not capture the feedback effects derived from international trade flows, as in the Dynamic Global Trade Analysis Project (GDyn) model (Ianchovichina and Walmsley, 2012). The choice of a national model is since it recognizes the main taxes levied on the Brazilian tax base on the value of imported goods in its data structure. This statistical information is contained in the IBGE input-output matrix (2019). The GDyn model encompasses links between productive structures, international trade flows, international capital mobility in 141 countries. However, the tax structure is not modeled for international economies. In addition, the simulation policy is specific and has a national scope for Brazil, which, considering the tax structure on imports, avoids distortions in the economic projections of this study.

4 Results

This section presents the economic impacts of an elimination of the port foreclosure tax on the tax base of imports in Brazil. The results are solutions solved recursively in an annual dynamic and represent percentage deviations from the reference scenario (business-as-usual). The absence of the tax portion of the foreman would cause a direct drop in the purchase prices of imported goods and inputs. This reduction in import costs would be transmitted through the channels established in the production and demand links of the Brazilian production system. Productive sectors would find lower cost constraints to produce goods and to form new units of physical capital, while consumption baskets would become cheaper in the country. Consequently, the scale of supply and demand for domestic goods would increase in the domestic and foreign markets, requiring more inputs per unit of product in the production processes. This increase in demand in the markets for goods and primary factors would, on the other hand, cause upward pressure on prices, which could reverse or more than offset the general drop in domestic costs initially generated by the policy.

Table 5 presents the impacts of the policy on the main macroeconomic variables. It is observed that the policy would generate positive effects on the growth rate of the Brazilian Gross Domestic Product (GDP) in the medium and long term. In 2040, GDP would reach a deviation of 3.8% from the baseline scenario, but accompanied by an expansion of domestic costs and prices in the economy. The implicit GDP deflator would grow more intensely in the years of the policy simulation and would cool down significantly in the long term, accumulating an effect of 1.1%. This combination of results between GDP and the deflator would confirm that the policy of tax reduction on imports, by stimulating market demand, would generate a net effect of increasing

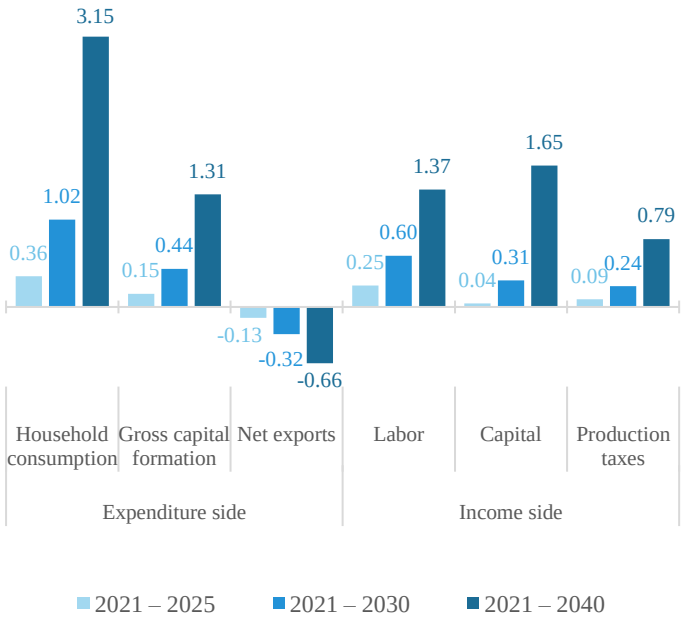
domestic prices in the economy. Furthermore, the evolution of these prices would be more intense in the medium term, mainly because the capital supply reacts laggedly in relation to current investments and, therefore, the price of this type of primary factor would increase more in the initial years of the policy. In the short and medium term, productive sectors would adjust the payroll more easily to adapt to the expansion of demand, since the labor factor is intersectorally mobile and its supply is elastic, as defined in the economic environment of the simulation. The demand for national employment would rise above the trend employment in the order of 1.72% between 2021 and 2030. From the income perspective, the contribution of the labor factor remuneration (0.60%) would be greater than that of capital (0. 31%) for the GDP impact until 2030 (Chart 1). However, with the expansion of the supply of capital in the long term, this relationship would be inverted in a way that capital would become a prominent contribution to GDP from the perspective of income in the long term (1.65%).

Table 5 - Macroeconomic impacts (var.%)

Variables	2021 – 2030 Medium term	2021 – 2040 Long term
GDP	1.15	3.80
GDP deflator	1.21	1.10
Investment	2.68	7.68
Physical (KF)	2.74	7.84
R&D (KH)	0.97	2.81
Physical Capital stock	0.59	3.18
Knowledge Capital	0.58	1.94
Household consumption	1.55	4.87
Utility	1.02	2.79
Employment	1.72	4.21
Total government income	2.19	4.48
Tax revenue	1.80	3.70
Trade flows	1.65	4.08
Exports	0.33	1.82
Imports	2.85	6.14
Trade terms	4.06	6.84

Source: Research results.
Note: * % cumulative deviations from baseline.

Graph 1 – Contribution (%) of components to real GDP



In terms of expenditure, the positive effects of the components of internal absorption of domestic goods would more than offset the negative contribution of net exports (-0.66%) to the impact of the policy on GDP in the long run. The marginal deficit in the trade balance would be justified by the relatively lower growth in foreign sales between 2021 and 2040 (1.84%), as the terms of trade would grow by 6.84% in the same period.

The expansion of the exported volume would occur due to the reduction of import expenses in the structure of production costs in sectoral activities traditionally exporting and more intensive in the labor factor. However, this growth in foreign sales would be limited by the upward trajectory of prices in the economy (deflator), since in the theoretical structure of the model the external demand function has an inverse relationship with the domestic price in a fixed exchange rate environment. In turn, the volume of imports would grow not only due to the relations of productive complementarity in the country, but also due to competition with inputs of domestic origin. That is, the policy would also change the relative prices in the composites of goods so that the demand for imported goods would increase to the detriment of domestic goods (CES function). In the long term, the imported volume would present a positive deviation of 6.14% in relation to the counterfactual scenario, which, together with the increase in the exported volume, would increase the trade flow by 4.08%.

On the domestic market side, household demand would accumulate 4.87% in relation to the trend scenario, contributing with 3.15% of the 3.8% of GDP in the long term. In the model, this expenditure component is linked to aggregate real income, whose increase in private consumption (4.87%) by a LES specification results in an average utility increase of 2.79% in the long run. In this variant, the tax cut policy in port foreclosure would generate a welfare gain for the Brazilian economy. This tax policy would also promote, at the margin, a positive effect of 3.7% on the nominal tax revenue of the public budget in the long run. The total government income, which comprises taxes collected and the flow of payments from private institutions (companies and families) to the public, would grow 4.48% in the period 2021 - 2040. In short, the revenue and income generating effect for public budget would be positive with the implementation of the tax policy simulated in this study.

Gross capital formation, which encompasses physical and knowledge capital, would be the main component of expanding internal absorption (7.68% in 2040), but it would contribute less than private demand to the composition of the effect on GDP over the long term. term (0.44%). The positive impact on investments in physical capital is due to two main reasons. First, the annual drop in imported input costs would reduce the unit cost of creating additional units of physical capital over the period, which would stimulate the allocation of investments in this type of primary factor. Second, as there is an annual lag in the recursive dynamics of the physical capital stock in relation to current investments, the pressure of production requirements for this type of primary factor would raise capital income more intensely in the initial years of the policy. With the increase in the return on capital and the decrease in the unit cost of the investor, the expected rate of return and the volume of investments increased in the current years. However, the maturation of investments in subsequent periods would contribute to the accumulation of the capital supply and would cause downward pressure on profitability in this type of primary factor, which, as a result of this process, would have a continuous cooling

of the positive variations of productive investments and the physical capital by 2040. This stock-flow relationship in the model's recursive dynamics module also extends between knowledge capital and R&D investment over the simulation years. As shown in Table 5, the change in tax policy without the foreman costs would imply a 7.84% increase in physical capital investment and a 2.81% increase in R&D investment at the end of 2040. In the same time interval, the stock physical capital would accumulate 3.18%, while knowledge capital would register 1.94%.

Industrial sectors, especially intensive in physical capital and/or suppliers of inputs for the formation of physical capital, would, therefore, be directly benefited by the policy of eliminating the tax incidence on imports. Nevertheless, this policy would indirectly affect the country's technological core in the long term by changing the sectoral composition of R&D investments, since in the model the allocation of this investment category is dependent only on the domestic supply of R&D. Table 6 presents a group of sectoral activities according to the OECD's classification of technological intensity (2011), while Graph 3 illustrates the evolution of investments and capital stocks of the private sector in the Brazilian production system. Figure 2, on the other hand, details the accumulated deviations of the policy in production, exports and imports in 2040.

Medium-high and high-technology industries would be those that would most grow and invest in the economy. The supply of goods from these two categories of industrial activities would accumulate a positive deviation of 4.70% and 4.31%, respectively, with positive impacts above 7.94% on physical capital investments until 2040. Even with a horizontal elimination of the port foreman tax on the tax base of all tangible imports, the positive effects of the policy would endogenously extend to service sector provision and investment, especially in knowledge-intensive business services (KIBS) activities.

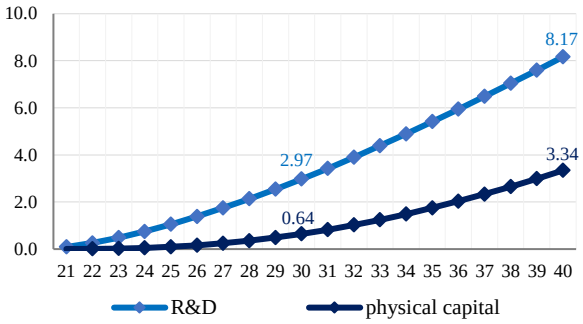
The sectoral projections also indicate that the policy would contribute to a relative increase of the private sector in the country's productive composition (4.24%). Private investments in physical capital and R&D would show an upward and regular trajectory in the medium and long term, accumulating a total of 8.17% and 5.53% in 2040. In this variant, the facilitation of imports generated by the tax policy would enable the process of physical capital and knowledge formation by complementing the domestic supply of inputs with imported ones, but it would also reduce the country's dependence on the public sector for the implementation of R&D investment and physical capital, indirectly relieving the public budget in the long term. In general, the policy would avoid economic downturns and, therefore, changes in the composition of public spending on R&D and the counter-cyclical strategy of the more technologically intensive private sectors, as pointed out by Pellens et al. (2018).

Table 6 - Effects on sectoral activities in 2040

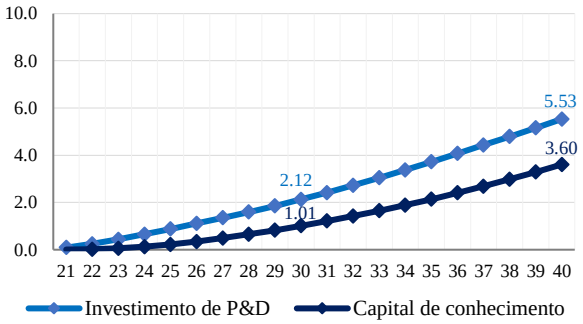
Sectors	Output	Investment		Capital	
		R&D	Physical	Knowledge	Physical
Agriculture	2.64	4.53	6.36	2.92	2.71
Industry	3.86	5.98	6.43	3.92	2.25
Low	3.49	4.65	7.65	2.83	2.92
Medium-low	3.66	6.04	5.04	3.94	1.51
Medium-high	4.70	6.24	8.74	4.09	3.67
High	4.31	5.46	7.94	3.67	3.00
Services	3.87	1.07	8.42	0.71	3.50
KIBS*	3.92	4.26	7.83	2.75	3.01
Other services	3.86	-0.03	8.50	-0.13	-0.13
Private R&D	4.24	5.53	8.17	3.60	3.34
Public R&D	0.02	-0.52	0.84	-0.50	-0.14
No R&D	3.62	4.76	7.69	3.02	3.04

Graph 3 – Evolution of investment and capital in the private sector

Panel (a): investments



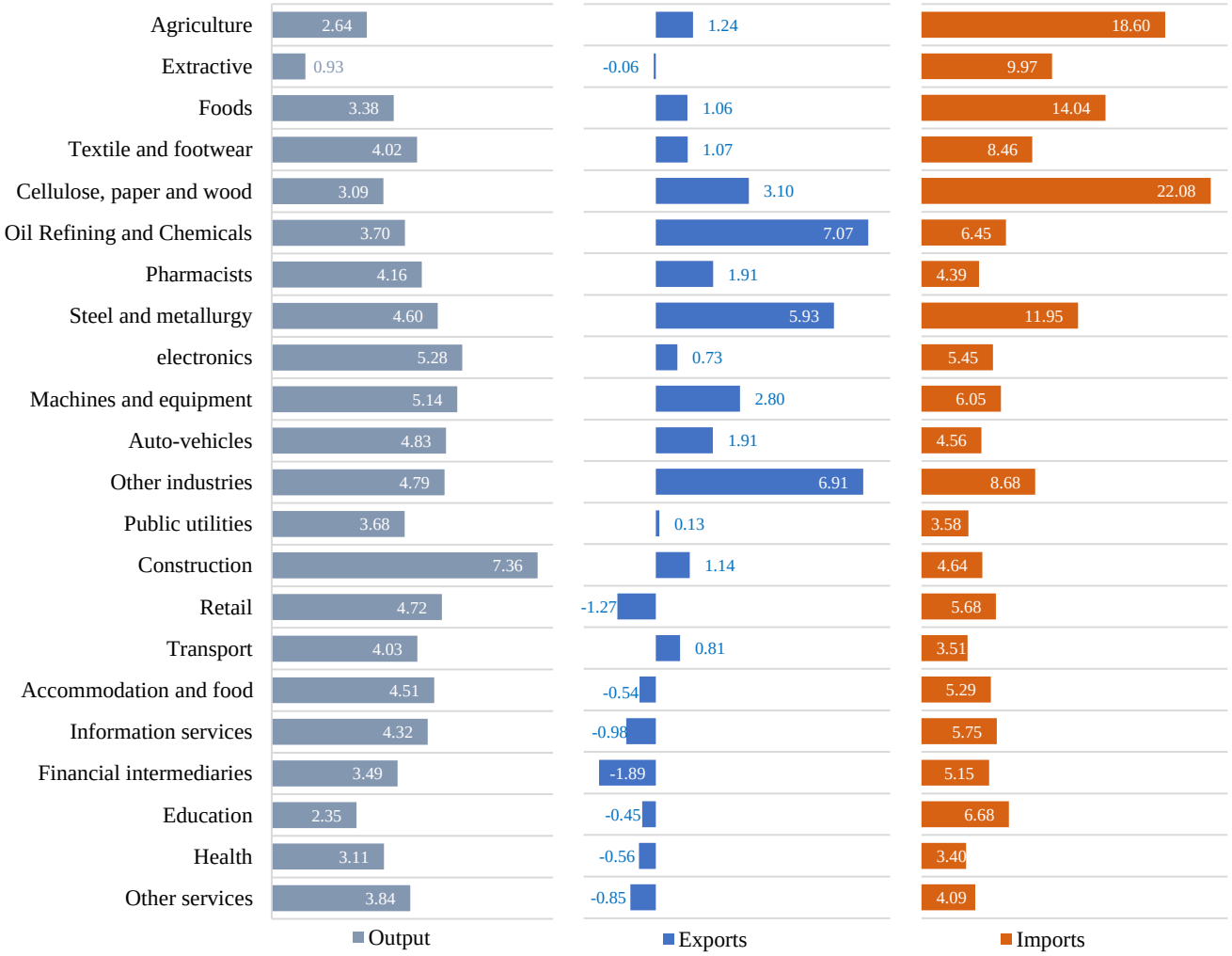
Panel (b): capital stock



Source: Research results.
Note: * % cumulative deviations from baseline.
* Knowledge-intensive business services (KIBS).

Even with greater penetration and competition from imported inputs in the Brazilian economy, the impact of the policy on domestic activities would be positive and widespread in the long term (Figure 2). Sectors more linked to gross capital formation and which are among the most important in the country's technological base would grow relatively more, such as Civil Construction (7.36%), Electronics (5.28%), Machinery and equipment (5.14%), Automotive vehicles (4.83%), Various industries (4.79%) and Steel and metallurgy (4.60%). These last two activities would still be one of the sectors that would export the most in the long term (6.91% and 5.93%), but would face relatively greater competition from similar goods in the country's import list. Imports of goods manufactured by Sundry Industries and by Steel and Metallurgy would register an accumulated variation of 8.68% and 11.95% in 2040 in relation to the trend scenario, respectively. On the other hand, despite the growth in the supply of services sectors in the long term, their foreign sales would decline marginally, while the penetration of imported services would expand more than the domestic supply in the period. The exception would be transport services, so that the impact on the provision of this type of domestic service would be greater than that of a similar import, but accompanied by an expansion of foreign sales

Figure 2 - Accumulated impacts (%) on sectoral indicators in 2040



Source: Research results.
Note: * % cumulative deviations from baseline.

5 Concluding remarks

The port wharfage cost has always been part of the tax base for imports in the Brazilian economy, whose policy distorts the structure of relative prices, the conditions of domestic and foreign markets, as well as maintaining non-tariff barriers against the absorption of imported goods. The horizontal elimination of this tax from the basis for calculating taxes on imported goods is a recurring concern in the ongoing policy debate by the National Confederation of Industry (CNI) and other sectoral entities, precisely because it burdens the costs in various production processes of tangible goods. and go against the global trend of trade facilitation that permeate tariff and non-tariff reductions. A central question is whether a change in this tax policy could in fact reinforce the competitive tendencies of certain markets and how other domestic activities would be affected by

a greater penetration of imported inputs in the Brazilian production system. However, on the other hand, there is an expectation that this change in policy will also contribute to the expansion of foreign trade and economic growth in the country, especially through the process of gross capital formation.

This study contributed to this debate by evaluating and quantifying the medium and long-term economic impacts of a reduction in the import tax base by removing the port foreclosure tax. The forward-looking projections signal the benefits and costs generated by this policy change in Brazil. To this end, the study estimated the average annual rate of port foreclosure in the purchase price of each imported good to then be simulated between 2021 and 2040 through a general equilibrium model based on SAM and R&D. The conclusive results indicate that the cut in the customs duty on the import value would contribute to the industrialization of the Brazilian economy with greater technological intensity, both in the medium and long term. Due to the gains in competitiveness due to the fall in import costs, the volume exported would increase and the export list would become more diversified, with a relative increase in the share of manufactured products in foreign trade. These projections are in line with the objectives of Brazilian trade policy, which is intended to increase the share of manufactured goods in the country's trade flow. However, with the prominent expansion of imported volume in the long run, the flow of foreign trade would increase, but accompanied by a marginal deficit in the trade balance.

The policy change would also favor gross capital formation in the long run. Investments would be the main component of internal absorption in the evolution of the Brazilian economy, reaching an accumulated effect of 7.68% in the long term in relation to the reference scenario. In general, industrial sectors of medium-high and high technological intensity and more linked to the formation of physical capital would stand out due to the increase in economic activity and exports, even in the face of greater competition from similar goods of imported origin. There would be a generalized expansion of sectorial activities in the long term, although the growth in the provision of some types of services would be inferior to the very increase in imports that competes. The country would still become more intensive in private R&D and would be in line with the global trend of increasing R&D intensity in a context of rapid internationalization of business around the world.

Together with household consumption, the expansion of the domestic market would therefore be the main contributor to the 3.80% growth in Brazilian GDP by 2040. Consequently, the generating effect of tax revenue for the public budget would be positive, which, combined with the greater participation of the private sector in the composition of investments in physical capital and in the technological core of the country, would relieve the public budget, as the country's dependence on the public sector for the implementation of R&D investment and physical capital would fall over the long term. term. In this variant, the projections contributed within the

very debate of the fiscal austerity policy as the control of federal expenditures, as the planners face intertemporal choices about the instruments of balance of the public budget.

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Appendix A - Estimation of the Port wharfage

In order to estimate the share of the port foreclosure, statistical information was first compiled on the movement of physical loads of each commodity in the import list and the prices charged for the provision of services by operators in each port. The physical cargo movement data were obtained directly from Antaq (2020a) and had a high level of detail (i.e., port facility, type, municipality, navigation, cargo profile, merchandise by the position of the harmonized system - SH4, direction, type of cargo operation and gross tons handled). In these statistical yearbooks, it was possible to obtain the totals received and dispatched by ports and terminals in different types of goods. Goods (SH4) packed in full 20- and 40-foot containers were identified in auxiliary tables, extracted from the ANTAQ data system (2020a). In these auxiliary tables, physical movements are measured in net tons and, therefore, the relative shares of each commodity (SH4) were computed in order to distribute the gross tons, according to the proper correspondence of full container, navigation, direction and of port facility. Therefore, this procedure made it possible to consistently disaggregate the gross tons of cargo in containers, properly identify the goods (SH4), as well as maintain the measurement standard in relation to other types of packaging.

The prices charged by public ports were taken from documents published by Antaq (2020b, 2019b) and by the National Secretariat of Ports and Waterway Transport (Brasil, 2020c). In common, these prices charged are broken down by type of packaging: general cargo, containerized cargo (full and empty), liquid bulk and solid bulk. The current year varies depending on the source of information. Most documents published by Antaq (2020b) indicate the year 2016, 2018 or 2019 in force, which depended on the selected public port. In all, twenty-five documents were obtained, one for each public port. The port prices in these documents present some types of prices (segmented), according to the internal process of each port (i.e. berthing-load-operation). Basically, there are prices for: (a) waterway access infrastructure – loading and unloading of goods on vessels; (b) operational/land infrastructure – use of port facilities for accessing goods “arrival and departure” from port

warehouses; and (c) cargo movements within the port structure. For the period from 2010 to 2015, in general, this study also used the diagnostic reports on the Brazilian port system from the following plans: National Port Logistics Plan, Master Plans, Port Development and Zoning Plan and General Grant Plan (BRAZIL - Special Secretariat for Ports, 2016; Brazil, 2020c).

It should be noted that not all facilities charge these three types of prices simultaneously. Thus, if the port facility does not charge a certain type of price for a certain cargo profile, according to documents collected by Antaq (2020b) and the National Secretariat of Ports and Waterway Transport (Brasil, 2020c), then the respective price is null. Other ports also presented total prices instead of a segmentation by type of price. In these cases, care was taken in the tabulation of prices to avoid double counting or overestimating the cost with segmented prices. These caveats and procedures mentioned above also extend to the main companies (S/A) of private terminals, whose prices charged were acquired on their websites. In total, twenty-one documents were collected from private companies operating in the sector. On the other hand, some port facility companies are not publicly traded and publicly disclose prices practically for reasons of commercial interests and strategies. Thus, in the absence of price information, this study adopted the hypothesis that prices by type of packaging follow the prices charged by other port activities in the same municipality or in the same port complex.

The prices collected were then weighted with the respective physical movements, whose mathematical procedure generated the costs of cargo movement with a high level of detail of the Brazilian port system between the years 2010 and 2017. The structure of each one of this matrix of costs by weighting prices and physical movements (η_ipt^R) was applied to the effective costs of the port service for each Brazilian state (C_rt^E), derived from a combined disaggregation between IBGE information (2019, 2018) and the salary mass of the Annual Report of Social Information (RAIS)., that is:

$$C_{iprt}^{F} = \eta_{ipt}^{R} C_{rt}^{E} \quad (3)$$

where C_{ipr}^{F} is the estimated final port cost for commodity i, port p and region r in year t; C_{rt}^{E} is the effective cost of region r in the same year; and η_{ipt}^{R} is the share of the weighting cost of merchandise i at port p in relation to the total weighting costs of each corresponding region. The estimated final cost for each port comprises the years 2010 to 2017, in accordance with the limit of the historical series of the IBGE National Accounts System (2019). After identifying the costs on goods (SH4) in each port facility by region in a given year (C_{iprt}^{F}), they were made compatible with the 128 products of the IBGE's System of National Accounts (SCN), whose dimensions are stated in the Resource and Use Tables (TRU) between 2010 and 2017. An additional issue in the matching work was in relation to the products (SH4) identified within each container. There is only one

description of the goods, sometimes irregular in relation to the descriptions of goods (SH4) tabled between 2010 and 2017 or due to the lack of the SH4 code. For these cases, it was necessary to carry out the correspondence of each commodity by the SCN products. For regular cases, with proper codes and descriptions of goods in position SH4, the study used the IBGE public translator. Therefore, the correspondence involved the 10641 goods (SH4), listed by the IBGE translator, as well as 15091 goods identified inside the containers. Finally, the detailed breakdown of final port costs (C_{iprt}^{F}) makes it possible to separate port costs associated exclusively with cargo movements unloaded by long-distance shipping. Therefore, these port costs of unloaded cargo movements are those identified as port foremanship on imports of goods into the country.