

PRELIMINARY DRAFT – NOT TO BE CITED
IMPACT OF THE PAYROLL TAX EXEMPTION IN THE BRAZILIAN ECONOMY

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Abstract

The Brazilian Federal Government adopted a payroll tax exemption in 2012, but in 2015 such policy was reviewed and changed by removing part of the exemption over some sectors. This study aims to evaluate the economic impacts of these policies using a computable dynamic and multisectoral general equilibrium model developed for the Brazilian economy. The simulations represent deviations from a baseline scenario for the period 2013-2025. The results show that the exemption policy would imply a cumulative growth impact of 0.34% in GDP, while the new policy leads to a cumulative growth impact of -0.37%. This result is explained by the sectoral distortions resulting from the changes in the exemption policy which increases the cost of payroll in capital-intensive sectors as well as in its production cost, leading to reductions in the aggregated investment rate.

Keywords: payroll tax exemption, CGE model, economic impact.

JEL code: E61, E62, H32, C68.

1 Introdução

After the financial crisis of 2008/2009, many national governments have implemented anti-cyclical policies to stimulate the economy and restore the growth of output and employment. In Brazil, considering the fiscal policy, the federal government acted mainly through two incentive instruments: the exemption of the IPI (taxes over industrialized products) and payroll.

In this study, our interest is to evaluate the economic impacts related to the payroll tax exemption policy. This policy was instituted in 2011 (Provisional Measure No. 540/2011 and Law No. 12,546 / 2011) and extended in subsequent years to include more sectors. However, in 2015 the Federal Government reviewed the results of the policy and sent a Project to Congress which has the goal to impose a new payroll tax (Law Project No 863/2015). In this context, the purpose of this study is to evaluate the impacts of the policy of payroll tax exemption as well as the impacts of a new payroll tax system.

To investigate the impact of these policies, we have used a dynamic computable general equilibrium (CGE) model developed for the Brazilian economy. One of the features of the policies mentioned above is the heterogeneous allocation of the incentives across sectors

because the tax rates are differentiated by sector. Thus, an impact assessment needs to consider the multisectoral perspective. Additionally, these policies have influence on production costs and thus on the relative prices of all sectors in the Brazilian economy. The theoretical and empirical consistency of the dynamic CGE model make it suitable to handle with the complexity of the propagated effects from a tax policy in the economic system.

Note that often the policy decisions are made without a comprehensive and consistent analysis of its effects. In general, these decisions are based on static indicators of the representativeness of each economic sector on the economy, its tax burden and its intersectoral relationships. This corresponds to an analysis of a limited effect of a policy change, usually considering only the first order effects of the policy (DOMINGUES e HADDAD, 2003). However, by affecting relative prices, these policies have second-order effects related to the adjustments of the decisions of the post-political economic agents. These effects are rarely evaluated in decision making, but can be investigated through simulation exercises as proposed in this study. In this sense, our study contributes to support decision making in the context of tax incentive policies.

The study is divided into more six sections besides this introduction. Section 2 sets out a brief history of the policies of interest in this study. Section 3 presents the main characteristics of the dynamic CGE model which was used to simulate the impact of the policies. Section 4 describes the strategies adopted for the simulations, discussing the CGE model closures and the calibration of the shocks. Section 5 presents the analysis of the results and finally, section 6 discusses the conclusive remarks.

2 Historical of the payroll tax exemption policy

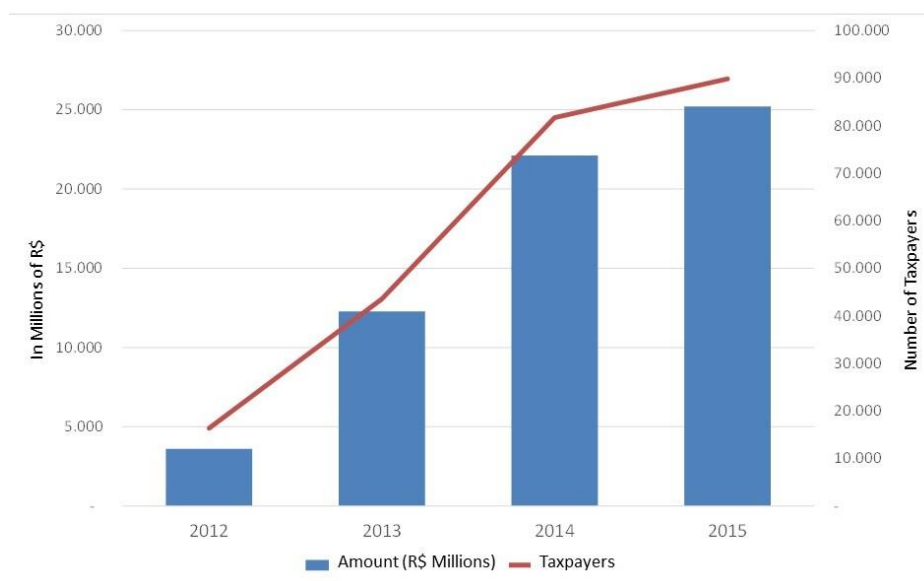
The payroll tax exemption was introduced by Provisional Measure N° 540 on August 2, 2011, after being transformed into Law No. 12,546, published on December 14, 2011. This policy was part of a broader menu of actions of the Federal Government to stimulate the economy in the post-crisis context 2008/2009. The policy established a change in the form of gathering employer contribution on the payroll of some sectors, according to criteria such as the activity performed or type of good. This change has consisted of a replacement, partial or total, of the employer contribution from 20% on the payroll to a rate of 1% to 2% on the revenue or sales through the creation of the so-called Employer Contribution on Gross Revenue (*Contribuição Patronal sobre a Receita Bruta - CPRP*).

According to the Ministry of Finance (2015), this policy represented a tax waiver as the rates of CPRP were set at a level below that required to maintain neutral the revenues over the

previous form of payment, levied on the payroll. In 2011, the Law covered a few sectors such as information technology, call center, industry of leather, footwear and textile sector. However, there was a major expansion of the sectors benefited from the policy in 2014, through the Provisional Measure N° 651/2014 and Law N° 13,043/2014. As a result, the number of taxpayers affected by the policy increased significantly, as well as the value of the tax waiver.

Figure 1 presents the estimates of the tax waiver resulting from the payroll tax exemption from 2012 to 2015, according to Ministry of Finance data, as well as the evolution of the number of contributors. The value of the waiver increased from R\$ 3.6 billion in 2012 to an estimated R\$ 25.2 billion in 2015, representing an increase of approximately 597.2%. The number of taxpayers has increased from 16,300 to 89,800 in the same period, representing an increase of 449.3%. In fact, these changes demonstrate the significant expansion of the scope of the policy of payroll tax exemption.

Figure 1
The Tax Waiver Estimate from the Payroll Tax Exemption
(All amounts in current prices)



Source: Finance Ministry/ Payroll Tax Exemption Report

The policy had a countercyclical character and was established with the following objectives: increasing the competitiveness of domestic industry; encouraging exports; and stimulating the labor market. However, concomitantly with the implementation of the policy, there was also significant deterioration of public finances, notably in the case of the Federal Government. After three years of implementation and expansion of the policy, the Ministry of Finance (2015) reviewed the policy basis. The conclusion was the policy has produced distortions because not all sectors were covered by the Law and the distribution of the tax

exemption was discrepant between sectors, namely, the policy would benefit labor-intensive sectors to the detriment of capital-intensive sectors. Even the Ministry of Finance has listed a series of distortions associated with the policy:

- Dilution of the link between contributions and benefits of the Social Security;
- Increase the regressivity of the tax system;
- Creation of a new “cascading tax”;
- Distortion caused by the adopted level of rates;
- Administrative costs of the measure.

Thus, seeking to mitigate the distortions of the payroll tax exemption, the Federal Government submitted to the Congress the Law Project nº 863 on March 20, 2015, changing the rules of the policy. The new project provides an increase from 1% to 2.5% of the CPRP rates and from 2% to 4.5% in the respective sectors classified in each rate according to the previous law. Additionally, the project makes optional the choice of the employer contribution scheme by the companies. If it is not advantageous the collection through CPRP, the company can opt for the traditional contribution system, e.g., the rate levied on the payroll.

The practical effect of the Law Project would be the reduction of the waiver level of the current policy until then, promoting a new encumbrance on the employer contribution. According to the estimates of the Ministry of Finance (2015), the changes in the tax rates under the Law Project nº 863/2015 can generate winners or losers for the taxpayers. Considering the estimates for 2015, the overall waiver of the exemption policy in existing molds would be R\$ 25.2 billion. However, if approved PL Nº 863/2015, this waiver would be reversed to a positive value of the order of R \$ 5.7 billion. Thus, the overall effect of the new Law Project implies a new payroll encumbrance, although some sectors may continue to benefit in choosing to make the employer contribution by the CPRP. This Law Project was approved and transformed into Law Nº 13,161 in August 2015.

Table 1 presents the waiver estimates (negative values) and the new encumbrance (positive or negative values lower than the payroll tax exemption policy) for the economic sectors¹, according to the calculations of the Ministry of Finance regarding a projection for 2015. In general, all sectors have some degree of encumbrance over the previous policy. Although the sectors realize some level of waiver, it will be lower than that obtained in the previous policy. We can also observe some sectors that had significant waiver at first, would

¹ The Ministry of Finance adopts the classification of CNAE in double digits in the disclosure of sector calculations. Here we had grouped values according to the classification of 56 sectors of the System of National Accounts, which is adopted in the CGE model simulation. Because some sectors incompatibilities, certain sectors of the classification 56 were added.

have increased tax burden now: machinery and equipment, construction and trade. Overall, as said before, the effect is a new encumbrance on the employer contribution.

Table 1
Estimates of the Impact of the Exemption and of the New Payroll Encumbrance for 2015
(R\$ Millions)

Sectors	Exemption Policy	Encumbrance Policy
Agriculture	-48.40	43.39
Oil and Natural Gas	-0.10	0.39
Iron Ore	-0.10	-0.12
Other of Mining	-71.80	-41.85
Food and Beverage	-780.50	656.65
Tobacco	0.00	0.00
Textile	-453.40	260.90
Clothing and Accessories	-596.70	55.99
Leather and Footwear	-588.80	-152.01
Wood – furniture exclusive	-24.60	22.34
Paper and Cellulose	-389.90	339.28
Newspaper, magazines and records	-36.90	-5.07
Petro-chemistry	-2.90	-1.48
Chemistry	-117.70	960.36
Pharmaceuticals and agrochemicals	-724.00	-64.33
Rubber and Plastic	-660.50	623.82
Cement and others of non-metallic minerals	-299.90	224.42
Steel and non-ferrous Metallurgy	-203.50	-29.81
Metal Products	-416.00	82.28
Machinery and Equipment	-1,112.90	44.61
Appliances and electrical materials	-487.60	167.76
Electronics, computer and medical equipment	-249.40	-9.69
Automobiles and other vehicles and parts	-1,956.00	-127.09
Furniture and Various Industries	-489.10	123.89
SIUP	-13.70	-4.70
Construction	-3,741.80	1,425.65
Trade	-1,742.40	3,091.62
Transport, storage and postal services	-4,029.40	-210.71
Information Services	-3,596.60	-1,169.63
Financial Intermediation	-41.00	-5.16
Real estate Activities and Rentals	-0.60	14.32
Maintenance and Repair Services	-121.40	-71.13
Accommodation and Food Services	-238.60	152.82
Services provided to firms	-1,923.90	-634.08
Private and Public Education	-8.80	-5.69
Private and Public Health	-0.80	0.09
Services provided to household	-28.20	-9.04
Domestic Services	0.00	-0.01
Public Administration and Social Security	-10.90	-10.13
Total	-25,208.80	5,738.85

Source: Ministry of Finance (2015).

Although these estimates of exemption or new encumbrance allow seeing how the sectors can be affected by the policy, it is not possible to precisely measure the effect on the dynamics of the whole Brazilian economy. In fact, the weight of the labor cost and the taxes associated with it in the production costs of the firms is specific to each sector. The mere display of the waiver amounts is insufficient to assess to what extent each policy benefits or not the Brazilian economy and which sectors tend to be more or less benefit. To evaluate these aspects, we need to use a consistent methodological tool to be able to recognize sectoral specificities caused by the payroll tax scheme, composition of labor-capital ratio and also of intersectoral relations, as the decrease (increase) of the production costs in a sector can benefit (harm) other sector in the context of the links in the production chain. The purpose of this study is to use a dynamic computable general equilibrium model and multi-sector to simulate the effects of these policies. The model will be presented in the following section.

3 The Dynamic CGE model

The dynamic CGE model developed for the simulations in this study is called ORANIGBR, which is a computable general equilibrium model developed for the Brazilian economy and follows the theoretical structure of the Australian model ORANI-G (HORRIDGE, 2011). These models are specified in the form of a linearized system according to the Johansen approach (1960), where the results represent percentage variations from the initial equilibrium solution. The ORANIGBR model was initially calibrated to 2007 data from national accounts and the input-output matrix and its database has been updated for 2012. In addition, a recursive dynamic module was introduced to enable the implementation of simulations in which the capital stock accumulates over time, as well as the labor market has a certain inertia in the adjustment of wages and employment.

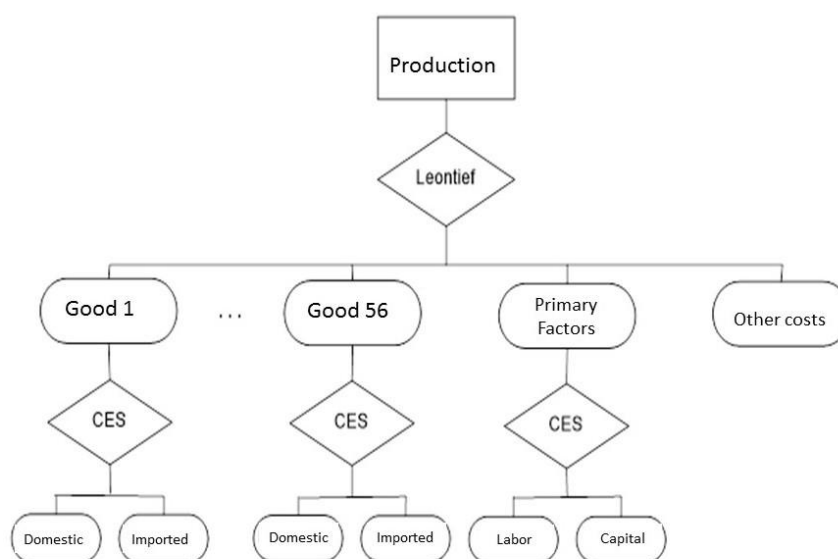
The model has 56 sectors and 56 commodities, five components of final demand (household consumption, government consumption, investment, exports and inventories), two elements of primary factors (capital and labor) and two sectors margins (trade and transport). The model also has a labor disaggregation into eight classes of income (up to 1/2 minimum wage (MW); from 1/2 MW up to 1 MW, from 1 MW up to 2 MW; from 2 MW up to MW 3; from 3 MW up to 5 MW, from 5 MW up to 10 MW; from 10 MW up to 20 MW; more than 20 MW).

The development of the model comprises the calibration of the database, whose monetary values define the initial solution of equilibrium, the theoretical specification of the behavior of economic agents and the coefficients and parameters of the equations. Following

the theoretical structure of ORANI-G model, the optimization behavior of the agents is defined as an economy with perfect competition market.

The ORANIGBR consists of blocks of equations that determine demand and supply relationships, according to optimization assumptions and market equilibrium conditions. In addition, several national aggregates are defined in these blocks, as aggregate employment, real GDP, balance of trade and price indexes. The productive sectors minimize production costs subject to a technology of constant return to scale where the intermediate inputs combinations and primary factor (aggregate) are determined by fixed coefficients (Leontief). There is substitution via prices between domestic and imported goods in the composition of inputs via constant elasticity of substitution function (CES). A CES specification also controls the allocation of the domestic compound between the various regions. It also occurs substitution between capital and labor in the composition of the primary factors by CES functions. Thus, the production function has a nested structure as can be seen in Figure 2.

Figure 2
Structure of the Production Function in the ORANIGBR model

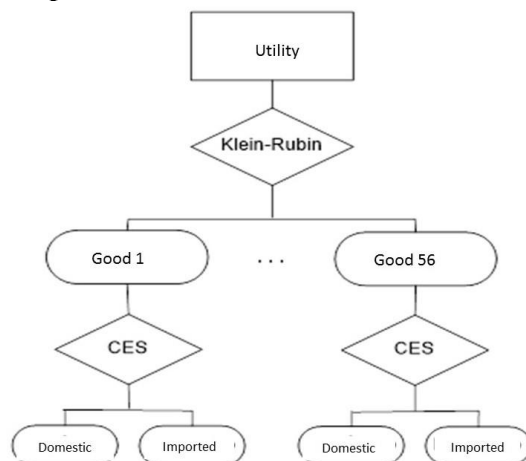


Source: Elaborated by the authors

In the model, there is a representative household that consumes domestic and imported goods. The choice between domestic and imported (from other countries) is performed by a CES specification (Armington hypothesis). Treatment of household demand is based on a combined system of CES/Klein-Rubin preferences. Thus, the utility derived from consumption is maximized according to this utility function. This specification gives rise to the linear expenditure system (LES), in which the share of spending above the subsistence level, for each

good, is a constant proportion of the subsistence total spending of each family. Figure 3 shows the structure of the consumption function.

Figure 3
Consumption Function in the ORANIGBR model



Source: Elaborated by the authors

Government consumption is exogenous. Demand for exports is defined in the usual way, i.e., as a decreasing function of the effective price of exported goods given the elasticity of exports. In turn, the change of the inventories accompanies the production level of the sectors, and also can treat it as exogenous.

The model works with market clearing for all goods, both domestic and imported, as well as in the primary factors market (capital and labor). The purchase prices for each user group (producers, investors, households, exporters and government) are the sum of the basic values and sales taxes (direct and indirect) and margins (trade and transport). Sales taxes are treated as ad-valorem rates on the basic flows. Demands for margins (transport and trade) are proportional to the flow of goods to which the margins are connected. The production structure considers that each industry can produce various goods (secondary production) using the inputs (domestic and imported) and the primary factors (capital and labor).

The ORANIGBR model has a recursive dynamic specification in the investment and capital stock accumulation following mechanisms of accumulation and intersectoral shift from pre-established rules, associated with depreciation and rates of return. Thus, one of the changes to make ORANIGBR a dynamic model is to link the flow of annual investments to the capital stocks. The labor market also presents an intertemporal adjustment element, which involves variables such as the real wages, current employment and employment trend.

According to Dixon and Rimmer (1998), in each year of simulation, it is assumed that the growth rates of the capital in industry j (and thus, investment levels) are determined by the willingness of investors to provide funds to industry j given the increases in the expected rates of return in j and the likely disturbances of its rate of return are limited gradually. In other words, it is assumed that the capital growth in j in year t is limited by the investor perceptions of risk, instead of increasing installation costs (via its effects on unit costs of construction and other capital-supplying industries). Basically the capital growth rate in industry j in year t will be higher than the normal rate (steady state capital growth) as the expected rate of return by investors is higher than the normal rate of return (DIXON and RIMMER, 1998)

It is noteworthy to mention that in the recursive dynamic CGE modeling there is a damping investment responses, since the cost of an extra unit of capital installed in industry j in year t is an increasing function of the j industry investment during t . In most firms, the unit costs of construction services and other inputs for creation of capital are weakly dependent on changes in investment of the firms (DIXON and RIMMER, 2002).

Thus, in ORANIGBR model, the accumulation of physical capital can be formalized mathematically as follows (DIXON and RIMMER, 2002):

$$K_j(t + 1) = K_j(t) \times (1 - D_j) + I_j(t) \quad (1)$$

where:

$K_j(t)$ is the amount of capital available in industry j during the year t ;

$I_j(t)$ is the investment of industry j during the year t ; and,

D_j is the depreciation rate, treated as a known parameter.

With the initial stock $K_j(t)$ and with the mechanism for determining investment $I_j(t)$, equation (1) can be used to outline the trajectory of the capital stock in j .

Removing the time subscripts to simplify the notation, we have:

$$E_t[ROR_j(t)] = EEQROR_j + DISEQ_j \quad (2)$$

where:

$E_t[ROR_j(t)]$ is the expected rate of return in year t for capital owners in j ;

$EEQROR_j$ is the expected rate of return of equilibrium, i.e., the required rate of return to indefinitely sustain the current growth rate of capital in j , and;

$DISEQ_j$ is the measure of disequilibrium of the current rate of return in j .

In most applications of dynamic CGE models, the mechanism for determining the investment j can be represented by:

$$E_t[ROR_j(t)] = -1 + \frac{E_t[Q_j(t+1)]}{C_j(t)} \times \frac{1}{1+r} + (1 - D_j) \times \frac{E_t[C_j(t+1)]}{C_j(t)} \times \frac{1}{1+r} \quad (3)$$

and

$$E_t[ROR_j(t)] = f_{jt} \left(\frac{K_j(t+1)}{K_j(t)} - 1 \right) \quad (4)$$

where:

E_t is the expectation in year t ;

$ROR_j(t)$ is the rate of return on investment in industry j performed in year t ;

$Q_j(t + 1)$ is the return on capital in year $t + 1$;

r is the interest rate;

$C_j(t)$ is the cost of an extra unit of installed capital in industry j in year t ;

f_{jt} is a non-decreasing function.

Equation (3) defines the expected rate of return of industry j in year t as the present value of an extra real of investment, that is, one real of investment buys units of capital in year t . Moreover, on this equation, it is expected to generate an income in year $t + 1$ of $\frac{E_t[Q_j(t+1)]}{C_j(t)}$ and to reduce the need for spending on investment $(1 - D_j) \times \frac{E_t[C_j(t+1)]}{C_j(t)}$. Equation (4), on the other hand, defines a supply-investment curve and shows that the rate of return required by investors when they spend an extra real in industry j depends on the growth rate of the capital stock in j . This equation has, by hypothesis, the reduction of the availability of investment funds so that on the positive slope of f_{jt} function, the industry j attracts considerable investment funds given a high rate of capital growth, and thereby causes a high expected rate of return to attract the marginal investor. It should be noted that it is usual to assume that the supply of investment funds is infinitely elastic with respect to the interest rate.

The labor market, in turn, presents an intertemporal adjustment element which involves variables such as real wage, current employment and employment trend. In its adjustment mechanism, when the employment level exceeds in $x\%$ related to the employment trend of the economy, the real wage increases in $yx\%$. Thus, since there is a negative relationship between employment and real wage in the labor market, the increase of $xy\%$ will adjust the level of employment in later periods to converge to the trend level.

The labor market can be defined mathematically as:

$$\frac{\Delta w}{w_0} = \gamma \left(\frac{L_0}{T_0} - 1 \right) + \gamma \Delta \left(\frac{L}{T} \right) \quad (5)$$

where:

L is the current employment level;
 T is the employment trend level; and
 w is the real wage.

4 Simulation Strategy

To simulate the impact of the policies is necessary to define two procedures. The first is to define assumptions about the behavior of macroeconomic variables in the baseline scenario, which will be a reference to compare with the policy simulation. Thus, the policy effects represent deviations from the baseline scenario. The second procedure is to calibrate the shocks in accordance with the policies of interest, in this case, the tax exemption and the new payroll encumbrance. The following sections present the treatments defined for each of these procedures.

4.1 Simulation closures: baseline and policy scenario

The model closure is the determination of sets of endogenous and exogenous variables in the simulations. This closure represents the assumptions about the economy functioning and its adjustments and shocks (policies). The ORANIGBR is a dynamic model and allows capital accumulation over time and adjustments in the labor market. The two closures used for the recursive dynamics simulations are i) the closure of the baseline and ii) the policy closure.

In both closures, it is assumed that household consumption follows the national nominal income and that government spending follows the household income. Moreover, the share of nominal balance of trade on nominal GDP is determined endogenously. The model works with relative prices and the price variable chosen as a numeraire was the nominal exchange rate.

For the simulations we have used a baseline scenario for the Brazilian economy as a reference. Neither the tax exemption policy nor the new payroll encumbrance occurs in this scenario. This baseline appears as a trend scenario of the Brazilian economy in which deviations from it can be measured by estimating the effects of specific policies. The baseline scenario represents a growth trajectory of the Brazilian economy between 2008-2025, and is divided into two periods.

In the first period, from 2008 to 2012, we considered the main macroeconomic aggregates as exogenous, real GDP, investment, household consumption, government spending and export volume. The goal is to update the main macroeconomic aggregates according with the observed data in the period. Table 2 shows these indicators.

In the second period of the baseline, 2013 to 2025, the macroeconomic variables for GDP, household consumption and government spending are kept exogenous. In both closures,

we have population growth and the price index for imported goods as exogenous variables. This part of the baseline scenario shows a growth trajectory of 3%² per year for the period 2013-2025 and represents the projection that is compared to the policy scenario. Thus, it is simulated a growth of variables as real GDP variable, household consumption and government spending by 3% per year, while population growth is set at 1% per annum.

Table 2 – Variables of the Macroeconomic Scenario (Baseline) from 2008 to 2012 – in % change per year

Macro Variables	Anos				
	2008	2009	2010	2011	2012
GDP	5.23	-0.33	7.58	2.75	1.05
Investment	13.65	-6.65	22.13	4.88	-4.01
Household Consumption	5.7	4.4	6.9	4.1	3.22
Government Expenditure	3.2	3.1	4.2	1.9	3.33
Exports	0.5	-9.1	11.5	4.5	0.5
Populational Growth	1.05	0.99	0.93	0.87	0.82
Imported Price Index	21.81	-11.12	3.9	14.28	0.94

Source: Elaborated by the authors based on the National Accounts, FUNCEX and IBGE.

In the policy scenario, all the macroeconomic variables are endogenous. In this scenario, it is also evaluated the shocks of the simulation according to the policy of interest.

4.2 Calibration of simulation shocks

The payroll tax exemption and the new payroll encumbrance policies represent changes on the cost of productive labor factor in the production function of the economic sectors. In the model database, these costs include gross remuneration of labor, which includes the cost of employer contributions. In this case, to calibrate the shocks linked to each policy, we need to translate the monetary amounts of exemption or encumbrance in percentage changes on the cost of labor.

Thus, the procedure adopted in this calibration have used the information presented in Table 1 and the data on gross remuneration of labor from the Table of Resources and Uses (TRU) of Brazil for 2011, published by the IBGE. This is the most recent year for this information. The following steps were:

- i) The values shown in Table 1 were converted to 2011 constant prices based on the IPCA (Broad National Consumer Price Index);
- ii) For each sector, the constant remuneration in TRU were divided by the number of occupations, generating an estimate of the effective price of labor in 2011;

² This number is quite close to the historical average of the last 30 years (2.9% per year, 1984-2013, according to the National Accounts of the IBGE). Other studies with CGE models using a long run baseline scenario adopt numbers near this, as Ferreira Filho and Horridge (2014), which assume an increase of 3.5% per year, Magellan (2013) of 4% per year, and Souza and Domingues (2014) of 3% per year.

- iii) The values of exemption (encumbrance) were deducted (added) to the gross amount of labor remuneration, and the resulting amount divided by the number of TRU occupations. The result is the price of labor modified by the policies;
- iv) We calculated the percentage difference between the values obtained in step (iii) in relation to the values obtained in step (ii). The percentage differences calculated correspond to the policy shocks on the price of labor, which is a component of the production cost of each sector.

Tabela 3
Mudanças no Preço do Trabalho vinculados às Políticas de Desoneração e Reoneração da Folha de Pagamento (Variação Percentual)

Sectors	Exemption Policy	Encumbrance Policy
Agriculture	-0.10	0.09
Oil and Natural Gas	0.00	0.00
Iron Ore	0.00	0.00
Other of Mining	-1.12	-0.65
Food and Beverage	-1.27	1.07
Tobacco	0.00	0.00
Textile	-4.40	2.53
Clothing and Accessories	-3.74	0.35
Leather and Footwear	-5.76	-1.49
Wood – furniture exclusive	-0.39	0.36
Paper and Cellulose	-3.81	3.32
Newspaper, magazines and records	-0.68	-0.09
Petro-chemistry	-0.03	-0.01
Chemistry	-0.68	5.54
Pharmaceuticals and agrochemicals	-5.40	-0.48
Rubber and Plastic	-3.60	3.40
Cement and others of non-metallic minerals	-1.81	1.36
Steel and non-ferrous Metallurgy	-1.14	-0.17
Metal Products	-1.86	0.37
Machinery and Equipment	-4.15	0.17
Appliances and electrical materials	-3.67	1.26
Electronics, computer and medical equipment	-2.24	-0.09
Automobiles and other vehicles and parts	-3.93	-0.26
Furniture and Various Industries	-3.75	0.95
SIUP	-0.05	-0.02
Construction	-3.19	1.21
Trade	-0.66	1.16
Transport, storage and postal services	-3.91	-0.20
Information Services	-5.40	-1.75
Financial Intermediation	-0.04	0.00
Real estate Activities and Rentals	-0.01	0.24
Maintenance and Repair Services	-1.17	-0.69
Accommodation and Food Services	-0.57	0.37
Services provided to firms	-1.07	-0.35
Private and Public Education	0.00	0.00
Private and Public Health	0.00	0.00
Services provided to household	-0.06	-0.02
Domestic Services	0.00	0.00
Public Administration and Social Security	0.00	0.00

Fonte: Elaborado pelos autores.

Table 3 shows the final result of the simulation shocks calibrated according to the procedures described above. As can be seen when considering the effective cost of labor, the effect of both policies are very heterogeneous between sectors. As argued by the Ministry of Finance, this feature can generate distortions in the pattern of sectoral competitiveness of the Brazilian economy. However, all sectors have presented reduction of the waiver and, in some cases, an encumbrance as the policy shock has a positive effect of an increase in the cost of labor. In this sense, the effect of the new encumbrance policy involves to reduce the competitive advantages offered by the exemption policy. Additionally, the sectorally heterogeneous pattern of both policies reinforces the need to use a multi-sector model to analyze their impacts.

We simulated two scenarios. The first considers the shocks of the payroll tax exemption policy (first column of Table 3) from 2013, considering that the policy starts from this year and it is not modified, and its impacts are projected by 2025. The second scenario considers the exemption policy shocks combined with the shock of the new encumbrance policy from 2016 and the impacts are projected again by 2025. Thus, it is possible to evaluate the difference between the policies impacts considering the effective date of the exemption policy and the term perspective of the new encumbrance policy from 2016.

5 Results

As shown in Table 4 for the period 2013-2025, the results of the first simulation show that the payroll tax exemption policy would lead to a cumulative increase in the growth rate of Brazilian GDP of around 0.34% related to the growth of the baseline. The main determinant of this performance, from the perspective of the composition of GDP, would be the growth of household consumption (0.64%). The reduction in investment in the exemption policy is a result of the substitution effect between labor and capital, as this policy reduces the cost of labor. However, employment present a marginally negative growth (0.07%), as it would last long enough for real wages to adjust. As the model has an adjustment module of employment and wage, the payroll exemption has an initial impact of increasing employment, but over time, this increased demand for labor pushes real wages up and thus the dynamics of employment tends to return to its trend path.

In the case of the encumbrance policy simulation, the impact on GDP suffers a significant drop compared to the previous scenario, standing at -0.37% in the period. In this scenario, the investment would present a significant reduction compared to the previous scenario, standing at -2.67%. The employment decrease in the same proportion of GDP.

However, to better understand these results, you need to check what happens with the major GDP components over time, as well as the sectoral results.

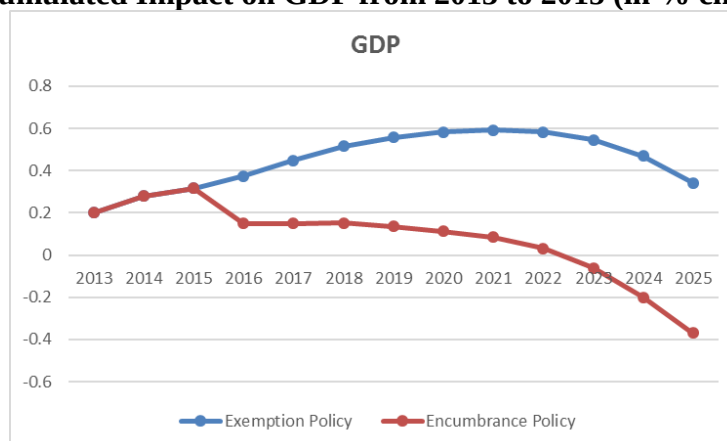
Table 4
Accumulated Macroeconomic Results from 2013 to 2015 (in % change)

Variable	Exemption Policy	Encumbrance Policy
GDP	0.34	-0.37
Investment	-1.05	-2.67
Household Consumption	0.64	-0.50
Exports	-0.38	2.06
Imports	0.19	-1.40
Employment	-0.07	-0.37
Government Expenditure	0.64	-0.50
Capital Stock	0.81	-0.27

Source: Elaborated by the authors.

In Chart 1 we can see the trajectories of the two policies on GDP. By 2021, the exemption policy would have an increasing positive effect on GDP, after we notice a slowdown of the growth, possibly caused by the fall of aggregate investment in the end of the period (see Chart 2). The payroll encumbrance policy in 2016, would reduce GDP growth rates until it became negative from 2023. Thus, the positive effects of the payroll tax exemption policy would be more persistent while with the encumbrance policy generates positive effects only in a short time, reverting to drop in economic activity from 2022.

Chart 1
Accumulated Impact on GDP from 2013 to 2015 (in % change)

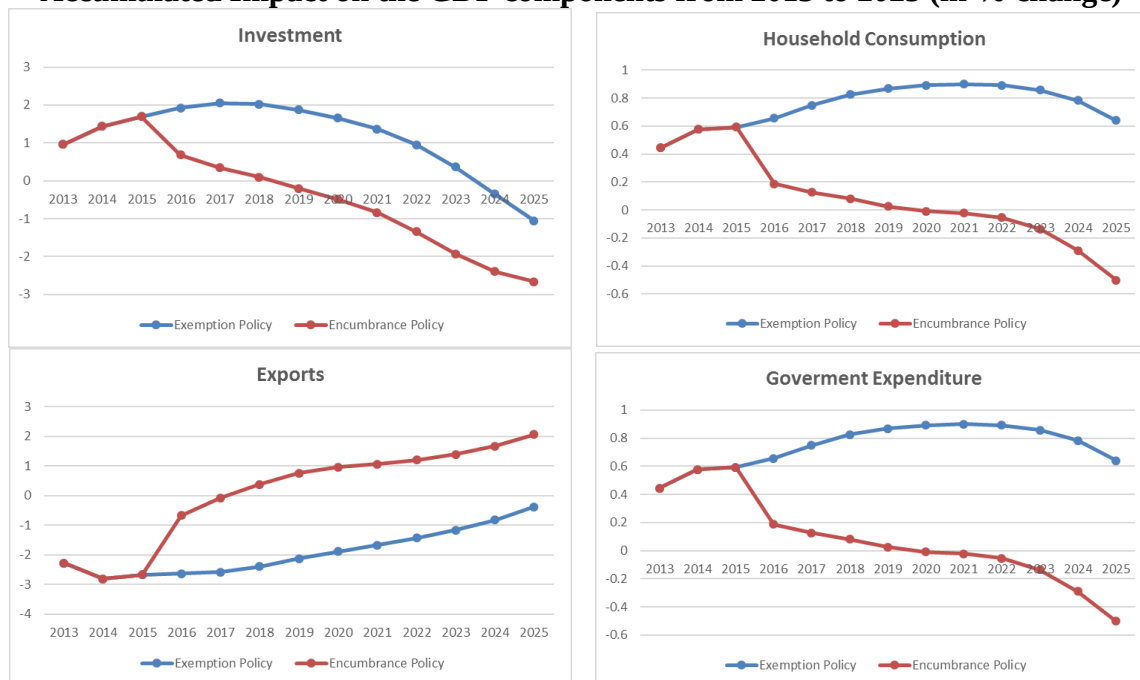


Source: Elaborated by the authors.

Chart 2 provides a better understanding of the results showing the trajectories for the components of GDP. The payroll tax exemption would increase employment in the economy by stimulating productive activities, leading initially to an increase of the economic activity and

of investment. As the real wage adjusts to the new demand for employment, there is a pressure to replace labor for work, which causes increases in wages, and consequently makes lower the profitability of investment. This causes a change in the trajectory of the investment over time. When the encumbrance policy is simulated in 2016, it is observed that the pressure in the price of capital via replacement is faster and lead to a further decrease in investment.

Chart 2
Accumulated Impact on the GDP components from 2013 to 2025 (in % change)



Source: Elaborated by the authors.

With regard to household consumption, we can observe that the effect is positive when the exemption policy is maintained, since the household income is linked to the wages and the policy acts directly stimulating employment. On the other hand, the encumbrance policy virtually eliminates the effect on the previous scenario of consumption, leading to a growth in a much lower level by 2019 and a decrease thereafter. The result of government expenditure is derived from the closure assumption of the model that the relationship between the consumption of public and private goods is kept constant and thus government expenditure follows household consumption.

The growth in exports observed in the first scenario is likely to be intensified by new encumbrance policy. This result arises from the effects of the two policies on the prices of exported goods. In the exemption scenario these prices would fall due to the reduction of production costs associated with the labor factor, while in the encumbrance scenario the

reduction of the domestic demand also leads to a reduction in the prices of domestic goods, making them more competitive in the international market.

Table 5 presents the sectoral results for the exemption policy. The sectors Textiles, Leather and Footwear, Real Estate Services and Rental, and Maintenance and Repair Services would present the greatest productive activity increases, and only the first two have a strong payroll tax exemption shock. The sector of Real Estate Services and Rental was benefited via the production chain as it purchases much of the Construction sector which was benefited directly with the exemption policy and showed significant cost reduction. But the Maintenance and Repair Services sector would also benefit indirectly because its purchases are concentrated in the industry Parts and Accessories (which also got high payroll tax exemption). An interesting result is that even with the reduction of production cost in the Construction sector, its level of activity would be negative accumulated in the period up to 2025. This result can be explained by the drop in investment that would occur in the last years of the simulation.

Table 5
Sectoral Results of the Payroll Tax Exemption Policy: accumulated deviation from 2013 to 2025 related to the baseline (in % change)

Sector	%. Change	Sector	%. Change
Agriculture	0.28	Machinery and Equipment	-0.55
Livestock	0.03	Appliances	0.43
Oil and Natural Gas	0.44	Office and Computer	-0.74
Iron Ore	0.04	Electrical materials	-0.01
Other of Mining	-0.27	Electronics	-0.42
Food and Beverage	0.28	Medical Equipment	-0.28
Tobacco	-0.07	Automobiles	0.83
Textile	0.93	Trucks	-0.83
Clothing and Accessories	0.81	Parts and Accessories	0.53
Leather and Footwear	1.15	Others of Transport	0.75
Wood – furniture exclusive	-0.18	Furniture	0.45
Paper and Cellulose	0.49	SIUP	0.50
Newspaper, magazines and records	0.34	Construction	-0.76
Petro-chemistry	0.48	Trade	0.25
Alcohol	0.61	Transport	0.53
Chemistry	0.20	Information Services	0.56
Resin and Elastane	0.22	Financial	0.43
Pharmaceuticals	0.70	Real estate Activities and Rentals	0.97
Agrochemicals	0.26	Maintenance and Repair Services	0.91
Perfumery	0.66	Accommodation and Food Services	0.15
Paints	-0.12	Services provided to firms	0.01
Others of Chemistry	0.17	Private Education	-0.56
Rubber and Plastic	0.32	Private Health	0.37
Cement	-0.53	Services provided to household	0.02
Others of non-metallic minerals	-0.38	Domestic Services	-1.18
Steel	0.00	Public Education	0.54
Non-ferrous	-0.10	Public Health	0.53
Metal	-0.17	Public Administration	0.51

Source: Elaborated by the authors.

Roughly, the sectors that benefited most from the policy would be labor intensive activities, with the exception of the sectors Home Services and Commercial Education, since the exemption in these sectors would be almost zero, as well as they would not benefit indirectly via productive chain. Another result that stands out is the Automobile sector, which although it is not labor-intensive, it is also one of the beneficiaries. This is explained by the direct effect of the exemption in this sector, but also by the increase in household consumption and the domestic share afforded by the policy.

Table 6
Sectoral Results of the Payroll Encumbrance Policy: accumulated deviation from 2013 to 2025 related to the baseline (in % change)

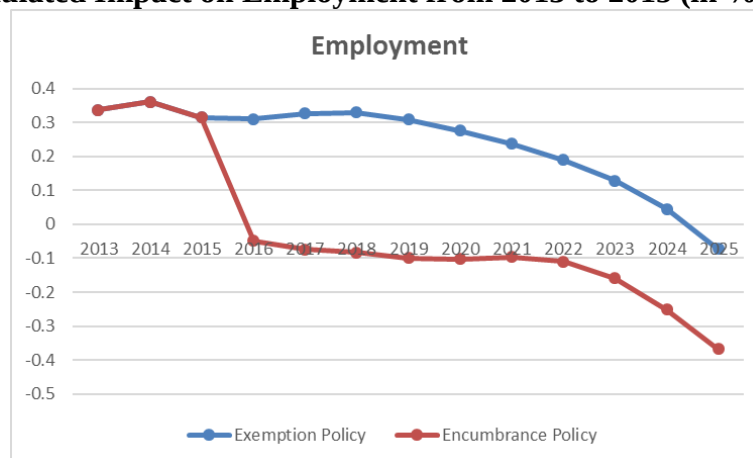
Sector	%. Change	Sector	%. Change
Agriculture	-0.25	Machinery and Equipment	-2.03
Livestock	-0.40	Appliances	-0.41
Oil and Natural Gas	-0.20	Office and Computer	-2.12
Iron Ore	-0.11	Electrical materials	-1.13
Other of Mining	-0.50	Electronics	-1.57
Food and Beverage	-0.16	Medical Equipment	-1.41
Tobacco	0.36	Automobiles	-0.57
Textile	-0.52	Trucks	-2.22
Clothing and Accessories	-0.45	Parts and Accessories	-0.48
Leather and Footwear	-0.17	Others of Transport	-0.91
Wood – furniture exclusive	-1.30	Furniture	-0.78
Paper and Cellulose	-0.48	SIUP	-0.37
Newspaper, magazines and rec	0.03	Construction	-2.28
Petro-chemistry	-0.45	Trade	-0.65
Alcohol	-0.44	Transport	-0.13
Chemistry	-0.47	Information Services	-0.01
Resin and Elastane	-0.70	Financial	-0.26
Pharmaceuticals	-0.33	Real estate Activities and Rentals	-0.18
Agrochemicals	-0.26	Maintenance and Repair Services	-0.06
Perfumery	-0.35	Accommodation and Food Services	0.35
Paints	-1.42	Services provided to firms	0.76
Others of Chemistry	-0.84	Private Education	-0.43
Rubber and Plastic	-0.63	Private Health	-0.54
Cement	-1.93	Services provided to household	-0.20
Others of non-metallic minerals	-1.65	Domestic Services	-0.29
Steel	-1.14	Public Education	-0.50
Non-ferrous	-0.69	Public Health	-0.50
Metal	-1.18	Public Administration	-0.50

Source: Elaborated by the authors.

Table 6 presents the sectoral results for the new payroll encumbrance policy in 2016. In this case, note that all sectors suffer accumulated losses in 2025, except for the Tobacco, Accommodation Services and Food and Services provided to Companies. The result for the Tobacco is explained because this sector is not on the scope of the exemption policy. In other

cases, it would be sectors that have strong intersectoral links with others who have not suffered a large encumbrance payroll shock. It should be noted that the sectors with higher activity reduction are part of the metal-mechanical chain and capital goods: Metal products, Construction, Trucks, and Machinery and Equipment, Electrical Equipment, Electronic Equipment, among others. In the case of the Construction sector the expected effect is in the sense as the new encumbrance policy affects the price of labor, which is an important component of the production cost of this sector. For the other sectors, though less labor intensive, the decrease is mainly caused due to the effect of the new payroll encumbrance on the cost of production in these sectors.

Chart 3
Accumulated Impact on Employment from 2013 to 2015 (in % change)



Source: Elaborated by the authors.

Finally, it is appropriate to analyze the effects on employment and its composition by income class. Chart 3 shows the path of employment with the exemption policy and the encumbrance policy. In the scenario where the exemption is maintained until 2025, employment is stimulated initially and increases over time. However, as wages adjust, the demand for labor decreases, and the cumulative result is a small decrease in employment in 2025. Then employment would return to its trend level. Thus, when it comes the payroll encumbrance policy scenario in 2016, employment would present a much greater fall in the first years after the encumbrance. Therefore, these results show that the exemption policy in the long-term is largely neutral as to its impact on employment. In the case of encumbrance policy, the initial positive effects on employment are complementing reversed since 2016.

Considering the effects on employment disaggregated by income class (Table 6), the results show that the exemption policy is regressive, benefiting relatively higher income classes. In the case of the encumbrance policy, the effects are more uniform across income classes.

These results are influenced by the composition of employment by class of income of the sectors most affected by the policies. In the exemption simulation, at the end of the period, the negative effect on employment is dominant and some of the sectors with the largest decline are also more less skilled labor intensive and therefore with an average income concentrated in the lower income classes: Wood, Cement and Household services. Although the negative effects on employment are greater in the encumbrance shock, their distribution is dispersed among income classes.

Table 6
Results on Employment by Income Classes: accumulated deviation from 2013 to 2025 (in % change)

Income Class	Exemption	Encumbrance
	% change in employment	% change in employment
Up to 1/2 the minimum wage	-0.62	-0.37
From 1/2 to 1 minimum wage	-0.35	-0.35
From 1 to 2 minimum wage	-0.18	-0.37
From 2 to 3 minimum wage	-0.08	-0.36
From 3 to 5 minimum wage	0.01	-0.44
From 5 to 10 minimum wage	-0.01	-0.33
From 10 to 20 minimum wage	-0.05	-0.45
Above 20 minimum wage	-0.01	-0.25

Source: Elaborated by the authors.

6 Conclusions

In this study, we try to evaluate the economic impacts of the exemption policy payroll instituted in 2011 on the Brazilian economy, as well as the impacts of Law Project N° 863/2015, which established a new payroll encumbrance. To simulate the effects of these policies, we used a dynamic and multi-sector computable general equilibrium model developed for the Brazilian economy.

Considering a baseline scenario for the period from 2013 to 2025, the results showed that the exemption policy would contribute to a cumulative differential increase of 0.34% in the growth rate of GDP while the encumbrance policy reduces this impact to - 0.37%. These effects show that the encumbrance policy would not only eliminate the gains of the initial exemption, but also would cause negative effects throughout the economy. Moreover, the exemption policy reveals itself neutral in terms of impact on employment in the long run, while the exemption policy produces a reduction in employment.

The policy effect on the dynamics of consumption and investment is the main factor explaining the differences observed in each scenario. In short, the encumbrance policy implies an increase in the cost of production for most sectors of the economy. Sectors such as Machinery

and Equipment, Construction and Office and Computer would be burdened with the policy change, leading to a broader negative effect on the path of the growth rate of investment in the Brazilian economy. Although exports are relatively benefit in the encumbrance policy scenario, the impact is not enough to sustain the growth rate of the GDP obtained in the exemption policy scenario because the dynamics of investment and the fall in consumption.

Worthy to note that these policies influence the payroll cost of the economic sectors in different ways, affecting an important component of the production cost. Labor intensive sectors are relatively more benefit from the exemption policy, but other economic sectors also appropriate the competitive advantages resulting from the reduction of labor costs on the basis of inter-sectoral linkages. However, the encumbrance policy would represent an increase of the payroll cost of various sectors that form the metal-mechanical complex and capital goods, with relative burden on capital goods. It should be noted that the exemption policy represented a reduction of payroll costs for various economic sectors, albeit with sectorally differentiated distribution. Thus, the encumbrance policy remained reduced the payroll costs for some sectors, but extended this cost to other sectors. So, the effects of the encumbrance policy are distorting and lead to a reduction in output and employment.

The results obtained in this study also reveals an important aspect regarding the taxation policies for the decision-making process of public and private actors. The reduction of tax on labor can be a stimulus to the mechanism of economic growth which tends to favor both household consumption and investment, although the effects on investment are damped in the long run due to the adjustment of wages in the labor market. Apparently it is ironic that the investment rate can be benefited by the reduction of labor costs. But in an economy like Brazil where the tax burden is high and its sectoral distribution is distorting, such a result is hardly surprising.

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