Tax Reform: Theory and Proposals for Brazil

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Abstract

We analyze two tax reform proposals for Brazil. The first proposal is the government’s proposal and the second is the Brazilian National Confederation of Industry’s (CNI) proposal. Our focus is on the macroeconomics effects as measured by changes in consumption, stock of capital and output. More importantly we try to measure the welfare consequences of such proposals. In our analysis we consider the neoclassical capital accumulation model with a representative agent. We also calculate the Marginal Cost of Public Funds (MCF) from the different tax bases in Brazil. The MCF points to the most favorable directions for a tax reform. With regards to the specific proposals, we show that both proposals could increase the efficiency in the economy and cause a Pareto improvement to the society.

JEL Classification: C15, C68, H20, H30;
Key words: Tax Reform, Marginal Cost of Funds, Macroeconomics Effects, Brazil

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1 Introduction

In the last two decades tax revenues as a percentage of Gross Domestic Product, GDP, has increased by more than ten percentage points in Brazil. Figure 1 shows the evolution of this ratio between 1990 and 2007. There is a consensus that the current tax system is too complex\textsuperscript{1} and causes many distortions. These complexities and distortions cause a great deal of inefficiency in the economy and create some barriers to producers and households.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{tax_revenue.png}
\caption{Evolution of Tax Revenue (In percentage of GDP)}
\end{figure}

In the nineties, Brazil adopted a stabilization plan to control inflation. Brazil had success in bringing inflation down with low costs to the economy. However, the stabilization plan was based on increasing total tax revenue to support the government’s plan. Nowadays, inflation is controlled and Brazil has a good macroeconomics fundamentals. The current tax system is considered one obstacle to a sustainable growth and to the development

\textsuperscript{1}See Ministry of Finance (2008) and Brazilian National Confederation of Industry (2008).
of the country. Many are the avoidable distortions recognized by society that exists in the current system. One example is the enormous number of federal taxes and social contributions, which creates large administrative costs. Another example is the cumulatively levies, when tax paid at one stage of productive chain, does not generate a credit in the following stages. This non-efficient tax credit system is responsible to the inefficient organization of the productive structure and to increase the investment and export costs. However, the biggest problem is caused by the ICMS. The ICMS is value-added tax on goods and services. Nowadays, the ICMS has 27 different legislation, each state has its own law. Additionally, the other problem is that the ICMS is paid in the origin state. These two facts are responsible to create a fiscal war among states, with negative impact on growth and an bad inter states relations.

Although we recognize the role of these inefficiencies our discussion will focus on a more standard choice of optimal distribution of burden across the classic tax basis. Hence, the main goal of the present paper is to calculate the costs of current Brazilian’s tax system and examine in detail some proposals of tax reform in Brazil. We also measure the macroeconomics gains of a tax reform. We do a normative and positive analysis of the tax reform proposals. Our main focus is on the efficiency of allocations.

After defining the relevant equilibrium concept we calibrate the model for the Brazilian economy and measure the marginal costs of public funds (MCF), from the different tax bases. When the MCF differs for different tax bases there is money in the table in that it is possible to increase welfare and keep tax revenues constant by switching from taxes with a high to one with a low MCF.

To the best of our knowledge, ours is the first paper to produce this kind of measure for Brazil. We show that value of MCF for the tax base with the lowest MCF in Brazil is within the same range as the one found for others countries; e.g., Browning (1987), Hanson (1984) and Feldstein (1996). This suggests that a well designed reform may bring down the inefficiency of the Brazilian system to the levels found elsewhere.

The MCF is crucial in that regard for it allows us to determinate the distortions that are caused by each kind of taxation. Using the MCF we get a hint as of what directions of reform are bound to work better. We can also right away pass judgement about the proposals of tax reform that are bound to make things worse.

In the second part, we examine two concrete tax reform proposals. The first proposal
is the Government’s proposal and the second is the Brazilian National Confederation of Industry’s (CNI) proposal.3

We consider a standard neoclassical capital accumulation model with representative agents. We consider two cases. In the first case, there is no government spending to be financed and all tax revenue return to households in a lump-sum transfer in the same period. In the second case, there is the government spending to be financed by the taxes. We calibrate the government spending in such a way that there is no transfers to households. In this context, the households and government are rival in the use of resources. We can think of the second case as if there was total waste of resources, because the government spending does not provide any benefit to the society. We consider that both situations are extreme, the real world is a situation between in these two cases.

Our references to the present paper are Hall (1971), Atkinson and Stiglitz (1972), Ferreira and Araújo (1999), Ljungqvist and Sargent (2004) and Lledo (2005).

The present paper is composed as follows. In section 2 we present the model. In section 3 we have the proposal of the tax reform of the government and CNI. In section 4 we have the calibration of ours parameters. In the section 5 we find the MCF and present the results to ours simulations of the macroeconomics effects of the proposal of tax reform. The section 6 has the main conclusions. Additionally, there are two appendix that provide a support to our analysis.

2 The Model

We use non-stochastic version of the standard growth model with a deterministic fiscal shocks on equilibrium outcomes. This model allows us to simulate the allocative effects of a tax reform in the Brazilian’s economy. In our model the time is discrete, the economy is closed and there are no technological progress and population growth. Additionally, there is no debt in our economy.

As our focus is on the macroeconomics gains (or loses) of a tax reform, we prefer a simple model to assess the effects of a tax reform. For this reason, we do not consider productivity shocks, debt and an open economy.

2 see the proposal of Ministry of Finance in the references.
3 Our mains references are the Brazilian National Confederation of Industry (CNI) working papers available at www.cni.org.br, details on the references.
Besides the government, the economy is inhabited by representatives households and firm. The households optimally choose their consumption, stock of capital and leisure. The firm operates in a competitive market. The government levies the households in four ways. The households are levied on their consumption, investment, labor income and capital income.

The allocation of the tax revenue is an important variable in the determination of the equilibrium. As we said above, we suppose two cases to the taxes collected. In the first case there is no the government spending to be financed by the taxes. All resources return to the households by a lump-sum transfers in the same period. In the second case, there is the government spending to be financed by the taxes. The government spending consists in purchases of goods and services. The government does not invest in this economy and the government spending does not provide any productivity benefit to the society. In this situation, the households and the government are rivals in the resources allocations.

2.1 Household

In this model there is absence uncertainty and households have perfect foresight. The representative household maximizes his lifetime utility, equation (1), subject to his/her budget constraint. He/she chooses the sequence of consumption, capital and leisure, \( \{c_t, k_t, l_t \}_{t=0}^{\infty} \), that maximize his/her utility. In the initial period, \( t_0 \), the household has \( k_0 > 0 \) units of capital. In each period \( t \), the household has one time endowment and he chooses the time allocated to leisure \( l_t \) and to the work \( h_t = 1 - l_t \).

The household discounts the future with rate \( \beta \in (0, 1) \) and \( \gamma \) is the weight of leisure in the instantaneous utility function. As we said above, there is no population growth in this economy. The utility function, \( U(c_t, l_t) \), is assumed to be increased, concave and twice differentiable. The lifetime utility is given by:

\[
U[c_0, c_1, ..., l_0, l_1, ...] = \max \sum_{t=0}^{\infty} \beta^{t} \ln c_t \gamma \ln l_t 
\]

The household’s income consists from selling labor, renting capital to firm and the government’s transfers, when there is transfer. As we said above, we consider two situations to the taxes collected. In the first case, there is a lump-sum transfer and there is no government spending, i.e. \( g_t = 0 \). The government collects the taxes and redistributes its in the same period to the households. In the second case there is government spending to be
financed by taxes, i.e. \( g_t \neq 0 \). In this situation we want to investigate the behavior of the households when there is perfect rivalry between households and government.

The representative household’s budget constraint has the form:

\[
(1 + \tau_{ct})c_t + (1 + \tau_{it})i_t = (1 - \tau_{ht})w_t h_t + (1 - \tau_{kt})r_t k_t + tr_t
\]

(2)

where the variables \( c_t, i_t, k_t \) and \( tr_t \) represent respectively per capita consumption, investment, capital and government’s transfer\(^4\), where \( tr_t \neq 0 \) or \( tr_t = 0 \). The terms \( \tau_{ct}, \tau_{it}, \tau_{ht} \) and \( \tau_{kt} \) are respectively the time varying taxes rates on consumption, investment, labor income and capital income. The investment follows the condition \( i_t = k_{t+1} - (1 - \delta)k_t \), where \( \delta \) is the depreciation rate.

The household’s problem is given by:

\[
U[c_0, c_1, \ldots, 1 - h_0, 1 - h_1, \ldots] = \max_{\{c_t, h_t, k_t\}} \sum_{t=0}^{\infty} \beta^t [\ln c_t + \gamma \ln(1 - h_t)]
\]

(3)

subject to (2) and \( k_0 > 0 \)

The first order conditions of the problem described by equation (3) are given by:

\[
c_{t+1} = \beta c_t \frac{(1 + \tau_{ct})}{(1 + \tau_{ct+1})} \left\{ \left[ \frac{(1 - \tau_{kt+1})}{(1 + \tau_{kt})} \right] r_{t+1} + \left[ \frac{(1 + \tau_{it+1})}{(1 + \tau_{it})} \right] (1 - \delta) \right\}
\]

(4)

\[
c_t \gamma (1 + \tau_{ct}) = (1 - h_t)(1 - \tau_{ht})w_t
\]

(5)

The complete description of the solution of the household’s problem is in appendix A.

### 2.2 Equivalence between Taxes

In this subsection we show that some combinations of taxes do not change the consumption possibility set. For each period \( t \), we can rewrite the budget constraint, equation (2), according to the example below.

Let’s define the others taxes in terms of consumption tax. We can write the new taxes as:

\[
1 + \tau_{it} = \frac{1 + \tau_{ct}}{1 + \tau_{ct+1}} \quad 1 - \tau_{ht} = \frac{1 - \tau_{ct}}{1 + \tau_{ct}} \quad 1 - \tau_{kt} = \frac{1 - \tau_{ct}}{1 + \tau_{ct}} \quad \tau_{tr_t} = \frac{1}{1 + \tau_{ct}}
\]

\(^4\)\( tr_t = \tau_{ct}c_t + \tau_{it}i_t + \tau_{ht}w_t h_t + \tau_{kt}r_t k_t - g_t \). If \( g_t \neq 0 \), then \( tr_t = 0 \).
The budget constraints above could be rewritten as following:

\[ c_t + (1 + \tau_{it})i_t = (1 - \tau_{ht})w_t h_t + (1 - \tau_{kt})r_t k_t + \tau_{tr} r_t \]  

(6)

After the transformation of taxes, we can observe that our consumption possibility set is the same before the transformation. In other words, the we have the same slope before the transformation. Furthermore, in each period, we can normalize the taxes in terms of one tax. As described by Salanié (2003), when the consumption possibility set keeps uncharged, we can affirm that there is a equivalence between taxes in the model. Therefore, although we can write the budget constraint in different ways, the results of our model are the same.

2.3 Government

We suppose two situations to the tax revenue. In the first situation, there is no government spending to be financed, \( G_t = 0 \), in equation (7). The government levies the households and returns the taxes collected in the same period by a lump-sum transfers. In this case, we investigate a situation where there is no second order distortions caused by the government. In others words, the distortions are caused only by taxation.

In the second case, there is the government spending, \( G_t \neq 0 \), which is calibrated to represent in steady state 33.17% of GDP. When we do that, it means that there is no transfers to the households, \( TR_t = 0 \). Then, in this situation there is a competition between the households and the government for the resources. We can think this case as the government spending does not provide any benefit to households. The government wastes the resources of the economy. The government’s budget constraint in the period \( t \) in the general case is given by:

\[ \tau_{ct} C_t + \tau_{it} I_t + \tau_{ht} h_t w_t L + \tau_{kt} r_t K_t - G_t = TR_t \]  

(7)

where \( C_t, I_t, L, K_t, G_t \) and \( TR_t \) are respectively, aggregate consumption, aggregate investment, population (normalized to be 1), aggregate capital and aggregate lump-sum transfers. The terms \( w_t, r_t \) and \( h_t \) are the wage, the interest rate and the labor supply respectively.

Following Hall (1971), we take the government behaviors as exogenous, it means that for us, the government only lists the sequences for the government spending, \( G_t \), to \( t \geq 0 \)
and the taxes \( \{ \tau_{ct}, \tau_{it}, \tau_{ht}, \tau_{kt}\} \) as the sets of fiscals instruments.

Note that the government does not control directly the value of fiscals parameters, \( \tau \). It controls the tax revenue among the four tax base. Let \( \theta_m \) with \( m = \{c, i, h, k\} \) the share of each tax base \( m \) in the government’s tax revenue. The total tax revenue in the economy in period \( t \) is represented by \( \theta_t = \sum_{m=c,i,h,k} \theta_{mt} \). Thus the determination of the set of fiscals instruments is given by:

\[
\begin{align*}
\tau_{ct} &= \theta_{ct} \frac{Y_t}{C_t}, \\
\tau_{it} &= \theta_{it} \frac{Y_t}{I_t}, \\
\tau_{ht} &= \theta_{ht} \frac{Y_t}{w_t h_t}, \\
\tau_{kt} &= \theta_{kt} \frac{Y_t}{r_t K_t}
\end{align*}
\]

We use the equation (8) to calculate the marginal tax rate by each tax base. The equation (8) comes from a manipulation of equation (7). A tax reform implies in a change in the parameters \( \theta_m \). After a tax reform, we have new parameters thetas, \( \theta^*_m \). These new parameters \( \theta^*_m \) imply in a new marginal tax rate \( \tau^*_m \) to each tax base. Besides the fiscal parameter, the relations \( \frac{Y_t}{C_t}, \frac{Y_t}{I_t} \) and \( \frac{Y_t}{K_t}, w_t \) and \( r_t \) define the marginal tax rate by each tax base. The relations \( \frac{Y_t}{C_t}, \frac{Y_t}{I_t} \) and \( \frac{Y_t}{K_t} \) are exogenous in our model and the parameters \( w_t \) and \( r_t \) represent the technology in our economy.

2.4 Firm

The output, \( Y_t \), is produced by a competitive firm using the Cobb-Douglas technology. In our model there is only one firm that is responsible to all output in the economy. This firm works in a competitive market and has zero-profit condition. The share of capital and labor in the output are respectively \( \alpha \) and \( 1 - \alpha \). This technology holds Inada condition. The output is represented by:

\[
Y_t = k_t^\alpha h_t^{1-\alpha}
\]

The representative firm chooses \( \{k_t, h_t\} \) to maximize its problem. The firm hides workers and rents households’ capital. The firm’s problem is described by equation (10).

\[
\max_{\{k_t, h_t\}} k_t^\alpha h_t^{1-\alpha} - w_t h_t - r_t k_t
\]

We normalize the price of good to be 1. The firm’s first order conditions are described
\[ w_t = f_h(k, h) = (1 - \alpha)k^\alpha th^{-\alpha} \] (11)
\[ r_t = f_k(k, h) = \alpha k^{\alpha-1} h^{1-\alpha} \] (12)

2.5 Equilibrium

The assumptions by the form of utility function and the technology assure that the first order conditions are necessary and sufficient for our problem and that allocations are interior. Now we can define a competitive equilibrium:

**Definition 1** A Competitive Equilibrium consists of, given a policy rule \( \pi = \{G_t, TR_t, (\tau_{jt})_{j=\{c,i,h,k\}}\}_{t=0}^\infty \), an allocation \( \{c_t, h_t, k_t\}_{t=0}^\infty \) for the household and a price system \( \{w_t, r_t\}_{t=0}^\infty \) such that:

i) given the price system and the policy, the allocations \( \{c_t, h_t, k_t\}_{t=0}^\infty \) solve the household’s problem (3);

ii) competitive pricing i.e., (11) and (12) holds for firm’s problem;

iii) the government budget balances, i.e., equation (7) holds;

iv) the fiscal parameters are defined by (8);

v) market clearing condition holds.

3 Tax Reform Proposal

We describe below the point of the proposals of tax reform that we analyze in the present paper. We examine the government’s and CNI’s proposals. A common point in the both proposals is the hypothesis of revenue guarantee. The implication of this hypothesis is that the both taxes reforms are neutral, i.e., the tax revenue in percentage of GDP would be kept unchanged after the reform. The Table 1 shows the Brazilian’s tax system structure in 2006, organized according to our opinion about the allocation of the taxes and contributions in each tax base. This case is the benchmark situation. In the appendix B, we summarize the all taxes, with complete name, tax base, value and share in GDP (see Table 12).
Table 1: Tax Revenue (% GDP) According to Tax Base - Benchmark

<table>
<thead>
<tr>
<th>Consumption</th>
<th>Investment</th>
<th>Labor</th>
<th>Capital</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE, Others Revenues</td>
<td>II*, IOF**</td>
<td>IRPF,</td>
<td>IRPJ,</td>
<td></td>
</tr>
<tr>
<td>Fees, IPI-Cigar</td>
<td>IPI - Import*,</td>
<td>IRRF-T</td>
<td>IRRF-C</td>
<td></td>
</tr>
<tr>
<td>IPI-Beverages</td>
<td>IPI-Vehicle**,</td>
<td>IRRF-O</td>
<td>IRRF-F</td>
<td></td>
</tr>
<tr>
<td>FUNDAF, II*</td>
<td>IPI-Others**,</td>
<td>Employer/</td>
<td>IPTU</td>
<td></td>
</tr>
<tr>
<td>IPI - Import*, ISS**,</td>
<td>PIS/PASEP**</td>
<td>Employee</td>
<td>IPVA,</td>
<td></td>
</tr>
<tr>
<td>IPI-Vehicle**</td>
<td>CPMF**</td>
<td></td>
<td>ITCD,</td>
<td></td>
</tr>
<tr>
<td>IPI-Others**, CSLL**,</td>
<td>ICMS**,</td>
<td>Transfer</td>
<td>ITR</td>
<td></td>
</tr>
<tr>
<td>CID**,** COFINS**</td>
<td>CSLL**, ISS**,</td>
<td>to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIS/PASEP**, IOF**</td>
<td>COFINS**</td>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPMF**, ICMS**</td>
<td>CID**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

θc = 0.1448  θi = 0.0375  θh = 0.1004  θk = 0.0491  θ = 0.3317

Source: Elaborated by authors

where θc, θi, θh, and θk are respectively the share of each tax base in the tax revenue in percentage of GDP and θ = \sum_{m=\{c,i,h,k\}} \theta_m.

The cumulative taxes are marked with (**). They have incidence on consumption and on investment, this fact is responsible to increase the distortion of the current tax system. One way to separate the values that have incidence in each tax base, we multiply the total value of taxes marked with (*) and (**) by some ratio. For example, in the case of II, marked with (*), only 26.51%\(^5\) of its total value has incidence on consumption. In the cases of taxes marked with (**) , they have an incidence on consumption and on investment, thus their total value are multiplied by ratio C/Y in the case of consumption and by I/Y = 1 − C/Y in the case of investment.

We have to comment some points about the both proposals. First, the both proposals consider that there is a necessity to change the financing of the current regional development policy structure. The second point is about the changes in the federative relations and

\(^5\) The II has an incidence on consumption and on investment. The consumption share is compounded by consumption goods and 80.45% of oil and fuel imported. The investment share is compounded by capital goods, raw goods and 19.55% of oil and fuel, the investment share is equal to 73.49%.
the government’s transfers to states. In the present paper, we do not analyze these points, we leave these topics to others forward works. We keep our focus in the simplification of federal and state taxes and in the reduction of the taxes, specifically on the investment and on the payroll taxes.

3.1 Government’s Proposal

In February 28, 2008 the Brazilian’s government sent to the National Congress a tax reform proposal\(^6\). In present paper we will analyze some points of this proposal. Our focus will be on the simplification and elimination of federal taxes, reduction on payroll contribution and simplification of a value-added state tax, ICMS.

About simplification and elimination of the federal taxes, the government’s tax reform proposal suggests the elimination of the following taxes, COFINS, PIS and CIDE. To substitute these taxes, a federal value-added (IVA-F) tax would be created. As the COFINS, PIS and CIDE are cumulative levies, they have an incidence on consumption and on investment. By definition, the IVA-F has incidence only on consumption. Besides this changed, this proposal also suggests the extinction of the CSLL, which value would be incorporated into the corporate income tax (IRPJ). This change would create a new IRPJ. According to this proposal, all changes in the tax system would happen one year after the tax reform has been approved.

Additionally, the proposal intends to create a new ICMS. The ICMS is a state value-added tax. As we can see in Table 12 in appendix B, the ICMS is responsible for 7.10\% of percentage of GDP. The marginal tax rate of the ICMS is 7\%\(^7\) in some states and 12\% in the others. The government wants to replace these rates for a single tax rate equal to 2\% for every states.

Differently of COFINS, PIS, CIDE and CSLL, the changes in the ICMS would be gradual to the new value. The gradual process of reduction is described in Table 2. In present paper we want to evaluate the reduction on the marginal tax rate of ICMS. We find the final value of new ICMS multiplying the old value by \(2/8.55\), where 8.55 is the weighted\(^8\) mean between 7\% and 12\%. The values of transition periods are found in the similar way. Due to the transition period, the reform would begin in \(t = 1\) and would finish in \(t = 6\).

\(^6\)Details on the working paper of Ministry of Finance (2008).
\(^7\)The states, MG, PR, RJ, RS, SC, SP, have this tax. They are responsible for about 69\% of ICMS.
\(^8\)The weighted is given by share of states in the total value of ICMS.
Table 2: ICMS Rate and Payroll Reduction

<table>
<thead>
<tr>
<th>Period</th>
<th>ICMS Rate</th>
<th>Payroll</th>
</tr>
</thead>
<tbody>
<tr>
<td>t = 0</td>
<td>7%</td>
<td>12%</td>
</tr>
<tr>
<td>t = 1</td>
<td>6.5%</td>
<td>11%</td>
</tr>
<tr>
<td>t = 2</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>t = 3</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>t = 4</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>t = 5</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>t = 6</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: Elaborated by authors

The $t = 0$ is the benchmark value.

Although the ICMS is a value-added tax, it has an incidence on consumption and on investment in the current tax system. The reason is the system of charging the tax in interstate operations. In interstate transactions, part of the ICMS is due to the state in which the merchandise originated and part to the state of destination. As there are different taxes among states, based on the argument that states would have to refund a tax debt in a different state, many states resist refunding cumulative ICMS credits. In some cases, the firms have to wait a long time to receive the refund. The tax reform proposal suggests that the ICMS would be paid only in the state of destination. Therefore, after the tax reform, the government expects to eliminate this problem. This change in the tax system would be captured in our model because the ICMS would have an incidence only on consumption.

The other important point that we analyze in present is the reduction on payroll taxes. The first act to do that would be the elimination of the "Education Wage" - a social contribution that it is paid by employer. The amount collected with this contribution will be incorporated to IVA-F. Moreover the elimination of the "Education Wage", the employer contribution to the Social Security system would decrease from 20% to 14%.

Again, the reduction on Social Security contribution would be gradual, one percentage point per year. This reduction would begin in the second year following approval of the reform. The Table 2 describes the transition period until the contribution achieves the value
of 14%. To capture this change, we multiply the total contribution collected with the Social Security by \((14/20)\) in the end of reform. Looking at the data, we observe that 70% of Social Security contribution correspond to the employer/employee contribution and that the 2/3 of this total value is due to the employer contribution.

The new tax system structure after government’s tax reform is described in Table 3. The values in the Table 3 refer to the new equilibrium, after the transitory period.

Table 3: Tax Revenue (% GDP) According to Tax Base - Government’s Reform

<table>
<thead>
<tr>
<th>Consumption</th>
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<td>IOF**, IVA-F</td>
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</tbody>
</table>

\(\theta_c = 0.1696\) \(\theta_i = 0.0141\) \(\theta_h = 0.0869\) \(\theta_k = 0.0611\) \(\theta = 0.3317\)

Source: Elaborated by authors

3.2 National Confederation of Industry’s (CNI) Proposal

The Brazilian National Confederation of Industry’s (CNI) proposal\(^9\) has some common points with the government’s proposal. The reason is because the CNI and government have had some discussions about how to define a good tax reform in Brazil. There is a consensus that any reform has to keep the tax revenue unchanged, to avoid a collapse on government’s account and public services.

Nevertheless, in the government’s proposal, it prefers to avoid some controversies

\(^9\)Our references are working papers of Brazilian National Confederation of Industry (CNI) in February and Brazilian National Confederation of Industry (CNI) in May.
points because these points could delay the tax reform. Therefore, some important points are postponed to another opportunity. So, in this subsection we present some of these points. They are considered very important to the growth and competitiveness of the country in a soon future.

Table 4: Tax Revenue (% GDP) According to Tax Base - CNI’s Reform

<table>
<thead>
<tr>
<th>Consumption</th>
<th>Investment</th>
<th>Labor</th>
<th>Capital</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE,</td>
<td>II*</td>
<td>IRPF,</td>
<td>new IRPJ,</td>
<td></td>
</tr>
<tr>
<td>Others Revenues</td>
<td>IOF**</td>
<td>IRRF-T</td>
<td>IRRF-C</td>
<td></td>
</tr>
<tr>
<td>Fees, II*</td>
<td>CPMF**</td>
<td>IRRF-O</td>
<td>IRRF-F</td>
<td></td>
</tr>
<tr>
<td>FUNDAF,</td>
<td>Employer/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPMF**,</td>
<td>Employee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IOF**</td>
<td>Transfer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IVA-F, IVA-E</td>
<td>to Other</td>
<td></td>
<td>ITR, IPTU</td>
<td></td>
</tr>
</tbody>
</table>

\[ \theta_c = 0.1744 \quad \theta_i = 0.0063 \quad \theta_h = 0.0869 \quad \theta_k = 0.0611 \quad \theta = 0.3317 \]

Source: Elaborated by authors

In CNI’s proposal our focus will be on the simplification and elimination of federal taxes, reduction on payroll contribution and creation of a new state value-added tax, IVA-E. Although the CNI’s proposal has similar suggestions to the government’s proposal, the CNI wants a bigger and deeper change in the current tax structure. As we can see below, the CNI wants to reduce the period to implement all changes in tax system. According to CNI, the sort time to implement the changes in the tax system would cause effects in the short run.

One common point the both proposals is the reduction of payroll taxes. The CNI also suggests a reduction on the employer’s contribution to Social Security from 20% to 14%. However, it suggests an immediate reduction of values while the government suggests a transition period. Other common point is the incorporation of CSLL into the IRPJ.

Besides COFINS, PIS, CIDE, the CNI’s proposal wants to eliminate the IPI. The COFINS, PIS, CIDE and IPI would be substituted by IVA-F. Of course, CNI wants a reform with a bigger reduction on investment tax. The new tax system structure after CNI’s proposal is presented in Table 4.
The most important difference between the CNI’s and government’s reforms are due to ICMS and ISS, two cumulative levies. The CNI suggests the extinction of ICMS and ISS and the creation of state value-added, IVA-E. The IVA-E would have the incidence only on the consumption, furthermore it would provide a higher reduction of the taxation on the investment.

Table 5: Share of each Tax Base in Tax Revenue (% GDP)

<table>
<thead>
<tr>
<th>Period</th>
<th>Government</th>
<th>CNI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\theta_{ct}$</td>
<td>$\theta_{it}$</td>
</tr>
<tr>
<td>$t = 0^*$</td>
<td>0.1448</td>
<td>0.0375</td>
</tr>
<tr>
<td>$t = 1$</td>
<td>0.1513</td>
<td>0.0236</td>
</tr>
<tr>
<td>$t = 2$</td>
<td>0.1541</td>
<td>0.0226</td>
</tr>
<tr>
<td>$t = 3$</td>
<td>0.1580</td>
<td>0.0204</td>
</tr>
<tr>
<td>$t = 4$</td>
<td>0.1619</td>
<td>0.0183</td>
</tr>
<tr>
<td>$t = 5$</td>
<td>0.1658</td>
<td>0.0162</td>
</tr>
<tr>
<td>$t = 6$</td>
<td>0.1696</td>
<td>0.0141</td>
</tr>
</tbody>
</table>

Source: Elaborated by authors

*: $t = 0$ is the benchmark

In Table 5, we summarize the share of tax base in the tax revenue in percentage of GDP during the transition period for both tax reform until reaching the new equilibrium. As we said above, the CNI’s proposal suggests a faster implementation of the tax reform. Thus, the transition period is only one year while the government’s proposal has five years to implement all changes. We use the values of $\theta$’s in Table 5 to find marginal tax rate to each tax base in the next section.

4 Calibration

In this section, we find the parameters of our economy. The calibration of ours parameters is made using equation (8), the values in Table 5 and the first orders conditions of households and firm. As we said above, the complete description of taxes and contributions is in the appendix B.
4.1 Technology and Preference Parameters

The Table 6 summarizes the values of technology and preference parameters that we consider in the present paper.

Table 6: Technology and Preference Parameters

<table>
<thead>
<tr>
<th>$\beta$</th>
<th>$\gamma$</th>
<th>$\alpha$</th>
<th>$\delta$</th>
<th>$r$</th>
<th>$K/Y$</th>
<th>$C/Y$</th>
<th>$I/Y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9699</td>
<td>1.6589</td>
<td>0.3977</td>
<td>0.0738</td>
<td>0.1412</td>
<td>2.8166</td>
<td>0.7922</td>
<td>0.2078</td>
</tr>
</tbody>
</table>

Source: Elaborated by authors

The share of capital ($\alpha$) in the output is calculated using the capital-output ratio following Morandi and Reis (2004). We consider the mean between 1970-2000 and the value is equal to $K/Y = 2.8166$. The interest rate ($r$) is the mean in 2006 and it is equal to $r = 14.12\%$ per year. The share of capital is given by marginal productivity of capital that could be write as:

$$f_k(k,h) = \alpha Y/K = r$$
$$\alpha = 0.3977$$ (13)

The depreciation rate ($\delta$) is defined by steady state relations between $(I/Y)$ and $(K/Y)$. As we said above, the relation $(I/Y)$ is defined by the expression $I/Y = 1 - C/Y$. Thus, the depreciation rate is given by:

$$I = \delta K$$
$$\delta = 0.0738$$ (14)

The intertemporal discount rate ($\beta$) is given by the equilibrium condition in the steady state ($t = 0$):

$$\beta = \frac{(1 + \tau_i)}{(1 - \tau_k)r + (1 + \tau_i)(1 - \delta)}$$
$$\beta = 0.9699$$ (15)
We choose the weight of leisure in utility ($\gamma$), such that the household works $1/3$ of his time endowment in the steady state. According to this assumption, the value of $\gamma$ is:

$$\gamma = \frac{(1 - \alpha)(1 - \tau_h) \left[ \frac{1}{h} - 1 \right]}{(1 - \alpha)(1 - \tau_h) + (1 - \tau_k)\alpha - \frac{(1-\tau_k)\alpha^2}{1-(1-\delta)\beta}}$$

$$\gamma = 1.6589$$ (16)

### 4.2 Fiscal Policy Parameters

<table>
<thead>
<tr>
<th>Period</th>
<th>Government</th>
<th>CNI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\tau_{ct}$</td>
<td>$\tau_{st}$</td>
</tr>
<tr>
<td>$t = 0$</td>
<td>0.1800</td>
<td>0.1916</td>
</tr>
<tr>
<td>$t = 1$</td>
<td>0.1881</td>
<td>0.1209</td>
</tr>
<tr>
<td>$t = 2$</td>
<td>0.1916</td>
<td>0.1154</td>
</tr>
<tr>
<td>$t = 3$</td>
<td>0.1964</td>
<td>0.1045</td>
</tr>
<tr>
<td>$t = 4$</td>
<td>0.2012</td>
<td>0.0937</td>
</tr>
<tr>
<td>$t = 5$</td>
<td>0.2060</td>
<td>0.0838</td>
</tr>
<tr>
<td>$t = 6$</td>
<td>0.2109</td>
<td>0.0719</td>
</tr>
</tbody>
</table>

Source: Elaborated by authors

In this subsection we find the marginal tax rate to each tax base. For this, we use the values in Table 5, the conditions describe above and the relations that are given by equations (8) to determine the marginal tax rate to each tax base. According to these conditions, we find the new marginal tax rate to each tax reform. The values that we find are summarized in Table 7.

According to Table 7, we observe an increase in the taxation on consumption and the capital income and a reduction of the marginal taxes rates on investment and labor income in both proposals. As the CNI is the productive sector, its proposal intends to eliminate more cumulative levies. For this reason, we observe a more significant reduction in the taxation on the investment and an increase in the taxation on the consumption.
5 Results

As we said above, the main goal of the present paper is to calculate the costs of current Brazilian’s tax system and examine in detail some proposals of tax reform in Brazil. To calculate the costs of current tax system we consider the Marginal Cost of Public Funds (MCF) to measure the distortion caused by each tax base.

The MCF allows us to determinate the distortions that are caused by each kind of taxation. In this way, we can use the MCF to define the better direction to a tax reform. Using the MCF we can do judgement about the proposal of tax reform.

The other goal is to examine two tax reform proposals and measure the macroeconomics gains of these proposals. To do that we consider a standard neoclassical capital accumulation model with representative agents.

5.1 Marginal Cost of Funds

According to Dahlby (2008), the marginal cost of public funds (MCF) measures the loss incurred by society in raising additional revenues to finance government spending. The MCF is the key component in evaluations of tax reform, public expenditure programs and others public policies.

Before defining the MCF we have to calculate the dead weight loss (DWL). The definition of DWL that we consider is

\[
DWL = \frac{|U_{(t=0)} - U_{(t=T)}|}{\lambda(t = 0)}
\]

where the numerator is the absolute value of the difference between the utilities. The term \( U_{(t=0)} \) is the utility in the benchmark and \( U_{(t=T)} \) is the utility in the new steady state, after increasing the tax revenue in percentage of GDP in 1%, i.e. the tax revenue would be 34.17%. The term \( \lambda(t = 0) \) is the marginal utility of consumption in the benchmark\(^{10}\).

There are many ways to express the marginal cost of public funds. In the present paper we consider the following definition of Marginal Cost of Funds (MCF):

\[
MCF = 1 + \frac{\Delta DWL}{\Delta R/Y}
\]

\(^{10}\)In the next subsection, the DWL will be assessed in terms of marginal utility of consumption in the Pareto Optimal situation.
where $\Delta R$ is an increase of 1% in the tax revenue and $Y$ is the output in the new steady state. We find the MCF to each kind of tax base. For example, to find the MCF of consumption we increase the consumption tax rate until the tax revenue reaches an increase of 1%, kept the others marginal tax rate uncharged. We repeat this procedure to each tax base.

When we calculate the marginal cost of funds (MCF), we want to measure of the marginal costs of each tax base in the current Brazilian’s tax system. In others words, the MCF defines the better way to increase or reduce a tax. Therefore, the MCF can be used to determinate the better direction to a tax reform in Brazil.

In Table 8 we present the values of the MCF to each tax base. As we said above, we consider two situations to the taxes collected. In first situation the total taxes return to households in a lump-sum transfer. In the second situation there is no transfers to the households. When there is the transfers, the values of MCF are smaller than in the otherwise situation. The reason is due to the second order distortion caused by the government spending. In others words, when there is absence of transfers, the government and households are rivals in the use of resources. Therefore, the no productive spending increases the MCF.

<table>
<thead>
<tr>
<th></th>
<th>With Transfers</th>
<th>No Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>1.0639</td>
<td>1.3467</td>
</tr>
<tr>
<td>Investment</td>
<td>1.1957</td>
<td>1.4507</td>
</tr>
<tr>
<td>Labor</td>
<td>1.1312</td>
<td>1.3418</td>
</tr>
<tr>
<td>Capital</td>
<td>1.1315</td>
<td>1.4419</td>
</tr>
</tbody>
</table>

Source: Elaborated by authors

In the case with transfers, the smallest value is in the consumption and the highest is in the investment. The higher value means a more inefficient taxation. According to the results, if the government wants to finance a project using an increase in the taxes, the least distortionary levy is the taxation on consumption.

Let’s suppose a project with an expected cost of 1 million of dollars, the government should finance this project by taxation on consumption only if this project creates benefits to society more than 1.0639 million of dollars. In the same way, a project that would be
financed by investment taxation should provide benefits higher than 1.1957 million of dollars. According to our results, the taxation on consumption is the least inefficient taxation while the taxation on investment is the most inefficient taxation.

When there is no transfers, the values are higher. The taxation on investment is again the most inefficient, closed to it we have the taxation on capital. The values of taxation on labor and consumption are closed and there are the less inefficient taxation. The reason for these results is because the households have to work and save more. As we show in the next subsection, the stock of capital is higher in this situation compared to the situation with transfers. In the same way, the labor supply is higher in the case without transfers.

In the literature, there is no consensus about the value of MCF. Ballard et al. (1985) estimated a value between $1.17 and $1.56 dollars, Browning (1987) calculated a value between $1.10 and $4.00 dollars. In a more recent paper, Feldstein (1996) affirms that the MCF was $2.65 in the United States. Given these results, we could affirm that our values belong within the same range as the one found for others countries.

If MCF differs among tax bases, we can say that the government is not rational. When this situation happens, it suggests that there is available resources in the economy. Therefore it is possible to increase welfare and keep tax revenues constant by switching from taxes with a high to one with a low MCF.

As we said above, using the MCF we get a hint as of what directions of reform are bound to work better and can also right away pass judgement about the proposals of tax reform. Thus, we can take two conclusions of our results. First, if the government and CNI want to increase the efficiency in the economy, they have to decrease the most inefficiency taxation and also have to increase the least distortionary taxation. In this way, a simple reorganization of taxes may cause a Pareto improvement to the society.

The second conclusion is, the both proposals want to reduce the taxation on investment and on labor income and increase the taxation on consumption. As we show above, it is a good direction to reduce the inefficiency in the Brazilian’s tax system. Therefore, the both taxes reforms proposals may increase the efficiency of tax system and consequently they could increase the output and welfare in the society.
5.2 Macroeconomics Effects

As we said above, one goal of present paper is to examine two tax reform proposal. Using a standard neoclassical accumulation model with representative agents we simulate the effects of the tax reform proposals. Additionally, we also simulate the effects of Pareto Optimal reform, i.e. all taxes are equal to zero.

To determine the effects of a tax reform, we compare the present value of each variable in each reform to the value of benchmark situation, i.e. in the initial steady state. The values in level of the initial steady state are described in the Table 9 for the case when there is or not transfers.

<table>
<thead>
<tr>
<th>Variables</th>
<th>With Transfers</th>
<th>No Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>0.2441</td>
<td>0.3567</td>
</tr>
<tr>
<td>Consumption</td>
<td>0.3817</td>
<td>0.3248</td>
</tr>
<tr>
<td>Capital</td>
<td>1.3415</td>
<td>1.9605</td>
</tr>
<tr>
<td>Output</td>
<td>0.4807</td>
<td>0.7025</td>
</tr>
<tr>
<td>Wage</td>
<td>1.1861</td>
<td>1.1861</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>0.1425</td>
<td>0.1425</td>
</tr>
<tr>
<td>DWL</td>
<td>22.00</td>
<td>67.93</td>
</tr>
<tr>
<td>$C/Y$</td>
<td>0.7940</td>
<td>0.7941</td>
</tr>
<tr>
<td>$I/Y$</td>
<td>0.2060</td>
<td>0.2059</td>
</tr>
<tr>
<td>$K/Y$</td>
<td>2.7908</td>
<td>2.7908</td>
</tr>
<tr>
<td>Tax Revenue/Y</td>
<td>0.3318</td>
<td>0.3310</td>
</tr>
</tbody>
</table>

Source: Elaborated by authors

The steady state value of the variables are defined by equations (11), (12), (29), (30), (31) and (32). It is easy to see that the labor supply, the stock of capital and output are higher in the economy without transfers. However, the consumption is higher in the economy with transfers.

Figure 2 shows the transition path from the initial steady state to the new steady state in each situation considered. The difference between each path is due to the transitory
period to implement the reforms. As we said above, the government’s proposal suggests a transitory period to implement all changes in the tax system while the CNI’s proposal suggests that all changes would be made in one period.

Figure 2: Transition Path: Government’s and CNI’s Proposals - With Transfers

Looking at Figure 2 we observe that the variance of consumption in the government’s proposal is smaller than in the CNI’s proposal. However, the new steady state level is lower in government’s proposal. Our model achieves the new steady state in less than 60 periods, where one period is equivalent to one year.

In Table 10 we compare the difference among each reform when there is the transfers. To do that, we compare the present value of each variables in each reform to the benchmark situation. Table 10 shows the percentage deviation from the initial steady state. We observe that both proposals have an impact on the macroeconomic variables. The most important point in both proposals is the reduction of the taxation on investment, the most inefficiency tax. Due to the higher reduction of taxation on investment in the CNI’s proposal, its proposal has a better macroeconomic results than the government’s proposal.
Table 10: Impact of Taxes Reforms Proposals (%) - With Transfers

<table>
<thead>
<tr>
<th>Variables</th>
<th>Government</th>
<th>CNI</th>
<th>Pareto Optimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>1.97</td>
<td>2.56</td>
<td>41.07</td>
</tr>
<tr>
<td>Consumption</td>
<td>2.78</td>
<td>3.71</td>
<td>38.42</td>
</tr>
<tr>
<td>Capital</td>
<td>10.87</td>
<td>16.87</td>
<td>96.06</td>
</tr>
<tr>
<td>Output</td>
<td>5.39</td>
<td>7.98</td>
<td>59.58</td>
</tr>
<tr>
<td>Wage</td>
<td>3.37</td>
<td>5.30</td>
<td>13.51</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>-4.84</td>
<td>-7.41</td>
<td>-15.62</td>
</tr>
<tr>
<td>DWL</td>
<td>18.42</td>
<td>16.86</td>
<td>0</td>
</tr>
<tr>
<td>$C/Y^*$</td>
<td>0.7744</td>
<td>0.7627</td>
<td>0.6888</td>
</tr>
<tr>
<td>$I/Y^*$</td>
<td>0.2256</td>
<td>0.2373</td>
<td>0.3112</td>
</tr>
<tr>
<td>$K/Y^*$</td>
<td>2.9358</td>
<td>3.0207</td>
<td>3.4287</td>
</tr>
<tr>
<td>Tax Revenue/Y*</td>
<td>0.3291</td>
<td>0.3260</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Elaborated by authors
* Variables in level

According to our result, the consumption increases 2.78% in the government’s proposal and 3.71% in the CNI’s proposal. In the Pareto Optimal, the consumption would increase 38.42% compared to the benchmark situation described in Table 9. The capital and output would increase around 10.87% and 5.39% in the government’s proposal and around 16.87% and 7.98% in the CNI’s proposal. Therefore, after the both tax reform proposals we expect a good macroeconomic effect in the economy.

In both proposals, the wage goes up and the interest rate goes down. The other macroeconomics variables have the expected behavior according to the economic theory. We explain the better results in CNI’s reform due to the higher reduction in the taxation on investment, as described above, the most inefficient tax.

In Figure 3 we plot the transition path in the economy without transfers. The behavior of government’s sequence is a little different in the begin of the transition period. Again, the variance of the variables in the government’s proposal is smaller than the in the CNI’s proposal.

In general, the macroeconomic variables have a higher increase when there is no trans-
fers than in the case with transfers. The reason for this it is because the households are poorer than in the situation with transfers. As there is no transfer, the households have to work and save more. We can observe in Table 9 and in Figure 3 that the level of capital is higher in the case without transfers than in the case with transfers.

According to our results, the consumption, capital and the output would increase respectively 0.93%, 9.95% and 5.71% in the government’s proposal and 1.45%, 17.16% and 9.21% in the CNI’s proposal. The DWL is huge in the last situation because the government spending does not provide any benefit to the society. In this subsection the DWL is in terms of marginal utility of consumption in the Pareto Optimal case. Higher DWL implies in a lower welfare.

As there is absence of transfer and the government spending does not provide any benefit to the society, the taxation has a second order effect. The households and government are rival in the use of the resources. Therefore we can think that the government wastes the resources in a no productive way.
Table 11: Impact of Tax Reform Proposals (%) - No Transfers

<table>
<thead>
<tr>
<th>Variables</th>
<th>Government</th>
<th>CNI</th>
<th>Pareto Optimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>3.07</td>
<td>4.38</td>
<td>-4.08</td>
</tr>
<tr>
<td>Consumption</td>
<td>0.93</td>
<td>1.45</td>
<td>68.66</td>
</tr>
<tr>
<td>Capital</td>
<td>9.95</td>
<td>17.16</td>
<td>43.47</td>
</tr>
<tr>
<td>Output</td>
<td>5.71</td>
<td>9.21</td>
<td>12.29</td>
</tr>
<tr>
<td>Wage</td>
<td>2.58</td>
<td>4.68</td>
<td>17.24</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>-3.69</td>
<td>-6.51</td>
<td>-21.86</td>
</tr>
<tr>
<td>DWL</td>
<td>66.97</td>
<td>66.58</td>
<td>0</td>
</tr>
<tr>
<td>C/Y∗+</td>
<td>0.7732</td>
<td>0.7612</td>
<td>0.6945</td>
</tr>
<tr>
<td>I/Y*</td>
<td>0.2268</td>
<td>0.2388</td>
<td>0.3155</td>
</tr>
<tr>
<td>K/Y*</td>
<td>2.9027</td>
<td>2.9940</td>
<td>3.5658</td>
</tr>
<tr>
<td>Tax Revenue/Y*</td>
<td>0.2804</td>
<td>0.2615</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Elaborated by authors

*: Variables in level
+: We aggregate the households and the government.

Observing the Figures 2 and 3 and the Tables 10 and 11 we can conclude that the both proposals of tax reform may cause a positive macroeconomics effects in the economy. We observe an increase in the consumption, capital, output and welfare in the society. The two reforms are able to increase the efficiency in the economy.

The CNI’s proposal has the better results because it suggests a higher reduction of the taxation on investment, the most inefficient tax. The reduction of the taxation on investment is following by an increase of the taxation on consumption. In our model, the taxation on consumption is the least distortionary taxation. Additionally, the CNI’s proposal also suggests a short period to implement all changes in the tax system.

Due to the short period to implement all changes in the tax system, the CNI’s proposal provides the better benefit to the society in the short run. The stock of capital, the supply of labor and the output increase faster than in the government’s proposal. The consumption also has a bigger and a faster falls in the begin of transition period in CNI’s proposal. Nevertheless, in few periods after reform the consumption in CNI’s proposal catches up
and passes the consumption in government’s proposal.

Although the government’s proposal does not have as good results as the CNI’s proposal, the increase in the efficiency is impressive. We know that the two situations to the transfers are extremes. In reality, we guess that the real world belongs to a situation between the two extremes cases. For example, an increase in the GDP about 5% means more than 100 billion of reais in the economy per year. Therefore, even though the government’s proposal is simpler than the CNI, it already has a positive macroeconomic effects in the economy.

There is no question that Brazil needs a tax reform. The current tax system is very complex and creates many distortions. We show above that there are goods proposals to change the current system. In our opinion, in the first stage, it is important to define and approve one proposal of tax reform. In the second stage, some adjusts would be made according to the society’s interest.

As we said above, the CNI’s proposal predicts a better results to the economy due to the higher reduction of the taxation on investment. Besides this, there is a short transition period to implement all changes in current tax system, which it implies in a short run effects of the tax reform. The most important point is to approve one proposal of tax reform and gradually make the right adjusts in others opportunities.

The biggest advantage of our model is that we consider a very simple model to analyze the tax reform proposals. The government takes as reference the paper of Fernandes et al. (2004). However, our paper is simpler and provides the same directions to the tax reform effects than Fernandes et al. (2004).

6 Conclusions

In the present paper, ours main goal is to calculate the costs of current Brazilian tax system and examine in details some proposals of tax reform in Brazil. We examine the government’s proposal and the Brazilian National Confederation of Industry’s (CNI) proposal. We also measure the macroeconomics gains of a tax reform. We do a normative and positive analysis of the tax reform proposals.

We consider a standard neoclassical capital accumulations model with representative households. We consider two cases. In the first case there is no government spending to be financed and all tax revenue returns to the households in a lump-sum transfer in the
same period. In the second case there is the government spending to be financed by the
taxes. We calibrate the government spending in such a way that there is no transfers to
the households. In this context, the households and the government are rival in the use
of resources. As the government spending does not provide any benefit to the society, we
can think this case as if there is total waste of resources. We consider that both situations
are extreme, the real world is a situation between these two cases.

In the first part of present paper we measure the marginal cost of funds (MCF) to the
different tax bases. The MCF is crucial in that regard for it allows us to determinate the
distortions that are caused by each kind of taxation. Using the MCF we get a hint as of
what directions of reform are bound to work better. Therefore we can also right away pass
judgement about the proposals of tax reform that are bound to make things worse.

We show that the value of MCF to all tax base is within the same range as the one
found for others countries. We also show that the value of MCF differs for different tax
bases. A rational government should not allow this difference in the MCF. Because when
this is happened, we can say that there is available resources in the economy. Thus it is
possible to increase welfare and keep tax revenues constant by switching from taxes with
a high to one with a low MCF.

We find that the taxation on consumption has the lowest MCF while the taxation on
investment has the highest value. It means that a good tax reform should increase the
taxation on consumption and reduce the taxation on investment. After doing that, a good
reform may bring down the inefficiency of the Brazilian’s tax system. The both proposals
that we examine in the present paper suggest reforms in this direction.

In the second part we measure the macroeconomics gains of each tax reform. Accord-
ing to our model, both proposals may provide a positive impact in the economy. The model
predicts an increase in consumption, stock of capital, output and welfare. The CNI’s pro-
posal has the better results because there is a bigger reduction of the taxation on investment
than the government’s proposal.

Looking at our results, we could affirm that the both tax reform proposals are in correct
direction to cause a Pareto improvement in this society. They could reduce the distortions
in the economy, increase the efficiency of allocations and have positive effects in the wel-
fare.
References


7 Appendix A - The First Order Conditions

In this appendix we solve household’s problem described by equation (3). Let’s consider the case where there is the government’s spending to be financed, i.e. $g_t \neq 0$, in this case there is no transfers to the households, $t r_t = 0$. The household’s problem can be written as:

$$U[c_0, c_1, \ldots, 1 - h_0, 1 - h_1, \ldots] = \max_{\{c_t, h_t, k_t\}} \sum_{t=0}^{\infty} \beta^t [\ln c_t + \gamma \ln (1 - h_t)]$$ \hspace{1cm} (19)

s.t. $(1 + \tau c_t) c_t + (1 + \tau i_t)i_t = (1 - \tau h_t) w_t h_t + (1 - \tau k_t) r_t k_t + t r_t$ \hspace{1cm} (20)

and $k_0 > 0$ \hspace{1cm} (21)

The government’s budget constraint to each household is:

$$\tau c_t c_t + \tau i_t i_t + \tau h_t w_t h_t + \tau k_t r_t k_t - g_t = t r_t$$ \hspace{1cm} (22)

The first orders conditions (FOC) of household’s problem are:

$$U_{ct} = \mu_t (1 + \tau c_t)$$ \hspace{1cm} (23)

$$U_{lt} = \mu_t (1 - \tau h_t) w_t$$ \hspace{1cm} (24)

$$\beta \mu_{t+1} \left\{ \left[ \frac{(1 - \tau_{kt+1})}{(1 + \tau_{it})} \right] r_{t+1} + \left[ \frac{(1 + \tau_{it+1})}{(1 + \tau_{it})} \right] (1 - \delta) \right\} = \mu_t$$ \hspace{1cm} (25)

$$\lim_{t \to \infty} \mu_t k_t = 0$$ \hspace{1cm} (26)

where $\mu_t$ is the Lagrange multiplier on the budget constraint.

The equation (26) is the transversality condition and expresses that the value of marginal utility of capital is zero in the infinity. We can manipulate the equations above and we find the equations (4) and (5) in text. They are written as:

$$c_{t+1} = \beta c_t \left( \frac{1 + \tau c_t}{1 + \tau_{ct+1}} \right) \left\{ \left[ \frac{(1 - \tau_{kt+1})}{(1 + \tau_{it})} \right] r_{t+1} + \left[ \frac{(1 + \tau_{it+1})}{(1 + \tau_{it})} \right] (1 - \delta) \right\}$$ \hspace{1cm} (27)

$$c_t \gamma (1 + \tau c_t) = (1 - h_t)(1 - \tau h_t) w_t$$ \hspace{1cm} (28)

The interest rate ($r$), labor supply ($h$), stock of capital ($k$) and consumption ($c$) in steady
state are given by the following equations:

\begin{align*}
    r^{SS} &= \left( \frac{1 + \tau_i}{1 - \tau_k} \right) \left[ \frac{1}{\beta} - (1 - \delta) \right] \\
    h^{SS} &= \left( \frac{1 + \tau_i}{1 - \tau_k} \right) \left( \frac{1}{\gamma} (1 - \alpha) \left( \frac{r^{SS}}{\alpha} \right)^{\frac{\alpha}{\gamma}} - g \right) \\
    k^{SS} &= \left( \frac{r^{SS}}{\alpha} \right)^{\frac{1}{\alpha-1}} h^{SS} \\
    c^{SS} &= k^{SS} \alpha h^{SS}^{1 - \alpha} - \delta k^{SS} - g^{SS}
\end{align*}

where \( g \) could be \( g = 0 \) or \( g \neq 0 \).

Remember that when \( g = 0 \) there is transfers to the households and when \( g \neq 0 \) there is no transfers to the households. In the last situation, the government spending does not provide any benefit to society. It means that the government wastes the resources.

The aggregate consumption, capital, investment, labor and government spending in steady state can be written respectively as \( C^{SS} = Lc^{SS} \), \( K^{SS} = Lk^{SS} \), \( I^{SS} = Li^{SS} \), \( H^{SS} = Lh^{SS} \) and \( G^{SS} = Lg^{SS} \), where \( L \) is the population that it is normalized to be one.
We collect the data in the website of Ministry of Finance (www.fazenda.gov.br) and Instituto de Pesquisa Econômica Aplicada (IPEA) (www.ipeadata.gov.br). According to the government’s agency, the Brazilian Gross Domestic Product (GDP) was R$ 2,332,935,544,000,00 reais, in currency value of 2006. The other variable that we use in the present paper is the annual mean of nominal interest rate. The value is $r = 14.12\%$ per year.

The table below presents a summary description of the Brazilian tax system. The first column shows the name of each tax and contribution. The column 2 presents the amount collected in reais (R$) and in the column 3 we have taxes in terms of GDP. Finally, the column 4 shows the tax jurisdiction and the column 5 contains the incidence on each type of taxation.
Table 12: Complete Description of Taxes - Economy 2006

<table>
<thead>
<tr>
<th>Taxes and Contributions</th>
<th>Value - R$ Millions</th>
<th>Tax Burden</th>
<th>Jurisdiction</th>
<th>Tax Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>labor’s Income - IRPF</td>
<td>8.525.144.251,41</td>
<td>0.0037</td>
<td>Federal</td>
<td>Labor</td>
</tr>
<tr>
<td>Firms’ Profits - IRPJ</td>
<td>56.080.219.057,98</td>
<td>0.0240</td>
<td>Federal</td>
<td>Capital</td>
</tr>
<tr>
<td>Gains with Labor - IRRF-T</td>
<td>39.172.575.177,73</td>
<td>0.0168</td>
<td>Federal</td>
<td>Labor</td>
</tr>
<tr>
<td>Gains with Capital - IRRF-C</td>
<td>21.321.839.561,53</td>
<td>0.0091</td>
<td>Federal</td>
<td>Capital</td>
</tr>
<tr>
<td>Gains to Foreign - IRRF-E</td>
<td>7.448.585.342,85</td>
<td>0.0032</td>
<td>Federal</td>
<td>Capital</td>
</tr>
<tr>
<td>Others Gains - IRRF-O</td>
<td>4.694.273.238,74</td>
<td>0.0020</td>
<td>Federal</td>
<td>Capital</td>
</tr>
<tr>
<td>Financial Operations- IOF</td>
<td>6.784.082.199,75</td>
<td>0.0029</td>
<td>Federal</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>VAT on Manufac. Products - IPI</td>
<td>26.780.064.494,21</td>
<td>0.0115</td>
<td>Federal</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>Import Taxes - II</td>
<td>9.814.826.097,71</td>
<td>0.0042</td>
<td>Federal</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>Export Taxes - IE</td>
<td>42.309.714,80</td>
<td>0.0000</td>
<td>Federal</td>
<td>Consumption</td>
</tr>
<tr>
<td>Rural Property - ITR</td>
<td>284.023.315,98</td>
<td>0.0001</td>
<td>Federal</td>
<td>Capital</td>
</tr>
<tr>
<td>Bank Account Deposits - CPMF</td>
<td>32.081.789.761,64</td>
<td>0.0138</td>
<td>Federal</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>Social Contribution - COFINS</td>
<td>92.235.608.490,32</td>
<td>0.0395</td>
<td>Federal</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>Fuels - CIDE</td>
<td>7.816.026.081,48</td>
<td>0.0034</td>
<td>Federal</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>Social Contribution - PIS/PASEP</td>
<td>24.228.444.727,89</td>
<td>0.0104</td>
<td>Federal</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>Firms’ Net Profits - CSLL</td>
<td>28.070.606.880,29</td>
<td>0.0120</td>
<td>Federal</td>
<td>Capital</td>
</tr>
<tr>
<td>Others - Others Revenue</td>
<td>4.414.271.876,36</td>
<td>0.0019</td>
<td>Federal</td>
<td>Capital</td>
</tr>
<tr>
<td>Cont. to agriculture- FUNDAF</td>
<td>347.289.998,48</td>
<td>0.0001</td>
<td>Federal</td>
<td>Consumption</td>
</tr>
<tr>
<td>VAT on Goods &amp; Services - ICMS</td>
<td>165.666.357.598,86</td>
<td>0.0710</td>
<td>State</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>Vehicle License Registration - IPVA</td>
<td>12.064.105.158,21</td>
<td>0.0052</td>
<td>State</td>
<td>Capital</td>
</tr>
<tr>
<td>Property transmissions - ITCD</td>
<td>966.978.258,03</td>
<td>0.0004</td>
<td>State</td>
<td>Capital</td>
</tr>
<tr>
<td>Property transmissions- ITBI</td>
<td>2.098.945.204,64</td>
<td>0.0009</td>
<td>Local</td>
<td>Capital</td>
</tr>
<tr>
<td>Sales Tax on Service - ISS</td>
<td>14.541.132.561,67</td>
<td>0.0062</td>
<td>Local</td>
<td>Cons/Invest</td>
</tr>
<tr>
<td>Urban Property - IPTU</td>
<td>9.528.350.475,61</td>
<td>0.0041</td>
<td>Local</td>
<td>Capital</td>
</tr>
<tr>
<td>Payroll - Employer/Employee*</td>
<td>181.856.778.231,19</td>
<td>0.0780</td>
<td>Fed/Sta/Loc</td>
<td>Labor</td>
</tr>
<tr>
<td>Fees</td>
<td>12.386.145.280,23</td>
<td>0.0053</td>
<td>Fed/Sta/Loc</td>
<td>Consumption</td>
</tr>
<tr>
<td><strong>Total Tax Burden</strong></td>
<td>770.229.626.274,82</td>
<td>0.3317</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Ministry of Finance

*: Transfer to Others, S-System and Social Security Contribution