

Asymmetries in the taxation of labor and capital income: impacts of changes in the structure of personal income taxation in Brazil

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ABSTRACT

This paper discusses the asymmetry between labor and capital (profits and distributed dividends) income taxation in Brazil and simulates changes in the personal income tax structure in a neutral approach. An original dynamic recursive computable general equilibrium model is applied. The results indicate that a more progressive taxation of personal income would lead to a drop in household income inequality in the Brazilian economy. Consumption, Investment and production oriented to domestic market would be encouraged. However, the impacts on inequality and on the economy are small given the small representativeness of the personal income tax in the Brazilian tax base. We conclude that for effective changes towards a more progressive tax structure in Brazil it is needed to study a higher taxation on capital income associated to a decrease of consumption taxes.

Keywords: Personal income taxation; Inequality; Computable General Equilibrium.

JEL Codes: H24; O15; C60; C68.

1. INTRODUCTION

The debate about inequality and income distribution has gained focus in the recent economic discussion, especially due to an income concentration trend verified in developed countries and the repercussion of "Capital in the twenty first century", by Thomas Piketty. This author, when analyzing data of income taxation for several countries, concludes that inequality would be an intrinsic tendency to capitalism, since the remuneration of capital, as a rule of ownership of the rich groups, grows at higher rates than the product of the economy. As a policy recommendation, the author proposes that this process should be contained by increasing capital taxation.

In Brazil, a very unequal country, data and studies have pointed out to a very regressive tax structure (CASTRO, 2014; AFONSO, 2014; MEDEIROS *et al.*, 2015; GOBETTI E ORAIR, 2015). The excessive weight of indirect taxes and the little progressivity of the personal income tax have been pointed out as the causes of the high regressivity of the tax burden. Many authors is highlighting the asymmetry between labor and capital (profits and distributed dividends) income taxation and pointing to the exemption of taxation on the distribution of dividends as one of the causes of this asymmetry (GOBETTI E ORAIR, 2015). For these authors a more progressive tax structure may conduce a less concentrated income distribution structure.

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The participation of personal and corporate income tax in GDP was only 5.8% in 2015, accounting for 17.7% of total tax revenue. Comparing to the OECD, the representativeness of this type of tax in Brazil is low, since in the average of those countries the participation in the GDP was of 12.0% in 2014. Considering only the personal income tax, the representativity is still more exiguous, since it represents 0.5% of GDP and 1.4% of total revenue, according to data from the Federal Revenue Service (SRFB, 2016). Since Brazil is an extremely unequal country in terms of income, this composition of taxes places the country among the economies with the most regressive tax burden.

For Silveira (2012), Medeiros and Souza (2013), Castro (2014) and Medeiros et al. (2015), which analyzed a series of progressivity indices, the current Brazilian personal income tax structure would be progressive. Payeras (2008, 2010) points out that, although progressive, the effective tax rates on personal income are far from the nominal rates applied, which has significantly reduced the progressive potential of the tax. Gobetti and Orair (2015) use more disaggregated data for the top income strata and conclude that the personal income tax structure in Brazil is currently regressive at the top of the distribution. For these authors, the exemption of taxation on the distribution of dividends in Brazil is producing an asymmetry between labor and capital income taxation, in favor of capital income.

Considering that a more progressive tax structure may conduce a less concentrated income distribution structure, the aim of this paper is to simulate the impacts of changes in the personal income tax structure in Brazil, increasing progressivity in a neutral approach in terms of the government revenue.

An original dynamic recursive computable general equilibrium (CGE) model for the Brazilian economy is applied. This model, named BRIGHT (***B**razilian **S**ocial Accounting – **G**eneral **E**quilibrium Model for **I**ncome **G**eneration, **H**ouseholds and **T**ransfers*), is modified to consider issues related to direct taxes, income distribution and their impact on households consumption levels as well as on productive structure.

The BRIGHT has 10 representative households disaggregated by income classes, both in their consumption profile and in their sources of income (capital, labor, transfers) and takes into account the flows of income between households and other agents of the economy. These elements are captured in the database of the model, which has, among other elements, a detailed Social Accounting Matrix (SAM).

2. BRIGHT MODEL AND DATABASE

The BRIGHT model has several elements that make it appropriate to analyze the impacts of a cash transfer program, as the BF policy, as well as themes related to income distribution. It is a multi-product CGE model with recursive dynamic elements (backward looking) specified for 55 industries, 110 commodities, 12 institutional sectors (10 representative Households, Enterprises and Government) and Rest of the world; 3 endowments (land, capital and labor); 2 margins

industries (Trade and transport); indirect tax (IPI, ICMS, Others taxes) and production taxes, as well as income and corporation taxes.

The BRIGHT model was calibrated from a multiple households SAM for the Brazilian economy with base year in 2008. The SAM was developed by Burkowsky, Perobelli e Perobelli (2014) and gathers data from the I-O matrix estimated by the Nucleus of Regional and Urban Economy of the University of São Paulo - NEREUS (GUILHOTO and SESSO FILHO, 2010), the Tables of Resources and Uses and of the Integrated Economic Accounts of the National Accounts System (IBGE, 2015). In order to build BRIGHT, the household agent in the SAM was disaggregated in 10 representative households by income classes (Table 1) based in the data from the 2008-2009 Household Budget Survey (POF) (IBGE, 2014). BRIGHT is especially structured to interconnect the income flows between the productive sectors, the 10 households and the other agents of the Brazilian economy.

Table 1: Household income groups in terms of minimum wage groups – minimum wage in 2009: 415.00 Brazilian Reais

Income group	Wage groups- in terms of minimum wage (m.w.)	Monthly household income (in Brazilian Reais R\$)
H1	0-2 m.w.	R\$ 0 to R\$ 830
H2	2-3 m.w.	R\$ 830 to R\$ 1,245
H3	3-5 m.w.	R\$ 1,245 to R\$ 2,075
H4	5-6 m.w.	R\$ 2,075 to R\$ 2,490
H5	6-8 m.w.	R\$ 2,490 to R\$ 3,320
H6	8-10 m.w.	R\$ 3,320 to R\$ 4,150
H7	10-15 m.w.	R\$ 4,150 to R\$ 6,225
H8	15-20 m.w.	R\$ 6,225 to R\$ 8,300
H9	20-30 m.w.	R\$ 8,300 to R\$ 12,450
H10	Greater than 30 m.w.	Greater than R\$ 12,450

Source: authors' elaboration

BRIGHT follows the Australian tradition in CGE models and was built on the theoretical frameworks of the BRIDGE model (Domingues et al., 2014) and PHILGEM (CORONG and HORRIDGE, 2012; CORONG and HORRIDGE, 2014). Both are Johansen-type models, formulated as a system of linearized equations and solved by the GEMPACK software (Harrison and Pearson, 1994). The applied specification of both models is composed of blocks of equations that determine supply and demand relationships, derived from optimization hypotheses and market clearing conditions. However, these two models present an important difference: While BRIDGE follows the original structure of ORANIG and MONASH (incorporates recursive dynamics), PHILGEM represents an extension of ORANIG, since it innovates by incorporating multiple households and additional equations that allow the use of a detailed SAM rather than an I-O matrix. Thus, BRIGHT starts from the theoretical structure of BRIDGE to calibrate the model from the I-O matrix, but connects to it, with some adaptations, the PHILGEM extension, which allows the incorporation of the additional SAM flows.

In some aspects, the theoretical specification of BRIGHT follows the standard in CGE models with recursive dynamics elements. Industries minimize costs subject to constant returns of scale technology, combining intermediate inputs and primary factor (aggregate) by a fixed coefficients function (Leontief). In the composition of intermediate inputs, there is substitution by

prices between domestic and imported goods through a Constant Elasticity of Substitution function (CES). In the composition of the primary factors, there is also substitution by price between capital and labor by CES functions.

The household demand in the model is specified from a Stone-Geary non-homothetic utility function (PETER et al., 1996). This specification divides the consumption of goods and services into "luxury" and "subsistence" shares, reserving a fixed share of subsistence expenditure and a residual share in "luxury spending", which allows income changes to cause different modifications in the consumption of goods, hence its non-homothetic character. To the consumption decisions between domestic and imported goods, we use a CES function. Exports respond to demand curves negatively associated with domestic production costs and positively affected by the exogenous expansion of international income, adopting the hypothesis of a small country in international trade.

Investment and capital stock follow mechanisms of intersectoral displacement and accumulation based on pre-established rules, associated with expected rates of return and capital stock depreciation. Thus, industries with an increase in the expected rate of return, calculated endogenously, attract investment. This investment in period t generates the capital stock in period $t+1$ according to a standard accumulation rule, considering the initial capital stock discounted from the depreciation.

The labor market also presents an element of intertemporal adjustment, which involves the variables of real wages, current employment and trend employment. In this mechanism, the real wage rises relative to the trend scenario, proportionally to the deviation between the growth of labor supply and employment. The adjustment of the real wage to this gap between supply and demand of labor is controlled by an adjustment parameter.

We can mention some characteristics of BRIGHT that differentiate it from the Johansen tradition based CGE models for Brazil. BRIGHT has Enterprises as an Institutional sector and income characterization by sources: wages are distributed to households; income from Gross Operating Surplus (GOS) is distributed to households, enterprises and Government. BRIGHT also takes into account income from transfers (e.g. Government transfers to households and property income from enterprises to households). There are linkages among wages paid by industries and wages received by households. The characterization of expenditure is complete: besides consumption by households and Government and indirect tax payments, BRIGHT identifies others outlays as Social Security spending as well as Direct tax payments from households to Government. The household consumption become an explicit function of household income. Usually this linkage is considered implicit by "closure" hypothesis in traditional CGE models. Government consumption may be a function of tax revenue (usually it is considered exogenous or follows household consumption).

3. SIMULATION STRATEGY

The simulation strategy proposed in this paper aims to access the impact of changes on the personal income tax in Brazil, towards a more progressive direct tax structure. The simulations comprise the period 2009-2040 (2008 is the base year of the model). The period 2009-2014, called

the historical (or observed) scenario, has observed changes in macroeconomic components, such as GDP, investment, household consumption and government consumption. From 2015 to 2040, we imposed a projection scenario, applying predicted modifications to some components of macroeconomic dynamics.

The policy scenario, which defines a change in the structure of income taxation for individuals (model households) is inserted in 2015. This scenario permanently modifies the household income tax rates in the model and allows government spending is a function of the total tax revenue, exerting impacts on the endogenous variables over time, which deviates the economy's trajectory from the baseline scenario. In this way, the results in the model can be read as the cumulative deviation from the baseline.

In the policy simulation are inserted shocks that modify the structure of personal income tax between the 10 classes, by modifying their rates. This change means putting a 15% tax on profits and dividends for the households (income classes) that receive those incomes and a reduction of the income tax for the others (in a neutral approach), for which this type of income practically does not exist. We compatibilize data from the Brazilian Federal Revenue Service and the BRIGHT's model database (wich is based on the National Accounts and Household Budget Survey) to compute the shocks. Only classes 8, 9 and 10 would receive the positive tax shock on profits and dividends income, since in the others this component is irrelevant; while the others, who receive income mainly from labor and transfers would receive a reduction in their personal tax rate, in order to make the measure fiscally neutral.

Table 2 summarizes the main data on the income tax rates in the BRIGHT model, the shocks implemented in the policy simulation and the respective variation in the income tax revenue collected from each class, with a total variation equal to zero given the fiscal neutrality hypothesis.

Table 2: Tax simulations with the BRIGHT model: changes in the personal income tax rates and data of the household income

Households	Income in 2008 (in millions of Brazilian reais)	Income and property tax collection in 2008 (in millions of Brazilian reais)	Income Rates in the BRIGHT model (%)	Income Rate shocks (%)	Variation in Government Revenue (in millions of Brazilian)
H1	86.687	10	0,01%	-15,91%	-1,66
H2	140.992	44	0,03%	-15,91%	-7,05
H3	295.426	369	0,12%	-15,91%	-58,72
H4	135.452	482	0,36%	-15,91%	-76,71
H5	234.617	1.801	0,77%	-15,91%	-286,62
H6	190.336	2.971	1,56%	-15,91%	-472,81
H7	333.479	8.658	2,60%	-15,91%	-1.377,86
H8	229.697	10.400	4,53%	0,74%	77,08
H9	305.191	18.238	5,98%	1,36%	247,70
H10	628.722	50.206	7,99%	3,90%	1.956,65
Total	2.580.601	93.180	3,61%	-	0,00

Source: BRIGHT database.

4. RESULTS

The results of the simulations represent the difference between the variations obtained in the base scenario and the variations of the scenario considering the tax change in the household income. Therefore, it is the deviations, due to the taxation shocks, in relation to a trajectory of the Brazilian economy (base scenario) where this change did not occur.

Table 3 shows the results of simulations on real disposable income, real consumption, and household welfare. Changes in well-being are measured under two perspectives: equivalent income variation and variation in utility index. The first, measured in monetary terms, expresses the income that the consumer would be willing to pay to avoid price variation and continue to consume their original basket. That is, it quantifies the monetary amount that would be withdrawn (or added) to the consumer before the price changes to leave it as well as it would be after the price change (Varian, 1992). The variation in utility, in turn, is a function of the variation of the real consumption of the households above the subsistence consumption, according to the specification of the Linear Expenditure System- LES. It is a measure of the utility gain in terms of luxury consumption.

Table 3: Impacts of the change in the income taxation structure on consumption, well-being and disposable income of households, cumulative % deviation in 2015, 2025 and 2040

Households	Disposable real income (%)			Real consumption (%)			Equivalent variation (EV) in millions of Brazilian reais			Utility (%)		
	2015	2025	2040	2015	2025	2040	2015	2025	2040	2015	2025	2040
H1	0.03	0.09	0.1	0.03	0.09	0.1	81.1	487	939.9	0.05	0.15	0.15
H2	0.03	0.1	0.11	0.03	0.1	0.11	107.8	605.6	1125.8	0.06	0.17	0.16
H3	0.05	0.13	0.13	0.05	0.13	0.13	321.9	1296.3	2316.9	0.09	0.21	0.2
H4	0.1	0.17	0.18	0.1	0.17	0.18	245.2	667.2	1137.1	0.17	0.29	0.26
H5	0.18	0.25	0.26	0.18	0.25	0.26	747.4	1521	2503.3	0.31	0.42	0.38
H6	0.34	0.42	0.42	0.34	0.42	0.42	1108	1806.6	2819.3	0.6	0.69	0.63
H7	0.56	0.63	0.63	0.56	0.63	0.63	2891	4199.9	6416.1	0.98	1.04	0.95
H8	-0.01	0.05	0.05	-0.01	0.05	0.05	-44.1	406.5	787.8	-0.02	0.09	0.08
H9	-0.08	-0.01	-0.01	-0.08	-0.01	-0.01	-312.6	163.8	468.2	-0.15	-0.02	-0.02
H10	-0.39	-0.33	-0.33	-0.39	-0.33	-0.33	-2128.8	-1859.6	-2330	-0.68	-0.55	-0.5

Source: Results of the simulations.

The simulations show a rise in the disposable income of households that were exempted (from H1 to H7) and a reduction to those in which the tax rate increased (from H8 to H10). The income groups that are at the center of the distributive structure, from H4 to H7, would register the greatest gains in terms of disposable income, since they are the classes in which direct taxes represent a larger portion of the total income. H10 would be the one with the largest fall in disposable income, since it received the highest rate increase due to the largest share of profits and dividends in the total income.

It was also expected that the impact on the real household consumption would occur in the same sense and magnitude of the effects on the income, since the specification of the consumption implies that its variation follows the changes in disposable income. Thus, the effect on well-being, measured both by the equivalent variation and by the concept of utility, would be positive from H1 to H7 and negative for H8, H9 and H10.

The increase in the consumption of goods by the group that showed an increase of their income would be reflected in the incentive to productive activities, increasing the rents of factors, which would have positive effects on the appropriate income by households. This indirect effect would increase the accumulated income gain of the benefited households by the tax relief. Also, it would have the potential to reduce, in the longer term, the negative impact of the tax rate increase on the upper end of the distribution, and may even overlap the direct effect of higher taxation. For the H8, the cumulative effect on income would become positive in the long run (2040), albeit of small magnitude (0.05%). For H9, the accumulated effect in 2040 would be practically null, whereas H10 would be the only class that would show a drop in disposable income and, therefore, loss of welfare by reduction in consumption.

The changes on disposable income generate little change in its distributive structure. Table 4 shows the participation of each class in disposable income in 2040, comparing the distribution structure among the households in the baseline and in the policy scenario. In addition, the Table 3 presents the percentage variation in the Gini index between the two scenarios.

As expected by the simulation design, households in the middle strata of the distribution would obtain gains in terms of their share in the total disposable income, especially H7 (0.17 pp), since it is the group that direct taxation occupies a larger part of the income, at the expense of the reduction of the participation of those located in the upper end, mainly H10 (-0.26 pp).

Table 4: Impact of the tax changes on income inequality among Households: Household participation in disposable income and variation (%) in the Gini index in 2040

Households	Baseline	Policy scenario	Gain or loss of share in total income (in pp.)	% change in Gini Index of Disposable Income
H1	3.46%	3.46%	0	-0.50%
H2	5.81%	5.81%	0	
H3	11.93%	11.94%	0.01	
H4	5.43%	5.44%	0.01	
H5	9.29%	9.32%	0.04	
H6	7.40%	7.46%	0.06	
H7	12.80%	12.97%	0.17	
H8	8.67%	8.66%	-0.01	
H9	11.45%	11.42%	-0.03	
H10	23.77%	23.52%	-0.26	
Total	100.00%	100.00%		

Source: Results of the simulations.

These results indicate that a change in the structure of personal income taxation in Brazil, achieved by the taxation of profits and dividends concomitant with the granting of tax relief for

the classes that most of their income comes from wages and transfers, tends to redistribute the income in favor of middle-income classes in the long run. However, the results also show a low effect on inequality measured by the Gini index, since the index would fall by 0.5% in 2040.

Table 5 reports the macroeconomic impacts of the simulations, presented as cumulative percentage deviation in relation to the baseline for periods arbitrarily defined as short-term (2015 and 2020), medium-term (2030) and long-term (2040).

Table 5: Macroeconomic impacts of changes in the structure of household income taxation (% cumulative deviation in 2015, 2020, 2030 and 2040, in relation to the base scenario)

Macroeconomic Variables	Years (% cumulative deviation from baseline)			
	2015	2020	2030	2040
Real GDP	0.01	0.02	0.09	0.08
Household Consumption	0.08	0.11	0.17	0.15
Government Consumption	0.00	0.00	0.01	0.01
Investment	0.07	0.16	0.27	0.00
Exports	-0.18	-0.27	-0.22	-0.02
Imports	0.19	0.27	0.30	0.11
Employ	0.01	0.01	0.01	0.00
Real wages	0.01	0.06	0.17	0.15
Capital stock	0.00	0.03	0.15	0.15
Nominal tax revenue	0.28	0.36	0.35	0.13
Real tax revenue	0.00	0.00	0.01	0.01
Prices				
Consumption price index	0.27	0.32	0.25	0.03
GDP deflator	0.29	0.35	0.27	0.04
Investment price index	0.27	0.32	0.16	-0.01
Exports price index	0.19	0.28	0.22	0.02
Cost of primary factors	0.31	0.38	0.29	0.06
Nominal wage	0.29	0.39	0.42	0.19
Capital price	0.33	0.37	0.18	-0.06

Source: Results of the simulations.

The change in the tax structure of household income would have little effect on long-term GDP growth, both because it is fiscally neutral and by the recursive adjustment mechanisms of the model. But the increase in household consumption and investment are interesting results, in addition to the marginal trade deficit (in relation to the baseline) generated at the end of the simulation period. That is, although fiscally neutral there is a rise in domestic absorption (consumption and investment) with trade deficit.

The effect on GDP (cumulative deviation of 0.08% in 2040) is determined by the increase in household consumption (cumulative deviation of 0.15% in 2040), accompanied by a rise in investment, which would show increasing deviations over the medium term, however, would

converge to its long-term trend growth rate. This behavior is associated with movements in the price of capital, which determines the rate of return on investment.

The rate of return is defined by the difference between the price (return) of the capital and the price of the investment. Initially, the investment would increase because the differentials between these two prices would be positive. That occurs because of the expansion of production in some sectors to meet the increase in domestic demand is constrained by the exogenous growth of labor factor and the constraints of combination of inputs, raising the price factors, including capital. However, as investment increases and the stock of capital accumulates, the profitability of this factor tends to fall, also reducing the price of the investment. The results show that from 2030 the price of capital would fall more sharply than that of investment, inducing declines in the rate of return. So, the investment would converge to its trend growth rate.

The greater demand for productive factors and their reallocation would also pressure wages in the short and medium term, given that labor supply in the economy follows a pre-determined growth path in the baseline. Thus, the costs would be passed on to the price of domestic goods and services, as shown in Table 5. Rising domestic prices would have an impact on the trade balance, since it would stimulate imports and discourage exports, contributing negatively to the GDP in relation to the baseline. However, in the long term, the downward trend in the price of capital would be passed on to costs, inducing a fall in domestic prices and a tendency for some reversal of the trade deficit generated.

The government real consumption would not change, since the real tax revenue would remain the same as the baseline because of the fiscal neutral approach of the policy simulation. Endogenous changes in tax collection are possible due to changes in the activity level in the policy scenario. In Table 4 it is possible to verify that the nominal collection of taxes would rise over the period, following the activity level of the economy. However, small nominal changes would be offset by higher domestic prices, maintaining real revenue and, consequently, real government consumption in its trend rate.

In summary, the results suggest that changes in the personal income tax structure in Brazil, as designed in the simulation (neutral approach), would have little impact on short-term economic growth. That occurs due to the low representativeness of these taxes in income and in the gross tax burden, as already highlighted by authors such as Medeiros et al. (2013, 2015). However, the increase in household consumption and the impact on investment in the short and medium term are important results.

5. FINAL REMARKS

In Brazil, the distribution of profits and dividends are free of personal income taxes. The aim of this paper was to project the economic impacts of the placement of a tax on personal income from profits and dividends concomitantly with the reduction of the labor income tax, in a fiscal neutral approach. So, the simulations were carried out in order to evaluate the economic impacts of a more progressive income tax structure in Brazil. Using an CGE model this paper presents empirical results not yet explored for the Brazilian economy.

The results allow us to conclude that policies that modify the structure of personal income taxation in Brazil, imposing higher taxes on income from capital (distributed dividends) and lower taxes on labor income, would have the potential to aid the process of falling inequality. This would positively impact consumption, investment and production. However, in the type of simulated policy, with tax changes that are restricted to the personal income tax and that redistributes income in a neutral way, the redistributive effects would be from the "top" to the "center" of the distribution. This would occur because the lower strata would be little affected (since they are exempt of personal income taxes), and the consumption composition of the classes that would "win" (middle classes) is not very different from that of the classes that would "lose" (top classes).

Thus, the effect on inequality would only be on disposable income, that is, this type of policy would not modify the factor income appropriation structure, which is very concentrated in Brazil. In addition, the small impacts are also associated with the low representativeness of the personal income taxes, both in relation to GDP, and in relation to total tax burden. In this sense, for effective changes towards a more progressive tax structure in Brazil, with significant effects for the fall of inequality, it is primordial to think reforms that act on the regressivity of the indirect taxation on consumption of goods and services.

The increase in the progressiveness of taxation in Brazil, through the taxation of distributed profits and dividends and the exemption of indirect taxes on consumption, may be an interesting option of redistributive policy. Or, to direct the revenue with the taxation of profits and dividends to finance public policies that have effective results on the deconcentration of income, as cash transfer policies (as the Bolsa Família policy), could also be considered. As suggested in many studies, this type of policy benefits all classes with indirect income gains, so the initial negative effect of higher taxation in the upper classes of the distributive structure could be partially offset. The simulation of alternative policies related to the reform of the tax system in Brazil sets up a research agenda to be explored, made possible by the specificities of the model presented in this study in dealing with this theme.

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