WORKING PAPER

working paper **number 171**
july, 2018

ISSN 1812-108x

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The International Policy Centre for Inclusive Growth is jointly supported by the United Nations Development Programme and the Government of Brazil.

Working Papers are available online at www.ipcig.org and subscriptions can be requested by email to ipc@ipc-undp.org.

Print ISSN: 1812-108X

THE DISTRIBUTIVE IMPACT OF INCOME TAXES IN BRAZIL

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ABSTRACT

The objective of this paper is to analyse the effects of the Brazilian tax structure on national income inequality. To that end, it demonstrates how regressive taxation is in the country—as it is based on indirect taxes on consumption, to the detriment of direct taxes on income and property. We propose to estimate the impacts of a change in taxation on income concentration, by reintroducing personal income taxes on dividends, coupled with a reduction in indirect taxation. The paper uses data from the 2008-2009 Household Budget Survey (*Pesquisa de Orçamentos Familiares*—POF), which allows us to estimate direct and indirect taxation in Brazilian society, as well as recent data from the 'Large Numbers of Personal Income Tax Declarations' (*Grandes Números das Declarações de Imposto de Renda das Pessoas Físicas*—DIRPF), which capture with greater efficiency the income at the top of the distribution. Therefore, we combine the methods used by Silveira (2008; 2012) with the tradition inspired by Piketty in the works of Castro (2014), Medeiros, Souza, and Castro (2015) and Gobetti and Orair (2015) to estimate the distribution of income in Brazil while applying the counter-factual exercise of modifying the tax structure. We verify that individuals in the top decile concentrate over 50 per cent of all income in the country and that, in light of this fact, the taxation of profits and dividends would contribute to the increased overall progressiveness of the Brazilian tax system, leading to a positive distributive impact on prevailing inequality. The paper is divided into five parts. The first section provides an international comparison of income tax, pointing out the main differences from the Brazilian model. The second section discusses the progressiveness and distributive capacity of income taxes. Our methodology is presented in the third section. The fourth section presents the main results of our study, and the fifth and final section provides some concluding remarks.

Keywords: taxation and inequality; tax progressivity; income concentration in Brazil; Pareto interpolation.

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This paper was originally published in Portuguese (Fernandes, Campolina, and Silveira 2017).

1 INTRODUCTION

Brazil has always been known as a country marked by inequality. Whether of opportunities, income or property, this inequality is manifest in all stages of wealth accumulation. Within this dire landscape, the country has always stood alongside much poorer nations, while countries with similar income and development profiles have presented substantially better indicators.

Many scholars and academics have addressed this disturbing national quirk, analysing its origins and the main variables that have determined its persistent dynamics within Brazilian society. One element that has garnered relatively less attention in the analysis of the determinants of inequality is how the organisation of the tax system can impact the distribution of income. Therefore, in light of our investigation, one of the issues that has been identified as reinforcing the social injustices in Brazil is its national tax structure.

The tax structure influences income distribution, as it uses various collection mechanisms that impact each taxpayer differently. By having taxes target different economic events—such as ownership or transfer of assets, the appraisal of income, consumption or savings—the manner through which the State organises its tax system will impact each economic agent in a particular way, depending on their economic profile for each relevant tax.

Comparing Brazilian taxes to common practice around the world, we find that personal income tax (*Imposto de Renda sobre Pessoa Física*—IRPF) is milder than other tax administrations. Its structure is marked by relatively high exemption brackets, combined with a maximum marginal rate of 27.5 per cent (below the average for countries of the Organisation for Economic Co-operation and Development—OECD), which restricts its distributive capacity. In addition, the IRPF is even more lenient with regard to capital income—which is exclusively taxed at the source at linear rates, or is simply exempt, as in the noteworthy case of the distribution of profits and dividends.

This study intends to contribute to the literature relating taxation with inequality, analysing the distributive impact of the IRPF in the face of reintroducing taxes on profits and dividends, culminating in scenarios where excess revenue is spent on exemptions from social security taxes (PIS/COFINS) or otherwise allocated to expenditures on health, increasing the net income of the user population. Therefore, the analysis comprises not only the impact of the taxation of profits and dividends, but also its redistribution through less indirect taxation (regressive) and increased social expenditure (progressive).

2 PERSONAL INCOME TAX (*IMPOSTO DE RENDA*—IR)

Income tax has the highest progressive potential for redistribution, applying principles of horizontal and vertical equality. For this very reason, this tax receives greater attention in the literature, enjoying greater availability of data comparisons and estimates for inter-country analysis.

Its principle lies on the taxation of income received by an individual (in Brazil, the *pessoa física*—private person) over a given period. At the end of this period, the individual is required to declare all of their income, detailing it among specific categories, in the case of special taxation for each. In addition, the individual must declare specific tax-deductible expenditures, such as costs for education, health, debts, retirement plans etc. Some sources of income might also be tax-exempt, which also lowers taxable income. Finally, scaling rates are applied to the

taxable amount to determine the total due. In some countries—such as the USA, Canada and Italy—there is tax credit, which is an amount awarded according to certain prerequisites and which reduces taxable income and, therefore, the amount owed by the taxpayer.[4] The stages of the definition of the tax payment are shown in Figure 1.

FIGURE 1
Stages of income taxation

Source: Authors' elaboration.

Due to the many particularities of the tax—the various types of deductions, exemptions and quirks—some basic parameters shared by all countries are highlighted in the literature, creating a basic framework for international analysis. Fernandes (2016) presents a comparison of the basic personal income tax parameters for select OECD countries and Brazil. He points out that personal income tax has many applications, and that there is no unequivocal rule that allows it to be rated according to a 'best practice', as this would depend on other tax parameters (possibilities and limits for deductions, incomes that are exempt or subject to reduced rates etc.) and, especially, on the socio-economic characteristics of each country.[5]

In this sense, as demonstrated by Piketty and Saez (2017), even though France has a higher maximum rate than the USA and the UK, its effective rates are, on average, lower than those countries. This occurs because the French system is notorious for having many provisions for different exemptions and deductions which reduce the taxpayers' taxable income. Therefore, in 2005, while in the USA and the UK the P99–P99.5 percentile of the income distribution was subjected to average effective rates of 21.4 per cent and 27.4 per cent, respectively, the equivalent group in France was subjected to a rate of only 11.6 per cent.

Brazil starts taxing income too late compared to other countries, starting with individuals who earn the equivalent of 79 per cent of the median national wage. For the sake of comparison, only Sweden's central government starts taxation at a higher point; however, in Scandinavian countries—as in most of the countries analysed—regional governments also levy their own income taxes, which results in lower incidence rates and higher maximum marginal rates.

Similarly, the maximum consolidated rate in Brazil is quite low compared to the other countries analysed: the third lowest, after Hungary and the Czech Republic, which apply flat rates of 16 per cent and 15 per cent, respectively, on all income. Both the average and the median of maximum consolidated rates are above 40 per cent, while in Brazil they are less than 30 per cent. The highest tax bracket in Brazil starts at an income equal to 1.98 median wages, which is low compared to the other countries listed but compatible with the fact that the maximum marginal rate is low; Chile and Mexico, for example, have maximum marginal rates that are compatible with international practice but which reach only a minute portion of the population, given the income bracket to which they apply.

Fernandes (2016) also analyses which tax results from the combination of these characteristics with the socio-economic structure to which they are applied. He presents data for the amount taxed as a proportion of gross domestic product (GDP) and gross tax burden in selected countries, to compare the weight of income tax in each.

An analysis of the collected amounts yields a poignant picture of Brazil's tax situation relative to OECD countries. Denmark is the country that is most reliant on personal income tax, with a rate of 26.11 per cent of GDP, corresponding to over half of its total taxation. Data also highlight a positive correlation between the level of development of a country and its reliance on income taxes—with the notable exception of South Korea, which, despite having high income levels, collects only 3.73 per cent of its GDP in income taxes—which might indicate that development might be correlated with high income taxes, up to a point. In addition to South Korea, Turkey, Eastern European countries and Brazil are the only countries in the sample whose income taxes represent less than 5 per cent of GDP. Even within this smaller sample, Brazil has the lowest income tax revenue—only 2.69 per cent of GDP, on average 1 percentage point lower than the other countries—which suggests that there is room for the expansion of income taxes, even if towards a level that would still be much lower than the OECD average. In simple terms, in 2013, each percentage point increase in income tax revenue would equal an increase of USD48 billion in the country's total revenue, which, in light of this increase, could be balanced by an overall decrease in indirect taxes, with a more progressive tax system.

2.1 CAPITAL GAINS

In addition to the previously described basic factors described above, another variable that significantly influences the distribution of the income tax burden in a society, as well as its revenue, is the different treatment for different sources of income. In most countries analysed by Fernandes (2016), the highlighted rates are applicable to labour income, while capital gains—such as earnings from financial applications, gains from purchasing and selling shares, and dividends accrued from entrepreneurial participation—are subject to specific and generally more favourable rates (OECD 2015; Piketty 2014). In Brazil, the IRPF is also discriminatory in its legislation—while progressive rates apply to taxable labour income (ranging from 7.5 per cent to 27.5 per cent), regressive rates apply to capital gains (starting at 22.5 per cent, down to 15 per cent); earnings accrued from capital gains specifically are considered exempt: there is no taxation of this type of income for individuals.

To understand why decreasing taxation over capital gains contributes to the rise in income inequality, it is necessary to carefully analyse their composition. As demonstrated in Harding (2013), capital gains are traditionally divided into three categories: i) interest from deposits or securities; ii) gains realised on real estate properties and shares; and iii) profits and dividends.

As can be inferred, capital income inequality is much higher than labour income inequality, since these earnings are concentrated among the richest population. Piketty (2014) studied the evolution of this inequality in various countries based on tax data and found that, in general, the 10/50 ratio observed for labour income inequality is around 1, while the 10/50 ratio observed for capital income inequality is around 10. Burman (2013) estimated that, in 2010, the upper quintile of the US income distribution earned 90 per cent of capital income; the richest 1 per cent of people concentrated 70 per cent of these gains. In Brazil, using tax data made available by the Federal Revenue Service (Receita Federal) in tandem with the National Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios*—PNAD), the study by Gobetti and Orair (2015) points out that, in 2013, the richest quintile concentrated 96.2 per cent of capital income, while the richest 10 per cent and 1 per cent of people held 91.3 per cent and 67.9 per cent of this share, respectively.[6]

The rates applied to capital income are usually lower than those applied to labour income. Regarding the difference in taxation of capital, Brazil follows the same standard as other central countries, even with a smaller differential, given that its maximum rate for labour income is lower. In any case, this differentiation violates the principles of horizontal and vertical equity, with a clear preferential tax treatment for the top strata, both in Brazil and in other central countries.

2.2 PROFITS AND DIVIDENDS

The greatest discrepancy between Brazilian legislation and international practice occurs regarding the taxation of profits and dividends at the individual level, which is one of the manifest sources of injustice in the Brazilian income tax system. Profits, defined as income extracted from entrepreneurial activity, are taxed at the income tax level for companies (in Brazil, via Corporate Income Tax—IRPJ— and the Social Contribution on Net Income—CSLL) and, after distribution to the partners, can be subject to taxation at the personal level. It is necessary to analyse this dual process to understand the total taxation of this source of income. In Brazil, the taxation of profits and dividends for individuals preceded the creation of the IRPF—as early as 1891—and, since its institution, it has continued uninterrupted, even if there have been different forms of treatment over the years (Nobrega 2014).

However, since the enactment of Law no. 9.249/1995, income from profits and dividends—which at the time was taxed at a linear rate of 15 per cent—became exempt in the IRPF, or, in other words, would no longer be taxable at the personal income level. In addition, this law also introduced the feature of 'interest payments on net equity' (*juros sobre capital próprio*—JSCP), which is a way for a company to distribute its profits to shareholders (the other one being dividends), recording this payment as an expense, which reduces the total profits taxable by the IRPJ and the CSLL. Combining the exemption of dividends with the possibility of financial application of the JSCP (with a hypothetical value of 10 per cent of gross profit), the shareholder's profit increases by around 21 per cent—higher profits when a higher share is distributed through the JSCP.

Given this systematic favouring of profits and the fact that there are various mechanisms through which individuals can represent themselves as an 'individual company' to receive their income, a dual taxation system has been established. The introduction of a dynamic system of income generation creates incentives for individuals to transform their labour income into capital gains. This is known in Brazil as *pejotização*, and it affects the equity of the income tax system, in addition to negatively impacting its revenue.

As a general rule, the taxation of profits and dividends such as it is practised in Brazil has few parallels within OECD countries. Only Slovakia and Estonia do not tax this source of income at the personal income tax level. Slovakia, however, taxes profits and dividends at a 14 per cent rate through a social contribution that goes towards financing the health system (Gobetti and Orair 2015), leaving Brazil and Estonia in a peculiar situation. Among the countries which tax profits and dividends at the personal level, effective rates vary from 6.9 per cent in New Zealand to 44 per cent in France, averaging around 25 per cent. The same average is observed in the taxation of companies, unlike in Brazil, which has some of the highest corporate taxes. Therefore, the taxation of profits and dividends in Brazil at the individual level requires a revision of the IRPJ's tax structure to even out the total taxation of profits and dividends, towards what is observed in other countries with a similar level of development.

3 ESTIMATIONS OF THE DISTRIBUTIVE POTENTIAL OF THE IRPF

What can be done to reverse the regressive nature of the Brazilian tax burden? It is necessary to change the focus, from indirect taxes towards direct ones. This would enable the contributive capacity of each individual to be gauged, and contribute towards greater equity in revenue collection by the State. In principle, the main arena in which to engage in this transformation is the IRPF, given its potential to adjust taxation according to the individual's contributive capacity and its lenient structure regarding capital gains, as previously demonstrated.

This section presents some works that have focused on analysing potential adjustments of IRPF parameters, which will serve as inputs for an exercise in the next section. It is worth pointing out that these simulations are backed by a counterfactual exercise, and that the reaction of individuals regarding these adjustments in terms of labour supply or tax evasion/avoidance are not considered. They are kept intentionally simple, which, nonetheless, does not invalidate their purpose as a valid exercise.[7]

Rocha (2002a) investigates the distributive impact of the IRPF from 1981 to 1999, using PNAD microdata for the period. The author considers that all declared income is labour income, since the PNAD does not discriminate between labour income and capital income. Therefore, she remarks that her estimation must be considered cautiously, as it overestimates the distributive potential of the IRPF to some extent by subjecting all income to the progressive rates of the tax.

She points out that, for the entire period, the Gini index for per capita household income was reduced by 4.1 per cent, with the IRPF in 1988 causing the greatest redistributive impact—a 5.1 per cent decrease for that year. She then analyses the effect of the changes in the tax parameters: among others, in the exemption limits and the progressivity of the rates. She highlights that the exemption limit increased in real terms between 1981 and 1998, which caused a reduction in the redistributive impact of the tax, and that, for the entire period, the smallest exemption range was practised in 1987, and the greatest in 1996.

In broad terms, she states that IRPF's redistributive capacity is closely connected with the distributive structure of the Brazilian gross income, which prevents the tax from being used in a similar way as in countries with a higher level of development and a more equal income structure. People who contribute to the IRPF are a very small portion of the population, which affects its redistributive potential and precludes the incidence of more progressive rates from having a considerable impact on the net income of Brazilian families.

Another study that endeavours to measure the redistributive potential of the IRPF was carried out by Soares et al. (2010), using PNAD microdata from 2002 to 2007 to extract per capita household and personal income. As in Rocha (2002a), the authors consider all income as labour income, given the data limitations in capturing capital income.

Having estimated the main parameters involved in the calculation of the IRPF, the authors apply the tax's theoretical rates for each year, hoping to estimate its revenue. The reduction in Gini caused by income tax varies between 3.3 per cent and 4 per cent for per capita household income; these values are slightly lower than those estimated by Rocha for a previous period. The authors verify that, in 2007, the incidence of the tax was concentrated at the top of the distribution: only individuals at the 85th income percentile onwards contributed to the IRPF, and, similarly, only families starting at the 73th per capita income percentile were subject to the tax.

Despite the similarity of results, these two works bump into the inherent limitation of PNAD microdata, which are unable to properly capture capital income. Therefore, they only analyse the IRPF's potential regarding labour income, ignoring a significant portion of the inequality in income tax, whose excessively favourable rates applied to capital income diminish its redistributive potential.

Castro (2014) presents a new method to analyse the impacts of the IRPF by using primary data from taxpayers' income tax statements delivered to the Federal Revenue Service between 2006 and 2012, in addition to data from the PNAD and the population census conducted by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística—IBGE), which allows for the analysis of capital income in addition to labour income.

When examining the available data, the author confirms the findings by Rocha (2002a) and Soares et al. (2010), that the IRPF has a modest impact on income distribution, including compared to international practice. The main indicators estimated by Castro (2014) are shown in Table 1.

TABLE 1
Measurements of IRPF progressivity in Castro (2014), 2006–2012

Year	Pre-IRPF Gini	Post-IRPF Gini	Effect on Gini
2006	0.534	0.509	-4.68%
2007	0.521	0.493	-5.37%
2008	0.518	0.488	-5.79%
2009	0.510	0.482	-5.49%
2010	0.513	0.481	-6.24%
2011	0.494	0.460	-6.88%
2012	0.491	0.458	-6.72%

Source: Castro (2014).

The effect of taxation on income distribution exhibits a positive tendency in the period: while in 2006 the IRPF caused a reduction in the Gini of 4.68 per cent, this reduction reached 6.72 per cent in 2012. It is important to note that the level of reduction in the Gini for 2006 and 2007 is much higher in Castro (2014) than in Soares et al. (2010), which is a likely consequence of the use of tax data for a more precise estimation of the income of wealthier individuals.

Castro (2014) notes that taxes on capital income offer the highest potential to increase the IRPF's distributive potential, as it focuses on the upper strata of the distribution and features a system of more favourable rates than those applied to labour income. In this sense, to analyse the distributive potential of the IRPF, the author simulates the following different taxation scenarios for 2012: (i) taxation of profits and dividends at 15 per cent; (ii) taxation of profits and dividends at 20 per cent; (iii) progressive taxation of profits and dividends, using different income brackets compared to labour income; (iv) creation of an additional rate for labour income, of 35 per cent; and (v) creation of two additional rates, of 35 per cent and 40 per cent, for labour income. The results are presented in Table 2.

TABLE 2
Tax modification scenarios, simulated in Castro (2014), for 2012

Scenario	Additional revenue (BRL billions)	Pre-tax Gini	Post-tax Gini	Effect on Gini
Current IRPF	-	0.491	0.458	-6.72%
I	31.0	0.491	0.449	-8.55%
II	41.5	0.491	0.446	-9.16%
III	50.0	0.491	0.443	-9.78%
IV	18.5	0.491	0.453	-7.74%
V	29.0	0.491	0.450	-8.35%

Source: Castro (2014).

It is interesting to note how even the introduction of a linear 15 per cent rate, similar to the ones applied on capital income, yields a more significant reduction in the Gini than the introduction of higher rates—35 per cent and 40 per cent—on taxable income. This demonstrates that, despite the creation of additional rates for higher income brackets being desirable given the national reality *vis-à-vis* international practice, the taxation of profits and dividends suggests a stronger effect in terms of revenue generation and inequality reduction.

The novelty of Castro's work regarding tax data was followed by a large database with synthetic information from IRPF declarations, the DIRPF Large Numbers, being made available.[8] In the wake of this new information and in light of Piketty's (2014) focus on the extreme concentration of capital income around the world, Gobetti and Orair (2015) propose a more careful analysis of the effects of taxation of profits and dividends on income distribution and its contribution to revenue, using data from the DIRPF Large Numbers and the Household Budget Survey, for the 2006–2013 period.

In calculating the distributive effect of the 2012 IRPF, Gobetti and Orair estimate a reduction of 2.78 per cent in the Gini, which is less than the 6.72 per cent reduction estimated by Castro (2014) for the same year (see Table 1). Castro conducts his estimations based on eight aggregate income brackets, which ignores the income inequality within each bracket and can lead to different assessments of inequality according to pre-defined groupings for the same income distribution. Gobetti and Orair, in turn, choose to segment data by hundredths—and 0.05 per cent quantiles in the upper strata—smoothing the estimated distribution curve.[9]

Gobetti and Orair point out that the fall in effective rates at the top of the distribution is mainly because profits and dividends increase in proportion to total income as distribution moves towards the top. In this light, they analyse the impact of the reintroduction of taxation of these income sources on the income distribution. Therefore, they propose to analyse the impact of introducing: (i) a 15 per cent tax on profits and dividends; (ii) taxation of profits and dividends according to the same progressive rates applied to labour income; and (iii) rates of 35 per cent, 40 per cent and 45 per cent on taxable income, maintaining the exemption for profits and dividends.

TABLE 3
Tax changes simulated in Gobetti and Orair (2015), for 2013

Scenarios	Total revenue (BRL billions)	Additional revenue (BRL billions)	Pre-IRPF Gini	Post-IRPF Gini	Effect on Gini
Current IRPF	149.7	-	0.6011	0.5844	-2.78%
I	192.8	43	0.6011	0.5791	-3.66%
II	208.4	59	0.6011	0.5769	-4.03%
III	192.8	43	0.6011	0.5793	-3.63%

Source: Gobetti and Orair (2015).

The results of the simulations by Gobetti and Orair (2015) corroborate the estimations by Castro (2014), even though the former authors estimate a much higher level of inequality and a smaller reduction in the Gini. The introduction of taxation of profits and dividends at a rate of 15 per cent is equal, in revenue terms, to the introduction of three upper rates on taxable income but exhibits a slightly higher potential to reduce income concentration. The third scenario introduces high marginal rates on relatively low income brackets (in light of international practice); the intention of the authors is to show that forgoing the taxation of profits and dividends means greater taxes on upper-middle-class workers, in exchange for leaving a significant portion of the income of the really wealthy untouched.

Analysing the evolution of estimates of the distributive potential of the IRPF in the country, and in light of new data that have been made available—leading to a more refined appraisal of the types of income earned by individuals at the top of the distribution—will hopefully yield more reliable information for decision-making in the tax policy field.

4 DATABASE AND METHODOLOGY

Given the Brazilian incidence of taxation, specifically the IRPF and its favourable treatment of capital income, we will endeavour to analyse the impact of modifying the IRPF on the concentration of income. To that end, we will use data from the 2008-2009 Household Budget Survey and from the DIRPF Large Numbers, as well as the Pareto interpolation method to combine the two databases. As a result, we hope to present a reliable framework to understand the Brazilian context, enabling the analysis of individual preferences and taxation in greater depth.

4.1 DATABASE

This works uses microdata from the 2008-2009 Household Budget Survey (*Pesquisa de Orçamentos Familiares*—POF), conducted by the IBGE, and data from the DIRPF, with condensed data from tax returns for the 2007–2013 period, compiled by the Federal Revenue Service.

4.1.1 POF

The 2008-2009 POF was a nationwide household survey conducted between June 2008 and July 2009, with a sample size of 59,000 households and 190,000 individuals. It recorded the incomes and expenses of individuals and households during various specific periods of time (month, week, semester, year) to describe in detail their behaviour and preferences.

The POF seeks to measure the expenditure behaviour of households, shedding light on their geographic, demographic and socio-economic profiles, with nationwide coverage starting from the 2002-2003 survey (Silveira 2012). It determines categories of expenditures on goods and services, which are annualised to determine households' consumption needs over the period analysed.

In addition, it captures expenditures related to the main direct taxes, such as the IRPF, social security (*Instituto Nacional do Seguro Social*—INSS), automobile taxes (*Imposto Sobre a Propriedade de Veículos Automotores*—IPVA), property taxes (*Imposto Sobre a Propriedade Predial e Territorial Urbana*—IPTU), and a residual category containing other deductions on labour income (ibid.). Moreover, indirect taxes can be estimated through the theoretical application of the ongoing rates of the Tax on Circulation of Goods and Transportation and Communication Services (*Imposto Sobre Circulação de Mercadorias e Serviços*—ICMS), the Federal Excise Tax (*Imposto Sobre Produtos Industrializados*—IPI) etc. on the household consumption basket. As they result from a household survey—and, therefore, have a sample-based and declaratory nature—tax data are subject to errors and omissions and, in general, add up to less than official revenue records (Soares et al. 2010), which requires correction for their optimal application.

The POF allows incomes to be disaggregated by wage level, retirement pensions, social benefits and, among other revenues, profits; it is the only household survey that allows this last category to be identified separately, which makes it more robust at capturing this variable (Medeiros and Souza 2013; Silveira 2012). Conversely, the PNAD aggregates capital income to other types of income, which results in a loss of quality in the data (Rocha 2002b).

Given that the POF is a sample-based survey—which means it provides greater clarity regarding common traits to the detriment of what is peculiar in the sample—its data coverage is inherently less effective at capturing the highest incomes, which fall through its sampling screen and are, therefore, globally underestimated (Medeiros, Souza, and Castro 2015b; Soares et al. 2010; Soares 2006). Other reasons for this underestimation of the highest incomes in household surveys are failure to respond and intentional undervaluation by the responder, behaviours which are more prevalent in higher-income segments (Piketty 2014; Rocha 2002b). Even regarding the income of the lower strata, there is evidence of under-declaration, as high budget deficits are observed in poorer families, with declared incomes that are much lower than their expenses—an unsustainable situation in the long term (Siqueira, Nogueira, and Souza 2012; Silveira 2008).

The issue of capturing income in household surveys and the procedures used to deal with possible distortions is crucial to estimating income concentration in Brazil. Therefore, the use of supplementary data is a promising way to mitigate possible misrepresentations.

4.1.2 DIRPF Large Numbers

DIRPF Large Numbers are compiled by the Federal Revenue Service, with condensed information from IRPF annual adjustment declarations. Individuals who declare the IRPF are those who earn an income above a given amount set every year, who have conducted stock market operations or were owners of assets and rights above certain values established in legislation. Therefore, as the database contains only those who declare, it does not capture information for a large portion of the population.

The database contains information about income, deductions, calculations, taxes paid, and the rights and responsibilities of IRPF contributors, organised in 23 tables with refinements to the basic data. These variables are segmented by income bracket as a proportion of average monthly income, measured in minimum wages. There are 11 brackets, from incomes of up to half a minimum wage up to individuals with an average monthly income of 160 minimum wages. Each income bracket also contains information about the number of individuals it comprises.

Income is divided into three categories, according to how the IRPF is applied: (i) **taxable income**—basically wages which are taxed at progressive rates; (ii) **tax-withheld income**—subjected to specific rates and withheld at source, almost all of which comprises the 13th salary (around 35 per cent on average for the 2007–2013 period), earnings from financial applications (25 per cent) and capital gains from the sale of assets and rights (20 per cent); and (iii) **exempt income**, which is not subject to the IRPF but must still be declared to the Federal Revenue Service, comprising mainly profits and dividends of partners or shareholders (45 per cent) and asset transfers (12 per cent). The sum of these three types of income adds up to the gross income of the different income strata.

Information from the DIRPF allows researchers to consider different aspects of the reality of the richest individuals in Brazilian society while preserving the secrecy of tax data and avoiding any sort of personal identification. This information is of vital importance to better determine the economic situation of individuals in the upper income strata, since it complements data obtained from household surveys, which, as explained above, are less able to fully capture this specific group.

4.2 METHODOLOGY

Our intended purpose is to analyse the data from the 2008-2009 POF in concert with data from the DIRPF Large Numbers for the 2008 base year, imputing the tax record data for the household survey strata. The two databases are used in tandem because, although the DIRPF Large Numbers provides more detailed income data, those who declare it comprise a small portion of the Brazilian population (in 2008, slightly over 25 million people). Therefore, to analyse the potential changes to the country's income distribution as a result of changes to the tax system, it is necessary to use auxiliary data that provide information for those who do not declare the IRPF.

We apply the Pareto interpolation method popularised by Piketty (2014) to impute the data. Through this method's stratification of tax data, it is possible to glean information about specific population quantiles, assuming that the data follow a pre-set probability distribution. After combining data from the IRPF and the POF, it will be possible to estimate the total tax burden, using data from other direct taxes available in the POF and estimating indirect taxation based on individuals' declared consumption. It will also be possible to estimate the impacts of specific changes to the IRPF on inequality.

4.2.1 Pareto interpolation

The problem of interpolation arises when there is a database with grouped values for income—as generally occurs with data made available from tax returns, in Brazil and elsewhere—and one wishes to estimate a value in the sample for which there is no disaggregated observation. To estimate the appropriate income of a given quantile, it is assumed that income follows a Pareto distribution across the entire population—a hypothesis which is usually employed in this type of exercise (Medeiros, Souza, and Castro 2015a; Atkinson, Piketty, and Saez 2011).[10]

In the Pareto distribution, the proportion of the population with an income above *y* is given by the following distribution function:

$$1 - F(y) = (k/y)^{a}\,; (y > k > 0, a > 1) \qquad (1)$$

In which *k* and *a* are constant, with known as the Pareto coefficient. The corresponding probability density function is $f(y) = a\,k^{a}/y^{(1+a)}$. The main property of the Pareto distribution is that the ratio between average individual income above *y, y** does not depend on the income bracket; this ratio will have a constant value. A demonstration of this property is as follows:

$$y^{*} = \left[\int_{y}^{z} zf(z)dz\right] / \left[\int_{y}^{z} f(z)dz\right] = \left[\int_{y}^{z} dz/z^{a}\right] / \left[\int_{y}^{z} dz/z^{(1+a)}\right] = \frac{ay}{a-1} \qquad (2)$$

Therefore, from this expression, the result is:

$$y^{*}/y = a/(a-1)\,; \text{ and } \; a/(a-1) = \text{b} \qquad (3) \text{ and } (4)$$

As is possible to glean from equation (4), the constant *b* is a direct consequence of *a* and is, therefore, known as the 'inverted Pareto coefficient'. It is a synthetic measure of income inequality in the Pareto distribution: a larger *b* value implies a thicker tail at the end of the distribution, which means that income concentration is higher in this upper bracket (Atkinson, Piketty, and Saez 2011).

The Pareto interpolation method requires two additional definitions for estimation: the denominators of the total population and of the country's total income. This need arises whenever the tax database does not include the country's entire population and income. In this light, it is necessary to exogenously determine indicators for population and total income. For this paper, we have used individuals aged 18 and older as the population indicator, and the 2008 Gross Available Income (*Renda Disponível Bruta*), made available through IBGE's Integrated Economic Accounts (*Contas Econômicas Integradas*—CEI), as the income indicator.[11]

4.2.2 Preparation of DIRPF data

As previously explained, total income in the DIRPF is subdivided into three groups: (i) taxable income; (ii) income subject to exclusive taxation at source; and (iii) exempt income. The DIRPF provides a snapshot of the various sub-incomes that compose each type of income.

Unfortunately, the data do not allow for the information pertaining to each income bracket to be cross-checked against the composition of their sub-incomes by (i), (ii) and (iii). In addition, incomes that are tax-withheld at source are presented as net tax values (Gobetti and Orair 2015), and their untreated use would underestimate the effective rates applied to each income bracket.

Therefore, to calculate taxes levied on each income bracket, it was necessary to estimate the composition of sub-incomes for each stratum and impute the taxes levied on tax-withheld income. This estimation was conducted based on the classification of sub-incomes by their origin—labour or capital—and by carrying out imputations for each income bracket, weighing by taxable income (proxy for labour income) and exempt income (proxy for capital income).

Taxes levied were estimated by applying the effective rates of each income bracket on labour income, a 16 per cent rate on revenues from financial applications and a 15 per cent rate on other capital gains, according to the average tax rates computed by Castro (2014) between 2006 and 2012. Therefore, tax-withheld incomes were estimated at their gross value, as opposed to their net values as made available in the DIRPF, which resulted in an average increase in the total sum of this type of income of a little over 15 per cent.

Regarding tax-exempt income, once it is possible to determine which group receives profits and dividends based on a specific DIRPF table, we have opted to adopt the proportional distribution of profits and dividends according to the proportion of exempt withheld income of each bracket relative to the total volume of exempt income. The remaining categories of exempt income were also proportionally distributed among the different strata.[12]

The rule for imputing profits and dividends that was used potentially underestimates the concentration of these earnings in the upper strata (Gobetti and Orair 2015), as it is possible to assume that the concentration of this type of income increases as overall income increases. However, we have applied this adjustment as a conservative reference for the estimates.

Analysis of the composition of the DIRPF

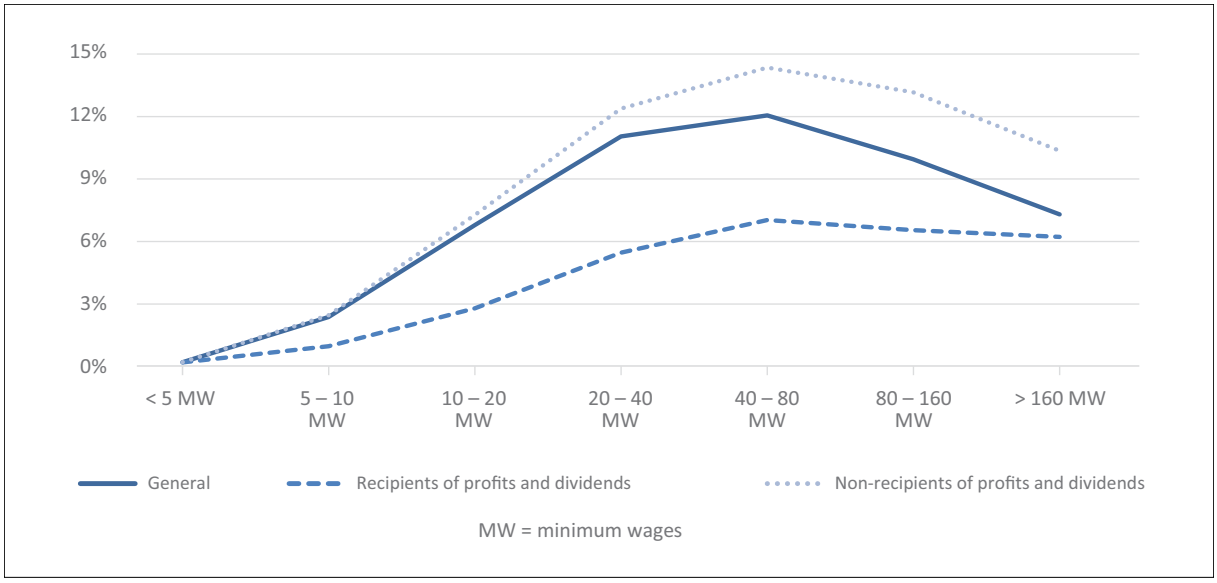
The estimation of the composition of the incomes of each income bracket in the DIRPF allows us a glimpse at the overall imbalance in the equity of the Brazilian tax system, in addition to confirming the extent of the country's income inequality. Table A1 (see Appendix, page 25) synthesises information on income earned and effective taxation for each monthly income bracket for taxpayers in 2008, and distinguishes between recipients of profits and dividends and individuals who do not earn this type of income.

As illustrated in Table A1 (see Appendix, page 25), the DIRPF provides information for rather high income brackets—starting at 40 monthly minimum wages—with very diverse income and taxpayer profiles. Therefore, while 71,458 individuals declare an average income of over 160 minimum wages (BRL797,000 a year) in a universe of 25,882,355 people who declare their taxes—0.28 per cent of the total—this same group earned 17.06 per cent of all declared income, a higher total amount than the almost 14 million people who earned up to five minimum wages during the year.[13]

Regarding the types of earnings, the proportion of taxable earnings decreases *vis-à-vis* the increase in tax-withheld and -exempt incomes, as overall income increases. While in the lower income stratum taxable incomes represent 88.68 per cent of declared income, as opposed to 7.76 per cent tax-exempt income, in the highest stratum these proportions are shifted completely to 12.92 per cent and 59.63 per cent, respectively.

The importance of this analysis can be synthesised in the analysis of the effective rates applied to each income bracket. Regarding the breakdown of vertical equity, it is possible to observe that effective rates follow a parabola, from 0.20 per cent for the lowest income bracket to 12.05 per cent for the income bracket between 40 and 80 monthly minimum wages and 7.30 per cent for the upper income bracket. Horizontal equity is similarly violated, as for the same income brackets the effective rates applied to the groups who receive profits and dividends are systematically lower than those applied to those who do not. This is illustrated in Figure 2, which depicts the parabola comprising the effective rates applied to the three groups and shows how the curve of the effective rates applied to those who receive profits and dividends follows a path that is always below the group that does not receive this type of income.

FIGURE 2
Effective IRPF rates for each income bracket, 2008



Source: Authors' elaboration.

Part of the justification for these two phenomena is the favourable treatment for capital income, to the detriment of labour income, especially regarding the non-taxation of profits and dividends. Table 4 shows the composition of income for each DIRPF stratum.

The data suggest an unambiguous answer for the decrease in effective rates for the upper strata: the continuous decrease in the proportion of labour income relative to capital income in the higher income brackets, which falls outside the progressive IRPF rates and is subjected to more moderate ones. While a large proportion of labour income is concentrated in the lower strata, capital income follows an inverse trajectory, with an even higher level of concentration. The 71,458 individuals in the upper income bracket concentrated 46.8 per cent of all declared capital income, more than around 25.5 million people who have declared that they earn up to 80 monthly minimum wages and who earn 42.7 per cent of all declared capital income. Conversely, labour earnings in the declarations of individuals at the top of the distribution make up only 6 per cent of the total, while the second group concentrates 89.5 per cent of this type of income.

TABLE 4
Labour and capital income in the DIRPF, 2008

Monthly income bracket	Number of taxpayers	Labour income		Capital income		Total	
		BRL millions	%	BRL millions	%	BRL millions	%
< 3 MW	6,459,577	34,904.9	3.8	2,261.4	0.7	37,166.4	3.0
3–5 MW	7,371,132	136,493.6	15.0	6,681.2	2.1	143,174.8	11.6
5–10 MW	6,501,415	199,902.8	22.0	19,835.8	6.1	219,738.6	17.8
10–20 MW	3,207,904	184,030.0	20.3	30,352.2	9.3	214,382.2	17.4
20–40 MW	1,458,385	154,880.0	17.1	38,849.4	11.9	193,729.4	15.7
40–80 MW	555,554	102,780.6	11.3	41,212.9	12.6	143,993.5	11.7
80–160 MW	146,930	40,758.1	4.5	34,189.6	10.5	74,947.7	6.1
> 160 MW	71,458	54,377.2	6.0	152,512.5	46.8	206,889.6	16.8
Total	**25,772,355**	**908,127.1**	**100.0**	**325,895.0**	**100.0**	**1,234,022.2**	**100.0**

Source: Authors' elaboration based on DIRPF data.

Note: Total income differs from Table A1 (see Appendix, page 25), as it excludes donations and inheritances, which are not considered income but wealth (Gobetti and Orair 2015).

4.2.3 Preparation of POF data

We have extracted from the POF database the incomes declared by individuals, distinguishing between incomes related to labour and to capital. Individuals under 18 years old were excluded from the database—together, they represented 0.4 per cent of total income, which was not considered in this exercise—and family expenses were imputed to the remaining household members as a proportion of their income.

As previously discussed, the literature highlights that the income measured by household surveys is potentially underestimated, in both the upper and the lower strata, for distinct reasons. To correct the underestimation of the lower incomes, an adjustment was proposed for individuals with budget deficits, whereby income was multiplied by a factor that is proportional to the expense that was imputed to each, thus eliminating deficits. This procedure is similar to the one proposed by Silveira (2008) and used by Siqueira, Nogueira, and Souza (2012).

The higher incomes, in turn, were parametrised according to the DIRPF database, adjusting the sum of the incomes of the upper strata of the DIRPF with equivalent strata from the POF, similarly to Medeiros, Souza, and Castro (2015b) and Gobetti and Orair (2015). Using the Pareto interpolation, we have extracted from the upper strata of the DIRPF 0.5 quantiles, containing a population equivalent to the nine upper percentiles of the POF—whose monthly income was subjected to income tax—which would ensure equivalency between the two databases.

As a final adjustment, the POF quantiles that were not imputed according to the DIRPF were multiplied by a linear factor, so that the sum of the entire database would correspond to the available gross income, given that this was the income denominator used by the Pareto interpolation method to extract the quantiles. The resulting database is termed 'POF-DIRPF', on which the analysis of tax incidence is based.

5 RESULTS OF THE SIMULATIONS REGARDING THE DISTRIBUTIVE IMPACT OF THE IRPF

In 2008, in addition to the ongoing tax exemption of profits and dividends, the progressive tax structure was even more simplified, with only two rates—of 15 per cent and 27.5 per cent—as shown in Table 5.

TABLE 5
Personal income tax, 2008

Annual calculation basis (BRL)	Rate (%)	Tax-deductible share (BRL)
Up to 16,473.72	-	-
From 16,473.73 to 32,919.00	15.0	2,471.06
Above 32,919.00	27.5	6,585.93

Source: Receita Federal (2018).

This is the basic structure for the analysis of alternative scenarios of IRPF taxation. In light of previous works that seek to analyse the modification of progressive taxation over labour income and the scope of this paper, we have opted to focus on the effects of the reintroduction of taxation of profits and dividends. Therefore, the two alternative IRPF scenarios proposed to simulate variations in post-tax income are as follows:

a. the maintenance of the tax structure of progressive rates, allied with the return of taxation of profits and dividends at a linear 15 per cent rate, as was the case in Brazil until the enactment of Law No. 9.249/1995; and

b. changing the classification of profits and dividends to taxable, subjecting them to unique progressive rates of 15 per cent and 27.5 per cent.

Table 6 presents the results of the simulations in terms of national revenue and the effect on inequality, as measured by the Gini index.

TABLE 6
Simulated changes to the structure of the 2008 IRPF

Scenario	Pre-IRPF index	Post-IRPF index	Effect on Gini	Additional effect on Gini	Revenue (BRL millions)	Additional revenue (BRL millions)
Original IRPF	0.7022	0.6904	-1.69%	-	61,473	-
I	0.7022	0.6866	-2.23%	-0.0038	83,931	22,458
II	0.7022	0.6834	-2.67%	-0.0069	101,148	39,675

Source: Authors' elaboration.

It is evident that the impact of personal income taxes on income concentration is relatively low. This is because the combination of applicable rates and income brackets is comparatively not very progressive, but also because income concentration in Brazil is extremely high. Incomes subjected to tax are concentrated in the upper decile of the distribution, while

individuals in the lower strata do not achieve the minimum annual income of BRL16,473.72 to be subject to any taxes, which limits the redistributive effects of income tax.

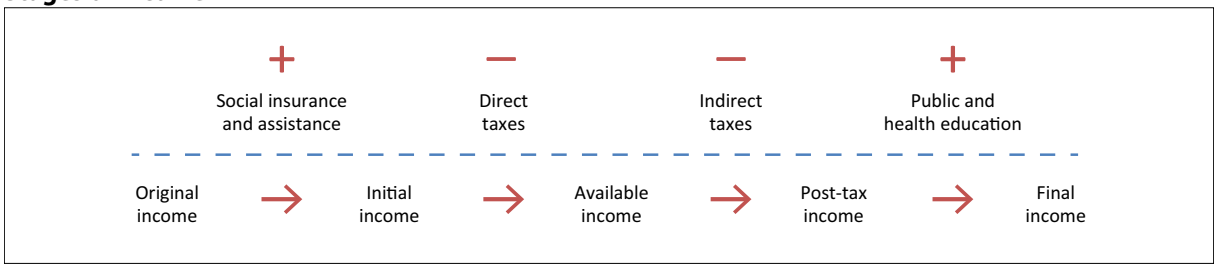
The introduction of taxes on profits and dividends increases the effect of the IRPF on the reduction of income inequality while considerably increasing revenue. While taxation according to the original IRPF reduces the Gini by 1.69 per cent, taxation of profits and dividends in a linear (scenario 1) and a progressive (scenario 2) fashion causes a reduction in the Gini of 2.23 per cent and 2.67 per cent, respectively, illustrating the disproportional concentration of profits and dividends in the upper strata.

5.1 EFFECTS OF THE TAXATION OF PROFITS AND DIVIDENDS ON TOTAL TAX BURDEN

The next step consists in incorporating all other taxes in the tribute and analysing the resulting final income. This includes estimates from the IRPF in effect and from the two scenarios of taxation of profits and dividends, incorporating deductions from other direct taxes declared in the POF and the estimation of indirect taxation of individual consumption. For this analysis, we used the stages of income transformation classified in a similar analysis by Silveira (2012), as shown in Figure 3.

FIGURE 3

Stages of income



Source: Compiled from Silveira (2012), based on Jones (2007).

In this exercise, our starting point is the POF-DIRPF income. We apply direct taxation—which, at the base, comprises the IRPF, the INSS, the IPVA, the IPTU, the Rural Property Tax (*Imposto Territorial Rural*—ITR), the Tax on Services (*Imposto Sobre Serviços*—ISS) and other deductions—to find available income. Then, indirect tributes are deducted from individual consumption, by estimating the ICMS, IPI, PIS/COFINS, the Contributions for Intervention in the Economic Domain (*Contribuições de Intervenção no Domínio Econômico*—CIDE) and the ISS, applying the rules and regulations of the federal government, of each state and of each capital to estimate post-tax income.

Finally, we estimate final income by imputing state expenditures on public provisions—i.e. expenditures on public health and education.[14] To estimate the amount of these provisions appropriated by each individual, we have identified individuals in the POF-DIRPF who have declared the use of these two types of goods, including regarding their under-age children. For education, the Ministry of Education provides data for per-student expenditure according to educational level; therefore, the imputation is direct; in the case of health, we have used information provided by the Ministry of Health, together with the health supplement for the 2008 PNAD.[15]

Table 7 presents the estimated Gini coefficients for each stage of taxation, according to current IRPF rates and the two scenarios for the taxation of profits and dividends, with linear rates of 15 per cent (i) and included in the progressive taxation of taxable income (ii).

TABLE 7
Overall effect of taxation on income distribution, 2008

Stage	Original IRPF		I		II	
	Gini	Change	Gini	Change	Gini	Change
Initial income	0.7022	-	0.7022	-	0.7022	-
Available income	0.6857	-2.35%	0.6816	-2.94%	0.6781	-3.43%
Post-tax income	0.7049	2.80%	0.7003	2.74%	0.6964	2.70%
Final income	0.6421	-8.90%	0.6374	-8.98%	0.6334	-9.04%
Total effect on Gini		**-8.55%**		**-9.23%**		**-9.79%**

Source: Authors' elaboration.

The differential effects of the suggested scenarios can be verified in the transition from initial to available income, in which the added effect of increased progressivity analysed in the previous section acts in tandem with other direct tributes to reduce the Gini coefficient even further. The most important finding regards post-tax income, in which the regressive nature of indirect taxation practically nullifies the redistributive effects of direct taxation, with the Gini coefficient practically returning to its point of origin. This is the synthetic numerical expression of the inequity in the Brazilian tax system: the emphasis on indirect taxation, to the detriment of direct taxation, which contributes towards even more income concentration by disproportionally taxing the poorest population.

Available and post-tax income summarise the effects of Brazil's regressive tax policy; the last step—final income—translates the other end of government action, expenditure. Its scope is impressive when compared to previous stages, being responsible for a large impact on the mitigation of income concentration, reducing the Gini coefficient by around 9 per cent. In a general assessment of initial and final income, we see that the weight of public expenditure is the sole component in the reduction of income inequality, given that taxation is slightly regressive towards neutrality, as its progressivity is increased by the introduction of taxes on profits and dividends.

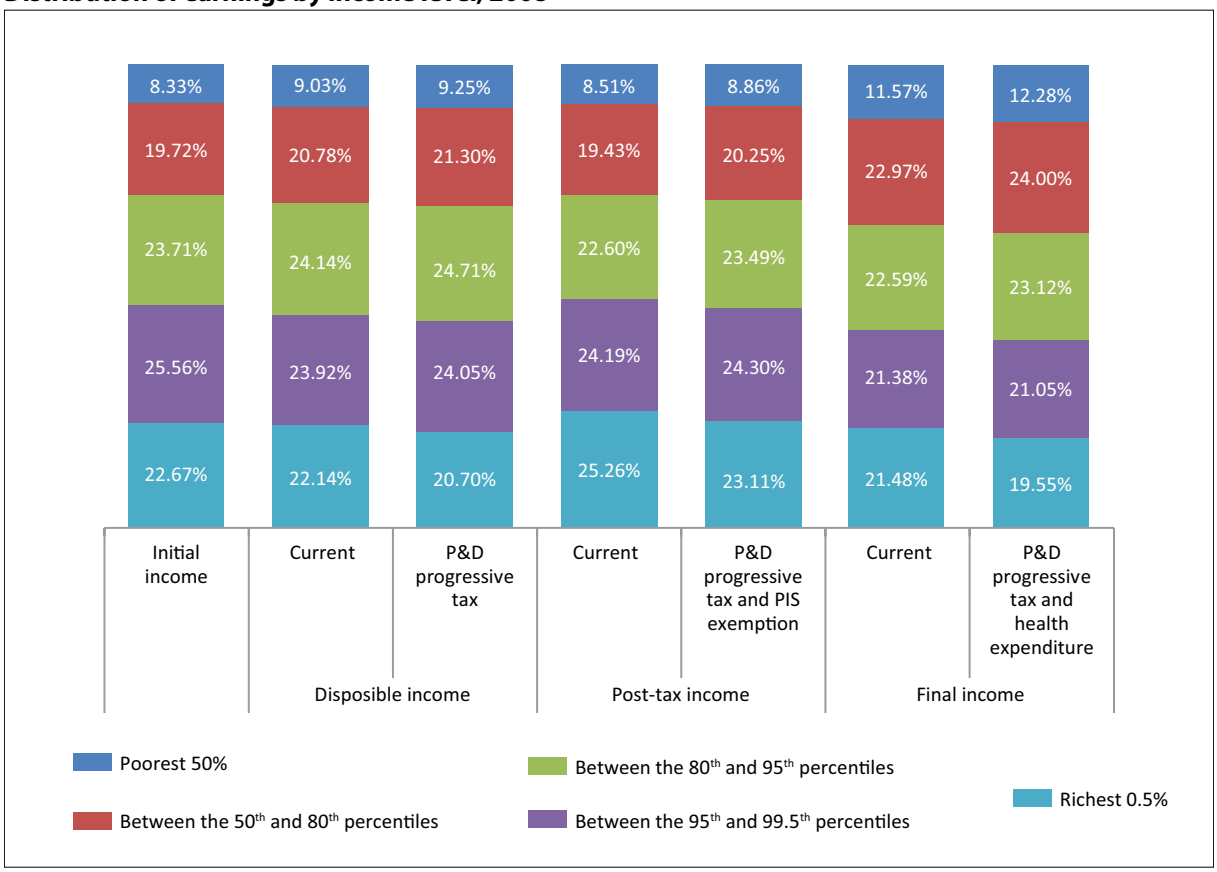
Considering the significant impact from the expenditure side on income concentration, Figure 4 shows the appropriate income by specific quantile, comparing the current situation *vis-à-vis* the progressive taxation of profits and dividends, whereby additional taxes are reverted by means of PIS exemption in post-tax income, or through expenditures on health in final income, so as to highlight the distributive impacts of the Brazilian State's process of tax collection and expenditure.

The inequality in income distribution across all levels is clear: the richest 0.5 per cent of people concentrate around a fifth of all income, while the poorest 50 per cent accrue only a tenth of this amount. A little over 40 per cent of all income earned in 2008 was concentrated among the richest 5 per cent, even after taxes and public expenditure.

We can also see that the conversion of additional revenue from the progressive taxation of profits and dividends into health expenditures yields a positive impact, increasing

the income participation of the poorest strata. Even if the general structure of income distribution remains stable, the final income accrued by the lowest strata up to the 95th percentile increases, with the impact being more significant among the poorest 50 per cent of people, whose final income increases by 6.13 per cent compared to their current final income.

FIGURE 4
Distribution of earnings by income level, 2008



Source: Authors' elaboration.

From the perspective of mitigating income inequality, the combination of these two policies—taxation of profits and dividends, and increased social spending—is promising. Even so, its impact is relatively modest.

5.2 METHODOLOGICAL CONSIDERATIONS REGARDING THE RESULTS

The estimates we have provided for the modification of the IRPF are more conservative than those in similar investigations undertaken by Castro (2014), and Gobetti and Orair (2015), as illustrated in Table 8. Castro estimated a reduction in the Gini of the original IRPF of 5.79 per cent, while this present paper finds a value of 1.69 per cent for these variables. One of the reasons for this discrepancy is the fact that Castro uses tax data directly, eschewing the DIRPF, which is more synthetic, allowing for precise estimations of the incidence of the IRPF on each individual.

TABLE 8
Estimations of the distributive impact of the IRPF

Estimation	Year	Pre-IRPF Gini	Post-IRPF Gini	Effect on Gini
Castro (2014)	2008	0.518	0.4880	-5.79%
Gobetti and Orair (2015)	2013	0.6011	0.5844	-2.78%
This paper	2008	0.7022	0.6904	-1.69%

Source: Authors' elaboration.

However, another factor that contributed to the difference in estimations is the method used by Castro to include individuals who do not contribute to the IRPF and the construction of an income distribution for society as a whole. The author's methodological choice is for the use of the PNAD's aggregate income tables, made available by the IBGE. Therefore, by mixing tax data with these tables, which aggregate income in only eight segmented brackets, the Gini estimation by Brown's method is undervalued, as the calculation of these aggregates ignores the intra-strata income distribution, which is potentially relevant, as pointed out by Castro himself. For this reason, even using income tax data from upper strata, the author finds lower Gini rates than the official IBGE calculations using only PNAD microdata.

Gobetti and Orair (2015) employ an estimation that is methodologically similar to the one used in this paper; however, they used data from the 2013 PNAD. Therefore, there is a natural difference between the numbers, given that the time periods are different. There is an additional factor that might have contributed to the more significant Gini reduction in their findings: the exclusion of individuals without income in the 2013 PNAD database, which potentially underestimated the Gini coefficient.

Naturally, our estimations in this paper are not exempt from ambiguities that might be further refined. The option to use gross available income as a parameter for total income probably overestimated the inequality of redistribution to some degree, given that—as demonstrated by Medeiros, Souza, and Castro (2015a)—it is the parameter of total income that leads to the largest income concentrations according to estimates based on the Pareto interpolation. The use of alternative parameters for total income would lead to less concentrated income distributions and, therefore, lower Gini coefficients.

Another crucial factor for the estimation is the way in which profits and dividends are distributed among DIRPF strata. We have used the same hypothesis as Gobetti and Orair (2015), which considers that profits and dividends are distributed as a proportion of each stratum's total income. Even if this option distributes more profits and dividends among individuals at the top, it is reasonable to assume that concentration would be even greater in the upper strata. However, more robust parameters must be developed to enable this imputation. The definition of more refined methods to combine DIRPF data with household survey data is still a fertile field, with many possibilities.

In any case, our estimation of the effects of the progressive modification of the IRPF on the tax burden remains in line with previous efforts, highlighting that the IRPF has an attenuating effect on income inequality; however, its distributive potential is limited to the initial income distribution. As Rocha (2002a) and Castro (2014) point out, the fact that Brazil is a highly unequal country creates an obstacle to the capacity of the tax: it imposes an additional tax

burden exclusively on the upper income strata, leading to a small impact on concentration as a whole. Its use as a privileged distributive mechanism increases as the country develops further and its income is redistributed, resulting in a two-way street, where the positive effect of one end reinforces the other in a feedback loop.

6 FINAL CONSIDERATIONS

The main goal of this article was to engage in an empirical exercise of combining income tax data, made available by the Federal Revenue Service, with data from the IBGE's 2008-2009 POF. The literature confirms that income inequality has always decreased as a result of a public expenditure policy that prioritises the supply or provision of goods and services, especially for the poorest share of the population. The objective is not to argue the efficiency or effectiveness of taxation in reducing inequality; however, as the Brazilian tax system is one of the most unequal, we have proposed an exercise that seeks to reintroduce the incidence of personal income taxes on profits and dividends.

To that end, we have developed two simulations. In the first, we applied a rate of 15 per cent, and in the second, a progressive rate varying between 15 per cent and 27.5 per cent.

The results indicate a small improvement in income distribution, which is modest given the high income concentration in the country. On the other hand, there is a significant increase in revenue, between BRL22 billion and BRL39 billion, depending on the model for the taxation of profits and dividends. The following exercise consisted in evaluating the impact of the adoption of a direct tax (on profits and dividends) regarding more equitable taxes. The results indicate that the most significant effect is on post-tax income, in which the regressive nature of indirect taxation contributes to practically nullify the redistributive effects of direct taxation, causing the Gini to practically return to its initial level. This is the synthetic numerical expression of inequality in the Brazilian tax system: the focus on indirect taxes, to the detriment of direct taxes, only contributes to further concentrate income, disproportionately burdening the poorest people.

Finally, we performed a counterfactual exercise, whereby the increased revenue generated by the adoption of taxes on profits and dividends was used to fund an increase in public expenditure in several areas. The result was an improvement in income distribution, which points to findings from previous works: increased expenditure can unequivocally improve income distribution.

In addition to these results, this paper puts forward a comparison between Brazil and OECD countries regarding income taxes, pointing out differences between the different tax models and highlighting the specificities of the Brazilian case. We specifically note the different treatment given to capital gains and the taxation of profits and dividends: Brazil is one of the countries that impose the lowest taxes on the profits and dividends of private individuals.

This theme becomes even more relevant given the country's current situation: a severe economic crisis brings to the fore the need to rethink the Brazilian tax system. Regardless of the historically small effect of direct taxes on Brazil's tax burden, there are signs that indicate that the country's socio-economic development over recent decades, with greater sophistication regarding expenditure, has not been accompanied by the tax policy, which remains based on indirect taxation, which is easier to apply.

Comparing the Brazilian structure to certain central countries, we realise that there is room for a reorganisation of its priorities, especially regarding the level of taxation of the transmission of wealth, or recurring property taxes. Although international comparison demonstrates that the revenue from these taxes is inherently low as a proportion of GDP, it is even lower in Brazil. Further studies to estimate the revenue potential of these types of taxes are necessary and welcome to properly define the country's potential.

Regarding income tax, Brazil is even more conservative than the other countries analysed, even compared to its Latin American neighbours with a similar social and economic profile. The structure of the IRPF is tight considering the maximum marginal rates applied, bloated regarding the size of the exemption bracket, and shy when capital income is specifically analysed. The profits and dividends earned by private individuals are completely exempt from any taxes, a situation similar only to Estonia among all the countries studied. Given that the proportion of capital income grows compared to labour income the higher you climb to the top of the income distribution, the option not to tax profits and dividends implies making the income tax system ever more regressive.

TABLE A1

Overview of incomes and effective rates by DIRPF income bracket, 2008 (in BRL millions)

Monthly income bracket	Number of declarants (n)	Taxable income				Tax-withheld income			Exempt income	Total income		
		Total	Deductions	Tax due	Effective rate (%)	Total (est.)	Tax due (est.)	Effective rate (%)		Income	Tax paid	Effective rate (%)
Total from declarations—by monthly income bracket												
< 5 MW	13,830,709	162,395	33,159	162	0.10	6,525	210	3.22	14,208	183,129	373	0.20
5–10 MW	6,501,415	182,613	54,564	4,623	2.53	12,765	740	5.79	30,106	225,484	5,363	2.38
10–20 MW	3,207,904	164,024	47,575	13,630	8.31	14,043	1,441	10.26	43,914	221,981	15,072	6.79
20–40 MW	1,458,385	133,920	30,267	20,052	14.97	15,313	2,247	14.67	52,706	201,939	22,299	11.04
40–80 MW	555,554	85,076	15,945	15,882	18.67	14,002	2,345	16.75	52,144	151,222	18,227	12.05
80–160 MW	146,930	30,384	4,721	6,274	20.65	9,658	1,657	17.15	39,688	79,729	7,931	9.95
> 160 MW	71,458	28,248	4,638	6,131	21.71	60,037	9,838	16.39	130,392	218,677	15,969	7.30
Total	**25,772,355**	**786,659**	**190,869**	**66,756**	**8.49**	**132,342**	**18,477**	**13.96**	**363,158**	**1,282,160**	**85,233**	**6.65**
Declarations from recipients of profits and dividends + incomes of partners and owners of microbusinesses—by monthly income bracket												
< 5 MW	412,246	3,341	660	1	0.03	100	11	10.58	2,467	5,908	12	0.20
5–10 MW	347,112	5,946	1,424	80	1.35	369	41	11.12	6,182	12,496	121	0.97
10–20 MW	336,053	9,362	2,503	535	5.72	1,085	138	12.68	13,636	24,083	673	2.79
20–40 MW	274,220	14,711	3,631	1,770	12.03	2,527	360	14.24	21,752	38,990	2,130	5.46
40–80 MW	170,008	16,521	3,625	2,697	16.33	4,110	638	15.52	26,805	47,436	3,335	7.03
80–160 MW	70,010	9,606	1,755	1,815	18.89	4,461	720	16.13	24,661	38,728	2,535	6.54
> 160 MW	46,368	14,019	2,033	3,070	21.90	43,317	6,984	16.12	104,225	161,562	10,054	6.22
Total	**1,656,017**	**73,506**	**15,632**	**9,968**	**13.56**	**55,968**	**8,891**	**15.88**	**199,728**	**329,203**	**18,859**	**5.73**
Declarations from non-recipients of profits and dividends (residual)—by monthly income bracket												
< 5 MW	13,418,463	159,054	32,498	161	0.10	6,425	200	3.11	11,741	177,220	361	0.20
5–10 MW	6,154,303	176,667	53,140	4,543	2.57	12,396	699	5.64	23,925	212,987	5,241	2.46
10–20 MW	2,871,851	154,662	45,072	13,095	8.47	12,957	1,304	10.06	30,278	197,898	14,399	7.28
20–40 MW	1,184,165	119,209	26,636	18,283	15.34	12,786	1,887	14.76	30,954	162,949	20,170	12.38
40–80 MW	385,546	68,555	12,321	13,185	19.23	9,893	1,707	17.26	25,338	103,786	14,892	14.35
80–160 MW	76,920	20,777	2,966	4,459	21.46	5,197	937	18.03	15,027	41,002	5,396	13.16
> 160 MW	25,090	14,229	2,605	3,062	21.52	16,720	2,854	17.07	26,166	57,115	5,916	10.36
Total	**24,116,338**	**713,153**	**175,237**	**56,788**	**7.96**	**76,374**	**9,587**	**12.55**	**163,430**	**952,957**	**66,374**	**6.97**

Source: Authors' elaboration based on DIRPF data.

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NOTES

4. Tax credit is different from tax deductions because it decreases the total amount due, while the latter decreases total income. Depending on its amount, tax credit can result in an amount to be repaid to the individual. In the USA, for example, there is the Earned Income Tax Credit (EITC), which results in an increase in income for the poorest taxpayer households (OECD 2015).

5. As highlighted by Soares et al. (2010, 229): "...as income distribution in different countries also varies significantly, the same system of rates, with the same exemptions and the same avoidance/evasion behaviours would lead to significantly different revenue results."

6. For further analysis of the composition of income concentration at the top, Atkinson and Piketty (2007; 2010) are good references. The authors provide detailed statistics for the evolution of the concentration of income at the top in other countries, highlighting capital income and corroborating the tendencies for higher concentration of this type of income at the top in general.

7. As Piketty and Saez stated (2007, 9): "economists have substantial disagreements on the size of behavioural responses to taxation, and so considering the basic case with no behavioural response is a useful starting point".

8. Please refer to the methodological section for a full description.

9. For example, Castro's (2014) last stratum contains 738,000 individuals with an annual income of over BRL149,000, while Gobetti and Orair (2015) use a stratum with 71,000 individuals with an income above BRL1.3 million. This extra refinement allows individuals with very uneven income levels and compositions, such as civil servants with high income, to be sorted from top-level executives and entrepreneurs whose capital income is more prevalent.

10. There is a broad debate around the Gini index and the Lorenz curve, whose discussions and formulas are detailed in Dorfman (1979). Theil (1976) is also considered a pioneer in the discussion. In Brazil, its application and theoretical discussion about interpolation was introduced by Hoffman (1979; 1980).

11. For a discussion about possible indicators for population and total income, and implications for alternative uses, see Medeiros, Souza, and Castro (2015a) and Atkinson, Piketty, and Saez (2011).

12. For a detailed analysis of the preparation of DIRPF data, see Fernandes (2016).

13. In 2008, the minimum monthly wage was BRL415.

14. State expenditures on monetary transfers, retirement pensions and other types of assistance are already computed in the initial income; therefore, adding spending on health and education comprises more than 90 per cent of the government's social expenditure (Silveira 2012).

15. For details about the estimations of indirect taxation and non-monetary public provisions, see Silveira (2012).

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