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WORKING PAPER

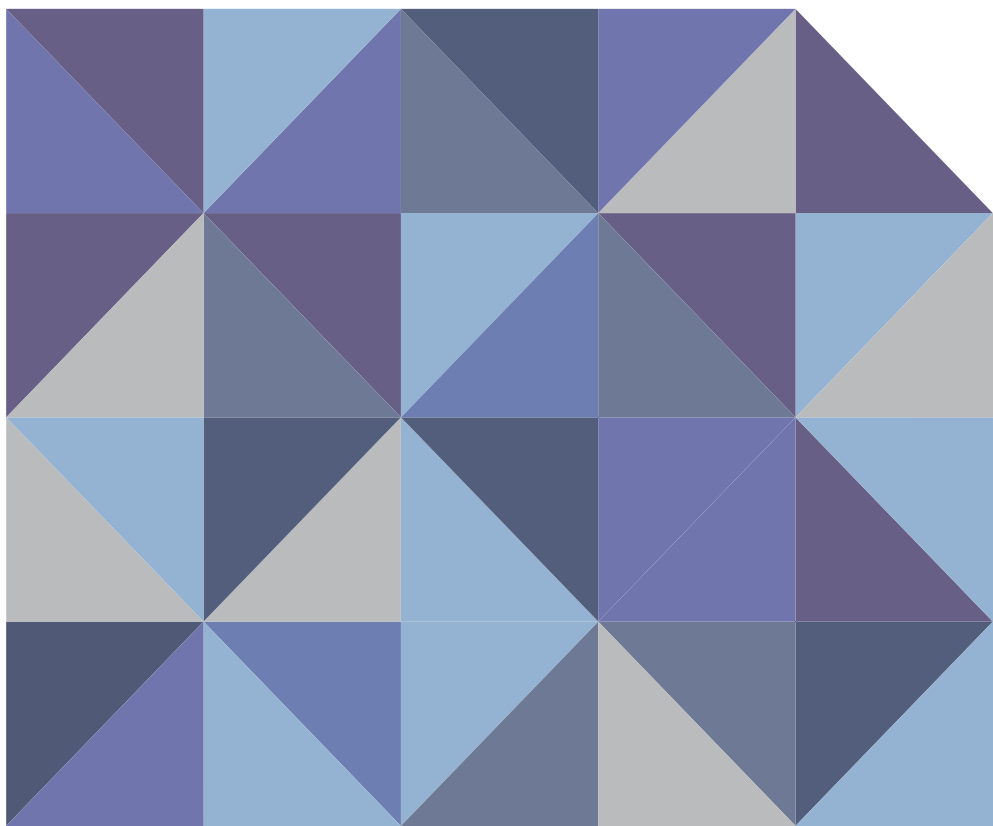
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INCOME INEQUALITY, GROWTH AND ELITE TAXATION IN BRAZIL: NEW EVIDENCE COMBINING SURVEY AND FISCAL DATA, 2001–2015

Marc Morgan¹

This paper analyses the pre-tax inequality in the income that individuals actually receive in Brazil and the role of the personal income tax in regulating these incomes. We produce a new distributional series of fiscal income, consistently combining annual and nationally representative household survey data with detailed information on income tax declarations recently released by the Brazilian Federal Tax Office. Our results provide a sharp upward revision of the official estimates of inequality in Brazil but maintain the decreasing inequality trends, even though they are less pronounced than previously measured. The exceptionally large concentration of income at the top is noteworthy, as is its relative stability over time. The income share of the wealthiest 10 per cent of the population fell from 54.6 per cent to 53.0 per cent of pre-tax fiscal income between 2001 and 2015, while the share of the poorest 50 per cent of the population rose from 10.6 per cent to 12.6 per cent. Brazil's squeezed middle 40 per cent of the distribution experienced a slight drop in its share, from 34.8 per cent to 34.4 per cent. Despite strong average income growth, the poorest 50 per cent only made moderate gains, which came at the expense of smaller shares for the middle and the top. Over the short to medium term, it is the level of average income of the bottom that matters more than its growth. We show that the role of the personal income tax in regulating incomes in Brazil is very limited, because the majority of the income of elites in Brazil is not subject to the tax. This explains the lower effective tax liability that is observed for upper income groups and illustrates that the personal income tax is not a progressive policy tool in Brazil, violating the principles of horizontal equity and vertical equity. This motivates the creation of a simplified and comprehensive personal income tax that would incorporate all income categories along a single or dual tax regime.

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1 INTRODUCTION

From a region historically characterised by high and persistent levels of income inequality—since at least the late 19th century (Williamson 2015)—Brazil is no stranger to being under the spotlight in the domain of income distribution. In any official report on income distribution by an international organisation, Brazil usually features near the summit of the inequality rankings, as measured by household survey data, alongside regional counterparts such as Chile or Colombia. With a gross market income Gini coefficient above 0.60, Brazil presents a case of extreme market income inequality across the entire distribution, or at least that which national surveys can measure. While most studies on income inequality in developing countries use either survey-based or tax-based measures of inequality (when available), this paper presents new inequality estimates for Brazil by consistently combining annual and nationally representative household survey data from the national statistics office with detailed tabulations on income tax declarations recently released by the Receita Federal do Brasil (RFB), the Federal Tax Office. Our focus is on the fiscal distribution of income—that is, on the gross inequality of incomes that individuals receive before paying income taxes. We also examine the role of the personal income tax in regulating this income distribution, by estimating effective tax rates for the portion of the population that are subject to the tax.

This is in contrast to most studies, which concentrate on disposable income inequality using the corresponding Gini coefficient or income shares computed from household survey data. While this focus is necessary to fully assess the role of the State in the redistribution of income in Brazil, its sole use detracts from the ‘original’ distribution of income, which is always the precursor to the disposable distribution of income. Thus, by focusing attention on the fiscal distribution of income, this paper provides a different angle from which to analyse income inequality in Brazil. It also motivates the reconsideration of the government’s role in distributional affairs through the application of personal income taxes, which can impact the pre-tax distribution of market income by limiting rent-seeking (Piketty, Saez, and Stancheva 2014). The argument rests on the impact that personal income taxes have on the pre-tax remuneration incentives of different income groups. Above certain (country-specific) thresholds, higher marginal income taxes for high earners will reduce their bargaining capacity for increased pay, since approval by fellow company stakeholders would be less forthcoming. The authors refer to this mechanism as the ‘compensation-bargaining elasticity’.

Why focus on elite taxation? There are several reasons. The obvious one is that only about 20 per cent of the population declare their personal income to the tax office. Since most of them are the highest income recipients in the country, the income tax covers declarations of elite income in Brazil. Beyond the boundaries of the tax, Brazil displays the regional characteristic of high inequality in the disproportionate concentration of income among individuals at the top of the distribution—individuals at least within the top 10 per cent of the distribution—rather than in income differences between lower segments of the distribution (Székely and Hilgert 1999; Palma 2011). The top is thus instrumental.

Moreover, analysing income shares helps to stratify the income-generating population into income classes, so that a top may be visible, as opposed to being confounded in a one-dimensional indicator such as the Gini. Indicators such as the Gini are synthetic in that they summarise with a single number the between-group dispersion of income across the whole population. Under such abstractness, it is difficult to understand how such an indicator has been constructed and what it really means. All we know is that when it is closer to 0 the distribution it describes is more equal, while when it is closer to 1 the distribution is more unequal. Yet when presented with a number such as 0.44 or 0.65, its economic significance it is not easy to grasp.

Distribution tables depicting income shares, on the other hand, are a lot easier to understand, as their construction is straightforward—the total income of a given fractile in the distribution divided by the total income received by the adult population—and their interpretation is transparent—an income share of 50 per cent for the top 10 per cent of the distribution gives us a clear sense of how the pie is divided. A group that receives half of all distributed income when it only represents one tenth of the population is a more concrete and visible claim on distribution in society than saying that the Gini is 0.60, as the latter is without reference to any particular social group in the hierarchy. Therefore, with an index such as the Gini we are unable to observe the inequality between the top and the bottom of the hierarchy, between the middle and the bottom, between the middle and the top or within the top. More important, presenting income levels in cash terms (instead of percentages) makes it possible for people to appreciate their position in the social hierarchy, which is a useful exercise that has implications for policy demands. Finally, putting the spotlight on the top is revealing, as elites are interesting *per se*. By concentrating income (or wealth), they affect the economic possibilities of others in a given society, giving them structural power (Fairfield 2015).² And this power may translate into undemocratic control of the policymaking process, making them politically very relevant.

A number of reasons may also motivate why we combine fiscal data and survey data for the purposes of this study. The most obvious one is the sole reliance on self-reported household surveys to assess income distribution, which only report part of the story, as they do not accurately measure top incomes. Brazil is no exception to this trend. While the true income distribution (defined by a probability density function) is unobserved, household surveys can approximate a personal income distribution by expanding the frequencies of a representative sample of the population. The problem with surveys is that they tend not to include full or any information on the very rich people in the country being studied. Despite random sampling, their income is either not well measured or not observed, due to the reluctance of the richest individuals to disclose all of their income sources, particularly their assets. Additionally, rich people may refuse to engage in the time-consuming task of answering a comprehensive household survey, assuming that interviewers manage to enter the gated communities in which they live. Moreover, statisticians may intentionally remove extreme observations, so as to top-code the distribution. After all, a survey's primary concern is representativeness, not completeness (Groves and Couper 1998; Groves 2006). Surveys are thus prone to misrepresent top incomes.

Income tax data capture richer individuals better, as filing a declaration is obligatory above specified income thresholds. Furthermore, tax data usually provide information on the tax liability of filers, which gives us some idea of how much redistribution is taking place. Although not everybody declares income to the fiscal authorities, and some people can be tempted to under-declare their income to pay less tax, we can be quite confident in thinking that the people appearing in tax data actually exist, as they are well identified by fiscal procedures, and earn at least what they declare. Finally, the use of fiscal data allows us to use the concept of fiscal income for the purposes of estimating inequality. Fiscal income, as defined by the Federal Tax Office, is the concept to which we seek to approximate the incomes in the household surveys.

This research is thus among the first to use personal income tax records to study distributive issues, but it is not the only one. Medeiros et al. (2015) have also contributed to fill the gap for Brazil. They use (less-detailed) income tax data to evaluate concentration at the top for the years 2006–2012 and compare them to household survey results. But they do not seek to reconcile the two sources. Gobetti and Orair (2016) also use the same Brazilian tax data to analyse the link between taxation and income distribution. The present paper

shares some similarity with this latter research, but seeks to crystalise some further aspects about income concentration and the taxation of elites in Brazil.

Concretely, this paper jointly explores personal income tax records and household surveys in Brazil between 2001 and 2015 to answer three questions. First, what does concentration of pre-tax fiscal income in Brazil look like, and how does it compare to other countries? Second, how was income growth distributed between different income groups over the period? And third, how progressive is the personal income tax in Brazil, and how can it be improved? Our findings confirm the extreme inequality of income in Brazil, with the top decile concentrating over half of all pre-tax fiscal income distributed to individuals—nearly five times the share of the poorest half of the population, a group five times larger. We also show the lack of progressivity in the personal income tax, as average effective tax rates begin to fall for individuals within the richest 0.5 per cent of adults. Rather than being subject to generous deductions, this phenomenon occurs because the majority of the income of elites in Brazil is not subject to the personal income tax. However, the faults of the design of the tax point towards its immediate improvement, both in terms of income regulation and revenue generation.

The remainder of the article is structured as follows. Section 2 presents the data, concepts and the methodology employed to calculate income shares for Brazil. Section 3 presents the principal results of the paper on income concentration, growth and taxation, and discusses some policy implications regarding income taxation. Finally, Section 4 concludes with a summary and links to further research.

2 DATA SOURCES, CONCEPTS AND METHODS

2.1 SURVEY DATA

This paper exploits three sources of data to arrive at the estimates of income shares across the entire distribution in Brazil. We begin with the *Pesquisa Nacional por Amostra de Domicílios* (PNAD), the large, nationally representative household survey organised by Brazil's National Statistical Bureau (*Instituto Brasileiro de Geografia e Estatística*—IBGE). The survey has been undertaken each year since 1976, except in the years coinciding with the national census (which is once per decade). It consists of a household wave and an individual wave, the latter's sample being approximately 350,000 people per year. We use the individual-level micro-files for the PNAD between 2001 and 2015 to extract personal incomes (which are freely available on the IBGE's website).³

These are nationally representative with the exception of the waves before 2004, which exclude the rural areas of six northern states (Acre, Amapá, Amazonas, Pará, Rondônia and Roraima). Thus for these years we adjust the incomes and population in accordance with the ratio of incomes and population estimated when including the rural north and excluding the rural north for 2004. The survey reports individuals' monthly incomes (in a reference month) according to the source of the income. Separate questions are asked about the value of income from work, pensions and property rent received by individuals. However, interests received on current accounts, financial investments, dividend income and income from social programmes (including social assistance and unemployment transfers) are all included

in the same question. To separate these components we follow guidelines from the Ministry of Social Development and the Ministry of Labour (see Higgins and Pereira 2013), such that values less than or equal to one monthly minimum wage are social assistance transfers (e.g. conditional cash transfers and welfare pensions), values greater than one minimum wage but less than or equal to two minimum wages are unemployment benefits, and all values above two monthly minimum wages are related to financial incomes. To get yearly incomes, we multiply monthly values by 12 and add a 13th monthly salary (an annual bonus defined in Brazilian law). Incomes reported are gross of tax except for interests from financial investments, which are subject to a withholding tax. See Appendix A for a description of the separate estimation of labour and capital income in the PNAD.

2.2 FISCAL DATA

We then exploit fiscal data, which are the personal income tax declarations (DIRPF). Income micro-data for the universe of tax filers are unavailable; thus we rely on detailed tabulations of the total number of declarants by ranges of total assessed income. The data come from *Grandes Números DIRPF Ano Calendário 2007–2015*, a series of yearly tax reports from the Receita Federal do Brasil (RFB), Brazil's Federal Tax Office, released for the first time in 2015. There are 11 ranges of income in the reported tabulations over our period of interest, except for the 2014 and 2015 tabulations, which contain 17 ranges. This contrasts with the official number of brackets associated with the marginal income tax (varying between two and four over the period). The assessed amounts are in Brazilian Reals (BRL). The ranges of assessed income are expressed in units of the minimum wage (from up to half a minimum wage to more than 160 times the minimum wage for 2007–2013, and more than 320 times the minimum wage for 2014 and 2015). These values are converted into total BRL by multiplying each unit by the statutory annual minimum wage (the monthly minimum wage multiplied by 12).

The nice feature of these tabulations is that they report three legal categories of personal income per bracket: 'taxable income', 'exclusively taxed income' and 'non-taxable income', such that the total personal income of declarants is assessed, and not just that which is strictly taxed.⁴ Taxable income is the income that will be subject to the progressive income tax schedule after the application of deductions. It comprises wages of salaried and self-employed workers, pensions and property rent. Income taxed exclusively includes categories of income already taxed (at source) according to a separate schedule.⁵ Hence they are reported post-tax in the tabulations. These mainly concern capital income (other than rents), such as capital gains and interests from financial investments, but also labour incomes such as the 13th salary (i.e. Christmas bonus) and worker participation in company profits. Between 2007 and 2015, these incomes accounted for about 10 per cent of total assessed income. Details of the items comprising this category are reported in Table 19 of the annual tax reports.

Non-taxable income refers to income exempt from the personal income tax. It includes a host of labour income and social benefits, such as compensation for laid-off workers, the exempt portion of pension income for people aged over 65, the exempt portion of agricultural income and scholarships, among other items, and capital incomes such as distributed profits and dividends of all incorporated businesses and small unincorporated businesses, interests from savings accounts/mortgage notes etc. Additionally, this category includes wealth transfers (donations and inheritances) and capital increases from the

incorporation of company reserves and the disbursement of shares as bonuses, which are interpreted by the Federal Tax Office as lump-sum income payments, such as lottery winnings, and used to track variations in personal wealth.⁶ In total these exempt incomes represent almost 30 per cent of total assessed income. The individual components of this category are reported in Table 20 of the annual tax reports. (See Appendix B for a more detailed description of how we estimate total labour income and total capital income from the tabulations.) All in all, we include between 25 and 28 million declarations over the period, which provide us with information on approximately 20 per cent of the adult population.

Since some important components of capital income are exempt from the personal income tax, such as dividends, this reduces the incentives to under-declare dividend income. When comparing the dividends declared in the tax statistics with those in national accounts we find that the difference is around 3 per cent on average. Moreover, capital income in the form of capital gains and interests from financial investments are withheld at source and taxed exclusively either at flat rates or at rates depending on the nature and maturity of the investments. This is facilitated by specific monitoring programmes used by the Federal Tax Office, which match declared personal incomes from tax records (all individuals are required to provide their bank account details on the declarations) with financial information provided by banks, through the *Declaração de Informações sobre Movimentação Financeira* (DIMOF).⁷ However, a certain amount of measurement error in the declaration of income should be expected, as well as the possibility of other income sources (typically property rent or self-employment income) being under-declared.⁸

2.3 INCOME CONCEPTS

The income concept we capture from the survey covers pre-tax labour income, mixed income and capital income. More precisely, this includes salaries and pensions, self-employment income, net interests, rents, distributed business profits and dividends, and capital gains made from the sale of assets. It thus corresponds to pre-tax post-replacement fiscal income—i.e. income received by individuals before personal income taxes, employee payroll taxes (including social security contributions) and legal deductions, but after accounting for social security benefits in cash (unemployment insurance and social security pensions). All these items are included to make our income in the survey consistent with the definition of income in the personal income tax declarations.⁹ It also excludes business expenses of independent workers required to keep accountancy books (e.g. doctors, dentists, psychologists, lawyers, independent commercial agents etc.), as these expenses are incurred by these workers to generate their income. Not deducting them would mean that we would be dealing with their gross revenue, rather than their gross income, which is the concept we wish to work with. These expenses can be identified in the deduction *livro caixa* in the personal income tax tabulations, which we use to subtract from total assessed income per bracket, assuming no changes in the rank of individuals. Such expenses are not identifiable in the household survey, but we expect them to more generally affect higher incomes, which the fiscal data capture better.

In the end we wish to use incomes from the survey and the tax records to approximate the distribution of fiscal income received by the household sector (S14) in Brazil's System of National Accounts (SNA) to the best of our ability. Fiscal income, as appearing in the tax records, can be calculated from the SNA. Using the latest SNA (UN 2008), we compute total pre-tax fiscal income as follows:

Total pre-tax fiscal income

- = Salaries (D11, S14)
- + Gross operating surplus, (B2, S14)-Consumption of fixed capital (P51c1, S14)
- + Gross mixed income (B3, S14)-Consumption of fixed capital (P51c1, S14)
- + Property income received by households (D4 resources, S14)
- Property income paid by households (D4 uses, S14)
- [= *Net primary income of the household sector (B5n, S14)*]
- + Social security benefits in cash (D621 + D622, S14)
- Imputed rent for owner-occupiers
- Investment income attributable to insurance policyholders (D441, S14)
- Investment income payable to pension entitlements (D442, S14)

These variables are taken from the IBGE for the years 2001 to 2014. For 2015 we use Quarterly National Accounts data and apply the 2014 ratio between fiscal income and national income to the 2015 national income and proceed similarly with the ratios of all the other variables. All variables are sourced from the *Contas Econômicas Integradas*, except for imputed rents, which is from *Tabelas de Recursos e Usos*, from the IBGE's SNA (reference 2010).¹⁰ Brazilian national accounts do not present information for fixed capital consumption of households. As a result, we apply the yearly depreciation rate on personal capital observed in Mexico over the same period (4 per cent of national income on average) and allocate it proportionally to gross operating surplus and gross mixed income.

The comparison of the raw income totals from the PNAD and DIRPF with the SNA confirms that the surveys underestimate capital incomes, while they do a better job at capturing labour incomes (salaries, pensions and unemployment insurance). Despite its restricted population, the fiscal data are better equipped to capture the quasi-totality of capital incomes, but they capture labour incomes less well than the surveys (see Table A.1 in the Appendix). This reflects the concentration of capital income with respect to labour income, where more than 40 per cent of all labour incomes registered in national accounts flows to non-filers—i.e. the bottom 80 per cent approximately. It must be stated that some measurement error is expected when computing the income totals across the three data sources. This is particularly true of the division of income in DIRPF, since it is estimated using the limited breakdown of the available categories of income in the tabulations of the tax reports (see Appendix B for more details of this calculation). Only greater transparency from the Federal Tax Office will improve the accuracy of these estimates.

2.4 COMBINING SURVEY AND FISCAL INCOME

To construct our fiscal income distribution series, we combine surveys, fiscal data and national accounts. We begin by combining surveys and fiscal data. Broadly, we proceed in two steps: we start from survey data on household incomes (step 1), which we correct using income tax data and generalised Pareto interpolation techniques (step 2). We scale the estimates so that the total is the same as total fiscal income measured from national accounts.

STEP 1

We define the unit of observation as the equal-split adult individual aged 20 and over, equally dividing the income of married couples. The advantage of this control total is that it facilitates international comparisons, as it is the adult threshold taken by the United Nations (see Alvaredo et al. 2017). The equal-splitting of couple income also has the benefit of not ‘overestimating’ inequality by not underestimating the resources available to non-working spouses, especially in societies with relatively low female participation in the labour market.¹¹ Using the survey micro-files from between 2001 and 2015, we estimate 127 percentiles in the distribution of annual income,¹² making the necessary adjustments to the original sample to match the concept of income defined previously (i.e. pre-tax post-replacement income among adults, where the income of couples is equally divided between the members).

STEP 2

Assuming that incomes from the fiscal data are more reliable for the top of the distribution, we correct the portion of the survey distribution whose percentile incomes are inferior to those in the same percentiles of the fiscal distribution above defined yearly thresholds (or ‘merging points’).

Step 2.1

To do so, we first estimate the distribution of equal-split adult income from the fiscal tabulations using ‘generalised Pareto’ interpolation techniques developed by Blanchet, Fournier, and Piketty (2017). These interpolation techniques, contrary to the standard Pareto interpolation, allow us to recover an income distribution without the need for parametric approximations. They estimate the full ‘generalised Pareto curve’ $b(p)$ (with p being the full cumulative distribution function $F(y)$) by using a given number of thresholds p_i . As such, the Pareto distribution is given a flexible form, which overcomes the constancy condition of standard power laws and produces more accurate and smoother estimates of the distribution.¹³

Prior to calculating these percentiles, we make three adjustments to the original tax tabulations. First, we assign the ‘missing declarations’ (if all adults were required to declare their income) and the ‘missing income’ (if total fiscal income from the national accounts were taken into account) to the lowest three brackets of the tabulations, which we group into one bracket. Thus, we are able to compute the distribution of fiscal income across the entire adult population and not just the 20 per cent of the population that file a declaration. Since the total reported income in the DIRPF represents about 70 per cent of fiscal income in the SNA, we assume that the missing 30 per cent of fiscal income is attributable to the missing 80 per cent of the adult population. We thus assume that those who do not appear in the declaration did not meet any of the criteria required to file an income tax return.

Second, in Brazil the tax unit is the adult individual or married couple (in cases when spouses opt to declare jointly).¹⁴ To calculate an equal-split adult series, we need to know the share of single filers per bracket. We deduce this share by using the total value of the deduction for dependents per bracket in the tabulations and its fixed value per dependent defined in the tax law to calculate the total number of dependents per bracket. This number includes spouses, children and other relatives. To calculate the number of spouses appearing on a joint declaration, we use the share of spouses in total dependents per bracket of household head income from the surveys for the same income brackets. This share varies from

about 25 per cent for the lowest bracket to 40 per cent for the highest brackets. Given the condition that persons filed as dependents (with or without income) on a declaration cannot file a separate tax return, the resulting estimation gives us the share of single declarations per bracket, such that we can calculate the equal-split adult income series. The share of single declarations falls with income, from 99 per cent for the bottom (indicating little joint filing for lower income), until it reaches about 62–66 per cent for mid-range incomes, after which it rises slightly for the highest income brackets to 66–72 per cent. Overall, joint declarations make up about 30 per cent of all the declarations.¹⁵

A third adjustment must be made, given that exclusively taxed incomes in the tabulations are reported after tax. To derive the pre-tax values of this income, we first sum the labour income components and capital income components of this category separately, using the decomposition of the total in the tax reports (see Appendix B for details). We then create two tabulations of labour and capital income per bracket out of these totals. We distribute the labour component in accordance with the per bracket distribution of taxable income (which mostly comprises labour income). We then subtract these values from total withheld incomes per bracket to deduce the capital income tabulation. We then impute an average tax rate per bracket on the labour component by taking the tax paid on taxable income per bracket (presented in the tabulation), and a per bracket average tax rate on the capital component (assumed to be 15 per cent).¹⁶ We derive the pre-tax values of the labour portion of withheld incomes and the capital portion using these imputed tax rates. We sum the resulting tabulations together to arrive at the total amount of pre-tax withheld incomes per bracket.

Step 2.2

Upon retrieving the full distribution from the adjusted fiscal data, we compare the incomes with those estimated from the survey micro-files. Between 2007 and 2015, the ratios between fiscal and survey incomes increase substantially the further up the distribution we look. Figures A.1 and A.2 in the Appendix present the ratios when we look at upper incomes $y(p)$ (i.e. the average income $y(p)$ above percentile (p)) over the portion of the distribution where we observe tax declarations (from the 80th percentile (P80) onwards). It can be seen that the discrepancy between average incomes in the tax data and in surveys becomes significant beyond percentile P90 (Figure A.1), when the ratios steadily rise above 1 until they reach double digits for the very highest percentiles (Figure A.2).¹⁷

Our preferred correction is the following. Survey incomes are maintained up to the point where the ratios of $y(p)$ in the two distributions are equal to 1 for each year, while fiscal incomes are superimposed above this point. Specifically, we apply the percentile re-scaling factors (i.e. the ratio between fiscal and survey average incomes observed in Figures A.1 and A.2) to the average incomes estimated from the survey micro-files for 2007–2015 when the overlap exits. For 2001–2006 we apply the re-scaling factors from the closest available year (i.e. 2007), in the absence of further information. The choice of the closest year as a reference for the extrapolation at least ensures that we maintain a degree of consistency with the macro data for the years before 2007. Figure A.3 in the Appendix illustrates this. The evolution of average real incomes in our combined survey and tax series closely follows the evolution of the equivalent income concept that can be calculated from national accounts. In the end, we adjust the incomes of our combined series to the national accounts total for fiscal income, to be fully consistent with the macroeconomic evolution.

This combination method is simple and transparent. Moreover, it produces statistical outcomes that appear consistent from an economic perspective. However, it is not without its limitations. One example is the assumption of the same treatment population in the two data sources, given the condition that the underlying total population remains the same. The top 1 per cent in the fiscal data may not be the same sample of individuals as the top 1 per cent in the survey data, such that the incomes of the latter are not strictly re-scalable to those of the former. This may be tested by comparing demographic or occupational variables of individuals located in the same part of the distribution. Flores and Morgan (2017) explore an alternative survey-adjustment method that re-weights the survey's percentile income frequencies, based on the frequencies in the tax distribution for the same percentile income thresholds. In that paper, we compare the distributional outcomes with the re-scaling method as used in this paper. The results for Brazil are very similar, both in levels and in trends, suggesting that the re-scaling method preforms well in specifying the full distribution of income.¹⁸

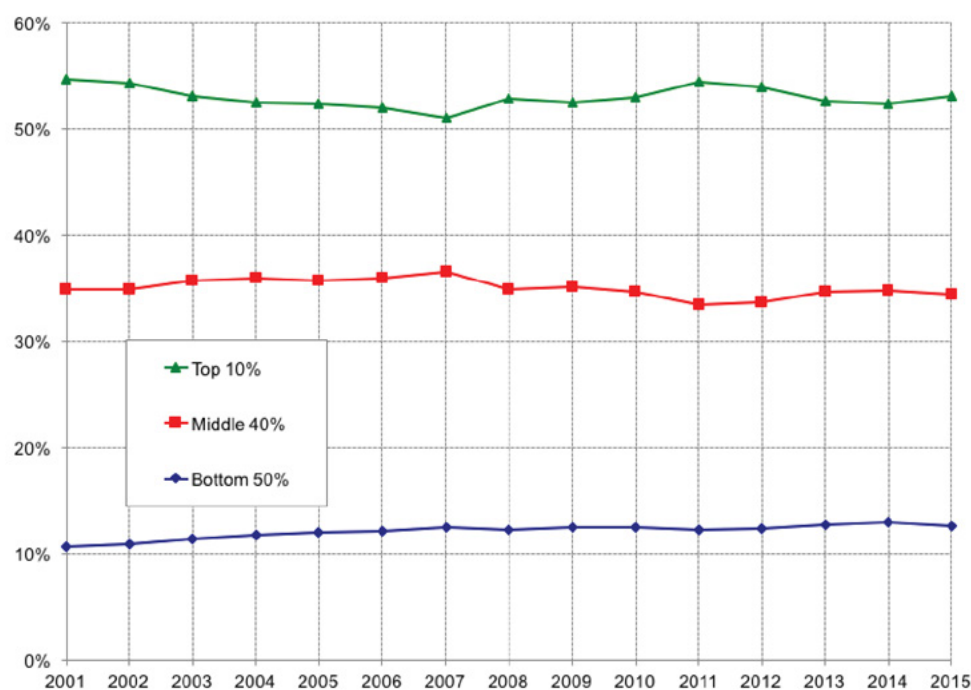
3 INCOME DISTRIBUTION IN BRAZIL: INEQUALITY, GROWTH AND TAXATION

Our analysis provides answers to three broad questions: First, to what extent is income concentrated in Brazil, and how does it compare to other countries? Second, how has growth been distributed over the period among different income groups? Third, how progressive is the personal income tax in Brazil? The answer to this last question reveals policy options available that go in the direction of greater progressivity. The following sections reveal our findings.

3.1 INEQUALITY OF FISCAL INCOME IN BRAZIL

Figure 1 presents our corrected estimates for the full distribution of pre-tax fiscal income in Brazil, separating the adult population into the top 10 per cent, middle 40 per cent and bottom 50 per cent between 2001 and 2015. The first finding to notice is the extent of income concentration in Brazil. The richest 10 per cent of the population receive over half of all the income distributed in society, while the bottom half of the population, a group five times larger, receives between four and five times less. The middle 40 per cent in the distribution receive about one third of total income, less than their proportional share. This reveals that inequality in Brazil is sourced from the large polarisation between the top and the bottom of the income hierarchy. Second, the trends over the 15-year period point towards the relative stability of the distribution, if not a slight compression. The income share of the poorest 50 per cent increased from 11 per cent to almost 13 per cent over the 15 years, while the share of the richest 10 per cent decreased from about 55 per cent to 53 per cent. Table 1 presents the magnitudes for 2015. To be one of the 14 million individuals in the top 10 per cent you need to receive an income of BRL42,700 (about USD23,000 purchasing power parity—PPP), while the average income of this group is about BRL139,000 (USD75,000). Incomes increase exponentially as you move up the distribution, with the average income of the richest 1 per cent being BRL618,000 (about USD334,000). This is greater than the corresponding amount of the richest 1 per cent in France (around USD220,000).¹⁹ It is also noteworthy that the average fiscal income of the bottom 90 per cent in Brazil is comparable to that of the bottom 50 per cent in France, which only conveys the extent of income inequality in Brazil and the lack of a broad 'middle class'.

FIGURE 1
Income inequality in Brazil, 2001-2015: corrected estimates



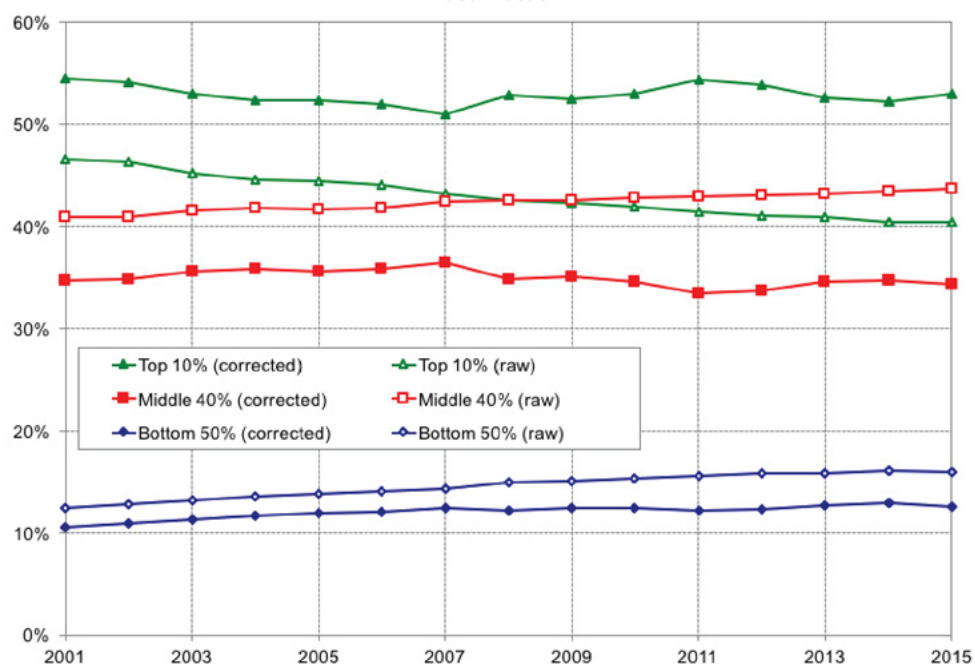
Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance) among adults. Corrected estimates (combining survey and fiscal data). Equal-split-adults series (income of married couples divided by two).

TABLE 1
Fiscal income thresholds and income shares in Brazil, 2015

Income group (distribution of average pre-tax fiscal income)	Number of adults	Income threshold	Average income	Income share
Full population	142,540,336	BRL0	BRL26,242	100.0%
Bottom 50%	71,270,168	BRL0	BRL6,602	12.6%
Middle 40%	57,016,134	BRL13,023	BRL22,568	34.4%
Top 10%	14,254,034	BRL42,725	BRL139,142	53.0%
Incl. top 1%	1,425,403	BRL213,546	BRL617,991	23.5%
Incl. top 0.1%	142,540	BRL793,319	BRL2,855,925	10.9%
Incl. top 0.01%	14,254	BRL3,466,548	BRL14,062,838	5.4%
Incl. top 0.001%	1,425	BRL30,819,034	BRL64,557,213	2.5%

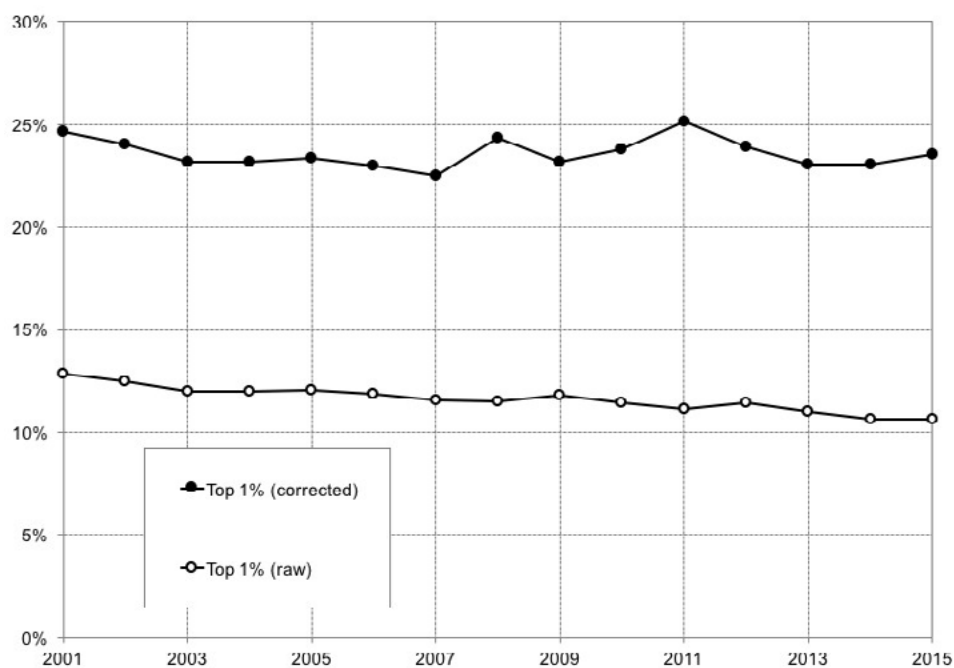
Note: This table reports statistics on the distribution of fiscal income in Brazil in 2015. The unit is the adult individual (20 years old and older; income of married couples is divided by two). In 2015, USD1 = BRL3.3 (market exchange rate) or BRL1.85 PPP. Income corresponds to pre-tax fiscal income. Fractiles are defined relative to the total number of adult individuals in the population. Corrected estimates combine national accounts, surveys and fiscal data.

FIGURE 2

Income inequality in Brazil, 2001-2015: corrected vs raw estimates

Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance) among adults. Corrected estimates (combining survey and fiscal data). Raw estimates rely only on self-reported survey data. Equal-split-adults series (income of married couples divided by two).

FIGURE 3

Top 1 per cent income share in Brazil: corrected vs raw estimates

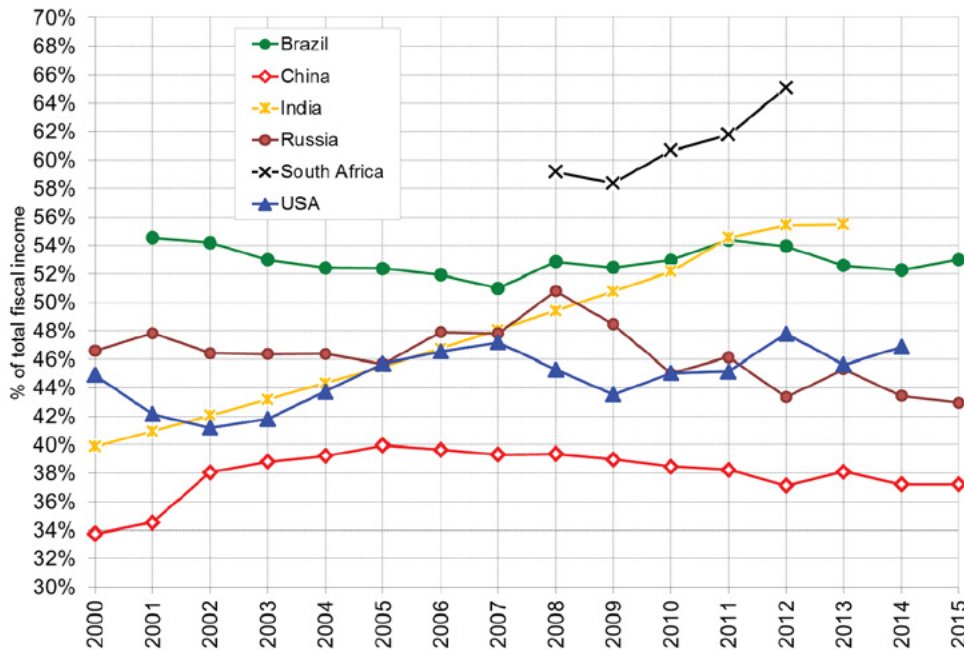
Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance) among adults. Corrected estimates (combining survey and fiscal data). Raw estimates rely only on self-reported survey data. Equal-split-adults series (income of married couples divided by two).

Figure 2 compares our corrected estimates (combining survey and fiscal data) with the raw estimates from the survey data for the same income groups as in Figure 1. The findings show the upward corrections made to income inequality in Brazil, due to the survey severely underestimating the incomes of the top 10 per cent (by between 8 and 13 percentage points) and overestimating the incomes of lower groups. According to the survey, the middle 40 per cent share exceeds the top 10 per cent share by 4 percentage points by the end of the period. However, our corrected series shows the latter share to exceed the former share by almost 20 points. Figure 3 shows a similar underestimation for the top 1 per cent. The revisions not only convey that surveys underestimate levels, but that they also overestimate the decline in inequality over the period. When using both sources of data to analyse the dynamics of inequality in Brazil, fiscal income inequality has not fallen as much as previously thought.

3.1.1 International perspectives

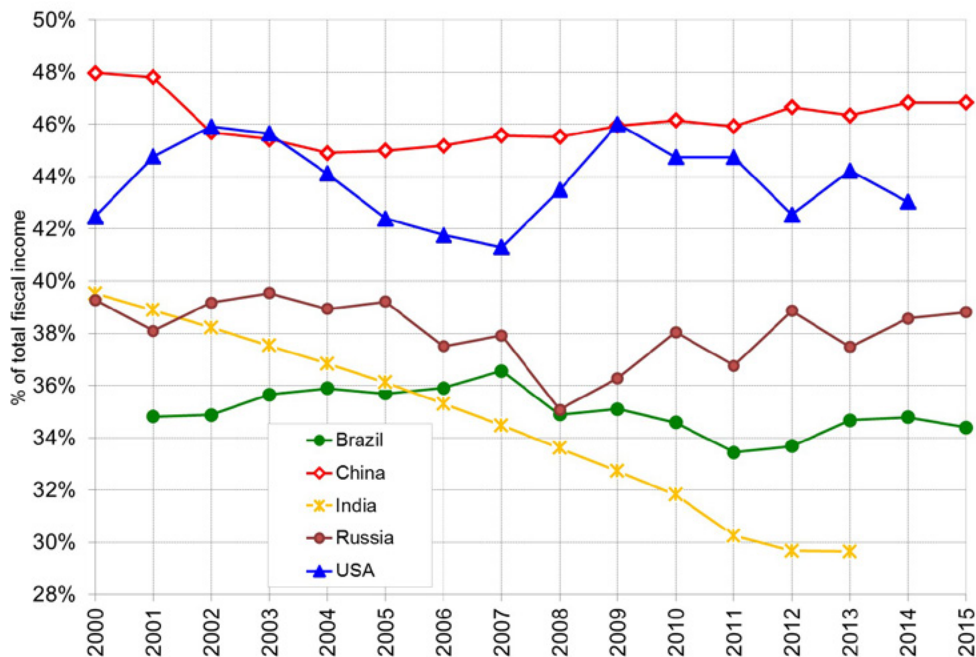
The income disparities in Brazil revealed in the previous section can be emphasised further if they are viewed from an international comparative perspective, as they are among some of the most unequal countries currently with comparable estimates for income shares covering the entire distribution. Figures 4–6 present the shares of fiscal income going to the top 10 per cent (Figure 4), the middle 40 per cent (Figure 5) and the bottom 50 per cent (Figure 6) in Brazil, China, India, Russia, the USA and South Africa (only for the top 10 per cent) over the last 15 years. The inequality between the top and the rest in Brazil is stark when compared to other countries. The top 10 per cent in Brazil consistently surpasses the share captured by the same group in China, Russia and the USA, even as the latter is moving closer to Brazilian inequality levels. The Brazilian level of concentration among the top decile appears to be clearly surpassed only by South Africa, and by India in the last few years. The situation for the middle 40 per cent is the inverse, as the Brazilian share has hovered around 35 per cent, falling between the shares of Russia and India since 2006, while the shares for the middle in China and the USA surpass their proportional mark of 40 per cent. Comparing the bottom 50 per cent, the Brazilian share has made noticeable comparative gains. Only in Russia has the bottom been subject to stronger growth. Interestingly, the evolution of the poorest half of Brazilian adults has been the opposite of that observed in the USA since the early 2000s. In sum, the Brazilian distribution over the last 15 years is among the most unequal and resilient in the world.

FIGURE 4
Top 10 per cent income share Brazil vs selected countries



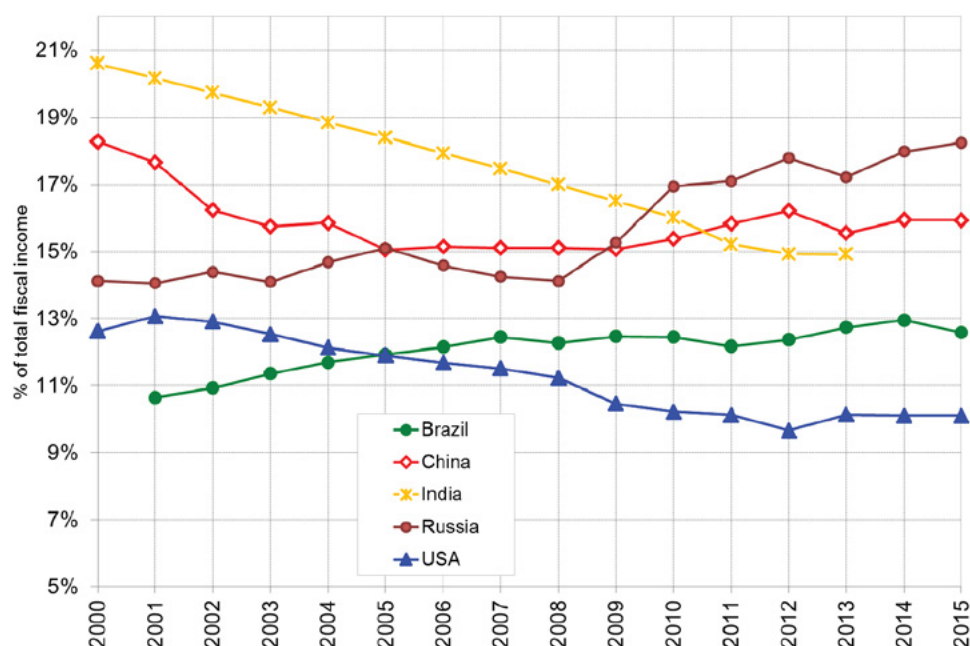
Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance) among adults. Corrected estimates (combining survey and fiscal data). Equal-split-adults series (income of married couples divided by two), except for South Africa, where only individual adult income is considered. Estimates for China, India, Russia, South Africa and the USA are from <http://wid.world/>.

FIGURE 5
Middle 40 per cent income share: Brazil vs selected countries



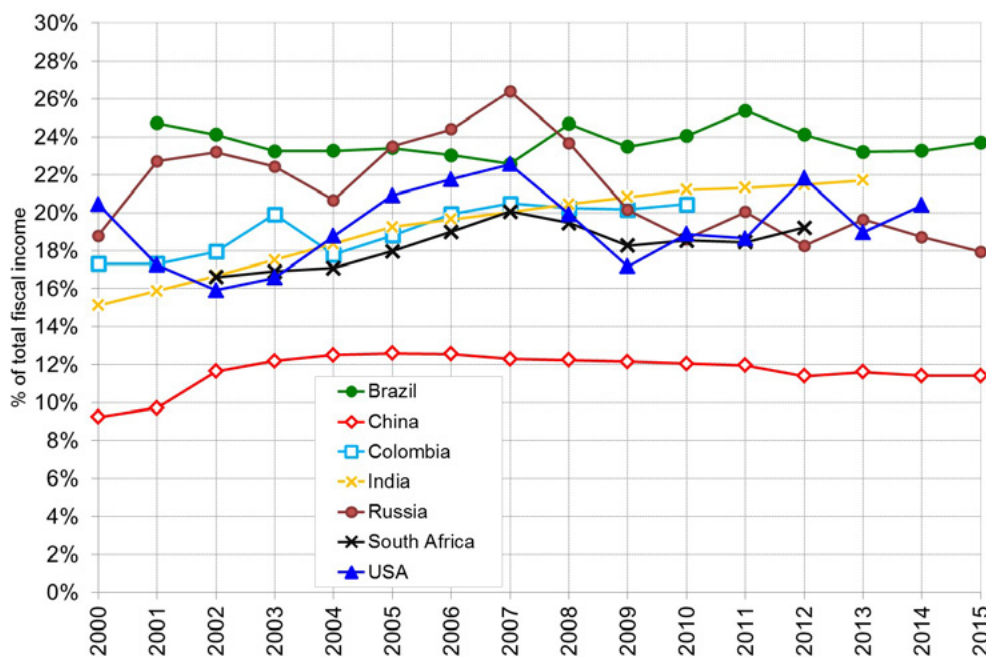
Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance) among adults. Corrected estimates (combining survey and fiscal data). Equal-split-adults series (income of married couples divided by two). Estimates for China, India, Russia and the USA are from <http://wid.world/>.

FIGURE 6
Bottom 50 per cent income share: Brazil vs selected countries



Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance) among adults. Corrected estimates (combining survey and fiscal data). Equal-split-adults series (income of married couples divided by two). Estimates for China, India, Russia and the USA are from <<http://wid.world/>>.

FIGURE 7
Top 1 per cent in Brazil vs selected countries



Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance) among adults. For Colombia and South Africa the unit of observation is the adult individual, while for Brazil, China and the USA it is equal-split adults (income of married couples divided by two). Corrected estimates (combining survey and fiscal data). Estimates for Colombia, South Africa, the USA and China are from <<http://wid.world/>>.

Figure 7 presents the income share of the top 1 per cent in Brazil compared with the shares in the same countries considered above, with the addition of Colombia. Brazil seems to demonstrate record levels of concentration at the summit with equally remarkable persistence. Since the beginning of the 21st century, only the richest 1 per cent in the USA and Russia have approximated or surpassed the levels of concentration of the richest 1 per cent in Brazil for the years preceding the global financial crisis of 2008. Compared to the USA, the 2008 financial crisis did not seem to have as large an effect on market inequality in underdeveloped countries. At the summit, Brazil concentrates twice as much income in the hands of the top percentile than China—about 25 times the average income of the country.²⁰

3.2. INCOME INEQUALITY AND GROWTH

Between 2001 and 2015 the total cumulative real growth of average fiscal income in Brazil was 27 per cent (see Table 2). The question that arises from this evolution is how the average income growth of different income groups compares to these numbers. Consistent with the slight decline in income concentration over the period, the income growth rate of the bottom 50 per cent was strong, compared to the middle 40 per cent and the top 10 per cent, both of which grew less than the average for the whole population. Here the marked growth of Brazil's real minimum wage over the period (73 per cent cumulative growth) is noteworthy. But despite the gains made by the bottom, the top of the distribution captured most of the income growth over the period, with the top 10 per cent capturing 47 per cent of total average growth.

The bottom line is that even with the strongest growth performance over the period, the bottom 50 per cent did not capture the majority of growth due to their extremely low levels of income and their subsequently low share of income (12 per cent on average between 2001 and 2015). Thus, over a short-to-medium-term time-frame, the income growth of the poor population seems to matter less than their share of total income. This is partly why the 1.4 million richest adults in Brazil captured the same fraction of total growth than the poorest 70 million Brazilians. Table 2 also shows the unequal effects of the 2015 domestic recession on incomes across the population. Per adult income fell by 9 per cent in one year for the whole population, but the decline was strongest at the bottom of the income distribution, with the share of the bottom 50 per cent falling by 12 per cent. However, a 12 per cent fall on BRL7,000 is much more acutely felt than a similar fall on incomes over BRL600,000 per year. This confirms the view that recessions are more negatively felt by poor people than by affluent people.

Table 3 presents the growth rates that would have been needed for all the income groups to have captured the same fraction of total per adult growth since 2001. The counterfactual scenario shows that there essentially had to have been a transfer of per adult growth between the top 10 per cent and the bottom 50 per cent, where the former would have grown by 5 per cent (instead of 23 per cent), and the latter by 126 per cent (instead of 50 per cent), for the groups to have received an equitable share of total growth over the period. This would have evidently needed policies targeting greater income growth for the bottom of the income distribution, such as more and better-paid formal jobs, as well as more regulated income growth for the top, coming, for instance, from stricter collective bargaining arrangements in firms and more binding personal income taxes. It is to this last policy area that we now turn.

TABLE 2
Income growth, recession and inequality in Brazil, 2001–2015

Income group (distribution of average pre-tax fiscal income)	Total cumulative real growth (2001–2015)	Fraction of total growth captured (2001–2015)	Average income share (2001–2015)	Total cumulative real growth (2014–2015)
Full population	26.7%	100%	100%	-9.2%
Bottom 50%	49.8%	19.8%	12.1%	-11.8%
Middle 40%	24.9%	32.3%	35.0%	-10.5%
Top 10%	23.5%	47.9%	52.9%	-7.6%
Incl. top 1%	21.4%	19.7%	23.6%	-7.0%
Incl. top 0.1%	22.5%	9.5%	10.9%	-7.3%
Incl. top 0.01%	15.5%	3.4%	5.7%	-9.0%
Incl. top 0.001%	1.5%	0.2%	3.2%	-12.0%

Note: Distribution of pre-tax fiscal income among equal-split adults. The unit is the adult individual (20 years old and older; income of married couples is divided by two). Fractiles are defined relative to the total number of adult individuals in the population. Corrected estimates combine national accounts, surveys and fiscal data, scaling up the totals to match national accounts data for the same income concept.

TABLE 3
Counterfactual growth rates for an equitable sharing of total growth in Brazil, 2001–2015

Income group (distribution of average pre-tax fiscal income)	Total cumulative real growth (2001–2015)	Fraction of total growth captured (2001–2015)
Full population	26.7%	100%
Bottom 50%	125.7%	50%
Middle 40%	30.7%	40%
Top 10%	4.9%	10%
Incl. top 1%	1.1%	1%
Incl. top 0.1%	0.2%	0.1%
Incl. top 0.01%	0.05%	0.01%
Incl. top 0.001%	0.01%	0.001%

Note: Distribution of pre-tax fiscal income among equal-split adults. The unit is the adult individual (20 years old and older; income of married couples is divided by two). Fractiles are defined relative to the total number of adult individuals in the population. The counterfactual growth rates are the growth rates that would have been required for all income groups to have captured the same fraction of total per adult growth.

3.3 ELITE TAXATION AND THE PROGRESSIVITY OF PERSONAL INCOME TAX

Given the scale of income concentration in Brazil, the third broad question this paper asks is how progressive the personal income tax is. Fortunately, the Federal Tax Office provides in its tabulated statistics information on the net tax paid per bracket as well as information on all sources of income, as was detailed in Section 2. Using this information we can evaluate the progressivity of the income tax under two criterion common in the tax literature: horizontal

equity and vertical equity. The former refers to the extent to which all income sources are subject to the same tax schedule, while the latter refers to the extent to which persons with higher incomes pay a higher fraction in tax. To evaluate the Brazilian income tax and its redistributive potential according to these criteria, it is necessary to detail how the income tax is levied.

In personal income tax declarations (DIRPF) three legal categories of income are reported. As was mentioned in Section 2, these are: taxable income (wages, pensions, rents), withheld incomes taxed exclusively (capital gains, interests from financial investments and some types of labour income) and non-taxable income (distributed business profits and dividends, indemnity income, exempt parts of agricultural labour income and pension income, interests from savings accounts and partner income from small-sized enterprises etc.). Taxable income is the only category subject to the personal income tax schedule, with four marginal tax rates varying from 0 to 27.5 per cent. Withheld incomes taxed exclusively are taxed according to a separate and definitive schedule. The fixed rates vary between 15 per cent and 22.5 per cent, depending on the nature of the gain or investment. Non-taxable incomes are by their nature exempt from personal income tax. To arrive at the personal income tax base, certain legal deductions are subtracted from taxable income.²¹ The result of the subtraction is the tax base upon which the personal income tax schedule is applied. Only about 13 per cent of adults end up contributing to the tax, with the top 4 per cent or so entering the highest tax bracket.

Taxable income currently accounts for about 60 per cent of total declared income, withheld income taxed exclusively accounts for 10 per cent, and non-taxable income accounts for almost 30 per cent. Since 2007 the share of taxable income has dropped by close to 10 per cent, with most of this fall being absorbed by non-taxable income. From this exposition it is clear that the taxation system for personal incomes in Brazil violates the principle of horizontal equity, since not all income sources are taxed according to the same schedule, with capital income being taxed less in general, or in some cases not taxed at all when received by the individual.

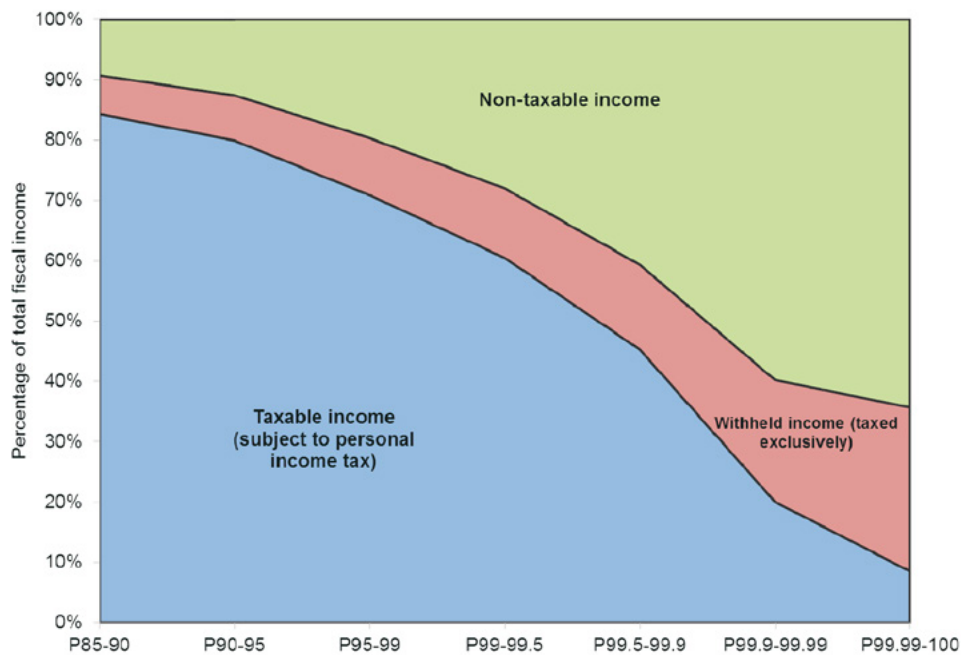
To evaluate the principle of vertical equity, we can first begin by investigating how these three categories are distributed among the individuals that file a tax return. Figure 8 displays the legal composition of top personal incomes in 2015 prior to any deductions, to offer an idea of the full picture. The trend is striking as we move up the distribution. For individuals in the top 10–15 per cent (P85–90), 85 per cent of their income is made up of taxable income (subject to the personal income tax), about 5 per cent is withheld income taxed exclusively, and about 10 per cent is non-taxable. The share of taxable income falls as we move towards higher groups, barely accounting for 10 per cent for the richest 0.01 per cent. The share of withheld incomes increases as we move up the distribution, reflecting the fact that richer individuals probably earn a higher fraction of their income from capital income such as interests and capital gains. The same is true of non-taxable income components such as distributed business profits and dividends. Between 2007 and 2015 it seems that the share of taxable income in total fiscal income has fallen, while the share of withheld income and exempt income has risen for all groups, with the latter becoming more important for the richest groups (see Figure A.4 in the Appendix).

Importantly, these legal compositions can influence the forms of remuneration chosen by asset-owning elites. In the case of dividends, for instance, the tax system may influence the extent to which corporate owners (i.e. shareholders) prefer to receive distributed profits (i.e. dividends) rather than to accumulate wealth through retained earnings, to re-invest in the corporation or to realise future capital gains by selling their shares at a later date; or other types of capital payments, such as share bonus schemes/buybacks. All these options can have important macroeconomic implications. In the Brazilian case, corporate owners pay less tax on distributed

profits (being completely exempt) than if they were to accumulate profits in the company (either for induced capital gains—taxed at a rate of 15 per cent—or for further investment to increase labour incomes—taxed at the highest marginal rate of 27.5 per cent). The Brazilian income tax system can thus be said to motivate distinct forms of rent-seeking behaviour among elites.

FIGURE 8

The legal composition of top personal incomes in Brazil in 2015



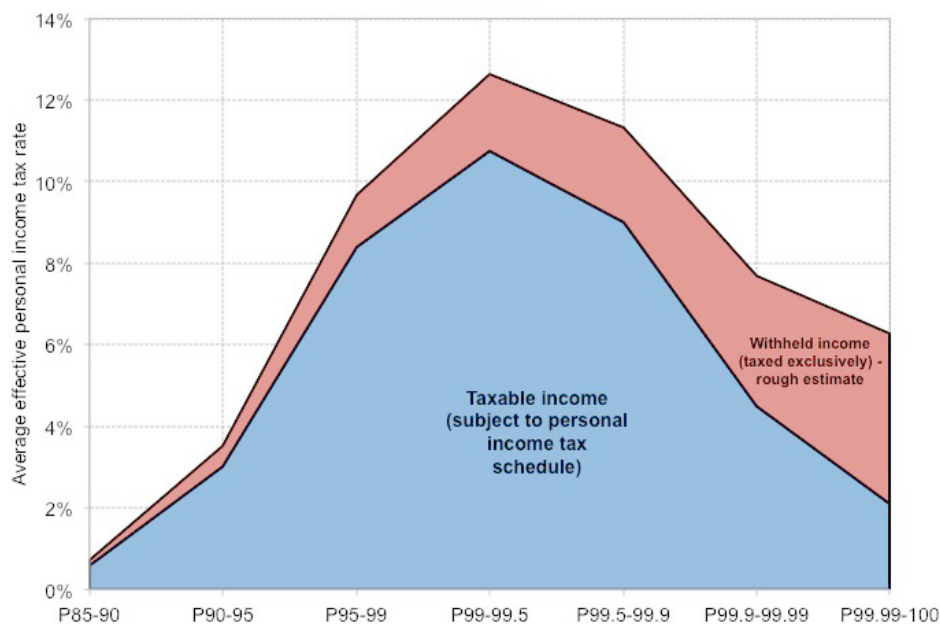
Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance). Income is total assessed income prior to deductions from income tax declarations. 'P90-95' includes individuals between percentiles 90 and 95, so between the top 10 per cent and the top 5 per cent; 'P95-99' includes the next 4 per cent, 'P99-99.5' the next 0.5 per cent, and so on. The unit of observation is the adult individual (income of couples filing jointly is taken as one unit).

According to studies based on household survey data (see, for instance, Higgins and Pereira 2013; Medeiros and Souza 2015), the income tax appears to be a relatively progressive instrument in Brazil. From Figure 8, however, it seems as though the personal income tax is not a very redistributive tool. A more definitive answer can be given by calculating the average effective tax rate paid by elites. As mentioned above, to arrive at the tax base on which the progressive rates are applied, numerous deductions can be subtracted from taxable income. These deductions are not uniformly distributed, as Figure A.5 demonstrates. The share of deductions is much lower for richer groups, whereas their importance is far more pronounced for the upper middle class. The share of the total income of the top 10–15 per cent accounted for by deductions is 21 per cent, with many opting for the standard discount. For the top 0.01 per cent it is only 2 per cent, with the great majority coming from deductions for business expenses.

Figure 9 presents the complete average effective income tax rates for top groups in Brazil in 2015 and its composition between the personal tax applied on taxable income and the exclusive taxes applied on withheld income (which are not subsequently subject to the personal income tax). The principle of vertical equity suggests that higher income groups should have higher effective tax rates. However, there is a clear violation of this principle,

as average tax rates begin to fall once we move beyond the top 0.5 per cent. Until then they are increasing from 1 per cent of total income for the P85–90 group to almost 12 per cent for the P99–99.5 group. Beyond the top 0.5 per cent of the distribution they fall until reaching about 6 per cent of total income for the richest 0.01 per cent of the population. That is, the richest 14,000 individuals pay only 6 per cent of their total fiscal income in tax.

FIGURE 9
Average effective income tax rates for top groups in Brazil, 2015



Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance). Income is total assessed income prior to deductions from income tax declarations. 'P90–95' includes individuals between percentiles 90 and 95, so between the top 10 per cent and top 5 per cent; 'P95–99' includes the next 4 per cent, 'P99–99.5' the next 0.5 per cent, and so on. The unit of observation is the adult individual (income of couples filing jointly is taken as one unit).

These findings are a clear reflection of the division of incomes presented in Figure 8, rather than the role of deductions (see Figure A.5). However, for lower income groups the impact of deductions is more noteworthy, given that most of their income is taxable income. But as one moves up the distribution it is the sources of the income received that affects the tax burden. As a final point we may also note how these average tax burdens have changed over time. Table 4 notes that for the income groups in violation of the vertical equity principle (above the top 0.5 per cent), their average tax rates have decreased since 2007, while for most of the lower income groups their average tax rates have increased.

With such low average effective tax rates, sourced from the fiscal separation of income, it is not difficult to understand how Brazil has come to have such a skewed income distribution. Piketty, Saez, and Stancheva (2014) argue that high tax rates make it more difficult for corporate executives (i.e. individuals who have to bargain to increase their income) to pay themselves more. In Brazil, as in many other countries, it is likely that corporate executives dominate the top of the distribution. With such low marginal tax rates and low effective rates (due to the absence of taxation for certain important categories of income) the 'compensation-bargaining' constraint is not going to be very binding.

TABLE 4

Evolution of effective income tax rates for top groups in Brazil, 2007–2015

Income group (distribution of average pre-tax fiscal income)	Percentage change (2007–2015)
Top 10–15%	350%
Top 5–10%	54%
Top 1–5%	318%
Top 0.5–1%	2%
Incl. top 0.1–0.5%	-15%
Incl. top 0.01–0.1%	-28%
Top 0.1%	-39%

Note: This table shows the percentage change in average effective income tax rates for top groups between 2007 and 2015. It is calculated from the income tax tabulations using information on total tax liability per income range.

3.3.1 Policy implications

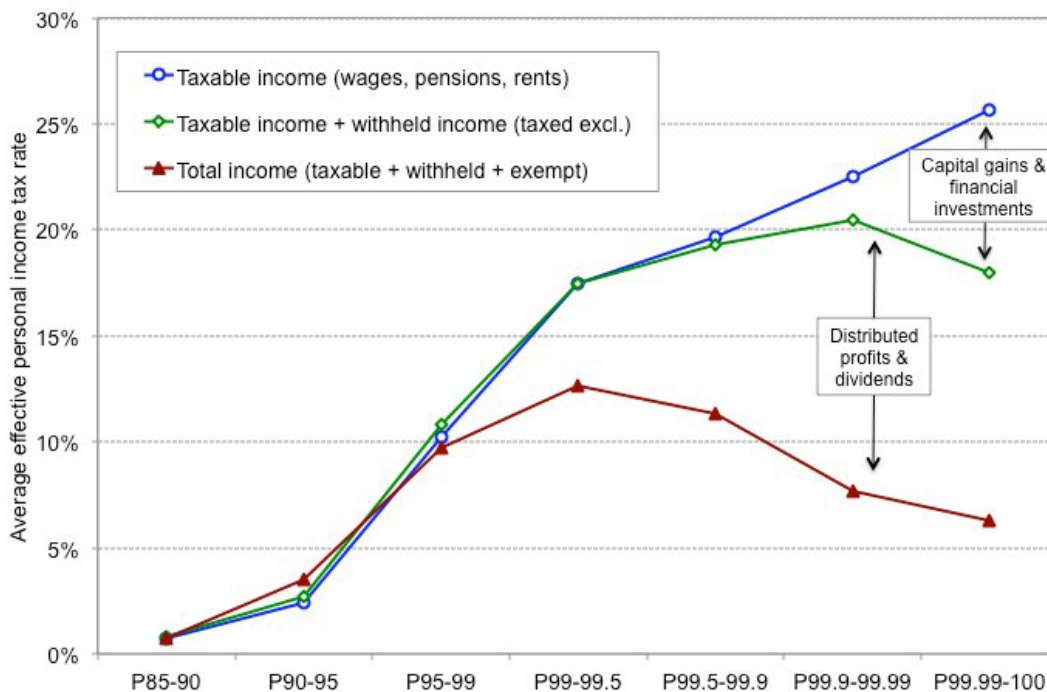
In light of the above findings on income concentration in Brazil and the taxation of its elites, one may ask what courses of action policymakers should target to give the personal income tax greater redistributive power. Figure 10 presents a clear picture of the first steps to improving the distributive consequences of the personal income tax in Brazil. It shows the average effective income tax rates according to three different distributions of income: the taxable income distribution, the distribution of the sum of taxable and withheld income, and the distribution of total income (the sum of taxable, withheld and tax-exempt income). The lesson from presenting these three distributions is that, to satisfy the principle of vertical equity, the average effective tax rates for total income should more closely resemble those for the taxable income distribution: the richer you are, the higher the share of your income you pay in tax. To do this, policymakers would need to remove regressive exemptions on incomes such as distributed profits and dividends that encourage rent-seeking behaviour, and apply the personal income tax schedule to all incomes currently withheld and taxed exclusively at lower rates. This means bringing capital gains and interests from financial investments also into the existing personal income tax schedule. One option satisfying the vertical equity criterion would be to create a comprehensive personal income tax that includes all categories of labour and capital income taxed under the same schedule. A variant of this would be a dual income tax schedule, where investment income (from capital ownership) would be subject to higher marginal rates than earned income (from labour).

Then the debate could focus on whether to add more marginal rates above the current maximum rate of 27.5 per cent, which is very low by international standards. For instance, the top marginal income tax rate is 40 per cent in the USA and Chile, and 35 per cent in Mexico. China operates a similar tax system to Brazil in the sense that different income tax categories are subject to different schedules. Wages are subject to a top marginal tax rate of 45 per cent, and business income to a top rate of 35 per cent, while capital income is taxed at a flat rate of 20 per cent (see Piketty, Yang, and Zucman 2017). What is particularly striking is that, from a historical perspective, it has not been an impossible task to apply higher marginal income tax rates in Brazil. Figure 11 shows the evolution of top marginal tax rates on the highest earners in Brazil compared to those in the USA and Chile since

1962. First, the current rate of 27.5 per cent is very low by Brazil's own historical standards. Prior to the 1988 Constitution the top tax rate in Brazil fluctuated between 50 per cent and 65 per cent, at a time when the economy was less developed and when a lower proportion of the population filed a tax declaration. While it is true that numerous fiscal exemptions existed in Brazil during these years, the point is that higher taxes for the greatest beneficiaries of economic development did not impede that development. But since then, Brazil has followed international trends in tax policy by drastically decreasing top tax rates by more than half, despite average incomes being higher now than before and despite a greater fraction of the population filing a tax return.²² The taxation of income remains a political problem to be deliberated democratically.

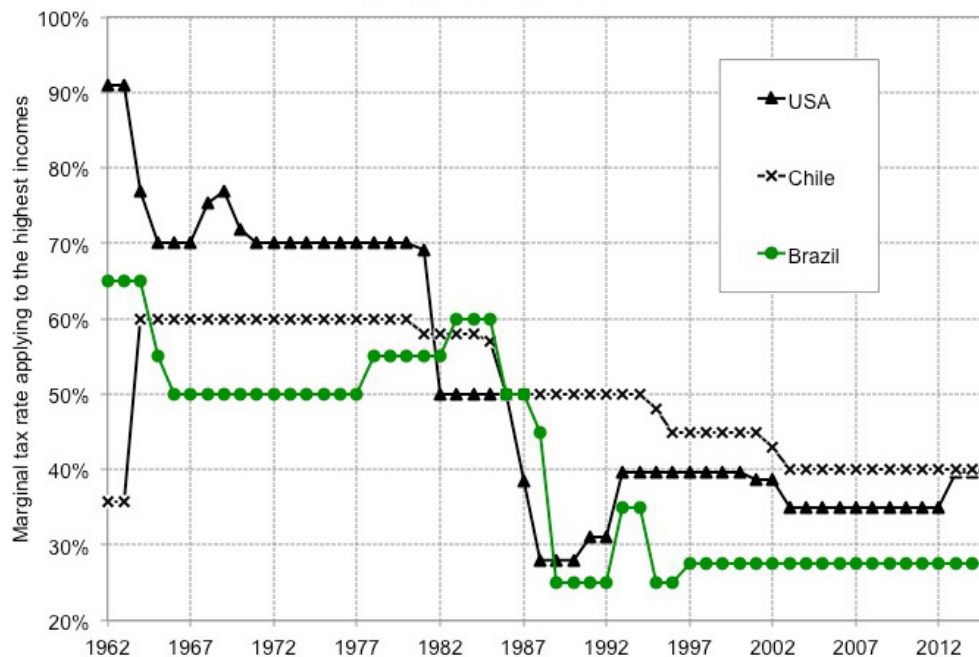
FIGURE 10

Average effective income tax rates for different income distributions in Brazil, 2015



Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance) according to three different income distributions. The unit of observation is the adult individual (income of couples filing jointly is taken as one unit). Taxable income includes labour income of salaried employees and self-employed workers as well as property rent. Withheld income (taxed exclusively) includes the 13th salary and capital gains and income from financial investments. Exempt income includes mostly distributed business profits/dividends, but also the exempt part of pensions and income from rural activity, interests from savings accounts and other types of labour and capital incomes.

FIGURE 11

Top marginal income tax rates in a historical perspective: 1962-2015

Note and source: The figure shows the evolution of the top tax rate applying to personal incomes. The rates for the USA are from <<http://piketty.pse.ens.fr/en/capital21c2>>. Rates from Chile are from Alvaredo et al. (2016). Rates for Brazil are from *Memória Receita Federal*.

4 CONCLUSIONS AND FUTURE RESEARCH

While most studies on income inequality in developing countries have used either survey-based measures or tax-based measures of inequality, this paper sought to combine these two sources in the case of Brazil over the last 15 years to estimate inequality and evaluate the effect of the personal income tax on regulating incomes. As a first step we produce a new series of fiscal income, consistently combining annual and nationally representative household survey micro-level data from the National Statistics Office with detailed tabulations on income tax declarations recently released by the Federal Tax Office. Our results provide a sharp upward revision to the official estimates of inequality in Brazil. This confirms that surveys grossly underestimate the level of incomes at the top of the income distribution. The notable results are the exceptionally large polarisation between incomes at the top and the rest, and the exceptionally weak command of income of the bottom 90 per cent of the distribution.

Income growth has also been unequal. The bottom of the distribution made gains, but not at much expense to top income groups. These groups in general still managed to capture disproportionate fractions of total growth, with the top 1 per cent capturing the same share of growth as the bottom 50 per cent. We also show that the majority of the income of the very rich population in Brazil is not subject to the personal income tax. While they concentrate a lower proportion of legal deductions, the elite upper class benefits from tax exemptions on distributed profits and dividends and lower exclusive tax rates for income from financial investments. The analysis of average effective tax rates motivated the consideration of potential

policy responses, which go in the direction of creating a comprehensive personal income tax schedule for all types of income, thus eliminating the current regressive exemptions, under a single or dual tax regime that maintains the principle of progressivity. Eventual increases to the top rates paid by the highest earners are an additional possibility, which are not unjustified given the historical experience in Brazil, and in other countries, of taxing top incomes.

This research is a preliminary step in the Distributional National Accounts (DINA) project presented in Morgan (2017), where we estimate a distributional series for national income using national accounts, as well as survey and tax data. Thus, the key difference is that this paper presents the distribution of fiscal income, while in addition to this Morgan (2017) estimates the national income distribution. The immediate benefit of this latter specification is to be more consistent with macroeconomic aggregates and to distribute official national income growth as measured by national accounts. In more direct terms, fiscal income is the distributed portion of primary income plus pension and unemployment transfers. However, as evidenced in Section 3.3, it is important to account for income generated in the economy that is not distributed to households, such as undistributed corporate profits, because how private individuals choose to distribute them may well vary across countries and over time (depending on tax incentives and other factors). This can introduce non-negligible biases in our distributional estimates, especially at the top.

Subsequent research will also look to exploit the 1976–1999 micro-files of the PNAD survey, to estimate a full historical series to the best of our ability. In doing so, we can use historical income tax records published in the *Annual Statistical Yearbook* of the IBGE between 1976 and 1989 to compare the profile of re-scaling factors with those calculated from the 2007–2015 tax data. Using historical tax data would also allow us to evaluate the progressivity of the personal income tax in earlier years and compare it with recent years, which is not covered in this paper. The present paper can thus be seen as a first step towards these broader goals.

APPENDIX

A. ESTIMATING LABOUR AND CAPITAL INCOME IN THE PNAD

This section describes how we estimate labour and capital incomes separately in the national household survey (*Pesquisa Nacional por Amostra de Domicílios*—PNAD).

Labour income is the sum of income reported from primary, secondary or all other jobs (V9532, V9982, V1022), pensions (V1252, V1255, V1258, V1261), work allowances (V1264) and unemployment insurance for all workers who do not classify themselves as employers or own-account workers in these jobs. Unemployment insurance is taken from other income sources declared (V1273) and estimated as income from this source that is reported between one and two monthly minimum wages. Values of V1273 equal to or below one monthly minimum wage are interpreted as social benefits. Finally, we add a 13th monthly salary (an annual bonus defined in Brazilian law for all formal employees and retired workers) to the annual calculation of labour incomes.

Capital income is estimated as the sum of rent (V1267), financial income and income from the primary or secondary jobs of workers classifying themselves as employers in their primary or secondary jobs. Financial income (interests and dividends) is taken from other income sources declared (V1273) and estimated as any income from this source that exceeds two monthly minimum wages.

Mixed income is the value of all income reported from primary or secondary jobs (V9532, V9982) by own-account workers (i.e. independent/self-employed workers). In Table A.1, mixed income is divided into its capital and labour components in proportion to the labour–capital split in the corporate sector, as can be calculated from the IBGE’s System of National Accounts. Thus, the portion of mixed income allocated to labour income in PNAD is the ratio *employee compensation (D1) / (employee compensation (D1) + net operating surplus (B2n))*, while the portion of mixed income allocated to capital in PNAD is the ratio *net operating surplus / (employee compensation (D1) + net operating surplus (B2n))*. This results in a labour–capital split of 61 per cent–39 per cent on average for 2001–2015.

B. ESTIMATING LABOUR AND CAPITAL INCOME IN THE DIRPF

This section describes how we estimate labour and capital incomes separately in the annual income tax declarations (DIRPF).

We proceed by estimating the labour and capital components of each category of fiscal income reported in the tabulations (Table 9 of the tax report *Grandes Números DIRPF*). Taxable income comprises salaries, pensions and rent. Thus, the capital component of this category is rent. We assume it represents 2 per cent of taxable income in the tabulations, following the share of property rent in taxable income that can be calculated from national accounts. The remaining portion of taxable income in the tabulations (i.e. 98 per cent) is attributed to labour.

Exclusively taxed income in the tabulations (Table 9) are decomposed in Table 19 of the annual tax reports, such that we can sum the labour and capital components separately. The labour component is the sum of the 13th monthly salary received by contributors and their dependents, wages received cumulatively by contributors or dependents and worker participation in company profits. The capital component comprises the sum of the remaining items: fixed-income investment income, interests on own capital (*juros sobre capital próprio*), variable-income investment income, capital gains etc.

Non-taxable incomes are the last fiscal category, whose decomposition is presented in Table 20 of the tax reports. Close to one fifth of these exempt incomes can be classified as labour income. These comprise compensation for laid-off workers, the exempt portion of pension income for people aged over 65, withdrawals from the employment security fund, scholarships etc. The remaining items can be classified as capital income (distributed company profits, dividends, interests from savings accounts/mortgage notes) or mixed income (the exempt portion of agricultural income). We attribute 70 per cent of this exempt mixed income as labour income, and 30 per cent as capital income. Note that we exclude asset transfers that are reported in this category, as they are not income flows but transfers of a stock of wealth. These are lump-sum payments related to donations and inheritances, as well as the incorporation of company reserves and the disbursement of shares as bonuses.

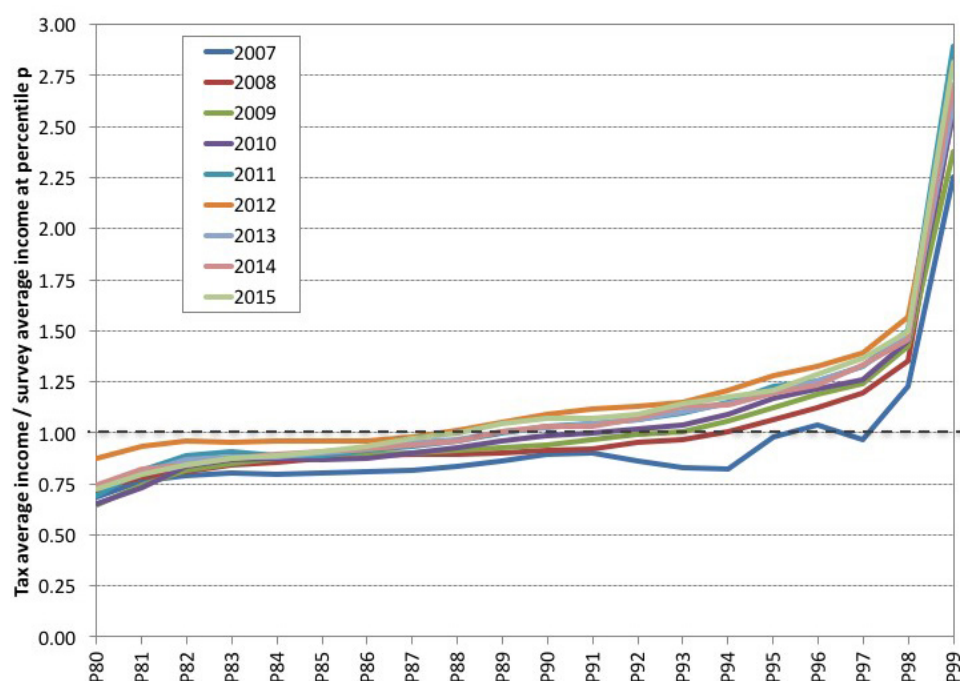
TABLE A.1
Comparison of raw data in the System of National Accounts (SNA), Household Surveys (PNAD) and Income Tax Declarations (DIRPF)

Year	"Population (000)"		"Total income (million R\$)"			"Labour income (million R\$)"			"Capital income (million R\$)"		
	"PNAD (adults)"	"DIRPF (declarations)"	SNA	PNAD	DIRPF	SNA	PNAD	DIRPF	SNA	PNAD	DIRPF
2001	105,985		866,383	698,520		680,126	552,089		186,256	146,431	
2002	109,224		963,481	779,435		772,093	612,668		191,388	166,767	
2003	112,069		1,076,534	869,498		876,932	685,866		199,602	183,632	
2004	114,176		1,185,792	956,230		967,081	758,713		218,711	197,516	
2005	117,162		1,328,782	1,087,668		1,093,564	862,147		235,218	225,521	
2006	119,954		1,472,070	1,227,178		1,231,365	970,474		240,705	256,704	
2007	122,434	25,225	1,650,957	1,345,026	967,312	1,382,513	1,091,503	761,751	268,444	253,523	205,562
2008	125,397	25,772	1,878,659	1,536,155	1,223,512	1,568,331	1,239,539	923,038	310,329	296,615	300,474
2009	127,713	24,384	2,067,953	1,661,437	1,302,325	1,742,896	1,362,874	1,001,959	325,057	298,563	300,366
2010	129,308	23,963	2,324,551	1,833,124	1,469,588	1,959,260	1,513,126	1,103,776	365,291	319,999	365,811
2011	130,904	24,898	2,635,479	2,004,812	1,718,384	2,220,767	1,673,449	1,255,089	414,712	331,362	463,295
2012	133,742	25,874	2,934,356	2,297,804	1,887,546	2,492,583	1,900,559	1,404,663	ç441,772	397,245	482,884
2013	135,624	26,494	3,290,131	2,526,710	2,071,901	2,797,873	2,103,102	1,532,714	492,258	423,608	539,186
2014	139,013	27,581	3,608,978	2,810,170	2,305,109	3,082,361	2,338,284	1,711,899	526,616	471,886	593,209
2015	142,540	27,519	3,740,585	2,938,756	2,482,412	3,194,765	2,477,782	1,837,451	545,820	460,974	644,961

Note: The adult population refers to the number of persons aged 20 and over. The adult population in PNAD refers to the expanded population after accounting for the weights. It thus corresponds to the census population for adults. The values for 2010 are averages of 2009 and 2011. The original population in DIRPF refers to the number of tax declarations. As explained in the text declarations can either be made by individuals or married couples (where they decide to declare jointly). Total income is the variable that corresponds to fiscal income in the tax declarations. Total income in each of the three sources is decomposed into its labour and capital components. See Appendix A and B for a description of the division of income in the PNAD and DIRPF. The PNAD incomes are from the microfiles provided by the IBGE, while incomes from the DIRPF are from detailed tabulations provided by the *Secretaria da Receita Federal do Brasil*. SNA data is from IBGE. 2015 is based on quarterly national accounts, were the values are re-scaled using 2014 ratios between each variable and national income.

FIGURE A.1

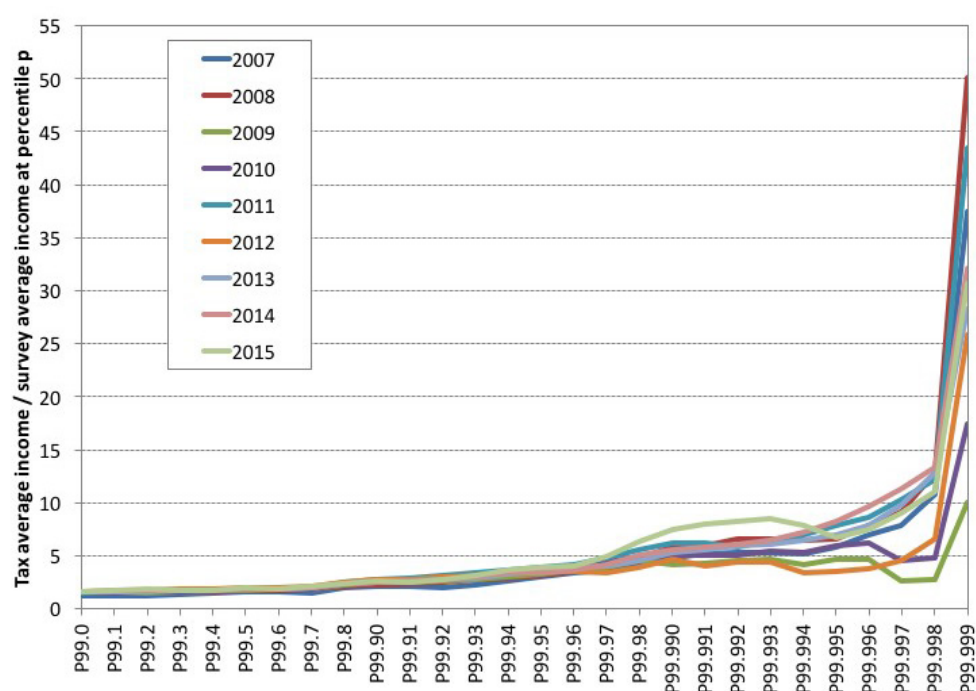
Ratios between tax and survey average incomes in Brazil: 2007-2015



Note: The figure shows ratios of fiscal average incomes to survey average incomes for each percentile of the two respective distributions up to P99–100. Fiscal data start at around P80 for all years.

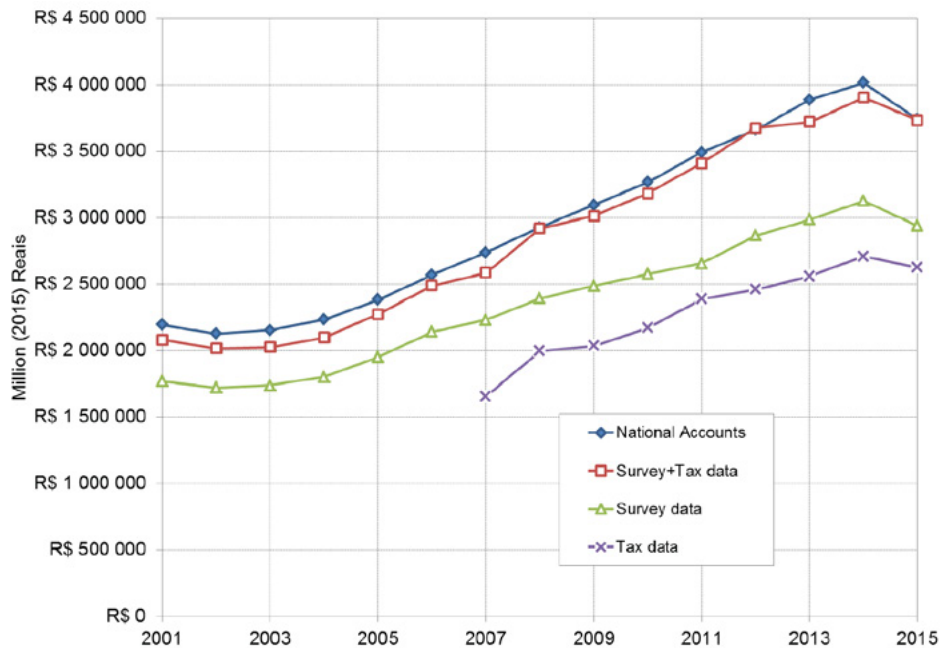
FIGURE A.2

Ratios between tax and survey average incomes in Brazil above P99: 2007-2015



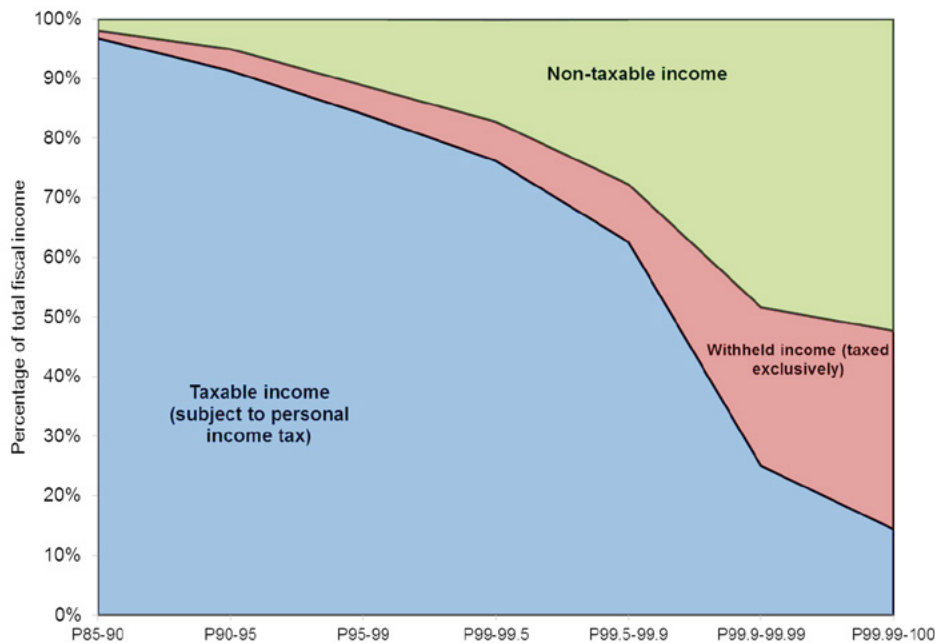
Note: The figure shows ratios of fiscal average incomes to survey average incomes for each percentile of the two respective distributions beyond P99. Fiscal data start at around P80 for all years.

FIGURE A.3
Evolution of total fiscal income in Brazil: 2001-2015



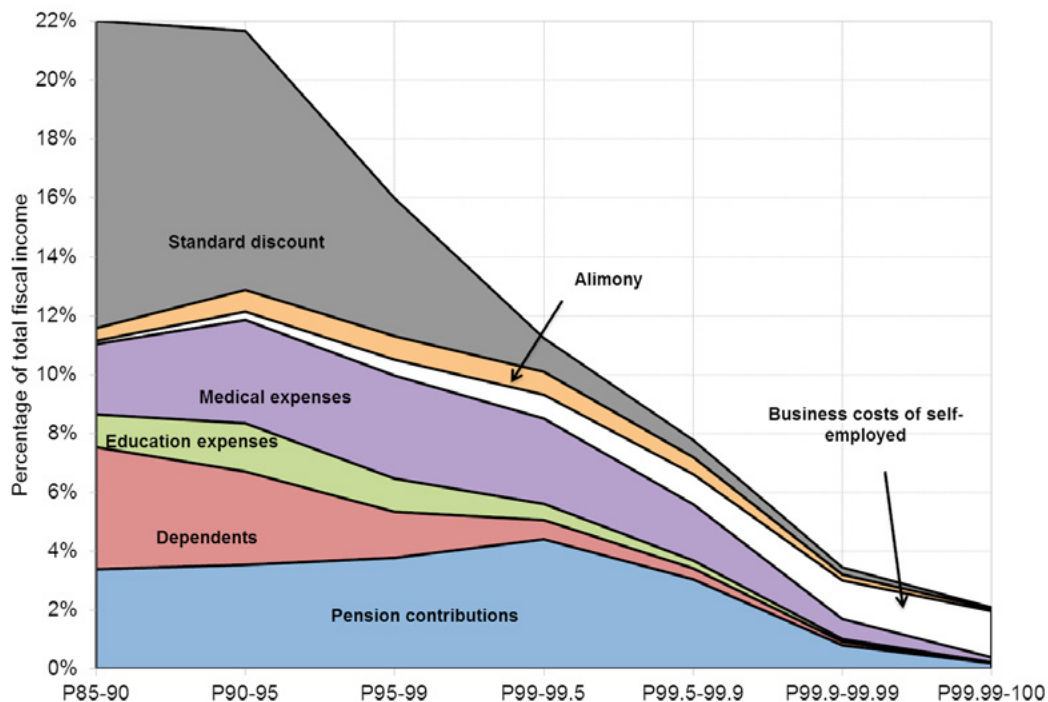
Note: The figure shows the evolution of total real fiscal income by data source in millions of Reais (BRL). The numerators come from the different sources and are such that the income concept is consistent across them. The Survey + Tax data series uses survey incomes up to the percentile where average percentile income in the surveys is less than or equal to that in the tax data, and percentile average incomes from the tax data beyond this point.

FIGURE A.4
The Legal composition of top personal incomes in Brazil in 2007



Note: Distribution of pre-tax fiscal income (before taxes and transfers, except pensions and unemployment insurance). Income is total assessed income prior to deductions from income tax declarations. 'P90-95' includes individuals between percentiles 90 and 95, so between the top 5 per cent and 10 per cent; 'P95-99' includes the next 4 per cent, 'P99-99.5' the next 0.5 per cent, and so on. The unit of observation is the adult individual (income of couples filing jointly is taken as one unit).

FIGURE A.5
Composition of deductions among top groups in Brazil in 2015



Note: Distribution of schedular deductions. 'P90-95' includes individuals between percentiles 90 and 95, so between the top 5 per cent and 10 per cent; 'P95-99' includes the next 4 per cent, 'P99-99.5' the next 0.5 per cent, and so on. The unit of observation is the adult individual (income of couples filing jointly is taken as one unit).

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NOTES

2. 'Structural power' is the indirect influence that individuals, groups or sectors have over the policymaking process through their control of investment and employment. Structural power thus derives from the economic position that agents have in particular societies. In market-based capitalist societies, private-sector agents will tend to have strong structural power, particularly if they are attached to a sector that contributes a significant share of gross domestic product (GDP), generates significant employment or maintains many linkages to other sectors that can magnify the impact of its investment decisions (see Fairfield 2015).

3. Due to the 2010 census, the PNAD was not carried out that year. All our estimates regarding 2010 are averages of 2009 and 2011.

4. Specifically, the criteria for resident individuals required to present an income tax return are that they: (1) have received taxable incomes over a defined value (e.g. BRL28,123.91 in 2015) and exempt incomes and exclusively taxed incomes whose combined value is over a defined threshold (BRL40,000); (2) have obtained capital gains from the sale of assets or have realised trades in financial markets or have opted for the exemption from the income tax levied on capital gains earned on the sale of residential properties, proceeds from which are used to buy residential real estate located in the country; (3) earned gross revenue from agricultural work over a defined amount (e.g. BRL140,619.55 in 2015); or (4) possess property (financial and non-financial) whose value is greater than a defined amount on 31 December of the given year (e.g. BRL300,000 in 2015). Individuals can choose to file as a dependent on someone else's tax form, but if they do so they must report their income/assets if they also meet any of the above criteria.

5. In Brazil capital gains and interests on own capital are taxed at the flat rate of 15 per cent. Interests from variable income investments are taxed at 15 per cent for share funds and short-term operations, and 20 per cent for day trades. Interests from fixed income investments are taxed at a rate of 15 per cent for placements of over 24 months; at a rate of 17.5 per cent for placements of between 12 and 24 months; at 20 per cent for placements of between 6 and 12 months; and at 22.5 per cent for placements of less than 6 months.

6. All filers must declare the value of their assets (if their total value exceeds a defined threshold) on 31 December in year t and on 31 December in year $t-1$, for the tax office to see if the change in the value of personal wealth declared by an individual/couple is consistent with the incomes declared over the same period.

7. The DIMOF is an obligatory declaration by banks (including credit cooperatives and savings and loan associations), through which information is passed on to the government about all financial operations undertaken by the banks' clients. It was initiated in 2008. Prior to 2008 the government could avail of the financial transactions tax (the *Contribuição Provisória sobre Movimentação Financeira*—CPMF) to cross-check the information about financial investments provided by contributors.

8. The under-declaration of self-employment income may not be as large as expected for two reasons. First, the DIMOF programme applies to all workers, independently of the nature of their occupation. Independent workers would have to do all their operations in cash for them to avoid a bank trail. Second, most own-account workers, on the basis of anecdotal evidence, create a legal business under their name and register their income as profit withdrawals or dividends so that they appear on the declarations but avoid paying the income tax.

9. 'Fiscal income' is distinguishable from 'national income', since it only concerns distributed income received by persons that is reported on income tax declarations. It should also be distinguished from 'taxable income', which is the income that is ultimately taxed after legal deductions. Some components of income can be reported on the tax returns but are not taxable. This may vary by country. In the case of Brazil it is explicit, as the tax declarations include a section for declaring non-taxable incomes.

10. These data are the updated series based on the UN's SNA 2008, where the years 2001–2009 are re-estimated to match the new classification.

11. This perspective assumes that couples redistribute income between their members, as if all couples operate joint bank accounts with equal access to the resources. However, this assumes away any unequal bargaining power among couples with unequal income flows, which may be an overly optimistic treatment of intra-household allocation of income. But the assumption of no sharing of resources is also unrealistic. We judge it preferable, where data do not allow for more refined calculations, to be on the lower bound of the inequality estimate (assuming equal splitting) rather than on the upper bound (assuming zero sharing of income).

12. Ninety-nine for the bottom 99 percentiles, 9 for the bottom 9 tenth-of-percentiles of the top percentile, 9 for the bottom 9 one-hundredth-of-percentiles of the top tenth-of-percentile, and 10 for the 10 one-thousandth-of-percentile of the top one-hundredth-of-percentile.

13. These interpolation techniques, contrary to the standard Pareto interpolation, are non-parametric. They estimate the full 'generalised Pareto curve' $b(p)$ (with p being the full cumulative distribution function $F(y)$) by using a given number of thresholds p_i . As such, the Pareto distribution is given a flexible form, which overcomes the constancy condition of standard power laws, and produces more accurate estimates.

14. In Brazil this decision depends on the income differences between individuals in a couple. A jointly filed declaration takes the combined total income of the couple for the application of the tax schedule. Where a spouse has little income relative to his/her partner, there are more incentives to file jointly if the fixed allowance for dependents (including spouses with or without income) that is deductible from gross income is greater than the additional tax burden brought about by a joint declaration. But if the spouse has higher income, then incentives increase for her to file separately, as her income would be subject to the different marginal tax rates (including the first exempt threshold), as opposed to being all subject to the highest rate if she filed jointly with her husband.

15. Since joint filing by couples is voluntary, this brings forth the complication that not all single declarations are made by persons who are actually single. Thus our equal-split series assumes that these individuals are either single or married to other individuals whose income falls in the same bracket, which may not be true. This means that we may overstate inequality compared to the perfect equal-split case (where all couples' income is divided by two), and understate inequality compared to the purely individualistic case (where each spouse is assigned his or her own income). If and when we obtain access to Brazilian micro-level tax data, we will refine this computation to estimate a separate equal-split and individualistic series.

16. This can be interpreted as a lower average bound of the exclusive tax rate applied to capital incomes withheld at source. In Brazil capital gains and interests on own capital are taxed at the flat rate of 15 per cent. Interests from variable-income investments are taxed at 15 per cent for share funds and short-term operations, and 20 per cent for day trades. Interests from fixed-income investments are taxed at a rate of 15 per cent for placements of over 24 months; at 17.5 per cent for placements of between 12 and 24 months; at 20 per cent for placements of between 6 and 12 months, and at 22.5 per cent for placements of less than 6 months.

17. Similar findings hold for the quantile function $q(p)$ (i.e. the income threshold $q(p)$ corresponding to percentile p).

18. However, when it comes to working with the distribution of other survey variables in the distribution of income, such as age, sex or occupation, the re-weighting method seems more appropriate.

19. See <<http://wid.world/>>.

20. If all adults earned the average fiscal income of their economy, then the share of income of the top 1 per cent should be 1 per cent. In Brazil this group concentrates about 25 per cent of income, which equates to them taking home over 25 times the average income per year.

21. There are seven legal deductions that can be applied: all social security contributions made to the public fund and up to 12 per cent made to private funds; allowances for declared dependents (children, spouses and other relatives) up to a fixed limit; education expenses up to a fixed limit; medical expenses without limit; business expenses of independent workers up to a fixed threshold; income maintenance of ex-spouses or relatives up to a fixed limit; or a standard discount of 20 per cent of taxable income for registered employees (that replaces all other deductions if selected).

22. In the 1960s about 2 per cent of the working population filed an income tax return. This increased to about 15 per cent by the mid-1970s. It was only in the 1990s that this increased further. Today, income tax declarations cover just over 20 per cent of the working population.



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