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Abstract

We study labor income tax progressivity in an economy with a large informal sector. When the cost of informality rises with productivity, greater progressivity can simultaneously reduce inequality and enhance efficiency. We extend a standard heterogeneous-agent incomplete markets model to include workers' choice between formal and informal employment, calibrating it to Brazilian data. The informal sector features a distinct productivity process and partial tax avoidance, consistent with empirical evidence. A policy experiment shows that increasing progressivity lowers inequality and raises GDP without reducing government revenues. The results offer a novel rationale for progressive taxation in economies with widespread informality.

JEL classifications: E2, H2, H3, J22, D30, D52

Keywords: Tax progressivity, Informality, Income distribution, Incomplete markets

1 Introduction

We study labor income tax progressivity in an economy characterized by a large informal sector. Our central finding is that when informal employment entails a productivity penalty that rises with individual productivity, greater tax progressivity can simultaneously reduce inequality, enhance aggregate efficiency, and maintain government revenues. This result hinges on workers' endogenous sectoral choice: individuals may opt to work in the informal sector to partially avoid taxes, but doing so entails lower average earnings and greater income volatility. We show that a more progressive labor income tax schedule can reduce informality among low- and middle-income individuals—where informal employment is most prevalent—while preserving or even strengthening incentives for high-productivity individuals to remain in the formal sector. These findings offer a novel rationale for progressive taxation in settings where informality is widespread and tax enforcement is imperfect.

We build a heterogeneous-agent incomplete markets model, à la Aiyagari (1994), in which individuals make decisions over labor supply, savings, and sectoral affiliation. In each period, workers choose whether to operate in the formal or informal sector. The formal sector entails higher taxation, while the informal sector allows for partial tax avoidance but comes with lower expected income and higher earnings risk. Critically, we allow the cost of informality to rise with productivity, capturing the fact that more productive individuals lose more by evading formal employment. This sectoral margin adds a new channel through which labor tax policy affects both efficiency and distribution.

A key innovation of our analysis is to show that the efficiency gains from progressive taxation in economies with widespread informality do not primarily arise from reallocating hours worked across individuals with different productivity levels—as emphasized in the standard literature—but rather from reallocating individuals across sectors. Traditional models of labor income tax progressivity improve efficiency by reducing distortions for high-productivity individuals, thereby encouraging greater labor supply. In our setting, however, the presence of informality introduces a new behavioral margin: the choice between formal and informal employment. Taxing high-productivity individuals more heavily can improve overall efficiency if it induces low- and middle-income workers to transition into the formal sector, where average productivity is higher and tax compliance is greater. This mechanism opens space for growth-enhancing redistribution in environments where tax enforcement is limited and informality is pervasive.

The empirical motivation for our framework is rooted in rich microeconomic evidence from Brazil (see Gomes et al., 2020). Informality remains a central feature of its labor market, with roughly 45% of workers outside formal employment. Transitions across sectors are frequent:

around 16% of workers switch between formal and informal employment each year. Informal workers earn substantially less—gross income falls by about 36% upon transitioning to the informal sector—and face greater income volatility. These patterns suggest that informality entails a cost that varies with productivity and that workers face significant income risk, particularly in the informal sector.

To capture these empirical regularities, we model the choice between formality and informality explicitly. Our specification is motivated by a growing body of work that treats sectoral affiliation as a strategic decision of both workers and firms. Recent studies, including Ulyssea (2018) and de Paula and Scheinkman (2010), provide strong evidence that informality is not merely involuntary or driven by labor market exclusion. Rather, individuals respond to institutional incentives and optimize over sectoral choice, weighing tax burdens against informality penalties. Importantly, we allow for sector-specific income processes—featuring different means and volatilities—and we estimate separate transition matrices between productivity states in the formal and informal sectors.

Our model is calibrated to Brazilian data, drawing on both macroeconomic aggregates and micro-level distributional statistics. We closely follow the methodology of Gomes et al. (2020), who provide detailed estimates of income moments and sectoral transitions across Brazilian households. We adopt their definition of informality and replicate key statistics, such as the variance, skewness, and kurtosis of earnings in both sectors, as well as the transition probabilities between formal and informal employment. This empirical foundation strengthens the credibility of our quantitative findings and ensures that the model captures salient features of the Brazilian labor market.

We perform two policy experiments to assess the effects of increasing labor income tax progressivity. In the first, we raise the exemption threshold in the tax schedule, thereby reducing the effective tax burden on low-income workers. This reform encourages greater formalization among low-productivity individuals who previously found it optimal to work in the informal sector. The resulting shift into formality expands the tax base, raises aggregate output, and reduces income inequality. Importantly, despite the decline in average tax rates, government revenues remain constant in real terms.

In the second experiment, we combine the expansion of the exemption threshold with an increase in the top marginal tax rate. This policy enhances redistribution while partially preserving the positive effects on output and formal sector participation. Moreover, the additional revenues from taxing high-income earners ensure that government revenues as a share of output remain unchanged.

Throughout the analysis, we assume that the government must raise revenues through labor income taxation. We do not consider the possibility of replacing labor taxes with other instruments, such as consumption taxes or corporate levies. This restriction reflects the empirical importance of labor taxes in financing social insurance and government services in developing economies like Brazil. It also allows us to isolate the optimal structure of the labor tax schedule itself, given the presence of informality and enforcement constraints. Taken together, our results challenge the conventional wisdom that progressive taxation necessarily trades off equity and efficiency. In economies with significant informality and imperfect tax enforcement, greater progressivity may improve resource allocation by altering incentives for compliance and sectoral participation. By encouraging formalization among lower-productivity individuals, a well-designed progressive tax schedule can generate both redistributive and efficiency gains. Our framework provides a policy-relevant lens through which to reassess optimal taxation in the context of developing countries and opens the door to further research on how enforcement frictions shape the equity-efficiency trade-off.

The remainder of the paper is organized as follows. Section 2 presents a simple model that illustrates the core mechanism linking formality costs and labor income tax progressivity. Section 3 introduces the full quantitative heterogeneous-agent model with endogenous sectoral choice. In Section 4, we describe the calibration strategy and document how the model replicates key empirical patterns in the Brazilian labor market. Section 5 presents the policy experiments and discusses the macroeconomic and distributional implications of alternative tax schedules.

2 A Simple Model

In this section, we illustrate our mechanism using a simple static model. In a setting that abstracts from the standard rationales supporting tax progressivity, such as those discussed in Heathcote et al. (2017), we show that labor income tax progressivity can be desirable when households choose between formal and informal employment—a common feature of less developed economies.

We consider a continuum of households, each supplying one unit of labor inelastically, with the total measure of households normalized to one. Households differ in productivity, denoted by $e \in [0, 1]$, which is distributed according to $F(e)$. The wage rate per effective hour of work is normalized to one, so productivity equals labor income. Each household chooses whether to work in the formal or informal sector. In the formal sector, households pay income taxes $\tau(e) \in [0, 1]$, where the tax rate depends on their productivity. In the informal sector, households avoid taxes but face a productivity penalty $\phi(e) \in [0, 1]$, which also depends on their productivity. Let $c(e)$ denote the consumption level of a household with productivity e. In this simple environment, households choose the option that maximizes consumption:

$$
\begin{aligned}
c(e) &= \max\left\{c^F(e), c^I(e)\right\}, \\
c^F(e) &= (1-\tau(e))\, e + T, \\
c^I(e) &= (1-\phi(e))\, e + T,
\end{aligned}
$$

where T denotes a lump-sum transfer from the government, common to all households. The functions $c^F(e)$ and $c^I(e)$ represent consumption under formality and informality, respectively. Households choose formality whenever $\tau(e) \leq \phi(e)$—that is, when the tax burden is lower than the productivity cost of informality.

Government revenues come from labor income taxation and are used to finance lump-sum transfers, T, and government consumption, G:

$$
G + T = \int_0^1 \tau(e) e\, \mathbb{I}\{\tau(e) \leq \phi(e)\}\, dF(e).
$$

The indicator function $\mathbb{I}\{\tau(e) \leq \phi(e)\}$ captures the endogenous choice of formality, since taxes are only collected from formal workers. Aggregate output in this economy equals average productivity, net of productivity losses due to informality:

$$
Y = \underbrace{\int_0^1 e\, dF(e)}_{\text{average productivity}} - \underbrace{\int_0^1 \phi(e) e\, \mathbb{I}\{\tau(e) > \phi(e)\}\, dF(e)}_{\text{informality cost}}.
$$

In what follows, we treat the informality cost $\phi(e)$ as a primitive of the economy, while allowing the government to choose the tax function $\tau(e)$. As noted in the Introduction, we take as given the need to raise revenues through labor income taxation, abstracting from the possibility of using alternative tax instruments or other sources of revenue.

Revenue Maximization and Income Tax Progressivity

Assume the government aims to maximize revenues, either for redistribution purposes or for its own consumption. In the absence of informality, the optimal policy would be to set $\tau(e) = 1$, so that all labor income is fully taxed. In this case, the model without the endogenous choice of formal or informal employment does not imply tax progressivity, as the tax rate is constant across all income or productivity levels.

However, once the option of informality is introduced, the government optimally sets $\tau(e) = \phi(e)$, equating the income tax rate to the productivity cost of informality. If the government were to set a higher tax rate for any given productivity level e, households would switch to the informal sector, and tax revenues would fall to zero. Therefore, setting $\tau(e) = \phi(e)$ maximizes government revenue. In fact, this policy not only maximizes revenue but also maximizes output. In this economy, informal employment introduces inefficiencies, as productivity is lost—akin to an iceberg cost. In contrast, labor income taxes do not generate distortions directly, since labor is supplied inelastically. In other words, the government increases tax rates up to the point where households are just indifferent between formal and informal employment, thereby ensuring that they remain in the formal sector.

Importantly, the optimal tax function $\tau(e)$ inherits the properties of $\phi(e)$. If the cost of informality increases with productivity, i.e., $\phi'(e) > 0$, then the optimal tax rate will also be increasing, $\tau'(e) > 0$. The literature on informality often assumes that the cost of being informal rises with productivity. In this sense, that alone provides a rationale for the government to pursue greater income tax progressivity—a mechanism that has not been explored in the literature on tax progressivity, which typically focuses on developed economies.

Departing from Optimality

We now depart from the optimal policy and consider a setting that brings us closer to the main quantitative analysis of the paper—based on the model presented in the following section—while still allowing us to build intuition about the mechanisms at play. We assume the following functional forms for the initial labor income tax $\tau_1(e)$ and the cost of informality $\phi(e)$:

$$\tau_1(e) = \begin{cases} \underline{\tau} & \text{if } e < e_{\tau_1}, \\ \underline{\tau} + c_\tau(e - e_{\tau_1}) & \text{if } e \geq e_{\tau_1}, \end{cases}$$

$$\phi(e) = \begin{cases} \underline{\phi} & \text{if } e < e_{\phi}, \\ \underline{\phi} + c_\phi(e - e_{\phi}) & \text{if } e \geq e_{\phi}. \end{cases}$$

Each function is defined by three parameters: an initial value ($\underline{\tau}$ for taxes and $\underline{\phi}$ for informality costs), a threshold (e_{τ_1} and e_ϕ) within the $(0, 1)$ interval, and a positive slope (c_τ and c_ϕ) that determines the linear increase in rates above the threshold. We assume there exists a cutoff e^* above which households choose to be formal, which corresponds to the empirically relevant case:

$$e^* = \frac{\underline{\tau} - \underline{\phi} + c_\phi e_\phi - c_\tau e_{\tau_1}}{c_\phi - c_\tau}. \tag{1}$$

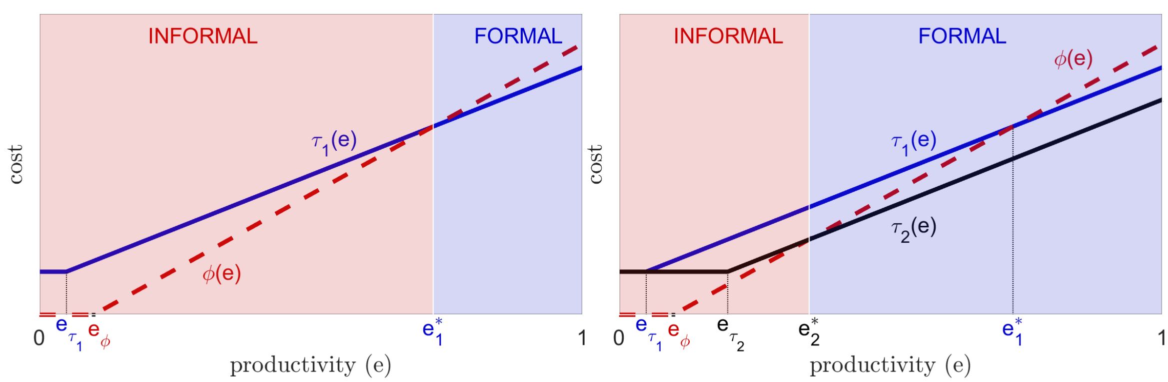
To ensure this condition holds, we assume parameter values such that $e^* \in (0,1)$ and $c_\phi > c_\tau$. This scenario is illustrated in Figure 1a, where the solid blue line represents the tax function and the dashed red line represents the cost of informality. The shaded red area indicates the range of productivity levels for which households choose to be informal. Note that the initial tax function already features some degree of progressivity, as the average tax rate increases with productivity for values above the threshold e_{τ_1}.

The main policy experiment we consider increases the exemption threshold in the tax schedule. The new tax function, $\tau_2(e)$, is identical to the initial one, except that the threshold above which the marginal tax rate rises shifts from e_{τ_1} to e_{τ_2}. For simplicity, we assume the slope c_τ remains unchanged. This case is illustrated in Figure 1b, where the solid black line represents the new tax function.

The new tax function $\tau_2(e)$ leads to a higher degree of formalization. As implied by Equation (1), the productivity cutoff separating informal and formal employment decreases as e_{τ_1} increases. Figure 1b illustrates this effect: the new cuttoff e_2^* is lower than the initial one, e_1^*, indicating that a larger share of households now choose to be formal—the shaded red area shrinks. This shift reflects the lower average tax rate under the new tax schedule.

Figure 1: Informality choice under different tax exemption thresholds

(a) Initial case (b) Expanding the threshold, $e_{\tau_2} > e_{\tau_1}$



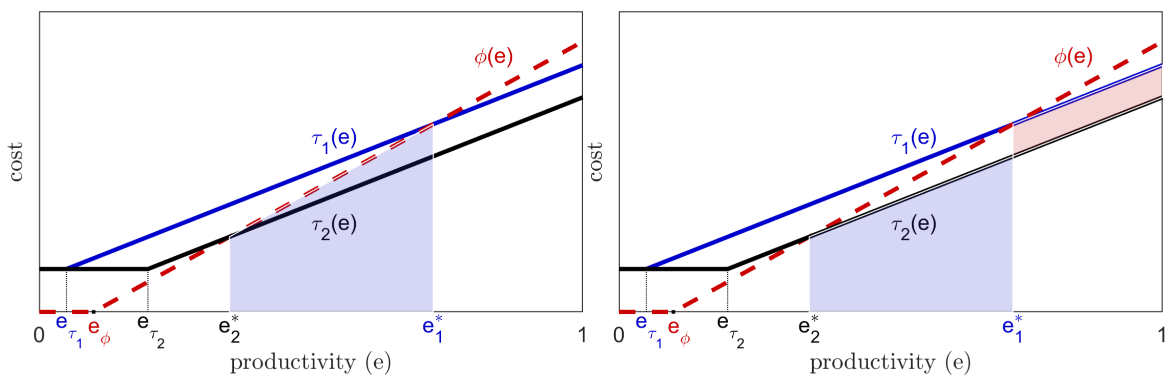
Next, we analyze the implications of this policy for aggregate output and government revenues. Formally, the variation in these outcomes is given by:

$$\begin{aligned} \Delta\text{output} &= \int_{e_2^*}^{e_1^*} \phi(e) e \, dF(e), \\ \Delta\text{revenue} &= \int_{e_2^*}^{e_1^*} \tau_2(e) e \, dF(e) - \int_{e_1^*}^{1} (\tau_1(e) - \tau_2(e)) e \, dF(e). \end{aligned} \tag{2}$$

Figures 2a and 2b illustrate these effects. Intuitively, aggregate output increases unambiguously: households with productivity between e_2^* and e_1^* now switch to formality, avoiding the productivity penalty associated with informality. This gain is represented by the shaded blue area in Figure 2a. If the distribution $F(e)$ is uniform, then this shaded area corresponds exactly to the increase in output. Although we have not made any assumptions about the shape of $F(e)$, it is clear that the larger the mass of households in the interval $[e_2^*, e_1^*]$, the greater the gain in output.

Figure 2: Output and revenue effects of higher tax exemption thresholds

(a) Output (b) Government revenue



In contrast, the effect on government revenues is ambiguous. On the one hand, the government gains new revenue from households that become formal—this is captured by the first term on the right-hand side of Equation (2) and illustrated by the shaded blue area in Figure 2b. On the other hand, it loses revenue from households that were already formal but now face lower tax rates, represented by the second term and the shaded red area in the same figure. As with output, the net effect on revenue depends on the distribution $F(e)$. If most households fall within the interval $[e_2^*, e_1^*]$, the positive effect may dominate. However, this also depends on the new tax rate $\tau_2(e)$ for productivity levels within that interval. If the rate is too low, the additional tax revenue from newly formal households may be insufficient to offset the loss, resulting in a negative overall impact on revenues.

The exercises in this section highlight that reducing tax rates for lower-income households can incentivize formalization and boost output without necessarily reducing government revenues. In such cases, the trade-off between equity and efficiency that often arises in debates over tax progressivity may not apply: consumption, output, and tax collection can all increase simultaneously as lower-productivity individuals transition out of informality. Moreover, the gains in output and consumption may be large enough that the government could find it desirable to compensate any potential revenue loss by increasing taxation on higher-income households. Whether this scenario is quantitatively significant remains an open question, which we explore next.

In the following section, we present our full quantitative model, which incorporates additional features such as endogenous labor supply and intertemporal decision-making. The model also allows us to estimate the distribution of households across productivity levels and the cost function of informality—both of which are unobservable. While the environment becomes considerably richer, the core intuition developed in this section remains central to our main results.

3 Quantitative Model

We now turn to our quantitative model, which we calibrate and estimate using Brazilian data. This model serves as the foundation for our main policy experiments, which compare different stationary equilibria arising from alternative labor taxation schemes.

Households

We consider a continuum of infinitely-lived households with standard preferences:

$$\mathbb{E}_0 \left[\sum_t \beta^t u(c_t, h_t) \right],$$

where c_t denotes consumption and h_t denotes hours worked at time t. Households are heterogeneous in their idiosyncratic productivity, which follows a stochastic process. While households face individual income risk, the aggregate state of the economy remains constant and is known to all agents.

Households can accumulate savings through a risk-free asset. Each period, they choose how much to work, how much to save, and whether to participate in the formal or informal sector. As in the simple model introduced in Section 2, the choice between formality and informality affects both income taxes and labor productivity.

We present the model in its recursive formulation, omitting time subscripts. The individual state of a household is described by its sectoral status—formal (F) or informal (I)—asset holdings a, and the productivity state vector s. Let $V^i(a,s)$ denote the value function of a household in sector $i \in \{F, I\}$. It satisfies:

$$V^i(a,s) = \max_{c,h,a',d' \in \{0,1\}} u(c,h) + \beta \left(d' \mathbb{E}[V^F(a',s')] + (1-d')\mathbb{E}[V^I(a',s')] \right), \tag{3}$$

subject to

$$(1+\tau_C)c + a' = \left(1 + (1-\tau_K)r\right)a + we^i(s)h - \tau_H^i\left(we^i(s)h\right) + T,$$

and the borrowing constraint $a' \geq 0$, where $d' \in \{0, 1\}$ denotes the choice of being formal ($d' = 1$) or informal ($d' = 0$).

Households take as given the wage rate w, interest rate r, consumption tax τ_C, capital income tax τ_K, lump-sum transfer T, and the labor income tax schedules τ_H^i.

The function $e^i(s)$ maps the idiosyncratic state s into effective labor productivity and differs across sectors, allowing us to capture the productivity penalty associated with informality discussed in Section 2. Beyond this static effect, the choice between formal and informal employment also influences the evolution of productivity. The productivity vector s follows a first-order Markov process governed by a sector-specific transition matrix Γ^i, such that $s' = \Gamma^i(s)$.

Importantly, households choose their sector for the next period after observing the current productivity state s, but before realizing the next period's state s', which evolves according to $\Gamma^i(s)$. We further discuss this timing assumption in Section 4. Finally, formal and informal households are also subject to different tax schedules τ_H^i. Section 4 provides additional details on the functional forms, calibration, and estimation of these components.

Firms

Firms produce a final good using capital K and effective labor H according to a constant returns to scale production function $F(K, H)$. They solve a sequence of static profit-maximization problems:

$$\max_{K,H} F(K, H) - (r + \delta)K - wH,$$

where r and w denote the rental rate of capital and the wage rate, respectively, and δ is the depreciation rate of capital. The final good is used by households for consumption and capital accumulation.

Government

The government faces an exogenous level of expenditure each period, G, and provides lump-sum transfers T. It finances these obligations through taxes on consumption, labor income, and capital income, as well as by issuing debt B', subject to a boundedness constraint.

The intertemporal budget constraint is:

$$G + T + rB = \tau_C C + \tau_K A + \int \tau_H^i \left(we^i(s)h \right) + B' - B, \tag{4}$$

where the integral is taken over all individuals, and $i \in \{I, F\}$ indicates whether the individual is employed in the informal or formal sector. The variable $C \equiv \int c$ denotes aggregate consumption, and $A \equiv \int a$ is the total stock of assets in the economy, including both physical capital and government debt. Note that in the stationary equilibrium (defined below), we have $B' = B$.

Stationary Competitive Equilibrium

Given a stock of government debt B, government consumption G, tax rates τ_C and τ_K, lump-sum transfers T, and labor income tax schedules $\{\tau_H^F, \tau_H^I\}$, a *stationary competitive equilibrium* is a set of value functions $\{V^F, V^I\}$, allocation rules $\{c, h, a', d', H, K', B'\}$, and prices $\{w, r\}$ such that:

1. The allocation rules $\{c, h, a', d'\}$ solve the household problem in (3), and $\{V^F, V^I\}$ are the associated value functions;

2. Factor prices are determined competitively:

$$r = F_K(K, H) - \delta, \quad w = F_H(K, H);$$

3. The government budget constraint in (4) is satisfied;

4. The following market clearing conditions hold:

$$\begin{aligned} H &= \int e^i(s)h, \quad i \in \{F, I\}, \\ K + B &= \int a, \\ \int c + G + K' &= F(K, H) + (1 - \delta)K; \end{aligned}$$

5. The distribution of households over their idiosyncratic states (a, s) and employment sector is stationary and consistent with the allocation rules $\{a', d'\}$ and the stochastic processes $s' = \Gamma^i(s)$, $i \in \{F, I\}$;

6. The aggregate stocks of capital and government debt are stationary: $K' = K$ and $B' = B$.

4 Calibration

Functional Forms

The utility function, common to both types of households, is given by:

$$u(c,h) = \frac{(c^{\gamma}(1-h)^{1-\gamma})^{1-\sigma}}{1-\sigma},$$

where γ governs the relative weight of consumption versus leisure, and σ determines the degree of risk aversion and intertemporal elasticity of substitution. Households discount future utility at rate β.

The production function follows a Cobb-Douglas specification, $F(K,H) = ZK^{\alpha}H^{1-\alpha}$, where Z denotes total factor productivity and α is the capital share in output.

Labor Income Tax Schedule

We calibrate the labor income tax schedule to reflect Brazil's labor taxation system, which consists of a proportional component and two main schedules: one for social security contributions and another for individual income taxes.

The tax schedule for formal workers, $\tau_H^F(y)$, is implemented as a stepwise function that maps labor income y into tax liabilities. Informal workers face a discounted version of this schedule, $\tau_H^I(y) = (1-\chi)\tau_H^F(y)$, where χ captures the degree of tax avoidance. Additionally, income taxes are discounted by a factor $d = 22.6\%$ to reflect typical deduction levels alowed by the tax system.

The brackets are defined as:

$$y_1 = \frac{2112}{1-d}, \quad y_2 = \frac{2826}{1-d}, \quad y_3 = \frac{3751}{1-d}, \quad y_4 = \frac{4664}{1-d}, \quad y_5 = \frac{7507}{1-d}.$$

The marginal tax rates (for formal workers) are defined as follows:

1. If $y \leq y_1$: social security tax of 7.5%, no income tax.
2. If $y \in (y_1, y_2]$: social security: 7.5% on y_1, 9.0% on $y - y_1$; income tax: $7.5\% \times (1-d)$ on $y - y_1$.
3. If $y \in (y_2, y_3]$: add 12.0% on $y - y_2$ for social security, and $15.0\% \times (1-d)$ on $y - y_2$ for income tax.
4. If $y \in (y_3, y_4]$: add 14.0% on $y - y_3$ (social security), and $22.5\% \times (1-d)$ on $y - y_3$ (income tax).

5. If $y \in (y_4, y_5]$: add 14.0% on $y - y_4$ (social security), and $27.5\% \times (1-d)$ on $y - y_4$ (income tax).

6. If $y > y_5$: continue taxing marginal income above y_5 at $27.5\% \times (1-d)$.

Formally, the income tax function for formal workers is:

$$\tau_H^F(y) = \tau_0 y + \text{Social Security}(y) + \text{Income Tax}(y),$$

where τ_0 is a flat-rate component and the other two terms are computed by bracket as described above. Informal workers are taxed according to:

$$\tau_H^I(y) = (1-\chi)\tau_H^F(y).$$

This stepwise structure introduces kinks that increase the marginal tax rate as income rises, in line with the Brazilian tax code and its enforcement-adjusted implementation.

Stochastic Idiosyncratic Productivity

We assume that idiosyncratic labor productivity consists of both a persistent and a transitory component, such that

$$e^i(s) = e_P^i(s)\left(e_T^i(s)\right)^\eta,$$

where $i \in \{F, I\}$ denotes the sector (formal or informal), and P and T refer to the persistent and transitory components, respectively. The parameter η serves computational purposes. As described earlier, the productivity vector s evolves according to a first-order Markov process, $s' = \Gamma^i(s)$.

We assume finite grids for both components, so s is an ordered pair, with the first element indexing the persistent component and the second indexing the transitory component. The functions $e_P^i(s)$ and $e_T^i(s)$ then map these indices to sector-specific productivity levels.

For example, consider a household in the informal sector with productivity state $s = (1,1)$, meaning both components are at their lowest grid values. If the household switches to the formal sector and draws the same state $s = (1,1)$, its productivity will correspond to the lowest value in the *formal* sector grid—distinct from its informal-sector value in the previous period. We allow both the transition matrices and the productivity levels to differ across sectors, with the only restriction that the transitory component has zero mean within each sector.

Timing of Formality Decision

As mentioned earlier, we assume that households choose the sector in which they will work in the following period before observing the realization of the productivity vector s'. Thus, the decision is based on the current state s, capturing the persistent component of idiosyncratic productivity. This modeling choice is crucial for generating an endogenous formality/informality decision rule without imposing a parametric cost of informality. We calibrate the grid points of the idiosyncratic productivity process and the associated transition probabilities flexibly to match observed data moments, including income distributions, income risk within each sector, and transitions between sectors, subject only to the restriction that the transitory component is zero in expectation.

Our timing assumption ensures that all grid points are visited in equilibrium, thereby imposing discipline on parameter values. This contrasts with, for example, the sovereign default literature, where parameters associated with unvisited states can be set arbitrarily, effectively acting as free parameters. In our case, such flexibility would amount to imposing an exogenous transition rule between formal and informal employment—an outcome we deliberately avoid.

To refine the parameters of the model, we employ three principal sources of statistical data: (i) macroeconomic time series data spanning from 2018 to 2022, (ii) distributional cross-sectional data points concerning productivity, and (iii) longitudinal data pertaining to the fluctuations in labor earnings. In our model, each cycle corresponds to a year's duration. The model's initial steady state is built to mirror significant aspects of Brazil's economic landscape that influence labor market dynamics. While it is acknowledged that the parameters collectively affect all outcomes within the equilibrium, we allocate specific parameters to particular empirical data points to enhance the clarity of our exposition. The model includes a total of 39 parameters, with 33 of them being adjustable and 6 predetermined. We present the values of these parameters, alongside the corresponding statistics they aim to replicate, in Tables 1 and 2. For an in-depth account of the methodology used to derive these empirical benchmarks, one can refer to the appendix.

Calibration

The calibration strategy is designed to ensure that the model captures the key structural features of the Brazilian economy that are relevant for evaluating labor income taxation and informality. We rely on three primary data sources: (i) macroeconomic aggregates covering the 2018–2022 period, (ii) cross-sectional data on the distribution of earnings across formal and informal workers, and (iii) longitudinal information on income dynamics and sectoral transitions. One model period corresponds to one calendar year, and we calibrate the model to match a steady state that replicates salient empirical moments.

The model features 39 parameters in total, of which 6 are preset based on values from the literature or official data (e.g., depreciation, capital share, discount factor), while the remaining 33 are calibrated internally to replicate specific moments of the Brazilian economy. The calibrated parameters are assigned to different blocks of the model, including preferences, technology, taxation, transfers, and productivity processes. For clarity, we map parameters to individual targets when possible, although general equilibrium interactions imply that all parameters jointly influence outcomes.

Table 1: Benchmark Model Preset Parameters

Description	**Parameter**	**Value**
Preset Parameters		
Discount factor	β	0.92
Consumption share	γ	0.53
Preference curvature	σ	2
Total Factor Productivity	A	1
Capital share	α	0.33
Depreciation rate*	δ	0.1
Tax deductions	d	0.226
Effective capital income tax	$\tau_{K,0}$	0.41
Effective consumption tax	$\tau_{C,0}$	0.20
Effective income tax (contributions)	$\tau_{H,0}$	0.20
Transfers	T_0	0.05
Elision coefficient	χ	0.6
Labor productivity processes		

Persistent shock

$$\Gamma_F = \begin{bmatrix} 0.920 & 0.041 & 0.039 \\ 0.088 & 0.871 & 0.041 \\ 0.097 & 0.170 & 0.733 \end{bmatrix} \quad e_F = \begin{bmatrix} 0.65 \\ 1.00 \\ 1.75 \end{bmatrix} \quad \Gamma_I = \begin{bmatrix} 0.954 & 0.027 & 0.019 \\ 0.011 & 0.874 & 0.115 \\ 0.090 & 0.100 & 0.810 \end{bmatrix} \quad e_I = \begin{bmatrix} 0.10 \\ 0.74 \\ 1.34 \end{bmatrix}$$

Transitory shock

$$P_T = \begin{bmatrix} 0.09 \\ 0.88 \\ 0.04 \end{bmatrix} \quad e_F = \begin{bmatrix} 0.33 \\ 1.00 \\ 1.03 \end{bmatrix} \quad e_I = \begin{bmatrix} 0.71 \\ 0.84 \\ 2.87 \end{bmatrix}$$

*The existing literature often adopts a δ value of 6.5%, but they do account for growth. Considering a growth rate in GDP per capita of 1% or 2%, that brings their value closer to the one used in SAMBA (10.8%).

Preferences are specified using a CRRA utility function over consumption and leisure, with curvature parameter $\sigma = 2$, consumption weight $\gamma = 0.53$, and a discount factor $\beta = 0.92$. These values allow the model to generate plausible labor supply elasticities and intertemporal substitution behavior. On the production side, we assume a Cobb-Douglas production function with a capital share of 0.33 and a depreciation rate of 10%, which is in line with the SAMBA model once long-run growth is netted out. Total factor productivity is normalized to 1 in the steady state.

The tax structure is one of the central features of the model. We replicate Brazil's labor income tax system as a piecewise-linear function combining social security contributions and income taxes. These are applied to formal workers, while informal workers face the same schedule scaled down by a parameter $\chi = 0.6$, which reflects differential enforcement or lower compliance. The effective rates for consumption and capital income taxation are calibrated to 20% and 41%, respectively, and are in line with aggregate tax data. Transfers and government consumption are also included and targeted to match observed fiscal ratios.

A key component of the calibration concerns the modeling of idiosyncratic productivity. We assume a two-dimensional process with persistent and transitory components, each discretized over three states. The transition matrices and productivity levels differ across sectors (formal and informal) and are calibrated to match sector-specific moments: income variance, skewness, and kurtosis, as well as average earnings and Gini coefficients. The transitory component is constrained to have zero mean within each sector to ensure a consistent interpretation of persistent productivity as the main determinant of sectoral sorting.

The model also targets sectoral transition dynamics by matching a 2x2 Markov matrix for employment in the formal and informal sectors. This ensures that the model captures observed persistence and switching patterns across labor market segments. Matching these transition probabilities is essential to accurately evaluating how tax policy affects the incentives to switch between sectors, and to assess the aggregate implications of informality in response to changes in labor income taxation.

Finally, we assess the quality of the calibration by comparing model-implied statistics with their empirical counterparts. The model closely replicates macro aggregates such as investment, interest rates, and government size, as well as income distribution measures, quintile shares, and tax burdens. While some discrepancies remain (e.g., overestimation of upper-quintile formal income share), the model achieves a good overall fit across a wide set of moments. This rich calibration provides a robust foundation for evaluating how changes to the labor income tax schedule affect equity, efficiency, and informality in the Brazilian economy.

5 Policy Experiment

We examine two tax policy experiments focused on labor income taxation. In both, we expand the exemption threshold at the bottom of the income distribution, effectively reducing the tax burden on low-income earners. In the second experiment, we combine this expanded exemption with a higher marginal tax rate for high-income workers. The results, reported as deviations from the benchmark equilibrium, quantify the trade-offs between equity, efficiency, and fiscal balance in an economy where informality is a relevant margin of adjustment.

In the first experiment—expanding the exemption threshold alone—output declines slightly (by 0.9%), but inequality, as measured by the Gini coefficient of total income, falls modestly. Formal employment rises by 2.3 percentage points, driven by stronger incentives at the bottom of the distribution. However, the reform is revenue-neutral: the reduction in income tax revenue is offset by a rise in social security contributions due to increased formality. This suggests that targeted relief for low-income workers can be achieved without major fiscal costs, and with potentially favorable employment effects.

The second experiment—combining the exemption expansion with higher top marginal rates—delivers stronger redistribution, reducing the Gini coefficient by 0.012. However, this comes at a higher efficiency cost: output declines by 3.0% and the increase in formality is more modest (1.7 p.p.). On the fiscal side, revenues rise by 0.8 percentage points of initial GDP, as the additional progressivity raises collections from top earners despite their behavioral responses. These findings highlight a classic trade-off: stronger redistribution comes with efficiency costs, though some can be mitigated when formalization rises in response to lower entry-level tax burdens.

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Table 2: Benchmark Model Economy: Target Statistics and Model Counterparts

(1) Macroeconomic aggregates

Description	**Target**	**Model**
Consumption Income Tax (τ_c)	0.125	0.115
Capital Income Tax (τ_k)	0.06	0.071
Labor Income Tax (τ_h)	0.068	0.112
Labor Income Tax Schedule (τ_{h_s})	0.029	0.053
Transfer to output (%)	8.8	6.1
Governement Expenditures to output (%)	20.9	25.6
Interest Rate (%)	9.2	11.1
Investment to output (%)	12.7	15.6
Proportion of Labor Income Revenue from Informal (%)	20	23.3
Average Labor Income Formal over Informal	1.625	1.620
Gini Labor Income - Formal	0.38	0.36
Gini Labor Income - Informal	0.44	0.43

(2) Statistical properties of income for formal workers

Description	**Target**	**Model**
Variance	0.46	0.45
Skewness	-1.14	-1.28
Kurtosis	14.56	9.73

(3) Statistical properties of income for informal workers

Description	**Target**	**Model**
Variance	0.73	0.73
Skewness	-0.01	-0.17
Kurtosis	6.06	8.73

(4) Labor Income Quintiles - Formal	**Target**	**Model**
1st-quintile	0.079	0.067
2nd-quintile	0.106	0.099
3rd-quintile	0.140	0.121
4th-quintile	0.195	0.309
5th-quintile	0.480	0.403

(4) Labor Income Quintiles - Informal	**Target**	**Model**
1st-quintile	0.040	0.068
2nd-quintile	0.102	0.115
3rd-quintile	0.142	0.143
4th-quintile	0.218	0.169
5th-quintile	0.498	0.506

(5) Markov chain probabilities	**Target**	**Model**
$M = \begin{bmatrix} F-F & F-I \\ I-F & I-I \end{bmatrix}$	$\begin{bmatrix} 0.465 & 0.077 \\ 0.080 & 0.378 \end{bmatrix}$	$\begin{bmatrix} 0.453 & 0.073 \\ 0.074 & 0.400 \end{bmatrix}$

Table 3: Results

Statistics	Benchmark	Varying tax rate at the top 42.5%
Main aggregates		
Output	3.9%	3.0%
Gini - total income	-0.004	-0.012
Fraction of formal HHs (%)	2.3 p.p.	1.7 p.p.
Government budget (% initial GDP)		
Revenues	0.0 p.p.	0.8 p.p.
contributions	0.5 p.p.	0.4 p.p.
income tax	-1.5 p.p.	-0.3 p.p.