The Impact of Social Security Reform on Occupational and Retirement Behavior: A Quantitative Assessment for Brazil

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Abstract

Brazil is not prepared to cope with population ageing. In fact, the country already spends a high proportion of GDP on retirement benefits given its income level and its still relatively young population. As a consequence, the deficit of the social security system has steadily increased since 1996 and is already approaching 6% of the Brazilian GDP. Several explanations have been provided for this increase such as the generous pensions provided mainly for civil servants whose benefits do not have an upper limit, the lack of a statutory minimum retirement age for those who contribute to the system for a certain period of time, the widespread labor informality which undermines the capability of the system to increase its revenue. Even though some attempts to reform the social security since the 1990s, there is a lot to be done in order to bring the trajectory of deficit back on track. In this paper, we develop, estimate and calibrate a dynamic general equilibrium model of occupational choice and retirement behavior to quantitatively study the social security problem in Brazil. In particular, in our model economy agents choose whether to work in the public, formal or informal sectors or stay home and, at later stages of the life-cycle, they are also allowed to decide the age of retirement. We estimate the parameters of the model by matching data moments on occupational choices, employment transitions, wages, and retirement from the Brazilian Monthly Employment Survey (Pesquisa Mensal de Emprego). Several counterfactual experiments are carried out in order to assess how changes in the rules of the social security affect labor allocation across the sectors, retirement behavior and life-cycle savings.

1 Introduction

Brazil is in the middle of a demographic transition. On the one hand, the average number of births per woman decreased from 4.98 in 1980 to 1.98 in 2007. At the same time, life expectancy increased from 56.87 years in 1980 to 72.5 years in 2007, being now around 75.5 in big states such as Sao Paulo, Minas Gerais, Rio Grande do Sul, Santa Catarina and Brasilia. As a consequence, the share of individuals aged 65 and over jumped from 4% in 1980 to 6.2% in 2007 and it is expected to reach 22% by 2050. As a combination of these facts, the dependency rate will likely follow a U shape in the years ahead, so that it is important to use the demographic bonus to generate the wealth that will be used to finance the higher expenditure to support the elderly population in the future.

The challenge is difficult since the country is not prepared to deal with population ageing. In fact, Brazil already spends a high proportion of GDP on pensions for a country of its income level and with a still relatively young population. Considering the social security system as a whole (public and private sector regimes), Brazil's public pension expenditure is about 9 percent of GDP, above the OECD average (Giambiagi and Mello, 2006). Given that OECD countries are generally not only wealthier, but also signicantly older, Brazil's expenditures are clearly excessive, draining resources away from other areas, such as health and education.

According to the Ministry of Social Security, the deficit regarding social security benefits has steadly increased since 1996 and is already approaching 6% of the Brazilian GDP. Around 70% of the deficit is due to the deficit from the social security of retirees from the public sector. A reason is that the rules used to calculate the retirement benefit for public sector workers are more generous than the ones used for the private sector workers. Starting in 1991, the workers from the private sector can retire with full benefit if they have contributed for 35 years. The benefit is defined as the arithmetic average of the 80% higher salaries over the lifecycle up to an upper limit, which does not reach 10 times the minimun wage. On the contrary, the retirement benefit in the public sector is equal to the last wage and does not have any upper limit. Therefore, the retirement benefit for private workers is potentially much lower than that of civil servants. In fact, according to the Brazilian Ministry of

Planning, the average benefit in the private sector amounts 1.7 times the mininum wage, while in the public sector the average benefit is around 20 times the minimum wage. Besides being extremelly inequitable, this system poses important obstacles to the flexibilization of the labor market.

Spending pressures also mounted because the average retirement age, despite recent improvements, is still relatively low in Brazil, which runs counter to international trends. Indeed, while in Brazil workers in the private sector that meet the eligibility requirement regarding to the minimum number of contributions retired on average around age 56 in 2004, in most OECD countries, the minimum statutory retirement age is 65 years, with the exception of France, South Korea (60 years) and Norway (67 years) (Giambiagi and Mello, 2006). This is so because Brazil does not have a minimum retirement age for those who have contributed to the social security system for 35 years. As a consequence, an individual that started contributing to the system at age, say, 16 can retire at age 51. The problem with that lies in the fact that life expectancy at 60 years of age is 25 years, which is comparable to the average of the OECD countries, so that pension benefits are paid in Brazil for a period much longer than what is done in those contries.

In terms of revenue, only after 2003 the workers in the public sector started paying a contribution of 11% to social security, while they did not contribute at all before. The contribution rate in the private sector is progressive between 8% and 11%. However, an expansion of the base of contributions to social security has been constrained by widespread labour informality, which has increased substantially in Brazil: from around 30% of the workforce in 1980, to 40% in 2000 (Soares, 2004). In fact, according to Neri (2002), 95% of the workers in the formal sector contribute to retirement, while only 5% of the workers in the informal sector do so. The problem was aggravated by the introduction of a number of means-tested programs since the early 1990s, which ensure a minimum wage for low-income individuals - especially the elderly and the disabled - regardless of their contribution history. Overall, this programs reduce the incentives for formalization thereby further increasing the size of the informal sector.

Since the late 1990s, there have been some attempts to enhance the sustainability of the social security system over time. A minimum retirement age of 53 was introduced for

private workers who meet the minimum number of contributions requirement. Even though this constitutes an advance, the average age of retirement will still remain low in comparison to 60/65 of the OECD countries, which, as said before, have comparable life-expectancy. In addition, new civil cervants have to work for at least 10 years in the public sector before being entitled to benefits from this sector and, intead of receiving the last wage, their benefits will be based on the average of earnings during the working life. Nevertheless, benefits in the public sector still do not have an upper limit.

The goal of the present analysis is to quantitatively assess the impacts of the reforms that have been made and changes that should be considered to ensure the sustainability of the social security system. In particular we seek to address the following questions: 1) How would occupational choices and retirement decisions change if we make the social security system more equitable, aligning retirement benefits in the public sector with those in the private sector? 2) How would individuals' behavior be affected by an increase of the minimum retirement age? 3) Would the level of formalization in the labor market and the average retirement age increase if we eliminate non-contributoty benefits? 4) What types of agents would be more affected in terms of occupational choice, skilled or unskilled workers? (5) By how much would private savings increase with these changes in the social security rules?

Addressing these issues simultaneously with the discipline imposed by general equilibrium modelling is, nevertheless, not an easy task, since such analysis invariably involves the construction of models capable of matching selected statistics of the actual economy, the rules of the social security system as well as replicating individuals ocuppational decisions over the life-cycle. The present paper constitutes an attempt in this direction. To guide our assessment, we develop a dynamic general equilibrium model with overlapping generations in which individuals make decision about their occupation, retirement and life-cycle savings. In particular, the model economy considered in this paper is populated by a large number of agents who live for a realistic number of periods and have preferences over consumption. At each period of time, they choose whether to work in the public, formal or informal sectors or stay home. At later stages of the life-cycle, they are also allowed to decide the age of retirement. Moreover, agents in our economy face sector-specific idiosyncratic productivity shocks, against which they cannot directly insure. However, they can trade an asset subject

to an exogenous lower bound on asset holdings. Following Aiyagari (1994), this asset takes the form of capital. Thus, savings may be precautionary and allow partial insurance against the idiosyncratic shocks.

We estimate the parameters of the model by matching data moments on occupational choices, employment transitions, wages, and retirement from the Brazilian Monthly Employment Survey (Pesquisa Mensal de Emprego). We show that the model is able to replicate the data fairly well.

As far as we know, there is no other paper that explicitly models the retirement system in the public sector in Brazil, even though it constitutes the most important origin of deficit in the system as a whole. The literature is also silent about the consequences of making the system more equitable on individuals' behavior, despite its positive effects on the flexibility of the labor market. Moreover, even though the widespread belief that informality affects the social security budget, the link has not been fully studied yet. Hence, the novelty of this paper lies in the development of a framework that enable us to investigate these issues simultaneously.

Besides this introduction, this paper is organized as following. In section 2, we present the model which will be used to guide our quantitative assessment. In section 3, the data and calibration procedures are described. In section 4, we discuss the main results. Section 5 concludes.

2 The Model

2.1 Demography, preferences and occupational choices

The model economy is populated by a continuum of mass one individuals. In each time period, a new generation is born with probability one. These individuals survive for a finite number of periods T, which is deterministic. The share of age-t individuals in the economy is denoted by γ_t. In addition, at each age t, individuals are heterogenous with respect to their educational attainment $i = 1, ..., I$. Let μ_i denote the share of individuals with education level i in the population. Both the age, $\{\gamma_t\}_{t=1}^{T}$, and education, $\{\mu_i\}_{i=1}^{I}$, distributions are

exogenous and satisfy $\sum_{t=1}^{T} \gamma_t = 1$ and $\sum_{i=1}^{I} \mu_i = 1$.

In each period of life, individuals are endowed with one unit of time, which is inelastically supplied to the labor market. They enjoy utility from consumption, c_t, over the life cycle according to:

$$E_0 \left(\sum_{t=1}^{T} \beta^{t-1} u(c_t) \right) \tag{1}$$

where β is the subjective discount factor, and E is the expectations operator conditional on information at birth. The utility function of each period is assumed to take the form:

$$u(c_t) = \frac{{c_t}^{1-\gamma}}{1-\gamma} \tag{2}$$

where γ denotes the risk aversion parameter.

During their working life, an individual can choose among four mutually exclusive and exhaustive alternatives: work in the informal sector, I, engage in home production, H, work in the formal sector, F, or work in the public sector, G. Let $d_{m,t}(\omega_t)$ denote the decision m of an individual with steady space ω_t at age t, such that $\sum_{m \in \{I,H,F,G\}} d_{m,t}(\omega_t) = 1$. After meeting the elegibility requirements for retirement, individuals can also choose whether ot not to leave the labor force. In our model, thus, the retirement decision is endogenous.

2.2 The social security system

The Social Security in Brazil is a pay-as-you-go system, which transfers income from workers to retirees. The system is financed with payroll taxes, and has two very different regimes – the private sector regime and the public sector regime.

The private sector regime is organized under INSS, which stands for National Institute of Social Security, and establishes a contribution rate according to wage levels (as taxas sao 8, 9 and 11%). Individuals who have contributed for at least 30 years (for proportional benefits) or 35 years (for integral benefits) may apply at anytime for retirement pensions. After december of 1998, applications for proportional entitlements were allowed only for individuals aged 53 and over. The value of the retirement benefit corresponds to the average

of 80% highest wages and salaries. Individuals aged 65 (the normal retirement age) and over need only 15 years of contributions to be entitled to retirement benefits. Low-income agents that do not contribute to the system will be entitled to a benefit equal to one minimum wage a month, after reaching age 65. Hence, applications for retirement pensions can be made under two different modalities: one based on the length-of-contribution and another one based on age. Let $b^p(x, t_{ss})$ denote the retirement benefit of the individual in the private sector, where x denotes the average past earnings and t_{ss} denotes the number of contributions to the social security system. Thus, $b^p(x, t_{ss})$ can be written as follows:

$$b^p(x, t_{ss}) = \max(\psi_p(t_{ss})x, y_{\min}) \tag{3}$$

where $y_{\min}$ denotes the minimum wage of the model economy.

The average lifetime earnings, x, is calculated by taking into account individual earnings up to the age of withdrawal from the labor force, t_r, that are lower than the maximum taxable income, $y_{\max}$. Thus, the law of motion for x can be written as:

$$x_{t+1} = \frac{x_t(t-1) + \min\{y_{F,t}, y\max\}}{t}, \ t = 1, ..., t_r \tag{4}$$

Note that only earnings from the formal sector are considered in the calculation of x. This is so because we are assuming that individuals in the informal sector or not in the labor force do not contribute to the social security system and then the earnings from these sectors are not used in (4). This assumption is widely supported by the data. Indeed, based on a survey of the urban underground economy carried out by the Brazilian Institute of Geography and Statistics (IBGE) in 2003, Neri (2002) shows that only 5% of the workers in the informal sector contribute to the social security, while 95 % of the formal workers do so.

The parameter $\psi_p(t_{ss})$ in (3), in turn, denotes the retirement replacement rate as a function of the number of contributions. We specify $\psi_p(t_{ss})$ in such a way that it mimics the rules of the social security system for private workers. For those who apply for benefits under the length of contribution modality, we have that the replacement rate is given by:

$$\psi_p(t_{ss}) = \begin{cases} 0 \ for \ t_{ss} < 30 \\ 0.70 + 0.05(t_{ss} - 30) \ for \ 30 \leq t_{ss} < 35 \\ 1 \ for \ t_{ss} \geq 35 \end{cases} \tag{5}$$

Under the age modality, individuals aged 65 and over who have met the fifteen years minimum contribution requirement are entitled to 70% of their average lifetime earnings x. For each additional year worked beyond the lower limit, the fraction of x they are entitled to increases in one percentage point up to 100%. Formally, we have the following specification for the retirement replacement rate under this modality:

$$\psi_p(t_{ss}) = \begin{cases} 0.55 + \frac{t_{ss}}{100} \ for \ t_{ss} \geq 15 \\ 0 \ otherwise \end{cases} \tag{6}$$

Now we turn to the especification of the benefits function for public sector retirees. According to constitutional rules, the hiring process for civil servants is provided by public competition. Once approved, selected and hired, civil servants have special rights, including a different pension system. In particular, retirement benefits for civil servants do not have an upper limit and correspond to the last wage. Further, retirement is mandatory at age 70 in the public sector.

In order to retire in the public sector under the length of contribution modality, individuas must have contributed to the system for at least 30 years for proporcional benefits and for 35 years for full benefits. Let $b^g(x, t_{ss})$ =max$(\psi_g(t_{ss})y_{G,t_r-1}, y_{\min})$ denote the retirement pensions of an individual who retired in the public sector based on his/her constribution history, where $\psi_g(t_{ss})$ follows the specification presented in (5).

Civil servants older than 65 years of age can apply for benefits under the age modality. In this case, individuals are entitled to a proportion $\frac{t_{ss}}{35}$ of their last wage, that is $b^g(x, t_{ss})$ =max$(\frac{t_{ss}}{35}y_{G,t_r-1}, y_{\min})$. It should be noticed that this formula entails low benefits for agents that reach 65 with a small number of contributions.

2.3 Individuals' budget constraints

Individuals' earnings in the occupation $m = \{I, F, G\}$, $y_{m,t}$, depends on their human capital h_t and on an occupation-specific productivity shock, $z_{m,t}$.

$$y_{m,t} = wh_{m,t}e^{z_{m,t}} - \tau_m \left(wh_{m,t}e^{z_{m,t}}\right) \tag{7}$$

where τ_m is the contribution to social security from sector's m earnings when the wage rate is w. It is important to recognize that the contribution τ_m does depend on the sector. First, the workers in the formal sector pay a progressive schedule as follows:

$$\tau_F = \begin{cases} 8\% \text{ if } y_{m,t} \leq y_1 \\ 9\% \text{ if } y_1 < y_{m,t} \leq y_2 \\ 11\% \text{ if } y_{m,t} > y_2 \end{cases} \tag{8}$$

where (y_1, y_2) correspond to the bend points applied to calculate the tax payable.

The workers in the public sector did not contribute to the social security system until 2003, when they started paying a flat rate of 11%. Given that our benchmark economy is based on the rules prevailed until 1998, we start with $\tau_G = 0$. Likewise, we set $\tau_I = 0$, thus assuming that informal workers do not contribute to the social security, which is in line with the empirical evidence providaded by Neri (2002).

We follow a stardard Mincer-Griliches formulation to specify an individual's human capital h_t as a function of schooling, s, and age, t, which is used as a proxy for experience, as follows:

$$h_{m,t} = \gamma_{m,0} + \gamma_{m,1}s + \gamma_{m,2}t + \gamma_{m,3}t^2 \tag{9}$$

We also consider alternative specifications adding, for example, age-occupational choices interation terms in order to capture the fact that working in different sectors may affect an individual's human capital differently.

The income for individuals who choose to stay home consists of a constant level of income plus a component that fluctuates randomly with age, that is:

$$y_{H,t} = \bar{y}_H e^{z_{m,t}}$$

In this equation, $\bar{y}_H$ is intended to represent a lower bound on income, suggesting that some types of social networks provide a positive amount of income to the individual.

The occupation-specific productivity shocks, $z_{m,t}$, are assumed to follow first-order autoregressive processes such that:

$$z_{m,t} = \gamma_m z_{m,t-1} + \nu_{m,t}$$

where the components $\nu_{m,t}$ are $NIID\left(0, \sigma_m^2\right)$.

We assume that individuals save in a risk-free asset which pays an interest r. They cannot have negative assets at any age, so that the amount of assets carried over from age t to $t+1$ is such that $a_{t+1} \geq 0$. Furthermore, given that there is no altruistic bequest motive and death is certain at age $T+1$, agents at age T consume all their assets, that is, $a_{T+1} = 0$.

The budget constraint for non-retired individuals is given by:

$$c_t + a_{t+1} = \sum_{m \in \{I,H,F,G\}} d_{m,t} y_{m,t} + (1+r)\, a_t \tag{10}$$

while a retiree's budget constraint can be written as follows:

$$c_t + a_{t+1} = b^j(x, t_{ss}) + (1+r)\, a_t + \xi \tag{11}$$

where $j = \{p, g\}$ and ξ denotes government transfers.

2.4 Value Functions

Let ω denote an individual steady state, which depends on the asset holdings, a, at the beginning of the period, on schooling, on number of years worked in the formal sector, t_f, and in the public sector, t_g, on the average lifetime earnings, x, and on a vector of the occupation-specific income shocks, $[z_m]$, where $m = \{G, F, I, H\}$, so that $\omega = (a, s, t_f, t_g, x, [z_m])$. Let $V_{m,t}(\omega)$ denote the value function of an agent in the occupation m at age t. In order to derive the value functions that guide choices made by agents, consider first individuals that are out of the public sector. At the beginning of each period, they receive an job offer from this

sector with probability $P_{m,t}(\omega)$, and with probability $1 - P_{m,t}(\omega)$ they do not. Thus, the value functions $V_{m,t}(s)$ for $m \neq G$ and $t = 1, ..., T_R$ can be written as follows:

$$V_{m,t}(\omega_t) = \max_{a_{t+1}} : u(c_t) + \beta \left[P_{m,t}(\omega_t) EV^A_{t+1}(\omega_{t+1}) + (1 - P_{m,t}(\omega_t)) EV^B_{t+1}(\omega_{t+1}) \right] \quad (12)$$

$$subject\ to\ (10) \quad (13)$$

where $V^A_t(\omega_t)$ and $V^B_t(\omega_t)$ are given by:

$$V^A_t(\omega_t) = \max\{V_{G,t}(\omega_t), V_{F,t}(\omega_t), V_{I,t}(\omega_t), V_{H,t}(\omega_t)\} \quad (14)$$

$$V^B_t(\omega_t) = \max\{V_{F,t}(\omega_t), V_{I,t}(\omega_t), V_{H,t}(\omega_t)\} \quad (15)$$

Consider now an individual that currently works in the public sector, that is $m = G$. For simplicity, the probability of this individual receiving an job offer from the public sector is set to 1. As a consequence, a public servant ia allowed to continue working for the government or goes to either the formal or informal sector, or engages in home production. Hence, $V_{G,t}(s)$ is given by the following dynamic program:

$$V_{G,t}(\omega_t) = \max_{a_{t+1}} : u(c_t) + \beta EV^A_{t+1}(\omega_{t+1}) \quad (16)$$

In the case that an agent has met the eligibility requirements for social security benefits (age or/and minimum of contributions), he or she can retire and the value functions in (14) can be rewritten as follows:

$$V^{AR}_t(\omega_t) = \max\{V_{G,t}(\omega_t), V_{F,t}(\omega_t), V_{I,t}(\omega_t), V_{H,t}(\omega_t), V_{Rj,t}(\omega_t)\} \quad (17)$$

$$V^{BR}_t(\omega_t) = \max\{V_{F,t}(\omega_t), V_{I,t}(\omega_t), V_{H,t}(\omega_t), V_{Rj,t}(\omega_t)\} \quad (18)$$

where $j = G$ if the agent is a civil servant or $j = P$ if the agent is a private worker. Once we have calculated (17), the value functions in (12) and (16) can also be obtained for the case in which the individual is eligible for retirement benefits.

2.5 Technology

To be done

2.6 Equilibrium

To be done.

3 Data

We use the Brazilian Monthly Employment Survey (*Pesquisa Mensal de Emprego*), henceforth referred to as PME.[1] PME is a monthly household survey with a sampling procedure that is similar to the US Current Population Survey (CPS). Around forty thousand households are interviewed in the metropolitan areas of São Paulo, Rio de Janeiro, Belo Horizonte, Salvador, Recife, and Porto Alegre. Each household is interviewed at most 8 times. It is convenient to study Table ?? to understand the peculiarities of PME. Every month the survey is conducted, there are 8 rotation groups to be interviewed. For example, in January/2002, these 8 groups in Table ?? are denoted by C1, C2, C3, C4, A5, A6, A7, and A8, respectively. The group A8 had its first interview in January/2001 and will have its fifth interview in January/2002. It will leave the PME sample after its last interview, which takes place in April/2002. Because we do not use the data from 2001, we have observations for that group only for 2002. Because we have information only for that year, we choose exclude group A8 from our analysis. Similarly, all groups that are shown in a pink cell are excluded.

Now, consider group C4. It has its first interview in January/2002. Note that its fourth interview takes place in April/2002. Because we use the data for 2003, we observe the same group C4 from January/2003 through April/2003. Therefore, we have observations for the same months over two different years for group C4. As a result, we include group C4 in our analysis. Similarly, all included groups are represented in our Table with green cells.

As stated before, the PME is a household survey. It contains labor market data for every person above 10 years-old who lives in the household. In total, PME has information about

[1] See Ribas and Soares (2008b) for a thorough description of the PME.

195,710 people who are in the included groups over the years 2002-2004. Out of those, 34,281 are males who are at least 26 years-old and at most 85 years-old, head of the household, and not enrolled in school.[2] We also discard from our data individuals who are not followed by PME over two years because of attrition.[3] Because our goal is to model the choices of workers, we also drop from our analysis employers. Our final sample contains data on 28,125 individuals.

Table ?? shows occupational choice by race of individuals aged between 26 and 60 years-old. [4] White individuals are more likely to be working in the formal sector and less likely to be at home. The differences are more pronounced when the comparison is made across schooling groups. The more educated groups are more likely to be working in the formal or public sectors. They are less likely to be home or working in the informal sector.

Table ?? presents the transition over all ages and by age groups. Clearly, there is strong persistence in occupational choices: over all ages, over 76% of the individuals in the informal sector in year t are also working in the same sector at year $t+1$. The figure for the formal and public sectors are 79.7% and 65.9%, respectively. The lower persistence in the public sector is partially explained by exit of the labor force via retirement. However, the pattern is not uniform across all ages: the persistence of staying in the same sector follows an inverted U-shape: It first increases and then decreases as agents continue to age.

Figure ?? plots the mean log income profile over ages 26-60 for the informal, formal, and public sectors.[5] As shown in the figure, there is a clear hierarchy: the mean log income in the public sector is the highest for all ages, followed by that of the formal sector. The informal sector has the lowest mean log income profile for all ages. We quantify these differences by estimating a simple random effects regression of log income against a quadratic in age, dummy races, years of schooling, a dummy for the formal sector, and a dummy for the public

[2] About 3% of the males at least 26 and at most 85 years-old who are head of the household are enrolled in school.

[3] Attrition in PME happens because of three different reasons. The first two are geographical mobility and refusals. There is nothing we can do to alleviate this problem. The third reason for attrition is the difficulty in linking observations from two different years. To avoid this problem, we follow the procedure proposed by Ribas and Soares (2008a).

[4] In what follows we truncate our analysis to age 60 because retired individuals dominate the sample above that age.

[5] We adjust the income figures for inflation by using the Getulio Vargas Foundation CPI index (Índice de Preços ao Consumidor) and adopt December/2008 as the base. See Table A1.

sector.[6] This simple regression estimates that the income in the formal sector is about 10% higher than in the informal sector, while the income in the public sector is over 20% higher than in the informal sector. From column 2, we see that the growth rate of income in the formal sector is higher than in the informal or public sector. In column 3 we see that black workers' income are about 20% below that of white. However, these differences are uniform across sectors. Finally, column 4 shows that the higher the education of an individual, the higher the differences in income in the formal or public sectors with respect to the informal sectors. One important remark is that a year of education is associated with 11% higher income for all specifications.

In Table ??, we estimate the increase in income for those individuals who switch from one sector to another. This is done by estimating a fixed-effect regression. Note that in this case, a switch from the informal to formal or public sector is associated with an increase in the income of about 4.6% or 8.5%, respectively. Note that these numbers are less than half those generated by the random effects regression.

4 Estimation results

To be done

5 Model fit to data

To be done

6 Counterfactual experiments

To be done

7 Conclusion

To be done

[6] We also added dummies for metropolitan areas (excluded dummy for Sao Paulo) and an intercept.

8 References

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