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CURSO DE CIÊNCIAS ECONÔMICAS

MARLON DOMINGOS FERREIRA

ANÁLISE MACROECONÔMICA DOS EFEITOS DE BEM-ESTAR DA PRIVATIZAÇÃO DE EMPRESAS ESTATAIS NO BRASIL

FORTALEZA
2018

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Monografia apresentada a Coordenação do Curso de Ciências Econômicas da Faculdade de Economia, Administração, Atuária, Contabilidade da Universidade Federal do Ceará para obtenção do grau de Bacharel em Ciências Econômicas.

Orientação: Prof. Dr. Marcelo de Castro Callado

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“Avoid wars you can’t win, and never raise your flag for an asinine cause like slavery”
(Francis Underwood)

RESUMO

Segundo Aschauer (1989), a privatização tende a aumentar o PIB e a produtividade devido à relativa maior eficiência econômica do setor privado. Este estudo investiga os efeitos de bem-estar da privatização de empresas estatais no Brasil. Foram usados dados do IBGE e do IPEADATA para calibrar um modelo, seguindo o trabalho de Kydland e Prescott (1982), modificado para se adequar aos modelos não-estocásticos propostos por Pereira e Ferreira (2010; 2018) e Bezerra et al. (2014). Foram identificados efeitos de bem-estar relevantes da privatização, mesmo sob o pressuposto de que as empresas estatais são economicamente mais eficientes do que as empresas privadas.

Palavras-Chave: Privatização. Eficiência Econômica, Bem-estar.

ABSTRACT

According to Aschauer (1989), privatization tends to enhance GDP and productivity due to the relative higher economic efficiency of the private sector. This paper investigates the welfare effects of the privatization of state enterprises in Brazil. We use data from IBGE and IPEADATA to calibrate a model, following the seminal work of Kydland and Prescott (1982), modified to fit non-stochastic models proposed by Pereira and Ferreira (2010; 2018) and Bezerra et al. (2014). We found relevant welfare effects from privatization, even under the assumption that state enterprises are more economically efficient than are private enterprises.

Keywords: Privatization; Economic Efficiency; Welfare.

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LISTA DE ABREVIATURAS E SIGLAS

CGU	Controladoria Geral da União
IBGE	Instituto Nacional de Geografia e Estatísticas
IPEA	Instituto de Pesquisa Econômica Aplicada
PIB	Produto Interno Bruto
STN	Secretaria do Tesouro Nacional

SUMÁRIO

1. INTRODUCTION AND LITERATURE REVIEW

The present work develops a variation of the neoclassic growth model, modified to analyze the effects of privatization of Brazilian state enterprises on the growth of the macroeconomic aggregates and social welfare.

The model assumes the existence of three kinds of capital: a private capital belonging to the private sector; a mixed capital (public and private) belonging to state enterprises; and a pure public capital (public good infrastructure), whose spillovers allow no private appropriation. The capital submitted to privatization in this model is the mixed capital.

Additionally, it is supposed that the government offers public goods, invests, collect taxes, receives income (profits) from state enterprises, sends transfers to individuals and pays interests on the stock of the public debt.

The model is calibrated to Brazil using the standard methodology of non-stochastic models, following the models developed by Pereira and Ferreira (2010; 2018) and Bezerra et al. (2014), in line with the model by Kydland and Prescott (1982).

To investigate the impact of either public capital or infrastructure on the economy, Aschauer (1989) estimated the productivity of the public capital. Although the estimates vary widely, Aschauer (1989), Dufy-Deno and Eberts (1991), and Easterly and Rebelo (1993) confirmed the hypothesis that public capital affects positively both the productivity and the output of the economy. On the other hand, Holtz-Eakin (1992) and Hulten and Schwab (1992) did not confirm this effect. Several studies, such as Schmitz and Teixeira (2008), and Boardman et al. (2016) have found positive impacts of privatization on both economic growth and total-factor productivity. Pereira and Ferreira (2018) see the weak performance of public capital as a reason for the wave of privatization in Brazil in 1990 and thereafter.

Barnett (2000) analyzed 18 countries and found a significant and positive impact of privatization on both growth and employment. Contrary to Barnett (2000), Cook and Uchida (2003) - using cross country regressions in developing countries—suggest a weak and, sometimes, negative relationship between privatization and economic growth, which would indicate that privatization alone would not be sufficient to ensure greater economic growth; thus indicating the need for further investigation of the impact of this privatization on economic growth and welfare.

According to Amaral and Lima (1998) there has been no uniformity in the use of revenues obtained from the disposal of public assets in several countries. France and England financed current spending and Turkey financed housing investments. In Brazil and Mexico, domestic debt payment was a priority because of the high roll-out cost and the heterogeneity of liabilities. Therefore, in this article, we carried out simulations of privatization policies, in which the resources coming from privatization were directed to the reduction of the public debt.

2. MODEL AND CALIBRATION

In this paper, we used a neoclassic model in a closed economy with government, such as that developed by Kydland and Prescott (2012), following the calibration and specifications of the Brazilian economy by Ferreira and Nascimento (2005), Pereira and Ferreira (2010; 2018), Santana et al. (2012), and Bezerra et al. (2014). The model has three agents: a representative firm, a representative household, and the government.

2.1. Firm

The *per capita* aggregate production function of this firm is a Cobb–Douglas function such as (1):

$$Y_t = A_t(Kp_t + \phi Kg_t)^{\theta} {H_t}^{1-\theta} {G_t}^{\gamma} \quad (1)$$

where A_t is technology, θ e *(1-θ)* are, respectively, the elasticity of the output in relation to capital and to labor, and γ measures the intensity of the infrastructure capital spillovers. Constant returns to scale to capital and labor have been imposed. ϕ is the productivity of the capital of state enterprises in relation to private enterprises. The t subscripts index years. The problem of the firm is (2):

$$\max_{Kp_t, Kg_t, H_t} A_t(Kp_t + \phi Kg_t)^{\theta} {H_t}^{1-\theta} {G_t}^{\gamma} - r_t Kp_t - r_{g_t} Kg_t - w_t H_t \quad (2)$$

where r_t, e, and $r_{g_t}$are, respectively, the private and the public capital rent rates, and w_t is the wage per worked hour. It was assumed $A_t = A$ to all periods of time.

2.2. Household

The representative household lives through infinite periods, and its preferences are as such (3):

$$U(c_t, Cg_t, h_t) = \sum_{t=0}^{\infty} \beta^t \{ln(c_t + \mu Cg_t) + \psi ln\,(1 - h_t)\} \tag{3}$$

where μ measures how much the household values the public consumption in relation to the private consumption, and ψ weights leisure on the utility function. The household shares its wealth between private capital stock (k_{p_t}) and bonds (b_t), and it receives income based on labor ($w_t h_t$), rents from public ($\alpha_t r_{g_t} Kg_t$) and private capital ($r_t k_{p_t}$), interest ($\rho_t b_t$), and transfers (tr_t). The household budget, where the income can be used to consume (c_t), to invest (i_{p_t}) or to buy bonds ($b_{t+1} - b_t$), is (4):

$$\begin{aligned}(1 + \tau_{c_t})c_t + i_{p_t} + b_{t+1} - b_t = (1 - \tau_{h_t})w_t h_t + (1 - \tau_{kp_t})r_t k_{p_t} + \\ (1 - \tau_{b_t})\rho_t b_t + tr_t + \alpha_t(1 - \tau_{kg_t})r_{g_t} Kg_t\end{aligned} \tag{4}$$

Where w_t is the working hour wage and h_t is the hours worked. r_t and $r_{g_t}$are, respectively, the discount rates from private and public capital. It can be observed that α_t, where $\alpha_t \in (0,1)$, represents the fraction destined to the families of the revenue from the capital lease of the state-owned enterprises, for example, by public company shares held by the people, and ρ_t is the interest rate from the public debt. The parameters τ_{c_t}, τ_{h_t},τ_{kp_t}, and $\tau_{kg_t} e\, \tau_{b_t}$ are, respectively, the tax rates on consumption, labor income, and rents from private and public capital and bonds.

Private and public capital are described in (5) and (6):

$$k_{p_{t+1}} = (1 - \delta)k_{p_t} + i_{p_t} \tag{5}$$

$$Kg_{t+1} = (1 - \delta)Kg_t + Ig_t \tag{6}$$

where δ is the depreciation rate of the capital.

2.3. Government

The government provides public goods and services (Cg_t) and transfers (TR_t). It also invests in public infrastructure (J_t) and state enterprises (Ig_t). On the revenue side, the government collect taxes on consumption ($\tau_{c_t} C_t$), labor income ($\tau_{h_t} w_t H_t$), private capital income ($\tau_{kp_t} r_t Kp_t$), public capital income ($\tau_{kg_t} r_{g_t} Kg_t$), and bonds income ($\tau_{b_t} \rho_t B_t$), as shown in (7).

$$T_t = \tau_{c_t} Ct + \tau_{h_t} w_t H_t + \tau_{kp_t} r_t Kp_t + \tau_{kg_t} r_{g_t} Kg_t + \tau_{b_t} \rho_t B_t \quad (7)$$

The government also finances itself through bonds emission (B_t) and participation in the capital of the state enterprises $(1 - \alpha_t)(1 - \tau_{kg_t}) r_{g_t} Kg_t$. Therefore, the government budget constraint is made by (8) and (9):

$$Cg_t + J_t + Ig_t + TR_t + \rho_t B_t = B_{t+1} - B_t + T_t + (1 - \alpha_t)\left(1 - \tau_{kg_t}\right) r_{g_t} Kg_t \quad (8)$$

$$G_{t+1} = (1 - \delta g) G_t + J_t \quad (9)$$

where δg is the depreciation rate of the infrastructure public capital. The government runs fiscal policies under the following constraints, (10) to (14):

$$\alpha_{c_t} = Cg_t / Y_t \quad (10)$$

$$\alpha_{j_t} = J_t / Y_t \quad (11)$$

$$\alpha_{i_t} = Ig_t / Y_t \quad (12)$$

$$\alpha_{b_t} = B_t/Y_t \tag{13}$$

$$\alpha_{tr_t} = TR_t/Y_t \tag{14}$$

where $\alpha_{c_t}, \alpha_{j_t}, \alpha_{i_t}, \alpha_{b_t} e\ \alpha_{tr_t}$ are, respectively, the share of the government expenditure on the product in relation to consumption, infrastructure, state enterprises' investments, public debt, and transfers.

2.4. Calibration

The model was calibrated, following the methodology used by Ferreira and Nascimento (2006), Pereira and Ferreira (2010; 2018), Santana et al. (2012), and Bezerra et al. (2014), to data of the Brazilian economy as of 2014, under the supposition that the economy is on a steady state trajectory. We used data from the National Treasury Secretary (STN), the Union General Controlling Board (CGU), the Applied Economic Research Institute (IPEA), and the Statistical and Geographical Brazilian Institute (IBGE). Tables 1 and 2 show the calibrated parameters.

Table 1 – Technology and preferences parameters (In absolute values)

β	μ	ψ	δ	δg	θ	γ	A
0.9267	0.5	1.1824	0.0886	0.0472	0.4228	0.09	14.6585

Source: the author, based on data from STN, CGU, IPEA, and IBGE.

Table 2 – Fiscal policy parameters (In absolute values)

α	τ_c	τ_{Kp}	τ_{Kg}	τ_h	τ_b	α_c	α_i	α_j	α_b	α_{tr}
36.74	14.50	30.12	30.12	15.72	16.97	19.15	1.40	2.96	32.58	6.47

Source: the author, based on data from STN, CGU, IPEA, IBGE, and Bezerra et al. (2014).

3. EMPIRICAL EXERCISE AND RESULTS

The main goal of this section is to measure how privatization of state enterprises in Brazil would affect the macroeconomic aggregates and the welfare function of a calibrated model of the Brazilian economy for 2014. The following assumptions were used: (i) the government transfers the full stock of the state enterprise capital in time t to the representative

household. (ii) in time t the public debt (B) is reduced by the amount of the stock of capital privatized: $(1-\alpha_t)Kg_t^{ss}$.

$$\alpha_{b_t}{}^{SP} = (B^{SS} - (1-\alpha_t)Kg_t^{SS})/Y^{SS} \tag{15}$$

where $\alpha_{b_t}{}^{SP}$ is the amount of the reduced public debt after the stock of capital privatized (SP), and the variables Kg_t^{SS} , $B^{SS} and\ Y^{SS}$ are the steady state (SS) variables.

3.1. Welfare gains

The privatization is simulated following the traditional methodology in the literature, as presented by Lucas (1987); Cooley and Hansen (1992); and Pereira and Ferreira (2010; 2018).

$$\sum_{t=0}^{\infty} \beta^t \{ln(C_t^{SS}(1+x) + \mu Cg_t^{SS}) + \psi\, ln(1-H_t^{SS})\} = \sum_{t=0}^{\infty} \beta^t \{ln(C_t^{SP} + \mu Cg_t^{SP}) + \psi\, ln(1-H_t^{SP})\} \tag{16}$$

Where C_t^{SS} and C_t^{SP} are, respectively, the steady state and the simulated privatization private consumption levels; Cg_t^{SS} and Cg_t^{SP} are, respectively, the steady state and the simulated privatization public consumption levels; and H_t^{SS} e H_t^{SP} are, respectively the steady state and the simulated privatization working hours. Positive values of x indicate that the proposed simulation would be equivalent to a permanent percentage increase in the levels of consumption determined in the initial steady state, *ceteris paribus.*

3.2. Simulation of privatization policies

In the simulated model of the privatization policy, shown in table 3, the full stock of the capital of state enterprises (Kg) is privatized, and the revenue is directed to pay the public debt, as in equation (15). In addition, any further revenues from the Government are allocated to Infrastructure Investment (J) to balance the budget, shown in equation (8).[1]

Table 3: Macroeconomic and welfare effects from privatization

Years after simulation[1]	0	1	4	8	12	50	100	200
Real Variable[2] (absolute value)								
Household Consumption (C)	1.00	0.9953	0.9970	0.9999	1.0030	1.0190	1.0233	1.0205
Government Consumption (Cg)	1.00	1.0024	1.0048	1.0081	1.0113	1.0267	1.0308	1.0315
Private Investment (Ip)	1.00	1.0955	1.1065	1.1125	1.1164	1.1299	1.1332	1.1337
Infrastructure Investment (J)	1.00	1.1800	1.1568	1.1584	1.1613	1.1816	1.1872	1.1882
Output (Y)	1.00	1.0024	1.0048	1.0081	1.0113	1.0267	1.0308	1.0315
Worked Hours (H)	1.00	1.0041	1.0045	1.0047	1.0048	1.0044	1.0042	1.0042
Private Capital Stock (Kp)	1.00	0.9997	1.0010	1.0039	1.0073	1.0257	1.0307	1.0315
Infrastructure Capital Stock (G)	1.00	1.0085	1.0286	1.0513	1.0704	1.1597	1.1838	1.1881
Debt (B)	1.00	1.0031	1.0056	1.0089	1.0120	1.0269	1.0308	1,0315
Taxes (T)	1.00	0.9951	0.9974	1.0007	1.0038	1.0192	1.0233	1.0233
Output Composition (%)[3]								
(C/Y)	62.29	61.85	61.81	61.78	61.78	61.82	61.83	61.83
(Cg/Y)	19.15	19.15	19.15	19.15	19.15	19.15	19.15	19.15
(Ip/Y)	14.18	15.50	15.62	15.65	15.66	15.61	15.59	15.59
(T/Y)	31.42	31.19	31.19	31.19	31.19	31.19	31.19	31.19

Source: the authors.

Obs.: welfare effect: $x(\%) = 0.1587$.

Notes: [1] 200 years is the reference period of time to reach a new steady state in all simulations. [2] Normalized by steady state values. [3] Variables as a fraction of output.

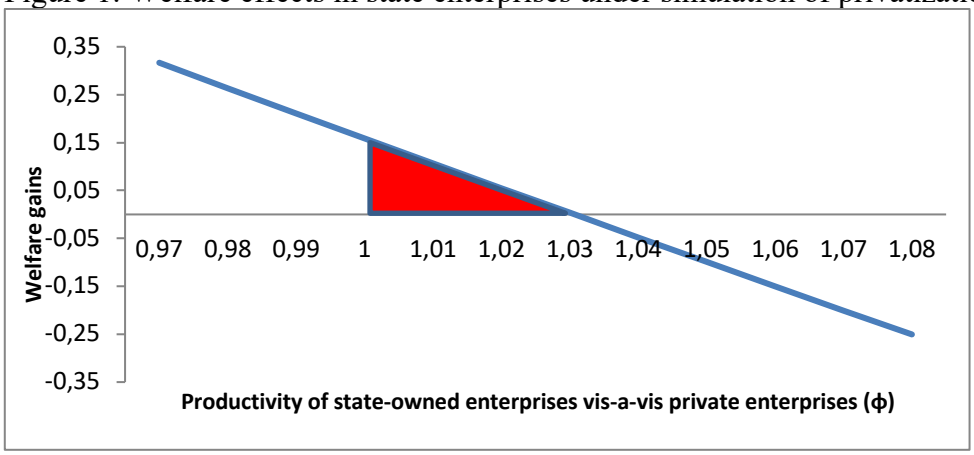
The simulation of the privatization policy indicates positive long-term effects on output, household consumption, private capital supply, infrastructure, and labor. In addition, welfare gains (x = 0.1587) mean that the benefits promoted by this policy would be equivalent

[1] When the Government uses any further revenues to increase the public consumption (Cg), the welfare gains are negative, x = -0.3080. When the revenue is directed to transfers to households (Tr) as models by Bezerra et al. (2014) and Campos and Pereira (2016), the results show zero welfare gains, and the macroeconomic variables do not present changes throughout the periods.

to a permanent increase of 0.15% in consumption levels that would be observed in the absence of the policy.

In the simulation above, the state enterprises have the same productivity as the private sector ($\phi = 1.0$). Angelo et al. (1992) found the productivity of the state enterprises significant under the productivity of the private sector. Figure 1 depicts a sensitivity analysis of the model, showing the evolution of the productivity of state enterprises in relation to private sector companies in the above simulation.

Figure 1: Welfare effects in state enterprises under simulation of privatization



Source: the author.

These exercises were made using the extreme values of the productivity ratio from ($\phi = 0.97$) to ($\phi = 1.08$) in simulation. The results show welfare gains when $\phi \cong 1.03$, that is, in an environment in which state-owned enterprises are up to 0.3% more productive than are private companies, privatization still shows positive results, according to the welfare measures proposed in the work.[2]

[2] Additional simulations were performed assuming that $\phi = 0.90$ and $\phi = 1.10$, that is, the public capital of state-owned enterprises is 10% less productive and more productive than private capital. The results of the welfare measure were, $x = 0.6959$ and $x = -0.3501$, respectively. When $\phi = 0.5$ and $\phi = 1.5$, these results are $x = 3.2325$ and $x = -2.1650$, respectively.

4. CONCLUDING REMARKS

The literature regarding the privatization process stresses the welfare gains from the superior innovation and efficiency of private sector firms in relation to state enterprises (Schleifer, 1998). The privatization simulations in this paper show the possibility of welfare gains, even when state enterprise firms show higher productivity then do private sector firms.

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