The Brazilian Slump and the Government-Driven Credit Expansion

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September, 2020

Research question

My paper addresses the following questions:

What are the dynamic effects of misallocation on productivity growth that can arise from an idiosyncratic government-driven credit expansion?

Could the misallocation induced by idiosyncratic credit policy be a contributing factor to the dismal performance of the Brazilian economy in the 2010s?

Contributions

1. **Methodological**
   - Formulates a version of the firms dynamics model with idiosyncratic credit policy – a share of the credit is directed by government with a subsidized interest rate.

2. **Literature on Misallocation**
   - Attempts to quantify the relative importance of the idiosyncratic credit policy for the productivity and growth using observed data.

What "big picture" issues does the paper address?

- Financial markets literature: nonlinear relation between credit and growth
- Why this non-linear relation exists?
  - Limits to borrow in countries with high credit-to-GDP ratios.
  - Limit the allocation of credit toward higher productivity firms and diverge the credit to unproductive ones.
- **How do explain this in countries with low credit-to-GDP?**

Hypothesis

Misallocation induced by the idiosyncratic credit policies.

Main Results

Main findings:

1. Subsidized establishments become larger;
2. Productivity cut for entering the market is lower for subsidized firms; and
3. Subsidy costs are increasingly harmful to the government with an expansion of the subsidized credit.

Frame Title

calibration calibration1

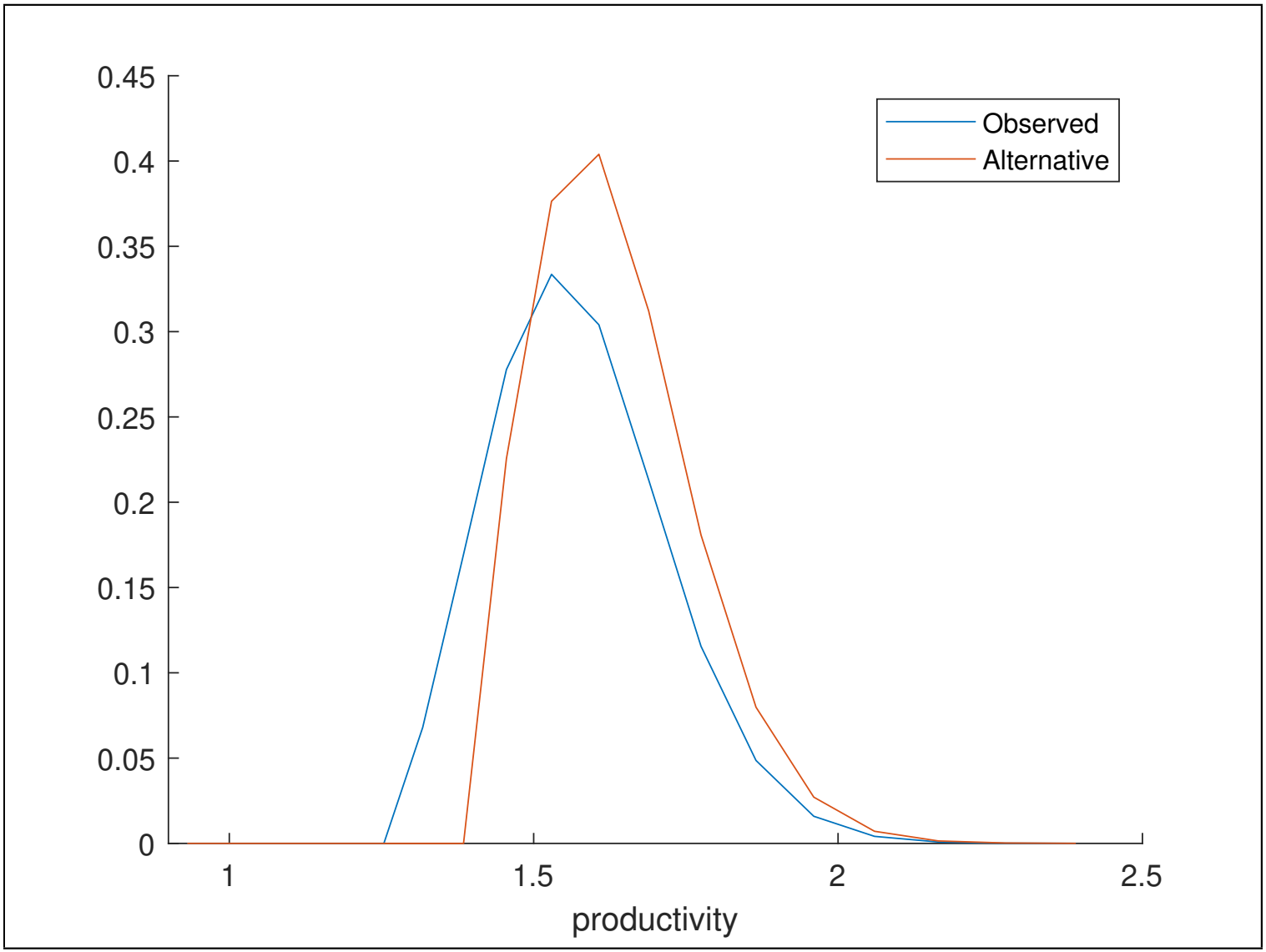
	Observed Scenario	Alternative Scenario
Relative productivity	0.96	1.06
Relative output	1.05	1.01
Relative labor	1.05	1.01
Relative capital	1.17	0.87
Relative subsidy cost	1.43	0
Relative K/L	1.11	0.86

Table: Effects of Idiosyncratic Distortions - initial scenario

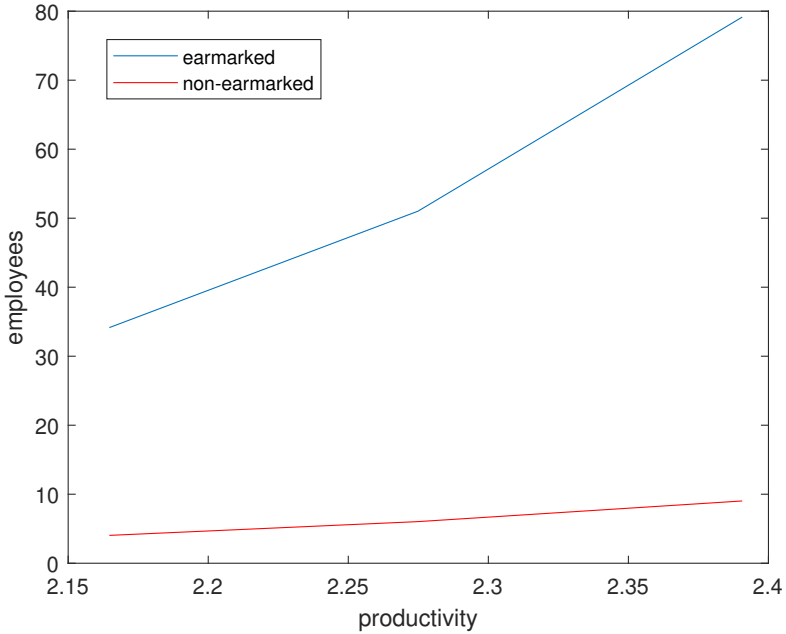
Initial Scenario			
Number of Employees	**Share of establishments**	**Share of output**	**Share of labor**
less than 5	42.44	5.70	6.30
5 to 49	49.82	53.70	56.29
50 or more	7.74	40.60	37.41
Observed Scenario			
Number of Employees	**Share of establishments**	**Share of output**	**Share of labor**
less than 5	44.85	5.12	5.51
5 to 49	46.16	51.22	54.27
50 or more	9.00	43.66	40.22
Alternative Scenario			
Number of Employees	**Share of establishments**	**Share of output**	**Share of labor**
less than 5	22.22	4.30	5.21
5 to 49	75.79	83.76	84.59
50 or more	1.99	11.94	10.20

Table: Effects of Idiosyncratic Distortions - initial scenario

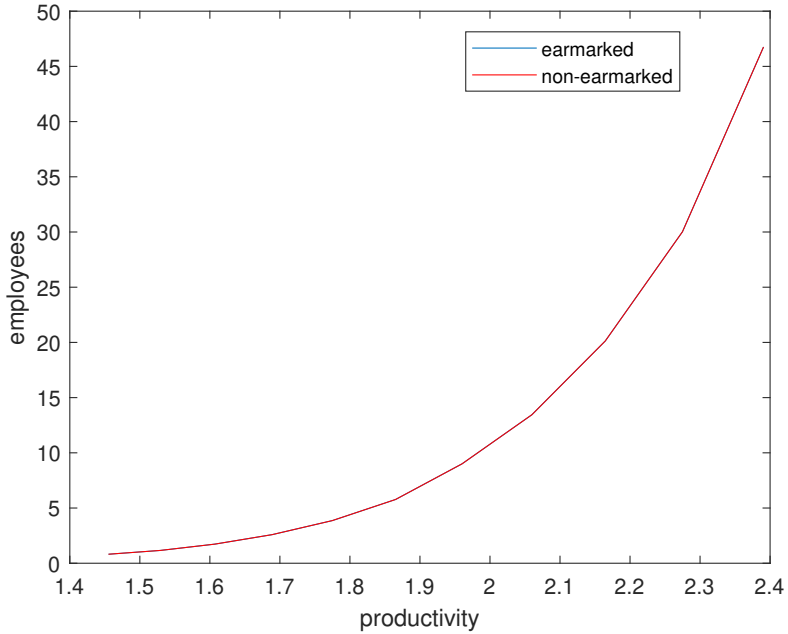
Productivity Distribution



Number of Employees



(a) Observed



(b) Alternative

Motivation

Features of the Brazilian economy in the 2010s:

- Low growth went along with capital deepening;

The Revival of Industrial Policy

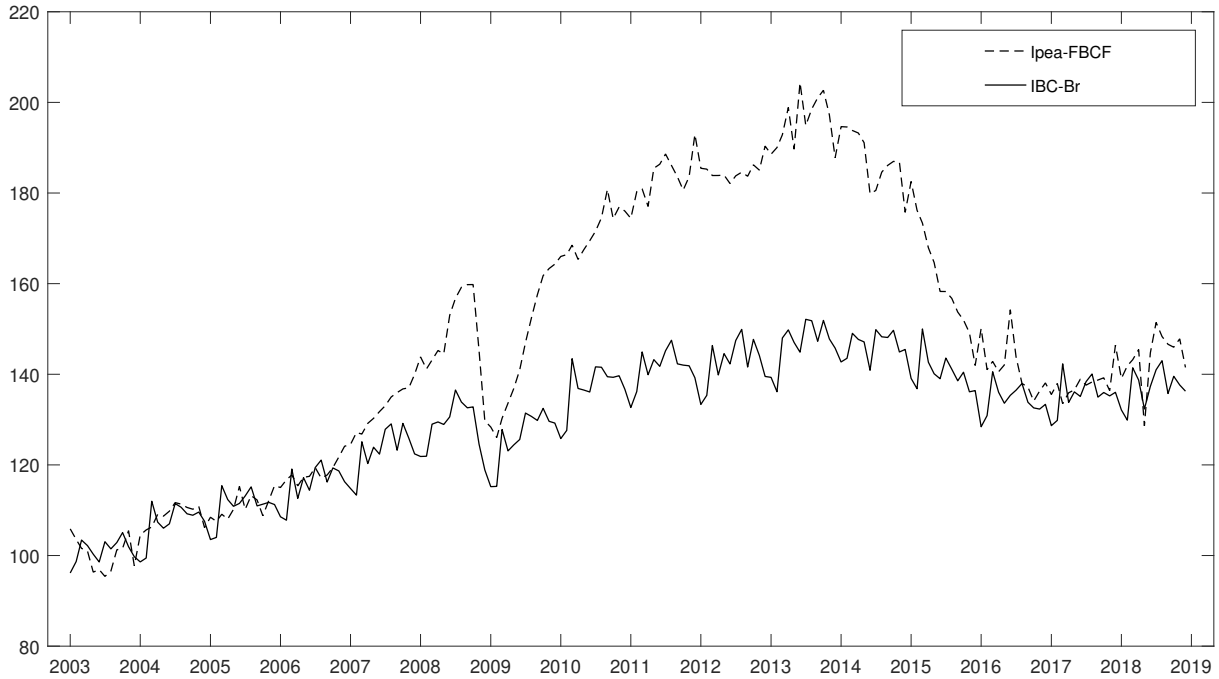


Figure: Index of Economic Activity of the Central Bank (IBC-Br) (2002=100) and Gross Fixed Capital Formation Ipea Index (1995=100)

Motivation

Features of the Brazilian economy in the 2010s:

- Low growth went along with capital deepening;
- Credit-to-GDP remains relatively low by international standards; and

Credit-to-GDP ratios

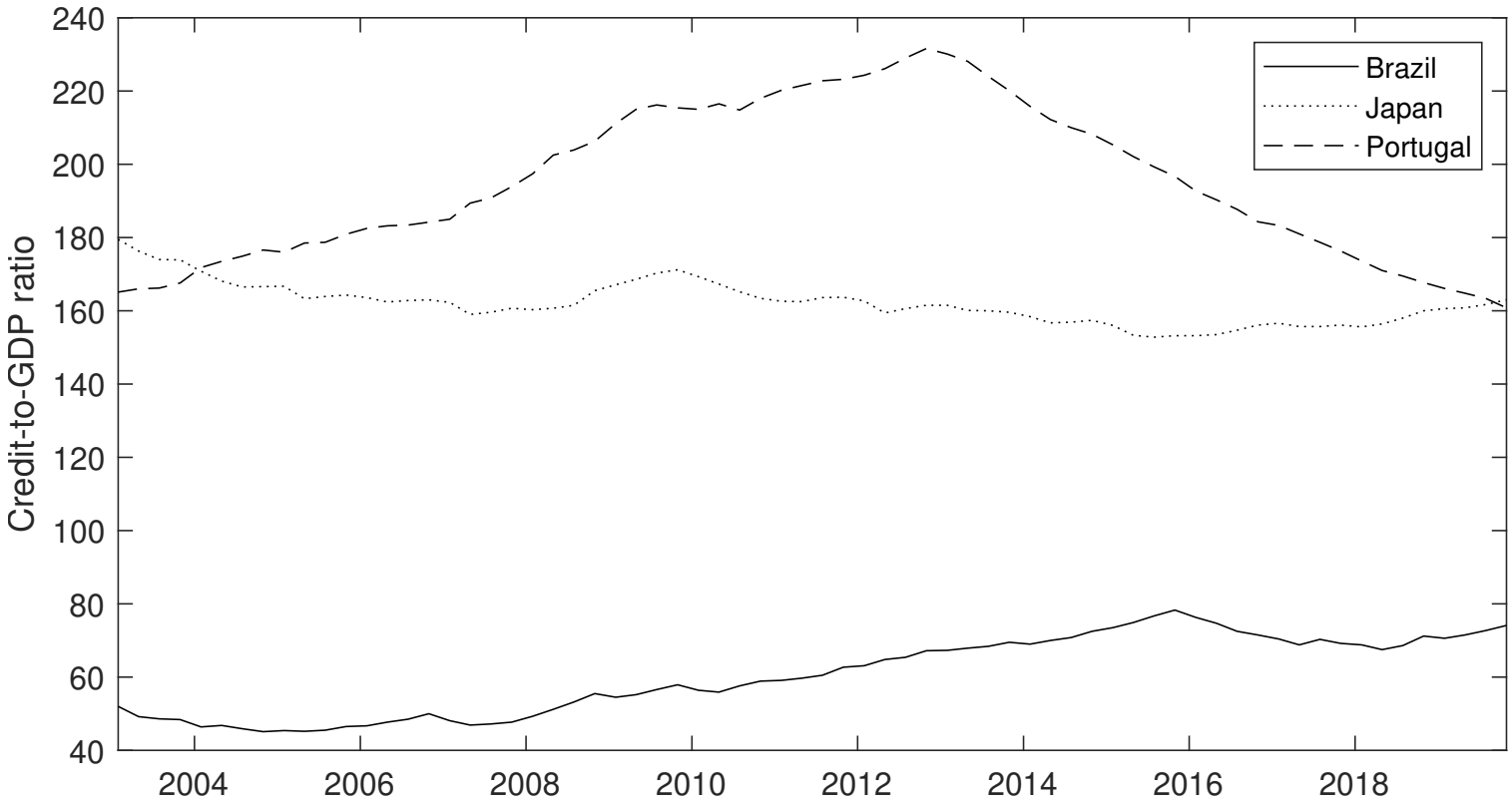


Figure: Credit-to-GDP ratios - Brazil, Japan and, Portugal

Motivation

Features of the Brazilian economy in the 2010s:

- Low growth went along with capital deepening;
- Credit-to-GDP remains relatively low by international standards; and
- Strong Expansion of earmarked credit.

Credit Expansion

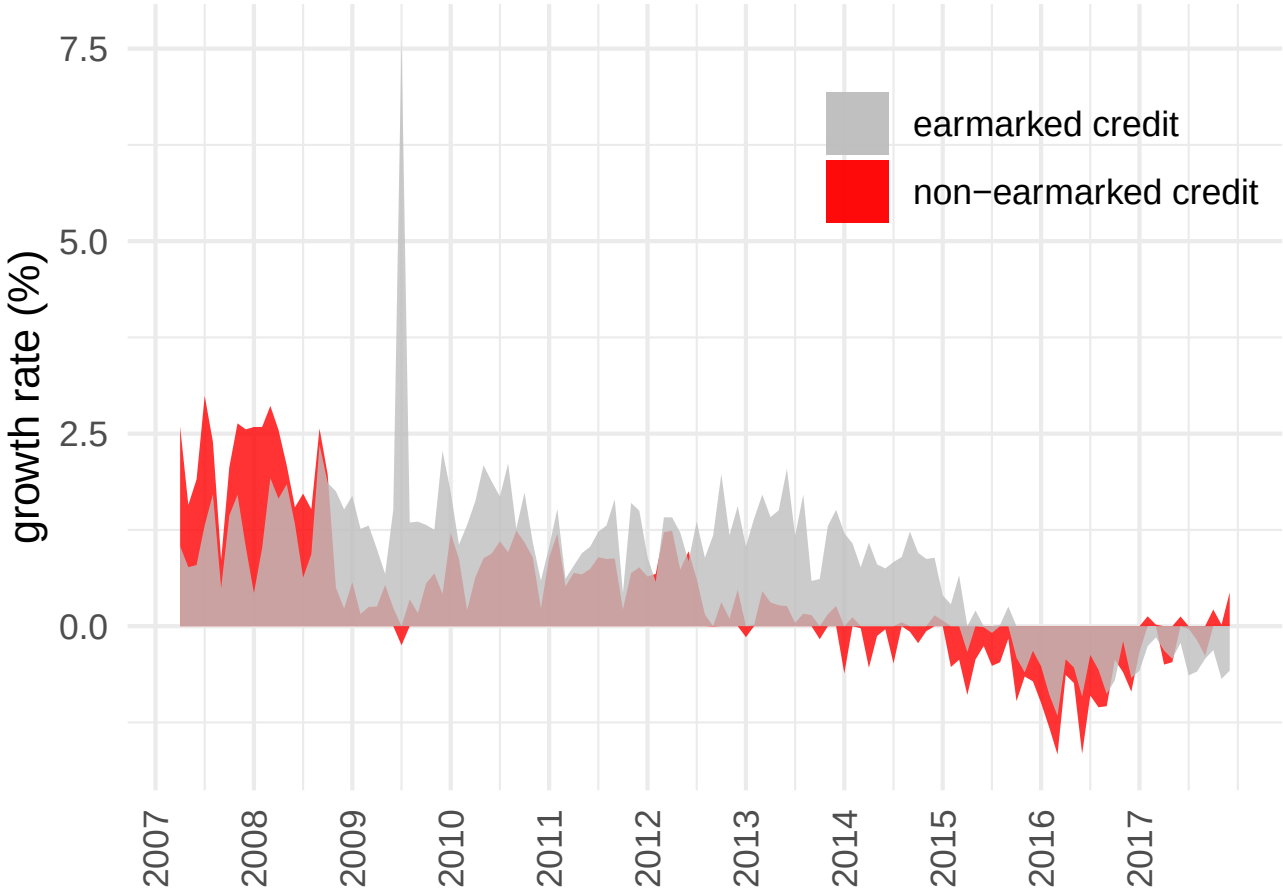


Figure: Credit Operations (2007–2017)

Share of the Earmarked Credit (2007–2017)

Share of the credit directed by government interventions with compulsory allocation or predetermined interest rate or both:

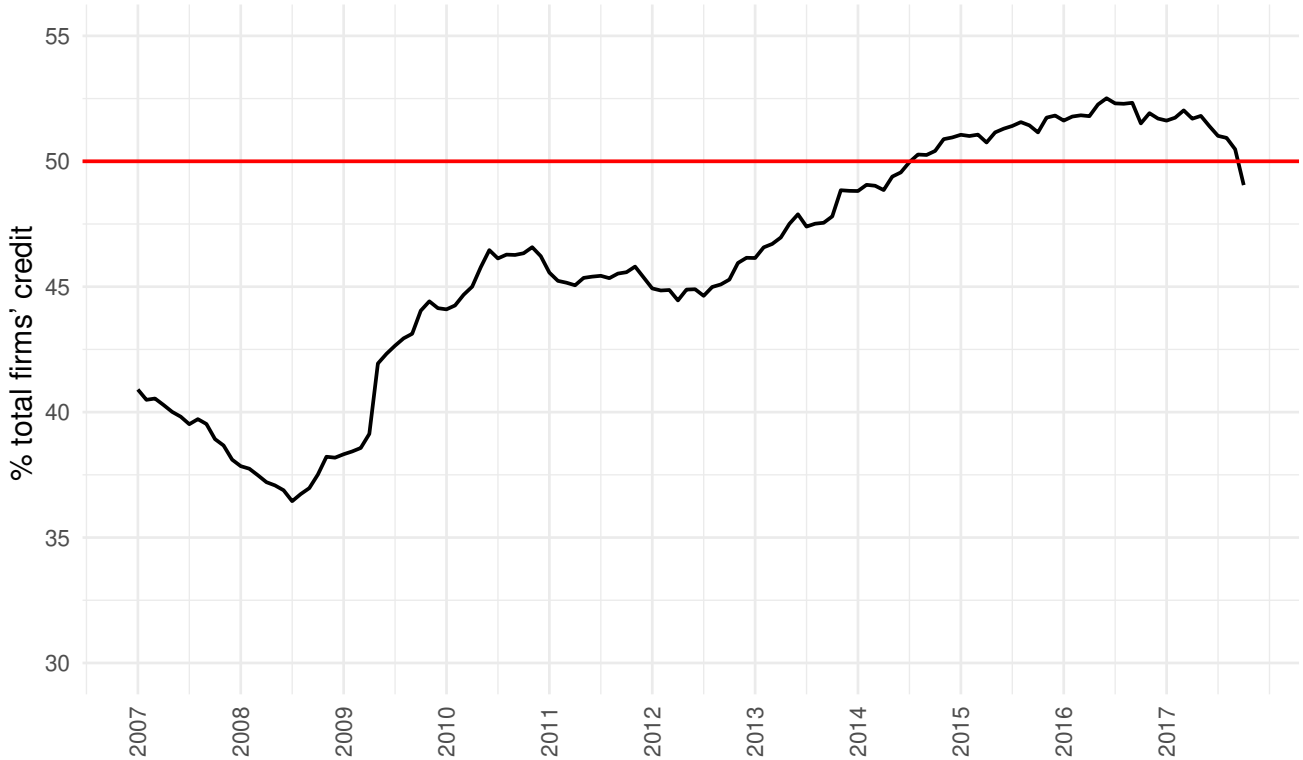


Figure: Credit for Firms (% total firms' credit)

Motivation

Features of the Brazilian economy in the 2010s:

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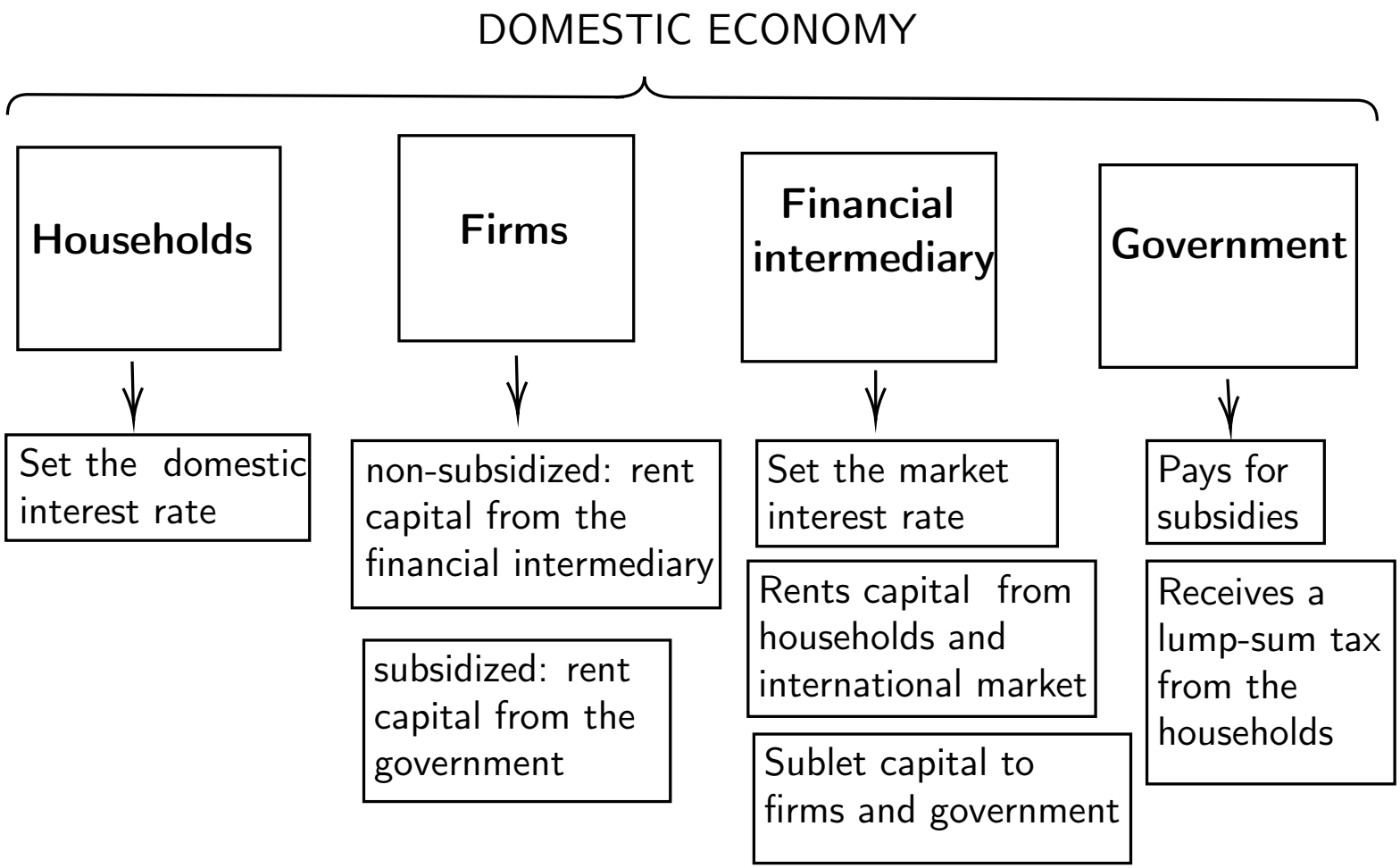
BNDES disbursements Net Exports

The Model


DOMESTIC ECONOMY
Households
Set the domestic interest rate
Firms
non-subsidized: rent capital from the financial intermediary
subsidized: rent capital from the government
Financial intermediary
Set the market interest rate
Rents capital from households and international market
Sublet capital to firms and government
Government
Pays for subsidies
Receives a lump-sum tax from the households

The Model

- Time is discrete $t = 1, 2, \ldots$.
- May receive a credit subsidy $\psi \in \Psi \equiv \{0, 1\}$ (constant over time).
- Idiosyncratic productivity s_t is independent among firms and follows a bounded Pareto distribution.
- Fixed cost c_f, entry cost c_e, exogenous exit probability λ.

The exogenous states of an agent is the pair $(s, \psi) = z \in Z = S \times \Psi$, that follows a Markov-chain with transition matrix Γ mapping from Z to Z

Capital and Interest Rates

- There are two types of capital:
  1. Domestic (k^H); and
  2. Foreign ($k^\star$)
- Three interest rates:
  1. Domestic Interest Rate (r^H);
  2. Market Interest Rate (r^{market}); and
  3. International Interest Rate ($r^\star$)

We assume a small open economy with perfect perfect capital mobility, therefore:

$$r^{market} = r^\star$$

Households

Households

Representative consumer maximizes:

$$E_t \sum_{t=0}^{\infty} \beta^t \left(u(.)\right) \tag{1}$$

subject to the period budget constraint

$$c_t + k_{t+1}^H - (1-\delta)k_t^H = r_t^H k_t^H + w_t n_t + \Pi_t - T_t^G - T_t^{nfa} \tag{2}$$

where Π_t, T_t^{nfa} and T_t^G denote the lump-sum profits, net taxes, and lump-sum transfers from the financial intermediary.

In steady state

$$r^H = \frac{1}{\beta} - 1 - \delta \tag{3}$$

Firms

Production function and Profits

- Cobb–Douglas production function with a decreasing returns to scale

$$y = (s_t k_t^{\alpha} n_t^{\gamma}) \qquad 0 < \gamma + \alpha < 1 \tag{4}$$

- Static profits

$$\pi_t(k, z) = p_t y - w_t n_t - \left[\psi r^{\psi} + (1-\psi) r_t^{market}\right] k_t \tag{5}$$

$$- g(k_t, k_{t-1}) \mathbb{1}_{(k_t=0)}, \tag{6}$$

where the capital adjustment costs is

$$g(k_t, k_{t-1}) = \begin{cases} \frac{\chi}{2}\left[\frac{i_t}{k_{t-1}} - \delta\right]^2 & \text{if } k_{t-1} > 0, \\ 0 & \text{otherwise.} \end{cases} \tag{7}$$

Incumbent's problem

ggg

Entrant's problem

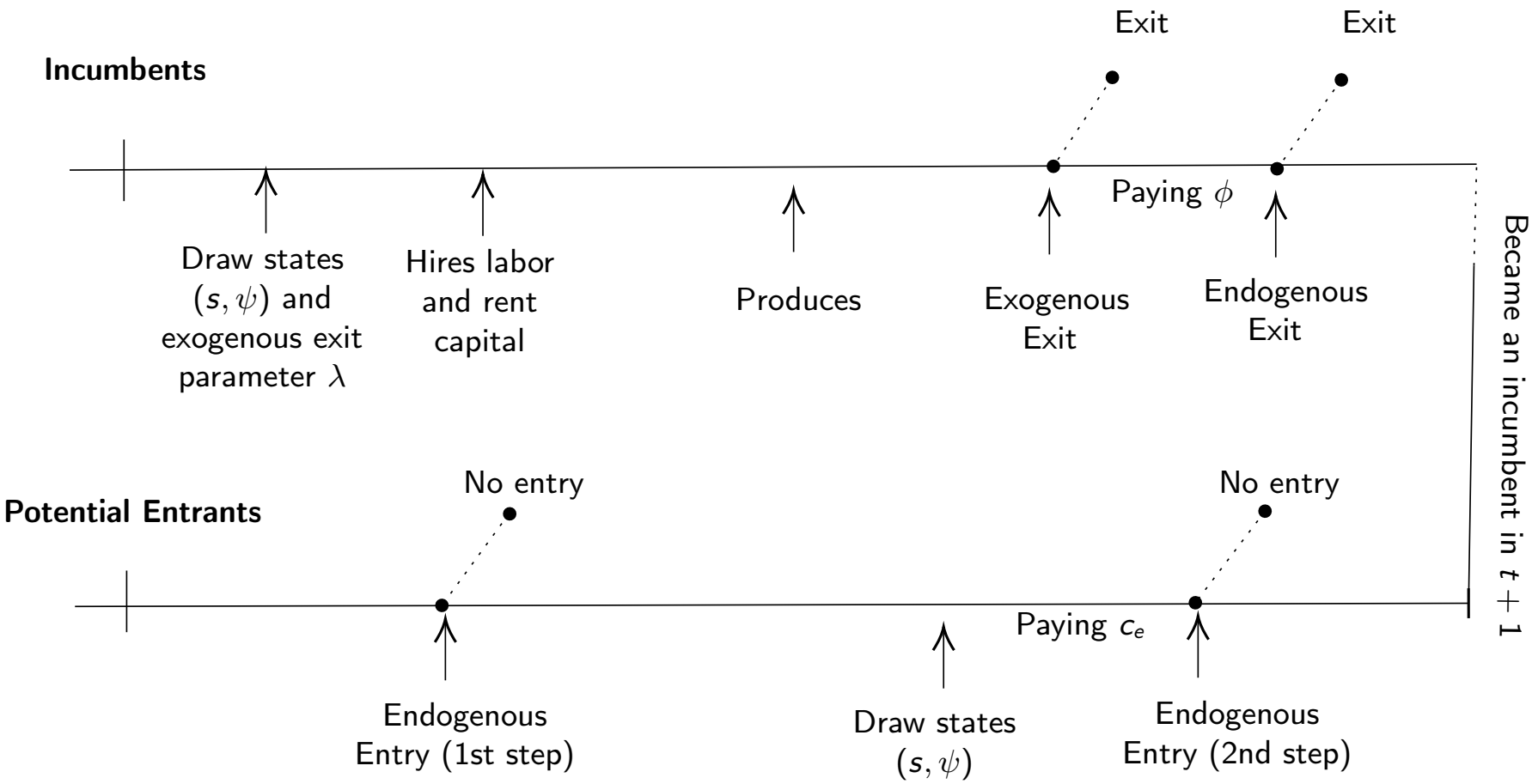
- Ex-ante identical.
- Two-step entry:
  1. consider engage in production no knowing z.
  2. Draw z from the joint distribution G(k,z) and decides if engage in production by paying c_e.

$$W^e = \int \max_{\bar{e} \in \{0,1\}} \left\{ \bar{e}(z) W^0(k,z) dG(k,z) - c_e \right\}. \tag{8}$$

In equilibrium

Free entry will guarantee that $W^e = 0$

Timing within period



Stationary distribution

The endogenous entry and exit decisions, together with the decisions of incumbents, imply a law of motion for the distribution of firms over the states (k, z):

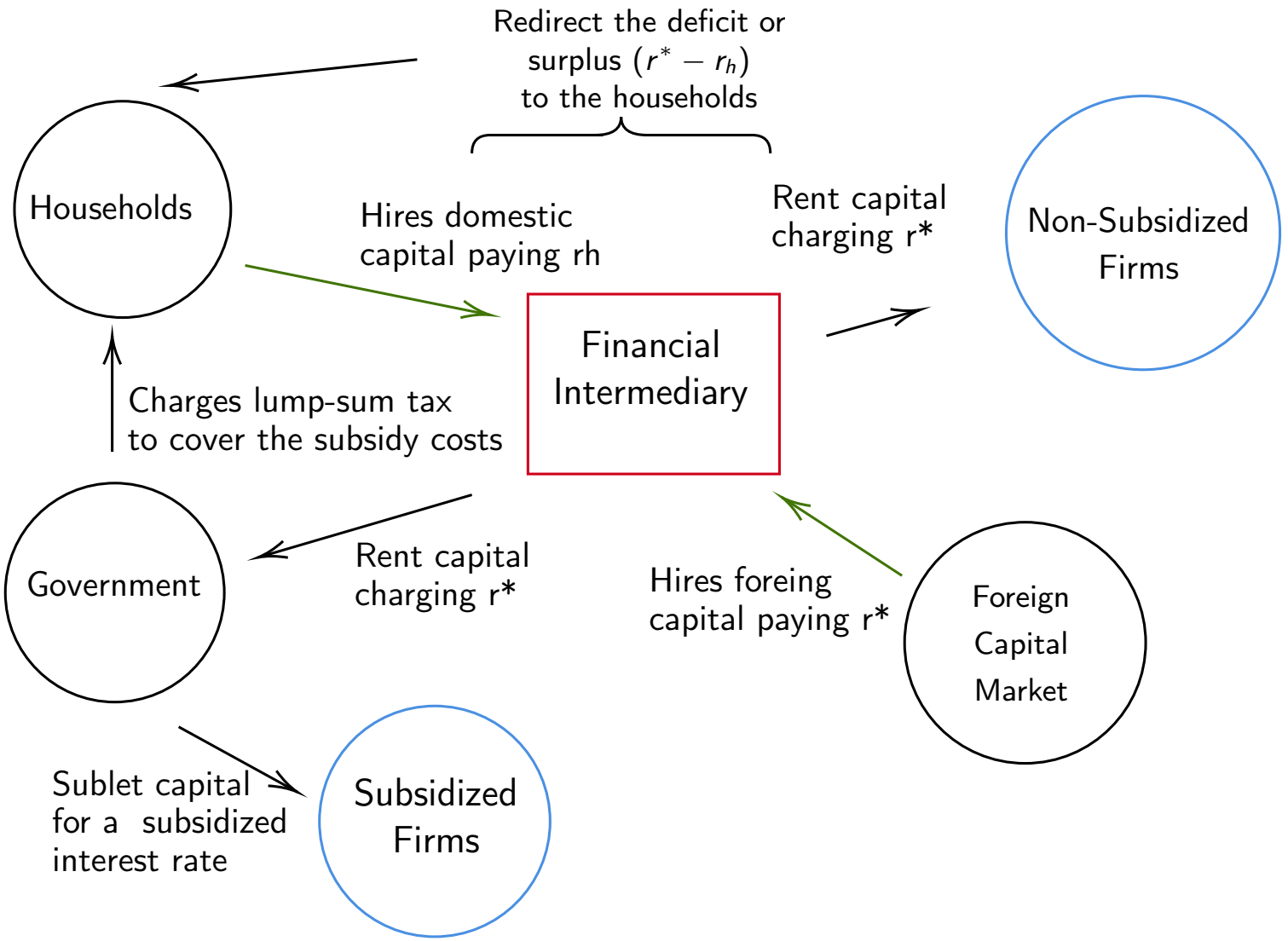
$$\mu_t(k', z') = \underbrace{\int \int \left[\tilde{\Gamma}(z', z)\right] \mathbb{1}_{[k'=g(k,z)]} d\mu_{t-1}(k, z)}_{\text{Surviving Incumbents}} + \tag{9}$$

$$\underbrace{N_t^e G(k', z') \bar{e}(z')}_{\text{Surviving Entrants}} \tag{10}$$

where the mass of agents evolve as $N_t = N_t^e + (1 - P^{exit}) N_{t-1}$

Financial Intermediary

Financial Intermediary



Financial Intermediary

- Net foreign assets

$$K^{nfa} = K_t - K_t^H, \tag{11}$$

where $K_t^H = \int \int g_{p,r^H}(z) d\mu_t(k,z)$ and $K_t = \int \int g_{p,r^{market}}(z) d\mu_t(k,z)$

- Financial Intermediary budge balance

$$T^{nfa} - \int \int (1-\psi)(r^H - r^\star) k' d\mu(k,z) = 0 \tag{12}$$

Government

Government

- Cost of subsidizing capital

$$c(K^{\psi}) = \int \int \psi(r^{market} - r^{\psi}) k_t d\mu(k, z), \qquad r_t^{market} > r^{\psi} \quad \forall t. \tag{13}$$

- Government Budget Balance

$$T_t^G - c(K^{\psi}) = 0. \tag{14}$$

Market Clearing

Conclusion

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Market Clearing

$$K = \int \int k'(z) d\mu \tag{15}$$

$$1 = \int \int n'(z) d\mu, \tag{16}$$

$$C + \delta K + N c_f + N_e c_e = p \int \int s k'^{\alpha} n'^{\gamma} d\mu \tag{17}$$

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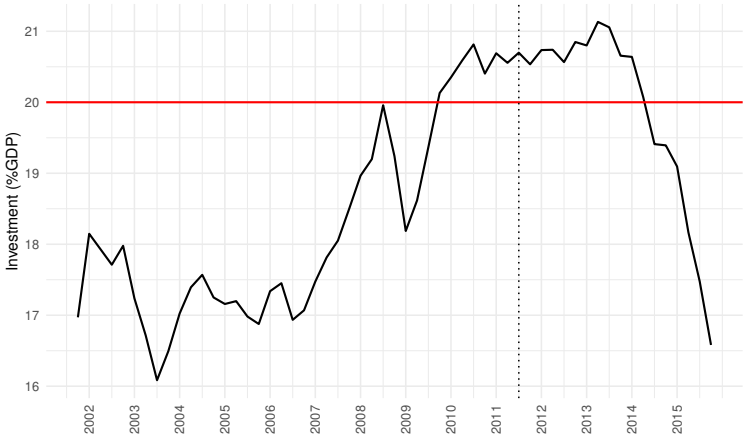
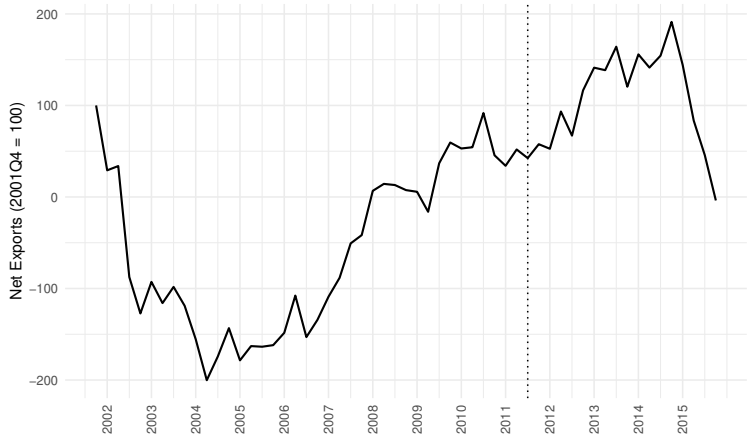


(a) Investment (%GDP)



(b) Net Exports

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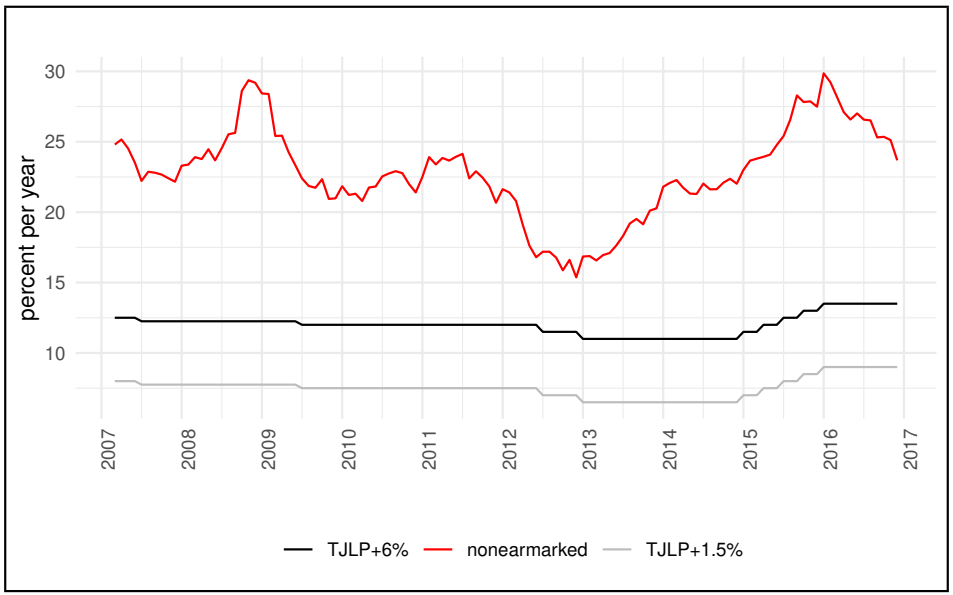
Calibration

	Initial	Observed	Alternative
Subsidized interest rate	2.9	2.6	0
Non-subsidized interest rate	5.0	5.1	3.6
Share of subsidized Firms	43.4	50.3	0



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Calibration

Parameter	Value	Description
β	0.9798	discount factor
α	0.399	capital share
γ	0.491	labor share
δ	0.025	depreciation rate
λ	0.0501	exogenous exit rate
χ	3.210	adjustment cost parameter
s range	$[1.5, 2.75]$	relative productivity range
k range	$[1, 1900000]$	relative capital range
c_e	1.05	entry cost
c_f	0.2	exit cost
ρ_s	0.9	persistence parameter
χ_s	5.8	shape parameter

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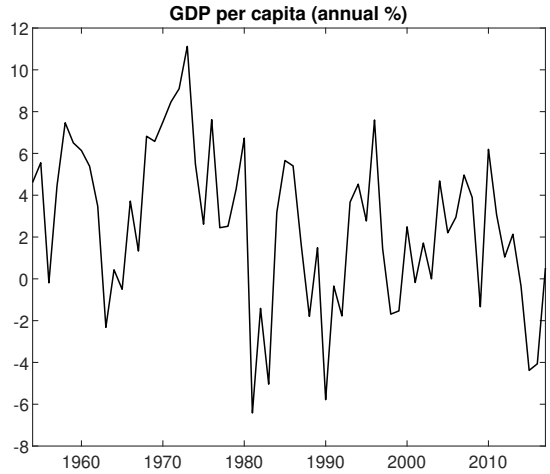
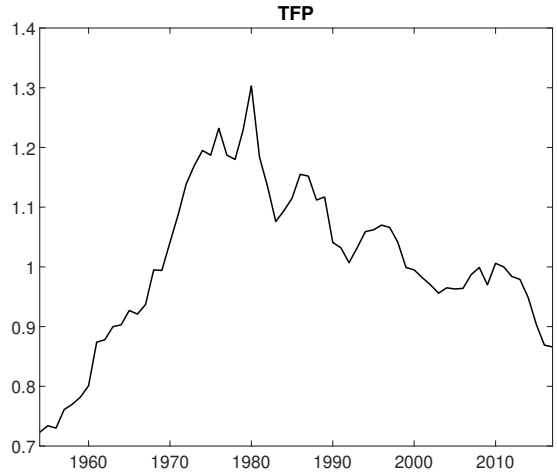
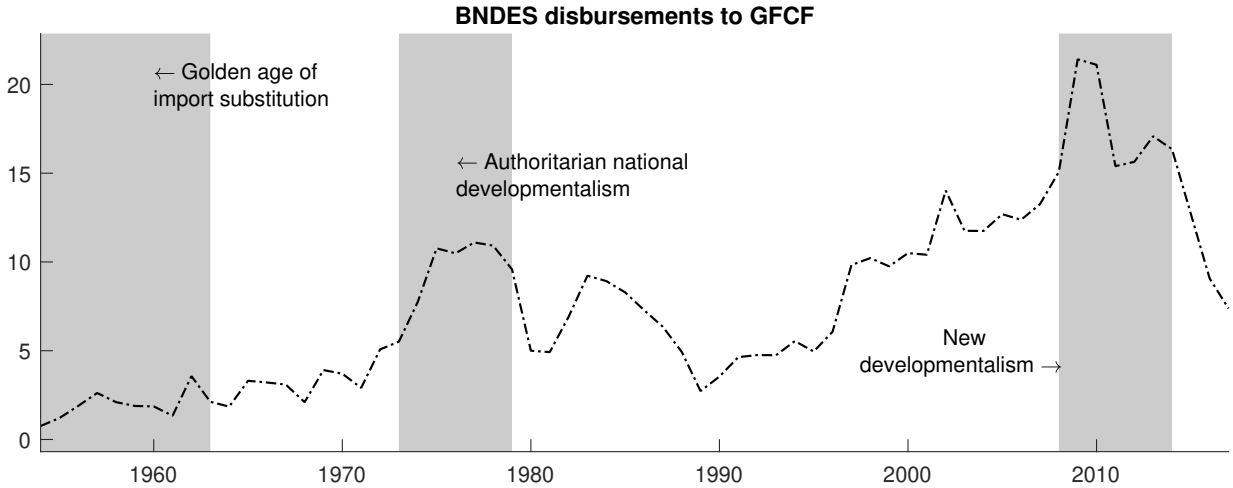
Brazil, 1954–2017







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