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Macroprudential Policies at Work: How do Government-Owned Banks affect Credit Markets?

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Macroprudential Policies at Work: How do Government-Owned Banks affect Credit Markets?*

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Abstract

How countercyclical macroprudential credit policies affect the loan spread? To answer this question, we propose a microeconomic model of bank competition that contemplates differences in the behavior of public and private banks and the peculiarities of the market for corporate loans vis-a-vis the market for consumer loans. We solve the model and calibrate it using parameters of the Brazilian economy, where government-owned banks not only account for almost half of the outstanding loans in the credit market but also have played a strong countercyclical role in the economy. Subsequently, we use the equilibrium conditions of the model to study the effects of macroprudential credit policies on loan spreads. The results indicate that credit expansion by public banks is more effective to reduce loans interest rates during recession periods than during periods of economic expansion.

Keywords: Interest Rate Spread; Bank Competition; Public and Private Loans.

JEL: E13, E43, E51.

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1 Introduction

Government owned banks have been used in many economies as a countercyclical tool during economic downturns in order to offset contractions in private loans supply and avoid extensively liquidity drops in credit markets. Nevertheless, the effect of government-owned bank's policies in credit markets is not clear.

In contrast with the literature that emerged after the 2008 Global Financial Crisis (GFC) (see, amongst others, Allen et al. (2013) and Bertay et al. (2015)), several works, such as Shleifer and Vishny (1994) and La Porta et al. (2002), have advocated that government control of banks tends to be associated with distortions in the allocation of savings since bank's decisions are biased by political objectives resulting in politically connected lending problems.

As an implication, government-owned banks would not be restricted to operate only countercyclical credit policies but, instead, they could perform non sustainable credit expansions in the economy, leading to artificially lower interest rates for loans and compromising the future capacity of public banks to offset negative shocks in private credit supply during recessions.

To account for this possibility this paper analyzes the effects of both cyclical and countercyclical public-led credit expansion on interest rates. We propose a model of bank competition that contemplates differences in the behavior of public and private banks and the peculiarities of the market for corporate loans vis-a-vis the market for consumer loans. We numerically solve the model and calibrate it using parameters of the Brazilian economy. Subsequently, we use the equilibrium conditions of the model to study the effects of macroprudential credit policies on loan spreads during periods of economic expansion and recession.

The Brazilian case is especially interesting because, after the strong countercyclical credit policy implemented to mitigate the negative effects coming from the 2008 GFC, government-owned banks continued to expand their loans operations in a rhythm considerably faster than the private banks until at least the mid-2015. As a matter of fact, starting in the second quarter of 2012 Dilma Rousseff's administration implemented a credit policy expansion using government-owned banks in an attempt to reduce the very high loan spreads prevailing in Brazil. In 2015 however, those banks started to face financial problems and reverted to a procyclical behavior, precisely when their countercyclical action would be more necessary to fight the largest recession in Brazilian history.

After calibrating the model, we built two counterfactual exercises based on alternative scenarios of public credit policies. First, we examine what interest rates and spreads would have been had government-owned banks not presented financial fragilities and, instead, continued to expand their loans as in the previous years. We assume that this would have lead to the maintenance of the same countercyclical policy of the period 2012-2015 to the most recent economic downturn in Brazil. Second, we study interest rates dynamics if public loans had grown in a more sustainable way between 2012 and 2014 not compromising the capacity of government-owned banks to maintain loans expansion rates after the beginning of the economic crisis in Brazil, in the second quarter of 2014.

Our results indicate that credit expansion by public banks would have been more effective to reduce loans interest rates if it had been implemented during the recession period 2015-2017, than during the period of economic expansion 2012-2014, as it actually happened.

Our results show the change in credit policy in Brazil after the middle of 2015 was responsible for 26.5% of the increase in interest rate for firms and for 33.7% for consumers. This means that even though interest rates for consumers and firms had risen due to factors not associated with the public credit policy after the first quarter of 2015, such as the interbank rate climb and higher default risks coming from economic downturn, the adoption of a procyclical behavior in public loans supply in a moment of economic recession intensified the hike in loans spreads .

To build the model we follow the baseline model of symmetric Cournot banking competition proposed by Freixas and Rochet (2008) and extend it to consider the differences between public and private banks. We do that by considering the aggregate public loan supply as an exogenous variable in the model. Private banks, in turn, compete with each other

There are a few articles discussing the effects of government-owned banks in credit market. Coleman and Feler (2014) analyze the role of Brazilian government-owned banks in mitigating the effects of 2008 GFC by providing more credit to offset the decline in lending by private banks. The authors find that localities in Brazil with a high share of government-owned banks experienced a relative increase in lending following the onset of the financial crisis when compared to areas with a low share of these banks.

Regarding the literature that discusses the determinants of the loans spreads in Brazil, Afanasieff et al. (2010), Bignotto and Rodrigues (2009) e Cardoso et al. (2017) empirically identify the micro and macro variables most significantly related to banking spreads, such as the bonds interest rate, the GNP, the default rates and the bank's market power.

Barbosa et al. (2015) analyze economies of scope effects on bank's market power. Using micro-data level from the Brazilian financial system, the authors find evidence that banks that produce other financial products beyond the classic ones have substantially more market power than banks that only offer classic products. Nakane and Alencar (2004) also investigate effects of banking competition on loans spreads. They find that an increase in bank competition reduces the reaction of the interest rate spread to monetary policy shocks.

The focus of those articles, however, is beyond bank spreads and credit market features. Therefore, they do not account for the different patterns of expansion in credit supply between public and private banks, or the distinguishing aspects of firms and consumers credit markets. Our paper contributes to the literature in these two dimensions.

We also use the multi-product banking firm structure presented in Barbosa et al. (2015) and Moshe and Berg (1998) to model the credit market separation between firms and consumers in order to consider the peculiarities of the market for corporate loans vis-a-vis the market for consumer loans[1]. The article is organized as follows:

[1]Barbosa, Rocha and Salazar investigate the competitive aspects of multi-product banking operations by proposing a model where banks offer two different financial products: loans and other non-classical products, grouped in brokerage services, insurance and capitalization bonds. Moshe and Berg analyze the behavior of banks operating simultaneously in the retail and corporate loan segments. In our setup, tough, banks will operate simultaneously in three different markets, the credit market for firms, the credit market for households, and the bonds market, where they can buy government bonds that yield a known interest rate. We include the government's bond

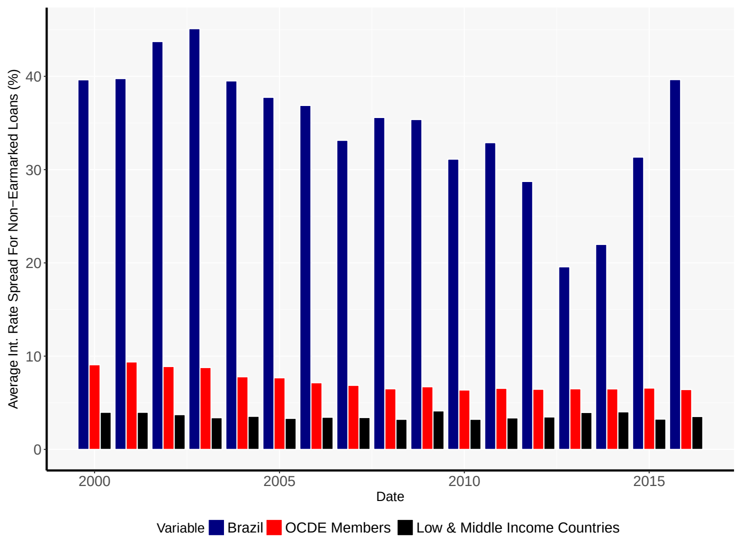
Section 2 discusses some key facts about Brazilian Credit Market that motivate our modeling choices; Section 3 presents the model; and Section 4 shows comparative static results and counterfactual exercises. The final section, Conclusion, summarizes the main results and draws some economic-policy lessons for Brazilian banking policy.

2 Institutional Background

This section presents the main stylized facts about Brazilian credit market over the last years. Our goal is to show descriptive statistics to motivate our research question, as well as stylized facts supporting the intuition of the model that will appear next.

In 2016, despite being the ninth larger world economy, the average Brazilian spread for retail loans reached 39.65% p.y., a value much larger than the one observed in countries facing fragile and conflict-affected situations (7.72% p.y.) as well as least developed countries (8.75% p.y.). In that year, the Brazilian banking spread was the second largest in the world[2].

Figure 2.1: Interest Rate Spread Compared



Data Source: International Monetary Fund (IMF).

market in the model to account for the effect of basic interest rate rise on the bank's credit supply in Brazilian economy, since the basic rate is a good proxy for the banks' cost of fund.

[2]According to World Bank Data, in a 225 countries sample, the bank spread in Brazil in 2016 was only lower than the one in Madagascar. See https://data.worldbank.org/.

In such context, the loan spread has long been an important issue in Brazil and its relevance relies not only in the high historical level of the Brazilian spread but also in its significant hike since the end of 2012, when the interest rate spread for non-earmarked loans went from 29.87 % p.y. in January 2013 to 52,82% p.y. in January 2017.

As a matter of fact, this hike could be at least partially explained by the rises of bank's cost of fund and default rates in credit operations over this period, specially after the middle of 2014 when the recent economic downturn in Brazilian economy begins[3]. We will show some evidence that the macroprudential credit policy extensively implemented in Brazilian economy (the supposedly countercyclical credit expansion after 2012) constituted also a key variable to understand the rise in retail credit market spread after 2014.

On August 2012, after the Central Bank recklessly lowered the benchmark overnight Selic interest rate to 7.5% , a full 5% drop from a year earlier, Dilma Rousseff's administration turned its focus to down bank spreads. For that, the government used public banks, the Banco do Brasil e the Caixa Econômica Federal, to reduce the spread of their main credit lines. As a result, this policy rose the market share of public banks until it overcame the share of the private ones as the outstanding of public loans increased from 43% to 54% of the total credit between January 2012 to January 2015.

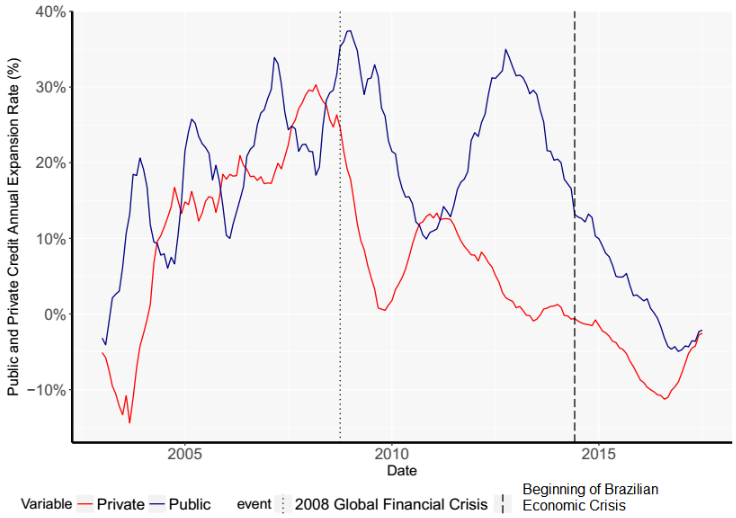
In the middle of 2014, however, public banks started to face financial fragilities to continue with the credit expansion policy from previous years. As consequence, the expansion pattern of public loans was replaced by a policy of contraction in public loan supply just in a period of economic recession. Thus, in the recent Brazilian economic crisis, the government-owned banks were no longer able to offset a fall in credit supply from private banks as before. Starting in 2016, loans from government-owned banks also shrank, intensifying the reduction in total credit supply and, hence, the rise in interest rates for credit operations.

Figure 2.2 shows that, in September 2009, when outstanding private loans

[3]According to the Brazilian Economic Cycle Dating Committee (CODACE), meeting on 30 July 2015, the current recession in Brazil began in the second quarter of 2014. For more information, see http://portalibre.fgv.br/main.jsp?lumChannelId=4028808126B9BC4C0126BEA1755C6C93.

stagnated, growing merely 0,8% in relation to September 2008, public outstanding loans grew by 31,4%. However, the macroprudential intervention in credit markets have not stopped after the main effects of 2008 crisis subsided; loans by government-owned banks continued to expand at a two-digit rate.

Figure 2.2: Private and Public Credit Expansion



Therefore, government-owned banks were not restricted to operate countercyclical credit policies. Instead, they performed a strong credit expansion policy in the economy.

Another stylized fact about Brazilian credit market that motivated our model came from the supply side of the loans market. In January 2016, the larger five banks were responsible for 82.8% of outstanding loans in Brazil.[4] To capture this high level of concentration, we adopt an oligopolistic structure to model competition in banking credit market. Like Freixas and Rochet (2008), banks will play a symmetric Cournot game choosing the optimal quantity of loans supplied to the borrowers. *Ceteris paribus*, the model predicts that the more concentrated the market, the higher the loan rate charged by banks becomes.

Another stylized fact is that the one-year interbank market rate, which is taken as a conventional proxy of banking cost of funding, increased from 7.2% p.y. in January 2012 to 15.3% p.y. in January 2016. Although the cost of funding does not configure a spread component, its rise does not imply a rise in the same proportion

[4]Source: Time Series Management System of Brazilian's Central Bank.

in loans interest rate. As pointed out by the literature, like in Freixas and Rochet (2008) and Nakane and Alencar (2004), as the intensity of competition in banking market increases, the loan interest rate becomes less sensitive to changes in the cost of funding.

The IO approach for banking competition captures the stylized fact that the basic interest rate emerges as an opportunity cost faced by banks in credit operations since they are able to use funds to grant loans or buy government bonds. Therefore, a rise in bonds interest rate will lead to a fall in loan supply, raising the interest rate on credit operations. Nevertheless, Figure 2.3 show that this effect seems to be different between firms and consumers credit market.

Figure 2.3: Interest Rates and One Year Interbank Rate - Annual

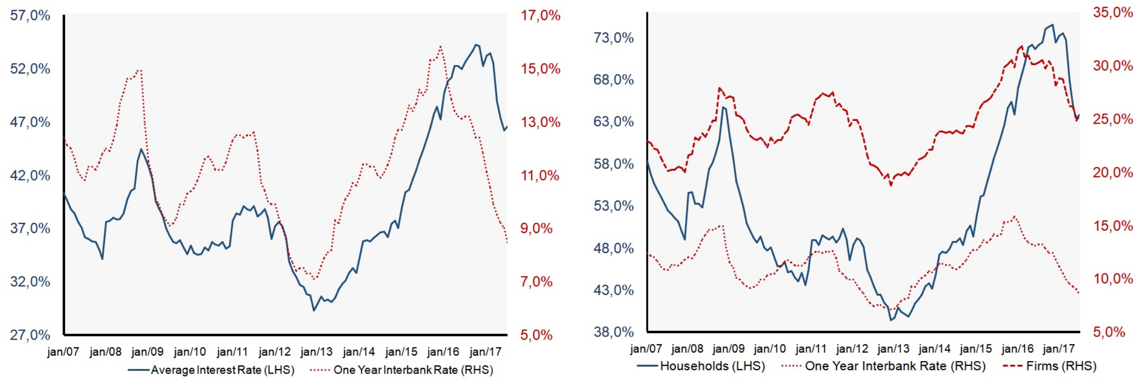


Figure 3.A

Figure 3.B

Figure 2.3.A shows the one-year interbank market rate (on the right-hand side) and the interest rate for retail loans. As expected by the theory, rises in banking cost of funding keeps up with higher interest rates for loans. Nevertheless, when we decompose the non-earmarked interest rate between firms and consumers, as shown in Figure 2.3.B, we see that the interest rate for loans has distinguishing patterns between those markets.

According to the data, variations in the cost of funding were associated with stronger movements in consumer credit loan rate than in the loan rates for firms. In fact, the rise in the cost of funding between January 2013 and January 2017 was associated with an increase in nominal loan rate for firms of 47.1% over the period, and with an increase in the nominal loan rate for consumers of 84.3%. Another important feature is that the interest rate for consumers is considerably higher than the one charged for firms. There are several reasons that can explain these differences between those two segments of the Brazilian credit market. One of them is that consumer's default rates have been historically higher than the one for firms, what leads to a higher spread in consumers market through the risk channel. Another reason is that firms have access to more options of funding than consumers, who are more dependent on retail banks to access credit services.

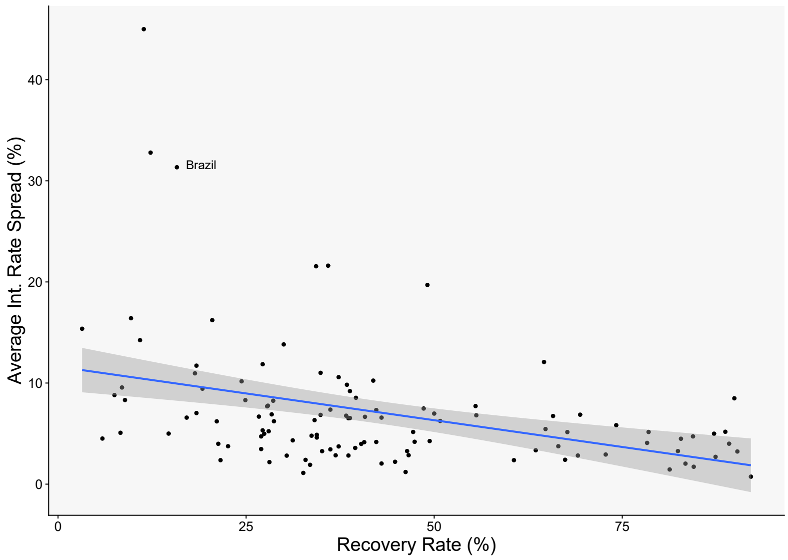
As a result, banks would have higher market power in consumers credit market when compared to firms credit market. Indeed, Coelho et al. (2017) [5] estimate credit demand elasticities in Brazilian economy and found that consumer credit demand is quite inelastic while firm credit demand is elastic. We use the authors estimations of loan demand elasticities to calibrate demand parameters in the model.

Finally, Figure 2.4 shows the last stylized fact about the Brazilian economy considered in our model. The figure shows the correlation between the spread for retail loans and the average recovery rate in a sample of 113 countries in 2016. Note that as the recovery rate is the fraction of the initial loan that a bank can recover in case of a borrower default, it is a measure of law enforcement and property rights in the economy.

The data shows a negative correlation between the recovery rate and the banking spread, what is likely to be expected since a lower recovery rate would imply a higher risk in credit operations, raising the loans rates. This can be an important feature to understand the very large Brazilian spread, since Brazil has one of the most lower recovery rates in the sample. As a matter of fact, for each dollar lent by Brazilian banks, they just expected to recover 0.158 cents in case of default. However, Brazil is an outlier in the sample since the 32.4% p.y. Brazilian spread is much higher than the average of 12.3% p.y. observed in countries with similar recovery rates. This suggests that, although the law enforcement is a relevant issue, there are other important factors leading to the overhead Brazilian spreads besides the risk associated with

[5] Based on the heteroskedasticity approach method proposed by Rigobon (2013), the authors use daily frequency credit data from BCB to estimate the interest-rate elasticity of firms and consumers credit demand.

Figure 2.4: Banking Spread and Recovery Rates



Note: The data was collected from the World Bank Data. The line is the fitted linear regression.

weak enforcement of the repayment of credit operations.

In our model, when a bank lends to a borrower, whether he is a firm or a consumer, it can recover a fraction of the initial loan in case of default. This fraction is calibrated to reflect the data showed above.

We use these stylized facts regarding the Brazilian credit market to provide intuition for the model that will be presented in Section 3. The main motivating fact, however, is the significant participation of government-owned banks in credit markets and the fact that these banks have performed a strong policy of credit expansion in a procyclical way, i.e., they considerably increase credit operations when the economy was expanding. However, after the beginning of the recession period in 2014, the public banks started to shrink new loans concessions, since they were no longer able to continue with their previous credit policy. This dynamic could intensify the drop in credit operations and the hike in loans spreads commonly observed in economic recessions, and this is exactly what we are going to observe in the results that appear in Section 4, after we show the model.

3 The Model

The economy is represented by a two-period model composed of four types of agents, namely: households, firms, banks, and the government. There is a continuum of households indexed in the unit interval which is divided into λ impatient and $1-\lambda$ patient households, $\lambda \in (0,1)$. There is a representative firm who produces a final consumption good demanding labor from households and working capital directly from the banks, which are divided into public and private ones. Private banks form a set of I identical banks that intermediate among the savers, the borrowers and the firms. The banks also have access to a treasury bond market. Public banks, on the other hand, are represented by one government-owned bank which has an exogenous credit supply. The government, through the representative public bank, closes the model operating a credit policy that is financed not just by bonds emissions to the banking system but also by a lump-sum tax charged from the households.

In the first period, agents make their decisions under uncertainty about the future state of the economy, which will only be known in the second period. This uncertainty comes from a productivity shock represented by a random variable z, whose distribution *f(z)* is known for all the agents in the economy.[6] Thus, both firms and households demand loans in the first period based on their expectations about future incomes. The loan repayment by them will depend, however, on the realization of z. In a sufficiently bad state of the economy in the second period, i.e., if z is very low, they both can default the banks.

While the firm does not pay the banks when her revenue is not enough to cover the loan plus interests, the default risk in consumers credit market comes from the possibility of a worker being fired by the firm in the second period. To generate this possibility in the model, we assume that the firm has to train the labor force in order to employ he or she in the second period. Thus, in period two, the firm will have at its disposal for production the working capital that it takes from the banks as well as an amount of trained workforce. The difference between those two production inputs though is that while the cost of capital is given in the second period, the labor cost

[6] In order to ensure only positive values for z, we assume that $f(z)$ is a lognormal distribution with mean μ and standard deviation σ, $f(z) \sim lognormal(\mu, \sigma)$.

is not. The firm has a possibility of not using some trained workers in production if the productivity shock is low, since she will not have to pay the equilibrium wage w to workers not used in production, just the cost of training, which we denoted by s. We define the ratio between the labor not used in production N_d and the labor previously hired by the firm to the training N as our economy unemployment rate u.

3.1 Firm

The production function $Y = F(K, N)$ is assumed to be neoclassical, i.e., for positive input values, the technology is increasing and concave with respect to each production factor. We assume the firm has access to a decreasing return to scale technology[7] which is represented by a Cobb-Douglas functional form. The firm's profit maximization problem in first and second period is described as follows:

Firm's Problem t=1

$$Max_{N,K} \;\; E_0\{\pi(z|N, K) = \; zN_p^{\alpha}K^{\psi} - (w + s)N_p - s(N - N_p) - (1 + r_f)K\}$$

Firm's Problem t=2

$$Max_{N_p,N_d} \;\; zN_p^{\alpha}\bar{K}^{\psi} - (w + s)N_p - sN_d - (1 + r_f)\bar{K}$$

$$st \;\; N_p + N_d \leq \bar{N}$$

Where r_f is the net interest rate charged by the banks to lend working capital K to the firm and w is the salary paid per hour worked. The firm solves her problem by backward induction choosing first the optimal amount of labor used in production N_p as well as the labor not used in production N_d for each realization of z. The solution for N_p is given by

$$N_p^* = min\left\{\left(\frac{\alpha z\bar{K}^{\psi}}{w}\right)^{\frac{1}{1-\alpha}}, \bar{N}\right\}$$

[7] This condition ensures a real and limited solution to firm's problem.

Or putting it in another way

$$N_p^* = \begin{cases} \left(\frac{\alpha z \bar{K}^{\psi}}{w}\right)^{\frac{1}{1-\alpha}}, & \text{if } \left(\frac{\alpha z \bar{K}^{\psi}}{w}\right)^{\frac{1}{1-\alpha}} > \bar{N} \\ \bar{N}, & \text{if } \left(\frac{\alpha z \bar{K}^{\psi}}{w}\right)^{\frac{1}{1-\alpha}} \leq \bar{N} \end{cases} \tag{1}$$

The equations 1 set a threshold Γ_n for the productivity shock distribution, which determines the set of z realizations where the firm operates under the labor constraint given by

$$\Gamma_n = \frac{w\bar{N}^{1-\alpha}}{\alpha \bar{K}^{\psi}}$$

Plugging second period solutions in period one problem, the firm solves following problem

$$Max_{N,K} = E[\pi(z)|z \leq \Gamma_n]p(z \leq \Gamma_n) + E[\pi(z)|z > \Gamma_n]p(z > \Gamma_n) \tag{2}$$

$$\equiv$$

$$Max_{N,K} = \int_0^{\Gamma_n} \left\{ z\left(\frac{\alpha z K^{\psi}}{w}\right)^{\frac{\alpha}{1-\alpha}} K^{\psi} - w\left(\frac{\alpha z K^{\psi}}{w}\right)^{\frac{1}{1-\alpha}} - sN - (1+r_f)K \right\} f(z)dz$$
$$+ \int_{\Gamma_n}^{+\infty} \left\{ N^{\alpha}K^{\psi} - wN - (1+r_f)K \right\} f(z)dz$$

Finally, we solve the system of equations formed by the first order conditions in relation to capital and labor of problem (3-2) in order to get the optimal solutions N^* and K^*, which are the demand for labor and for working capital in our economy.

3.2 Households

From the households side we assume that consumers maximize their expected utility function by solving a two-period consumption-saving problem under uncertainty. Consumers are from two types, impatient (borrowers), with intertemporal discount rate β_b and patient (savers), who have intertemporal discount rate β_s, such that $\beta_s > \beta_b$. We assume they are indexed in the unit interval which is divided into λ

impatient and $1 - \lambda$ patient households, $\lambda \in (0, 1)$.

For simplicity, we assume that impatient households are the workers in our economy, who only receive income from labor. Thus, the income uncertainty for them comes only from the firm's probability to not pay salaries. On the other hand, patient households own the firm and the banks receiving income from firm's and bank's profits and also from deposits yields. Besides, we assume that saver's income from the second-period is lump sum taxed[8]. The saver's problem is given by

Saver's Problem:

$$max\ log(c_1^s(i)) + \beta_s E_0\{log(c_2^s(i))\}$$

st.

$$c_1^s(i) + d(i) = \bar{w}_1^s(i)$$

$$c_2^s(i) = (1 + r^d)d(i) + y(i) + t(i)$$

The household utility function is assumed to take a logarithmic form. The budget constraint in first-period consists of an initial endowment that can be allocated between present consumption $c_1^s(i)$ or be saved through deposits $d(i)$. In the second period, savers receive the deposits plus its interest rate $(1 + r^d)d(i)$ as well as the profits from the banks and the firm $y(i)$ net from the lump sum tax $t(i)$. The first order condition in relation to $d(i)$ defines the deposit supply for the banks

$$\frac{1}{\beta_s(1 + r^d)} = E_0 \left\{ \frac{\bar{w}_1^s(i) - d(i)}{(1 + r^d)d(i) + y(i) + t(i)} \right\} \quad (3)$$

Note that in our model the saver's uncertainty is related not just to the deposits return–since banks could also default on the savers–, but also to the profits and the lump sum taxes, which will both depend on the productivity shock. The firm's profit is directly affected by it. The lump sum tax will depend on the public bank profit, which depends, in turn, on the z realizations[9].

[8] As we are going to show in bank's section, the optimal quantities of loans supplied by the banks as well as the interest rates for firms and consumers will not depend on deposit market.

[9] The dependency between tax and the productivity shock is shown in the government section.

We now turn to the impatient household (borrower) problem.

Borrower's Problem:

$$max\ logc_1^b(i) + \beta_b E_0\{log(c_2^b(i)) + \varepsilon log(T - n(i))\}$$

st.

$$c_1^b(i) = \bar{w}_1^b(i) + l(i)$$

$$c_2^b(i) + (1 + r^c)l(i) = wn(i)$$

The borrower maximizes an intertemporal utility function that depends on consumption over the two periods $c_1^b(i)$ and $c_2^b(i)$ and leisure in period two, which can be expressed in terms of the total endowment of time T - which we normalize to 1 - minus the hours of labor supplied to the firm $n(i)$. The borrower's income in the first period consists of an initial wealth $\bar{w}_1^b(i)$ and an amount of credit demanded by him from the banks $l(i)$. When he receives a full salary from the firm, he pays the loan plus its interests $(1 + r^c)l(i)$ at a r^c net interest rate and consumes $c_2^b(i)$ using his income from labor $wn(i)$. Note that if a borrower is not paid in period-two he automatically default to the banks because the salary is his only income in period-two.

The first order conditions of borrower's problem are

FOC L_c

$$\frac{1}{\beta_b(1 + r^c)} = E_0 \left\{ \frac{\bar{w}_1(i)^b + l(i)}{wn^b(i) - (1 + r^c)l(i)} \right\} \tag{4}$$

FOC N

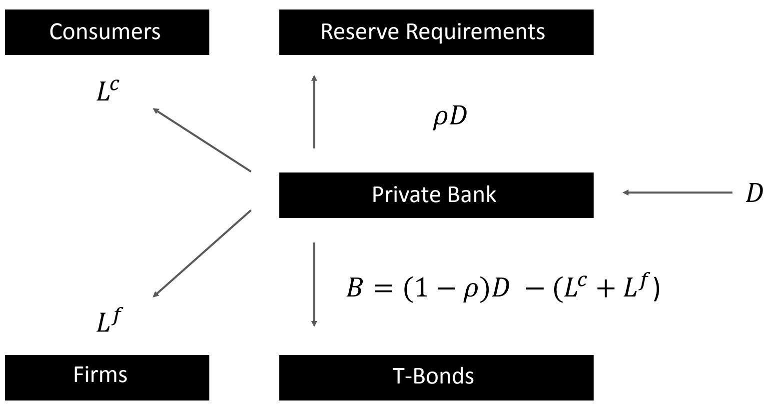
$$\frac{w}{\varepsilon} = E_0 \left\{ \frac{wn(i) - (1 + r^c)l(i),}{1 - n(i)} \right\} \tag{5}$$

The solution of equations (3-4) and (3-5) will lead to the labor supply $n(w; r^c)$ and the households demand for loans $l(r^c; w)$. As in the firm's case, equations (3-4) and (3-5) also demand a numerical solution.

3.3 Private Banks

Private banks intermediate the economy resources between savers, from one side, and firms and borrowers, on the other. They are financed through deposits by the savers (D) and allocate them in three different markets: the credit market for firms (L_f), the credit market for households (L_c) and the bonds market (B). We denote the fraction of reserve requirements stipulated by the Central Bank by ρ. Thus, the total resources available to the bank to be applied in credit and bond's market is $(1-\rho)D$. Figure 3.1 illustrates the bank's balance sheet.

Figure 3.1: Bank Balance Sheet



In the IO approach banks are taken as firms that produce deposits and loan services. To do that, each bank has a technology given by a cost function $C(L_i^f, L_i^c, D_i)$ which depends on the credit volume supplied to firms L_i^f and households L_i^h and the amount of deposits managed by the bank D_i. Following Diáz-Giménez et al. (1992) and Nakane and Alencar (2004), we assume constant returns to scale as well as additive separability in the banks cost function. These assumptions imply that

$$\frac{\partial C}{\partial L_i} = \gamma_L \qquad \frac{\partial C}{\partial D_i} = \gamma_D \qquad \frac{\partial^2 C}{\partial L_i \partial D_i} = 0$$

Where γ_L and γ_D are the marginal costs of loans and deposits operations. For simplicity, we assume that the marginal cost is the same to firms and consumers loans. With the separability assumption, the decision problem faced by the bank in credit markets is separable from the deposit market. So, the optimal loan interest rate will not depend on features of the deposit market, and vice versa.[10]

In its profit maximization problem, the bank allocates his portfolio according to the expected return in each market, which will depend on the default probabilities of firms and households. The bank problem can be described as

$$\begin{aligned} Max \quad \pi(L_i^f, L_i^h, B_i, D_i) = E[r^f(L^f)L_i^f] + E[r^c(L^c)L_i^c] + (1+r_b)B_i \\ -(1+r_d)D_i - C(L_i^f, L_i^c, D_i) \end{aligned} \tag{6}$$

subject to its balance sheet equilibrium

$$L_i^f + L_i^c + B_i = D_i(1-\rho)$$

B_i denotes the bonds bought by the bank i that yield a known net interest rate r_b and D_i is the amount of deposits remunerated by the bank at r_d net interest rate. $E[r^f(L^f)L_i^f]$ and $E[r^c(L^c)L_i^c]$ are the expected return in firms and households credit market, respectively. $r^f(L^f)$ and $r^c(L^c)$ are the inverse demand functions faced by

[10] Since we are interested in as specific channel, which are the competitions effects between public and privet banks on the interest rate spread, this assumption simplifies the analyses and does not harm the paper conclusions.

the bank in each market. Since the banks play a Cournot competition game, $r^f(L^f)$ and $r^c(L^c)$ are functions of all the other bank's credit supply, including the exogenous aggregated public loan supply L_G.

$$r^j(L^j) = r^j\left(\sum_{i=1}^{I} L_i^j + L_G^j\right) \quad, j = f, c.$$

As private banks face a downward sloped demand curve in both markets, a higher quantity of loans provided by public banks, *ceteris paribus*, drops the loan interest rate in equilibrium.

Given the demand functions, we can characterize the expected returns on credit operations in each market. As mentioned before, the default probability in firm's market comes from the probability of the firm's profit $p(\pi_f(z) < 0)$ becoming less than zero while the default probability in households market comes from the probability associated with the chance of a worker who borrows from the bank not being used in production by the firm in period-two, that is, the probability of the worker being fired after the training period.

The bank expected return in firms credit market is given by[11]

$$E[r^f(L^f)L_i^f] = \int_{\sigma_f}^{+\infty} [1 + r^f(L^f)]L_i^f f(z)dz + \delta \int_0^{\sigma_f} r(z)L_i^f f(z)dz \tag{7}$$

Where $\sigma_f = \sigma_f(K, N; w, r^f, s)$ is the threshold value that defines the realization of z where the firm has profit lower than zero and is forced to give a (partial) default on the bank. In other words, σ_f is defined as the value of z that equals the firm's profit to zero. When it happens, although the firm has not enough revenue to pay all the loan she took, she still has a return $r(z)$ that can be appropriated by the bank. The capacity of appropriation of firm's result by the bank in case of default is related to a enforcement parameter δ, $\delta \in [0, 1]$. A higher law enforcement in the economy drops the bank losses in case of default, which will lead to a higher credit supply by the banks. The firm's return when she incurs in partial default is given by

[11]In order to simplify the exposition, we show the algebraic derivation of expected returns in the Appendix.

$$r(z) = \frac{zN^{\alpha}K^{\psi} - (w+s)N_p - sN_d}{K} \qquad when \quad \pi(z) < 0$$

The return $r(z)$ is defined by the ration between the revenue liquid from labor costs in period-two and the loan borrowed by the firm in order to finance her working capital in period 1. On the other side, when the firm does not default the bank it receives the gross equilibrium interest rate $1 + r_f(L^f)$ multiplied by the quantity of loan it lent to the firm L_i^f.

On the other hand, the expected return in consumers credit market is given by

$$E[r^c(L^c)L_i^c] = \int_{\Gamma_n}^{+\infty} [1 + r^c(L^c)]L_i^c f(z)dz + \delta \int_0^{\Gamma_n} \frac{N_p(z)}{N}[1 + r^c(L^c)]L_i^c f(z)dz \quad (8)$$

Where $\Gamma_n = \Gamma_n(N, K; w)$ is the threshold that comes from the inequality (3-1) in firm's problem. When z assumes a value that the firm does not dismiss any worker, i.e. $z > \Gamma_n$, we have $N_p(z)/N = 1$ and all borrowers pay the bank. Since only the borrowers who are not fired by the firm do not default the banks, when $0 < z < \Gamma_n$ the bank only receives the loan repayment plus its interest from the mass of borrowers who receives salary, which we denote by $N_p(z)$. Thus, when the z realization is such that a positive mass of borrowers do not pay the bank it only receives $[1 + r^c(L^c)]L_i^c$ from the mass of borrowers employed in production. Since all borrowers are equal they work the same number of hours and the mass of borrowers who repay the loans can be given by $N_p(z)/N$. What a bank can recover in this situation will also depend, as in firm's credit market, on the enforcement parameter δ. Finally, since the deposits market does not affect the credit market equilibrium we assume perfect competition in this market to simplify analytical derivations.

The first order conditions with respect to L_i^f, L_i^c and D_i defines the optimal amount of loans supplied by the bank in firm's and household's credit market as well as the optimal amount of deposits. Defining the unemployment rate as $u(z) = \frac{N - N_p(z)}{N}$, the first order conditions are given by:

FOC L_i^f

$$[1 + r^f(L^f) + r^{f\prime}(L^f)L_i^f]P(\pi(z) > 0) + \delta E[r(z)|\pi(z) \leq 0] - (1 + r_b + \gamma_L) = 0 \quad (9)$$

FOC L_i^h

$$[1 + r^c(L^c) + r^{c\prime}(L^c)L_i^c]\,\{1 - E[u(z)|z < \Gamma_n]\}\,\delta - (1 + r_b + \gamma_L) = 0 \quad (10)$$

FOC D_i

$$(1 + r_b)(1 - \rho) - (1 + r_d) - \gamma_D = 0 \quad (11)$$

While equations (3-9) and (3-10) define the optimal loans amount in credit markets, equation (3-11) defines the equilibrium between the bonds and deposits market. In the model, the bond's interest rate, which is the bank's opportunity cost to grant loans to firms and households, depend on the reserve requirements and the deposit's interest rate through the following equilibrium relation

$$1 + r_b = \frac{1 + r_d + \gamma_D}{1 - \rho} \quad (12)$$

Thus, a higher reserve requirement will lead to a smaller loans supply by increasing the bank's opportunity cost to provide loans. Since we use the bond's interest rate as exogenous variable in the model, we are already capturing reserve requirements effects on credit supply through the equilibrium relation give by the equation (3-12).

Finally, we describe the role played by the government in the model.

3.4 Government

The government closes the model satisfying its budget constraint. In the first period, he plays a credit policy lending credit to firms L_G^f and households L_G^c . This policy, which is exogenously given in the model, is financed through bonds emissions to the financial system. The government credit policy in $t = 0$ is such that

$$L_G^f + L_G^c = B \tag{13}$$

In the second period the banks pay for the bond's interests, which is given by an exogenous rate r^b. Plus the revenue obtained in bond's market, the government also receive the profits of public banks and the lump sum taxes in second period, when its budget constraint is

$$(1 + r^b)B = L_G^h(1 + r^h)(1 - u(z)) + L_G^f(1 + r^f)|_{\pi(z)>0} + L_G^f \frac{R(z)}{L^f}|_{\pi(z)<0} + T \tag{14}$$

Replacing (13) in 14), we have a single government budget constraint that determines lump sum taxes and is given by

$$T(z) = L_G^h[(1 + r^b) - (1 + r^h)(1 - u(z))]$$
$$+L_G^f[(1 + r^b) - (1 + r^f)|_{\pi(z)>0} - \frac{R(z)}{L^f}|_{\pi(z)<0}]$$

Therefore, lump sum taxes will also depend on the z realizations. In this model, although the countercyclical policy leads to a lower interest rate for firms and households in equilibrium, it has the cost of increasing the taxes on patient households which (partially) offsets the welfare gain from a lower interest rate spread.

3.5 Equilibrium

Our model is evaluated at a symmetric Cournot equilibrium in credit market. The optimal solutions coming from bank's, firm's and household's problem and the market clearing conditions define our equilibrium, which we described bellow.

The *Equilibrium* Definition : Given a public credit policy $\{L_G^f, L_G^h, B\}$, a basic interest rate r_b and a productivity shock distribution $f(z)$, the equilibrium is a sequence of prices $\{w, r_c, r_f\}$ and a set allocations set $\{C_t^i, N^s, D^i, N^d, K, L^f, L^h, T\}_{t=0,1}^{i=b,s}$ such that

I) The firm solves its intertemporal problem (1) under $N_p + N_d \leq N$.

II) The borrowers and the savers solve their problems (2) and (3) under their budget constraints.

III) The private banks solve their profit maximization problems (3-6), leading to an Unique[12] Nash Equilibrium in Banking Sector.

IV) All Markets Clear[13]:

$$\sum_{i=1}^{I} L_{fi}^s + L_{fG}^s = K^d \quad (Firm's\ \ Credit\ \ Market)$$

$$\sum_{i=1}^{I} L_{ci}^s + L_{cG}^s = L_c^d = \int_0^{\lambda} l^d(i)di \quad (Household's\ \ Credit\ \ Market)$$

$$B = (1-\rho)\int_0^{1-\lambda} d^s(i)di - \sum_{i=1}^{I} L_i^f - \sum_{i=1}^{I} L_i^f \quad (Bond's\ \ Market)$$

$$\sum_{i=1}^{I} D_i = \int_0^{1-\lambda} d^s(i)di \quad (Deposit's\ \ Market)$$

$$N^d = N^s = \int_0^{\lambda} n^s(i)di \quad (Labor\ \ Market)$$

3.6 Calibration

For the calibration of the parameters, we adopt the following strategy:

1. We use parameters estimated for the Brazilian economy in Nakane and Alencar (2004) and for U.S. economy when estimations for the Brazil were not available.

2. The parameters that build the demand for loans from firms and consumers were calibrated in order to replicate the demand elasticities for loans in Brazil estimated

[12]Since all the banks are symmetric and face well behaved downward sloped demand curves for loans in both firms and consumers market, the Nash equilibrium is unique.[see **?**]

[13]We index the demanded quantities by the letter d and supplied quantities by the letter s.

by Coelho et al. (2017).

3. The parameters of the financial system were calibrated based on the average found in the data of Brazilian economy in 2010, which is our starting year when performing counterfactual analysis.

4. The other parameters were calibrated so as to ensure consistency with the data for the main economic relations in equilibrium.

In order to preserve a reasonable time duration for the agent's planning horizon in our two-period setup as well as use sufficiently data observations to ensure a robust analysis, we consider that each period has a duration of a quarter.

Regarding the parameters of the logarithmic utility function, we set $\varepsilon = 1.4317$, this value was estimated by GMM in Nakane and Alencar (2004) for Brazilian economy and is consistent with the calibrations of our other parameters and the model outputs. The impatient intertemporal discount rate β_b was set at 0.9153, a similar value estimated by Alencar and Nakane of 0.9140. Both β_b and the borrower's initial endowments W_0^b, which we set to 0.121, were chosen to reproduce an inelastic demand function for loans from the households as well as to ensure consistency between the data and the model outputs. Since the parameters from patient households have no practical consequences for the qualitative conclusions of the model economy we consider them as arbitrary normalizations.

The parameters α and ψ from the Cobb-Douglas production function were set in order to reproduce two features of Brazilian data. The first one is the high elasticity of credit demand by the firms, which was estimated by Coelho et al. (2017) to be between -1.8 and -2, from those we take the average -1.9. The second one is the average share of labor and capital observed in National Accounts. To satisfy both conditions we set $\alpha = 0.428$ and $\beta = 0.285$. The cost of training s, in turn, was calibrated to 0.3105 in order to get consistent values for the expected unemployment rate in our economy.

There are no available estimations for operational costs associated with the loan and deposit activities for Brazilian banks. We then use the estimates reported by Diáz-Giménez et al. (1992) for the U.S. economy. The value estimated by the authors are 0.11875% for the marginal cost of deposits η_D and 0.5625% for the marginal cost of loans. We consider that the loans have the same marginal cost whether they are made for the firms or consumers. The reserve requirements ratio on deposits was set at $\rho = 0.45$, which is close to the average values observed in Brazil.

Based on Central Banking data from December 2001, Nakane and Alencar (2004) set in 40 the number of private banks in their model. To work just with banks that have their main activities in the retail credit market, as our model requires, the authors select the banks who have more than 10 branch networks among a set of 160 banks operating in retail markets, since retail banks usually have large branch networks.

To deal with banks who have less than 10 branches, we use the data of financial conglomerates from *Balancetes e Balanços Patrimoniais* available in BCB website. In the data, there were 66 financial conglomerates operating in retail credit market in January 2010 in Brazil. However, since just five of them accounted for 81.43% of the total outstanding loans (including two government-owned banks Banco do Brasil and Caixa Econômica Federal), we understand that the market share should also be considered to calibrate the number of banks to replicate the high level of bank concentration. Since we have to adapt these numbers to our model of symmetric banks, we then set the number of private banks to 16. With such calibration we consider the stylized facts from the data and preserve the consistent economic relations in equilibrium.

The institutional parameters of enforcement δ was set in 0.158 to match the value of the recovery rate in Brazilian economy calculated by the Word Bank in 2016.

Finally, we calibrate the average and standard deviation parameters of the productivity shock distributive function in order to match the bank's expected fraction of defaults with observed default rates in firms and consumers credit market in Brazilian economy between 2010 and 2017. Thereby, we capture the risk dynamics in the economy through the productivity shock distribution in each period. Table 3.1 resumes the model parameters values.

Table 3.1: Calibrated Parameters

Parameters	Description	Values
β_P	Patient Households	0.9890
β_I	Impatient Households	0.9153
ε	Labor parameter Log Utility Function	1.4317
α	Labor Share Cobb-Douglas Production Function	0.4286
ψ	Working Capital Share Cobb-Douglas Production Function	0.2857
s	Labor Cost of training	0.3105
I	Number of Private Banks	16
λ	Fraction of impatient households	0.212
γ_L	Cost per Unit Value Loans	0.5625%
γ_D	Cost per Unit Value Deposits	0.11875%
δ	Recovery Rate	0.1580
ρ	Reserve Requirements Ratio on Deposits	0.45
W_0^b	Borrower's Endowment	0.2501
W_0^s	Saver's Endowment	0.8243

We also use three macroeconomic variables of the Brazilian economy that are exogenously given in the model. The new transactions of public loans to firms and consumers and the one year interbank market rate.

As in our model banks optimally choose how much to lend for firms and consumers in each period, the amount of credit corresponds to new loans in the economy. However, we did not have access to data on new loans in Brazil, since there is no open data source for new loans categorized between public and private banks. To recover new loans transactions of public loans we did a reverse engineering procedure by getting new transactions from outstanding loans, which are openly available in the *Balancetes e Balanços Patrimoniais* database stored in BCB website[14]. This database has the balance sheet of all Brazilian financial conglomerates.

However, note that to recover the new loans from outstanding loans we need the amortization. Although we do not have new transactions divided between public and private banks, we do have new loans and outstanding loans for firms and consumers in another open base provided by BCB called Time Series Management System

[14]http://www4.bcb.gov.br/fis/cosif/balancetes.asp

-(TSMS)[15] . From this base we got the average amortization for firms and consumers loans as a proportion of outstanding loans, which we denote by m_t. Thus, the amortization in each market M_{ti} was approximated by $M_{ti} = m_t S_{i,t-1}$, where $S_{i,t-1}$ is the volume of outstanding loans in period t for a bank i.[16] Since a $S_{i,t-1}$ is given by $S_{it} = S_{i,t-1} + L_{it} - M_{ti}$, we recover the new transactions in both credit markets.

$$L_{it} = S_{it} - S_{i,t-1} + M_{ti}$$

Which we approximate by

$$L_{it} = S_{it} - S_{i,t-1} + m_t S_{i,t-1} = S_{it} - (1 - m_t) S_{i,t-1}$$

Finally, we took the one year interbank market rate from TSMS.

4 Results

4.1 Comparative Static Exercises

In order to show the model consistency with economic theory, this section presents the main static relations between the model parameters and the loans interest rates for firms and consumers. We do it making isolated changes in: i) the number of private banks, ii) the recovery rates of firms and consumers credit market, iii) the one year interbank rate and iv) the expected default probabilities.

Figures 4.1 (a) and (b) show that a decrease in 20% in the numbers of private banks (16 to 13)[17] would lead to a rise of 7.8 p.p. in the annual interest rate for consumers and 1.6 p.p. for firms. The economic intuition behind this result is that, since in our setup banks have a higher market power in consumers credit market, an equivalent decline in competition will lead to a higher increase in interest rate for

[15]https://www3.bcb.gov.br/sgspub/localizarseries/localizarSeries.do?method=prepararTelaLocalizarSeries

[16]Since the new loans dynamic and policy changes in government-owned banks are coming through the difference in outstanding loans between t and $t-1$ and there is no reason for amortizations considerably differ between public and private banks, this approximation does not harm the evolution of public loans series.

[17]Note that there is restriction so that the number of private banks be an integer. As we are reducing the competition in 20% between private banks, we assume the number of private banks as a continuous variable.

consumers.

Figures 4.1 (c) and (d) present the effect in interest rates of an equivalent increase in recovery rates on firms and consumers credit market from 0.158 to 0.482, which is the average recovery rate of a sample composed by Brazilian neighbors Argentina, Chile, Mexico and Colombia. In this exercise we increase the recovery rates in firms and consumers market at the same proportion. This isolated change in the average recovery rate would lead to a decrease of rates in loan rates of 5.8 p.p. to consumers and 4.2 p.p. to firms.

The result is consistent with the data from Figure 2.4 which shows the correlation between the average recovery rate and the spread in retail credit market. From the data we see that the Brazilian spread is much higher than the average one observed in countries with similar recovery rates. What this exercise shows is that even if we just increased the Brazilian recovery rate to a value similar to the one observed in countries with low spread, the Brazilian spread would fall a little but it will continue to be significantly higher than the average of these other countries. The conclusion is that other factors beyond law enforcement are important to understand the huge spread in Brazilian economy, such as risk, cost of funding or lack of competition among banks.

In Figures 4.1 (e) and (f) we see that, *ceteris paribus*, a rise in one interbank market rate from 7.08% p.y. to 15.26% p.y. - the same rise observed between January 2012 and January 2017 in Brazilian economy - would lead to an increase of 10.68 p.p. in the interest rate for consumers and 8.58% p.p. in interest for firms. Such effect is consistent with the data shown in Figure 2.3[18]. As a matter of fact, the data show that the one-year interbank rate has a high correlation with interest rates whether in firms or consumers credit markets.

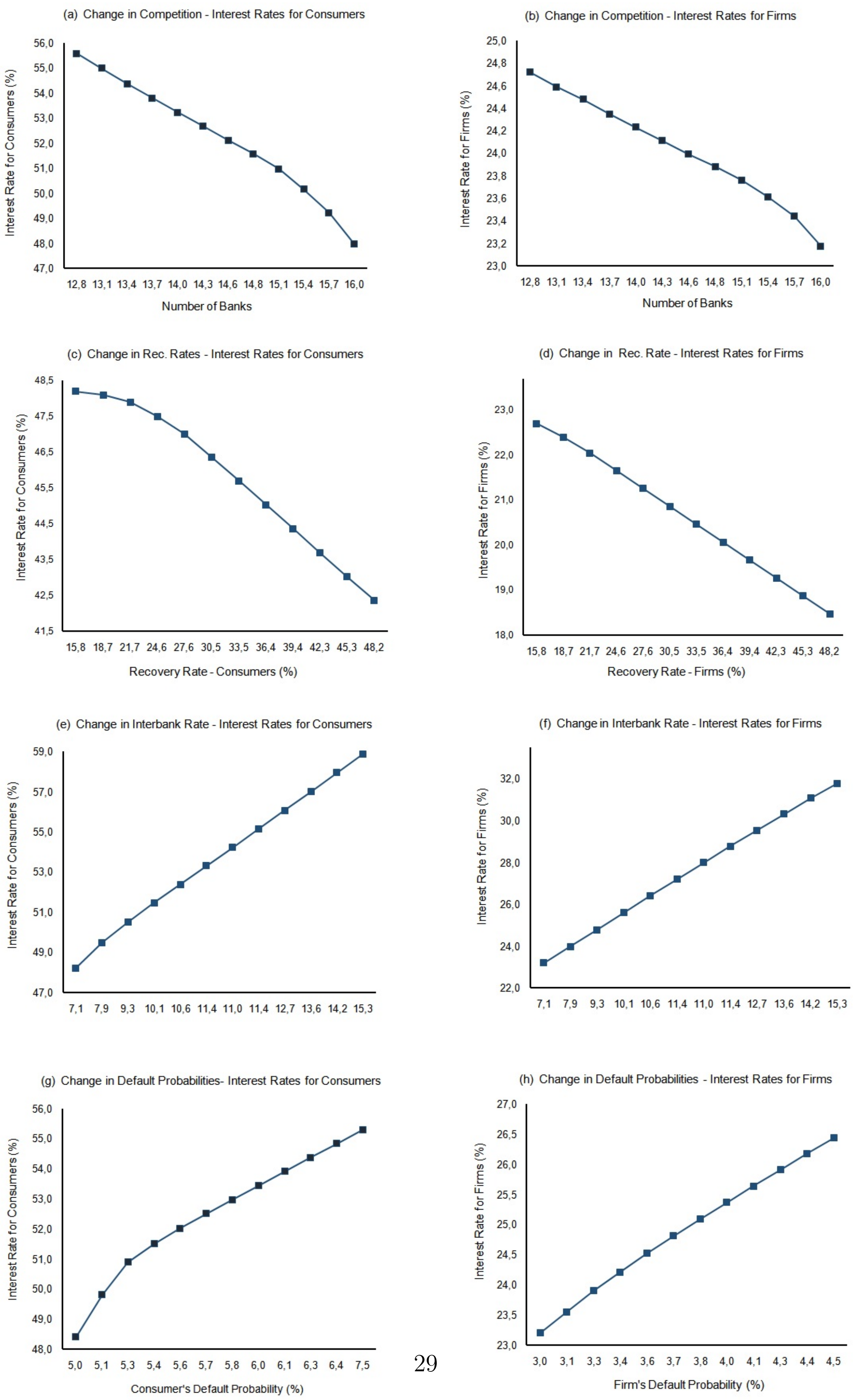
Lastly, Figures 4.1 (g) and 4.1 (h) show the effect of default rates variations on loan rates. We increased default rates in 50% in firms and households credit markets, a similar rise that took place in Brazil from 2010 to 2017. Such change would lead to a increase in interest rate of 3.2 p.p. for firms and 6.9 p.p for consumers, according to the model.

[18]Chapter 2.

Since interest rates in retail credit market rose in 31.7 p.p. for consumers and 9.38 for firms between January 2012 and January 2017 and no one isolated change had affected interest rates so much, the comparative static results show that there is no isolated factor capable of explaining the rise in Brazilian spreads in this period. Instead, a combination of all of them is required to produce such large increase.

All these results are consistent with the model behavioral functions and, thus, with economic theory. In the next section, we discuss how well the model is able to replicate the path of interest rates in Brazilian economy.

Figure 4.1: Comparative Statics Exercises

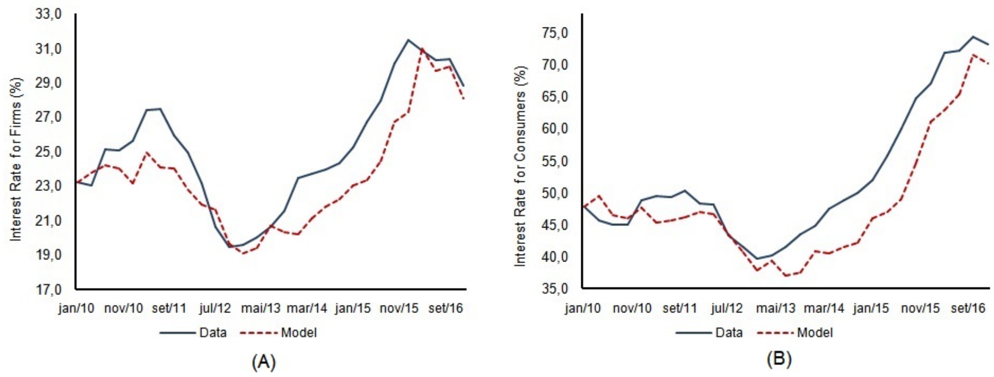


4.2 Model Fit

To generate the model fit we first calibrate the model parameters with data from 2010, which is our starting year in the counterfactual analysis. Then, we change only the parameters of the shock distributive function along the periods in order to capture the risk dynamics in the Brazilian economy. We simulate the model to assess how well it can replicate the observed dynamics of loans interest rates in Brazilian economy between January 2010 and January 2017.

Figures 4.2A and 4.2.B show the interest rate spread from the data and from the model in firms and households credit market. Although the model does not match the data perfectly, it fits well the long-run dynamics of interest rates in both credit markets. It captures the fall in interest rates over 2012 during the forced spread reduction in Rousseff's administration and also the climb in interest rates over 2014 and until the beginning of 2017. Besides, trough different loan demand elasticities and default risks between firms and consumers the model seems to capture the distinguishing features between firms and consumers market.

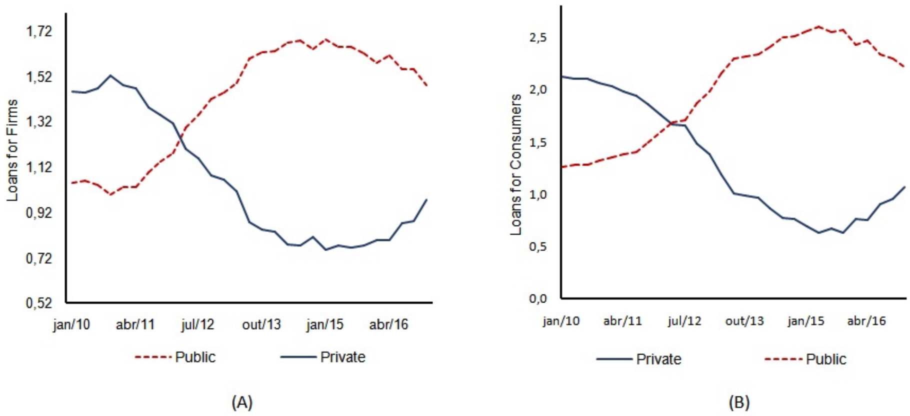
Figure 4.2: Model Fit



In relation to the quantities, Figure 4.3 shows how private credit reacts in our model to the exogenous public loans and the other model variables. Since we are working with a Cournot competion model, the private credit supply will come from the best response functions of private banks[19], which are negatively related to the public loans supply. Therefore, public and private loans will generally present a negative correlation, as we see in Figure 4.3.

[19]Since we solve the model numerically, we can not reach best response as formal functions.

Figure 4.3: Private Loan's Response



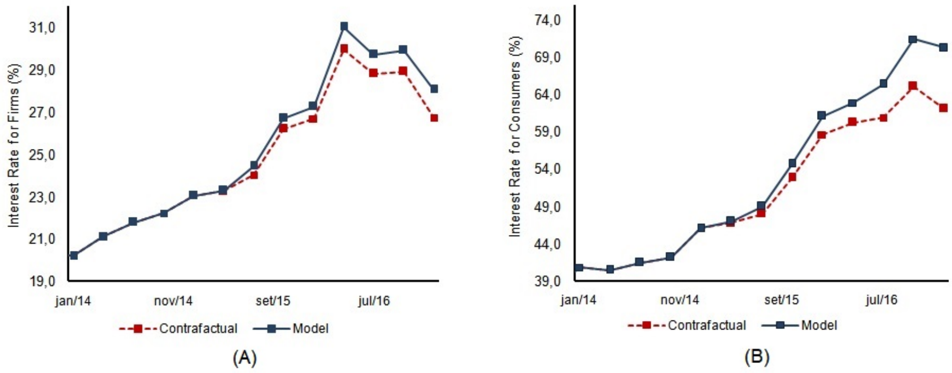
In next section we analyze the effects of both cyclical and countercyclical public-led credit expansion on interest rates trough counterfactual exercises.

4.3 Counterfactual Analysis

In this paper, we built two counterfactual scenarios. In the first one, we see what would have been the loans interest rates and spreads if government-owned banks had not presented financial fragilities. We assume that this would lead to the maintenance of the same countercyclical policy of the period 2012-2015, during the recent economic downturn in Brazil. In the other scenario, we look at what would have been the loan rates dynamics if public loans had grown in a more sustainable way between 2012 and 2014, so that it did not compromise the capacity of government-owned banks to maintain positive loans expansion rates after the beginning of the economic crisis in Brazil.

Government-owned banks expanded their new lending operations at an average pace of 2.42% per quarter between March 2012 and March 2015. However, after March 2015 and until January 2017, government-owned banks shrank their credit operations in retail markets at an average pace of -1.98% per quarter. What Figures 7.A and 7.B do is to show the interest rate behavior in firms and consumers credit market if government-owned banks had kept the expansion pace of 2.42% until January 2017.

Figure 4.4: Keeping the Public Credit Policy Unchanged



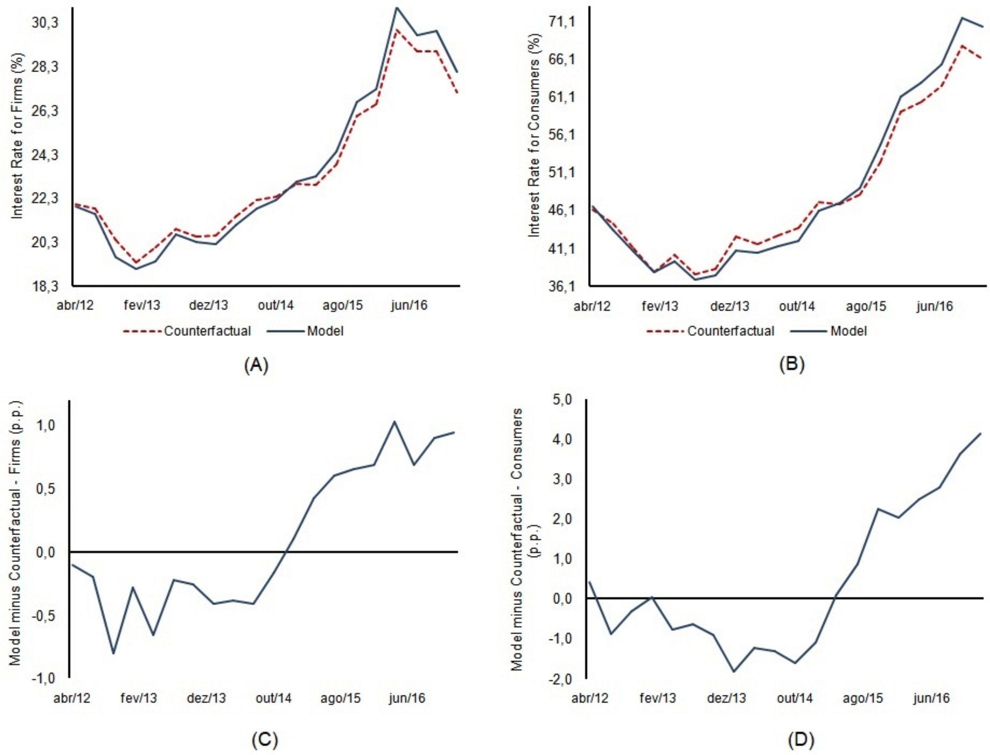
Our results show that if the credit policy expansion had kept the same rhythm from the previous years the loans interest rate in January 2017 would be 60.03% y.y. for consumers and 26.23% y.y. for firms, when model fitted values are 70.25% and 28.05%y.y., respectively. Thus, our results show that if public loans had continued to expand at the same path the interest rate would be 10.22 p.p. lower for consumers and 1.82 p.p. lower for firms. As the fitted values show that the interest rates had risen 5.02 p.p. for firms 24.22 p.p.for consumers between March 2015 and January 2017, the change in credit policy was responsible for 26.5% of the interest rate hike in firms credit market and for 33.7% of the hike in consumers credit market.

This means that even though interest rates for consumers and firms had risen due to factors not associated with the public credit policy after the first quarter of 2015, such as the interbank rate climb and higher default risks coming from economic downturn, the adoption of a procyclical behavior in public loans supply in a moment of risk leverage is an additional important factor to understand the rise in spreads.

The effect is higher in the consumer credit market. Our economic intuition is that since the consumer credit demand is quite more inelastic than the firms one (Coelho et al. (2017)), a supply shock like this would lead to a comparably higher price change for consumers.

The second counterfactual exercise measures what would have been interest rates paths if Rousseff's credit policy had presented a more sustainable growth of new loans transactions so government-banks could keep a macroprudential policy during the recent economic downturn. To do that we considered a 1% average growth per quarter of new public loans transactions between 2012 and 2017 instead off the 2.42% one observed between 2012 and 2015. Figures 4.5.A and 4.5.B show the result for firms and consumers market. Figures 4.5.C and 4.5.D show the difference between the model fitted values and the counterfactual values for both markets.

Figure 4.5: A Sustainable Credit Expansion Policy



The results in Figure 4.5.A and 4.5.B show that interest rates would have been higher between 2012 and 2015, but lower after that due to the maintenance of a positive average expansion rates in public loans. An even more interesting result is that the difference between counterfactual interest rates and their fitted values is higher during period of the Brazilian economic crisis than in the period between 2012 and 2015, as Figures 4.5.C and 4.5.D. show. Based on this result, a policy of credit expansion would be more effective in reducing bank spreads if it had been concentrated during economic downturns, i.e., if it were truly countercyclical. Therefore, our results indicate that, in order to maximize the potential of the credit macroprudential policy, government-owned banks should perform credit stimulus countercyclically, not cyclically. Of course, this statement sidesteps the most difficult political economy question of how to implement a truly countercyclical policy with government-owned banks.

5 Conclusions

To understand how government-owned banks affect loan rate spreads we adapt Cournot banking competition models in order to consider the countercyclical role played by public loans in the economy. The model incorporates both differences in the credit markets for consumers and firms and in the behaviour of public-owned and private banks.

We solve the model, calibrate it using data from the Brazilian economy and use it for a series of counterfactual studies. We are interested in understanding the effects of credit expansions led by government-owned banks on interest rate and spreads. Our results indicate that credit expansion by public-owned banks would have been more effective in lowering loan rates if it had been implemented during the recession period 2015-2017 instead of during the period of economic expansion 2012-2015. This suggests that to maximize the potential of the credit macroprudential policy, government-owned banks should perform credit stimulus countercyclically, not cyclically, as it happened.

More specifically, our results show that the change in credit policy in Brazil after the middle of 2015 was responsible for 26.5% of the loan interest rate hike for firms and for 33.7% of the hike for consumers. This means that even though interest rates for consumers and firms had risen due to factors not associated with the public credit policy after the first quarter of 2015, such as the interbank rate climb and higher default risks coming from economic downturn, the adoption of a procyclical behavior in public loans supply in a moment of economic recession did intensify the hike in loans spreads.

In summary, our results suggest the the use of public-owned banks to lower credit spreads in Brazil is a two-edged sword. If these banks were able to implement a true countercyclical policy, it could indeed help to lower the credit spreads. However, the actual attempt of the Rousseff administration to use government-owned banks to lower the credit spreads backfired.

6 About the Data

As we mention before in section 3, we use 3 macroeconomic variables of the Brazilian economy as exogenous in the model. They are the new transactions of public loans to firms and consumers and the one-year interbank market rate.

However, we did not have access to new transactions of loans in consumers credit market categorized between public and private banks. The same happens in the market for corporate loans. We only had access to the aggregated new loans for households and firms, not categorized according to bank ownership. To recover public and private new loans in each credit market we did a reverse engineering procedure extensively described in section 3. If we have access to new loans made by the two types of banks in each market we could improve the accuracy of the model. To deal with the lack of a more detailed data we had to assume some hypotheses that may have affected our results, especially the fit of the model.

We found the same problem with default rates. Although the default rates are not used as exogenous variables, we use them to extract moments from the data to calibrate the model. At the dataset provided by the BCB (Time Series Management System), we can access default rates faced by public and private banks, but not the rates faced by them in each credit market. To deal this issue we had assumed that default rates for each type of bank in each market are proportional to what we observe on the aggregate data, what can also affect our results since we may not be capturing exact moments from the data.

Thus, the access to a more rich database would potentially improve our results as well as our understanding of what extent government-owned banks affect credit markets.

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