Effects of interest rate caps in microcredit: evidence from a natural experiment in Bolivia

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Abstract

This paper evaluates the imposition of caps on microcredit lending rates through directed credit policies for productive sectors. This financial inclusion intervention provides a unique quasi-experiment, and we estimate their causal effect following a difference-in-differences analysis. Our results suggest that the imposition of interest rate ceilings negatively affected the portfolio balance of new microcredits and loans to SMEs granted by MFIs. Specially, we find robust results that the balance of the microcredit and SMEs' loan portfolio granted by MFIs, relative to the company´s portfolio granted by banks, decreased by 26.1% for an average MFI for the period 2011-2018.

JEL: G18; G28; G38.

Keywords: Interest rate ceilings, financial inclusion, credit access, microcredit loans, small and medium enterprises loans.

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Introduction

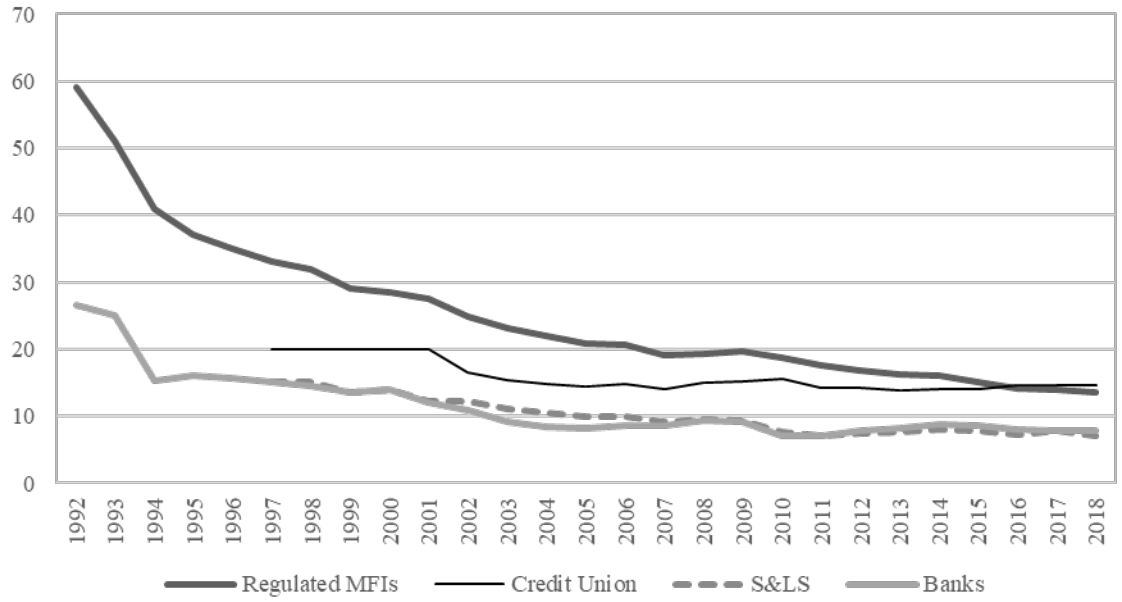
Since 90's, microfinance has been the most vigorous and a major segment of the Bolivian financial system, reaching large segments of the population, traditionally excluded from access to institutional financial services. This outstanding result responds to a virtuous conjunction of different elements. On the one hand, supply-side elements contributed to this outcome: excellent local non-government leaders, governance and institutional design that promote sustainability, and continue innovations in lending and deposit mobilization technologies --stands out the development, *in situ*, of credible relationships between borrowers and lenders.

On the other hand, the transformation of several of the original microfinance NGOs into prudentially regulated institutions (*fondos financieros privados*, FFP) and the creation of BancoSol — the first private commercial bank fully specialized in microfinance in the world – , provided a suitable context for the prudential regulation and supervision of microfinance. Furthermore, this transformation into regulated institutions positively spilled over into the non-regulated sector, fostering a strong competition among diverse financial intermediaries (Marconi and Mosley, 2006; Maclean, 2010; Gonzalez-Vega and Villafani-Ibarnegaray, 2011; Rojas and Ruesta, 2019).

During the 90's and the first decade of the present century, prudential framework adjusted to the evolution of the sector, by allowing innovation while ensuring financial stability, with no state intervention. The credit portfolios of the traditional regulated Bolivian microfinance institutions (MFIs) grew along an almost exponential path with a huge reduction of interest rates. The interest charged declined broadly from 45% on December 1992 to 13% on December of 2018 (Figure 1). The major force of this reduction was the

decrease of operational costs. These MFIs have formed a greater share of the national financial system's overall loan portfolio. From December 2000 to December 2018, the loan portfolio of traditional microfinance institutions share increased from approximately 4% to 20% of that of the national financial system (Gonzalez-Vega and Villafani-Ibarnegaray, 2011; Rojas and Ruesta, 2019, Global Microscope, 2015).

Figure 1: Implied interest rates



Note: These rates are computed as the effective financial earnings on the gross loan portfolio for banks, credit unions, savings and loan associations (S&Ls), and traditional regulated microfinance institutions (MFIs, names as 2018): Banco Sol S.A., Banco para el Fomento a Iniciativas Económicas S.A, Banco PYME Los Andes, Banco FIE, Banco PYME EcoFuturo and Banco Prodem. Source: Updated from "Las microfinanzas en la profundización del sistema financiero. El caso de Bolivia," by C. González-Vega, and M. Villafani-Ibarnegaray. 2007, El Trimestre Económico, 74, 41. Copyright 2007 by "Fondo de Cultura Económica".

The landscape for microfinance in Bolivia drastically shifted over the last decade due to changes in its regulatory environment. The Autoridad de Supervisión del Sistema Financiero (ASFI, the Financial System Supervisory Authority) established a long-anticipated financial services law, the Financial System Law of 393 (the Law), promulgated in August 2013 and implemented in mid-2014. Within the framework of the Financial Services Law, MFIs had to obtain licenses to operate as commercial or Small Medium

Enterprises (SMEs) banks, and assume a major tax change, which has limited their profitability.

With the objective of promoting productive credit and limiting usury practices, the Law imposed ceilings for interest rates for productive credits, and especially microcredit. Specifically, it defined upper limits for interest rates of 6% for productive loans to companies, 6-7% for productive loans to SMEs, and 11.5% for productive microcredits. Furthermore, the Law also established goals for the fulfillment of compulsory portfolio quotas for productive credits.

The Law was part of a comprehensive government plan responding to low levels of financial inclusion in this country. In Bolivia, despite the notable growth (above 4%-5%) and an impressive reduction of poverty level (Gini coefficient around 0.47)[2] in the last decade – mainly due to the high prices of commodities[3] –, and despite the performance of microfinance mentioned above, the majority of the population does not participate in the formal financial sector, and uses informal channels to carry out their financial transactions. In 2017, 51% of the population reported having a savings account in a formal financial institution, but only 16% reported using it in the last year. On the credit side, 45% of people said they had borrowed some money in the last year, but only 16% did so from a formal financial institution (Demirguc-Kunt et al., 2018).

Recently, some works have pointed out the potential impact of the regulatory measures and state intervention on Microfinance, and its unintended consequences (Global

[2] With information from the Ministry of Economy and Public Finance; data for 2018 corresponds to the month of December.
[3] Gas and other hydrocarbons and minerals constitute most Bolivia's exports.

Microscope, 2015; Rojas and Ruesta, 2019). This paper's principal objective is to analyze the impact on microcredit access of imposing ceilings on interest rates in Bolivia.

In order to accomplish this aim, we will follow an empirical strategy of difference-in-differences (DID) within the framework of a natural experiments. After the imposition of the interest rate caps, compared to the other productive credit portfolios, the decrease of the effective interest rates of microcredits and credits to SMEs granted by MFIs remarkably stands out. Therefore, in this study we estimate the impact of the imposition of ceilings on interest rates, analyzing the difference between the microcredit and SMEs portfolio granted by MFIs (treatment group), and the productive loans to companies' portfolio (control group). For this exercise, we use a unique database of high granularity, which contains information on the number and volume of new credit operations, disaggregated by financial institution (bank and MFI) and portfolio (credit to companies and SMEs, and microcredit).

The key findings of this study indicate that the imposition of ceilings on interest rates policy inhibited financial access. Our results suggest that this policy negatively affected the portfolio balance of new microcredits to SMEs granted by MFIs. More specifically, the balance of the microcredit and SMEs' loan portfolio granted by MFIs, relative to the company´s portfolio granted by banks, decreased 26.1% for an average MFI for the period 2011-2018.

This paper is structured as follows. In the first section, the literature related to our work is reviewed. The second section describes in detail the database and the financial inclusion policies under analysis. The third and fourth sections lay out our identification strategies and present the results for the natural experiment. Finally, we present our conclusions and discuss the main results.

2. Literature review

Our work contributes to the debate on the imposition of interest ceilings to promote access to credit. Advocates for this measure affirm that it protects financial consumers from usury practices, in addition to providing short-term credit to strategic industries (Dewatripont and Tirole, 1994; Miller, 2013). The use of interest rates caps would serve as a consumer protection policy against financial institutions that use information asymmetries to justify high and excessive lending rates. In addition, interest rate caps are most often used in low-income groups, where microfinance institutions impose the highest rates on a larger volume of low-value loans. Besides, in remote or rural areas, prices charged by these institutions are generally non-competitive, being higher than the real cost of lending. In this context, interest rate caps protect vulnerable segments by ensuring a maximum price. To the best of our knowledge, few empirical studies supports arguments in favor of this type of intervention (Demitriades and Luintel, 2001; Crotty and Lee, 2002).

Critics of the imposition of ceilings on interest rates argue that the imposition of caps magnifies the problem of asymmetric information, since credit institutions cannot charge a high-enough-rate to a large pool of borrowers with unidentifiable creditworthiness. Institutions therefore end up lending to people with higher collateral and excluding those who have little or no access to credit. In addition, interest rate ceilings can increase the cost of loan screening, which is harmful to financial outreach. Using panel data for different countries, several papers show how the imposition of ceilings on interest rates reduces transparency, and diminishes financial deepening and financial inclusion (Helms and Reille, 2004; Capera et al., 2011; Agudelo and Steiner, 2012; Miller, 2013; Maimbo and Gallegos, 2014). Along the same lines, several studies show that economies with financial repression

are found to impose financial restrictions and price distortions that turn into less financial system development, with unintended effects on poverty and growth as well as higher barriers to accessing deposit and lending services (Creane et al., 2003; Beck et al., 2008; Akhter and Daly, 2009; Gimet and Lagoarde-Segot, 2012). These studies conclude that the most effective policies in reducing lending rates and improving access to credit are those which directly affect the initial market failure -- e.g., measures that enhance competition and product innovation, consumer protection laws, and financial literacy.

We acknowledge a few works that uses DID to analyze the effects of interest rate caps in developing and emerging countries[4]. Using individual-level administrative data, Madeira (2019) analyze the implementation of a policy that gradually reduced the maximum legal interest rate for consumer loans in Chile. The author finds that being above the interest rate cap reduces the probability of consumers to credit access by 8.7% on average. Cuestas and Sepulveda (2019) analyze the same policy and find evidence that reducing the interest cap decreases the transacted interest rate by 9% and reduces the number of consumer loans by 19%. Our paper differentiates from these studies in that we exploit the individual level administrative data to analyze the effect of the increase of the interest rate cap on the microcredit loan portfolio rather than on the consumer portfolio. For the case of Colombia, Cubillos et al. (2019) study the liberalization of the microcredit usury rate in Colombia and its effects on loan expansion.

Similar to our study, in Kenya, using loan and deposit data from commercial banks, Safavian and Zia (2018) explore the imposition of an interest rate cap. Their results show a

[4] In the context of developed countries countries see Alessie et al. (2005); Zinman (2009), Benmelech and Moskowitz (2010) and Rigbi (2013).

significant decline in aggregate lending, an increase in nonperforming loans, and a change in composition of lending away from small and medium enterprises and toward safer corporate clients. They do not have variation across the cross-section of sectors or banks since all banks were affected by the caps and faced the same prevailing economic and market downturn. Then, the only heterogeneity they can exploit is across three time periods Therefore, they do not make causal claims in their analysis, as we are able to do in our paper.

The studies above use a framework of natural experiments and DID models to evaluate the impact the liberalization or imposition of interest rate caps. In all cases, the effects of liberalization on credit access were positive. Our work follows this estimation strategy but employs a broader, multidimensional vision of financial inclusion, considering imposition of interest rate caps.

3. Background of Microfinance sector in Bolivia

In Bolivia's financial system, productive[5] loans granted to firms are divided in three different portfolios: credit to large companies (henceforth companies), credit to SMEs, and microcredit. In this country, microcredit is credit given to people with self-employment activities and microenterprises, whose source of repayment is the income generated by said activities. SME credit is any credit granted to a natural or legal person to finance production, and where the size of the economic activity is classified as Medium Enterprise and Small Businesses by the Bolivian index. Credit to companies is any credit granted to a natural or legal person to finance production, and where the size of the economic activity is classified

[5] Productive credit comprises the following economic sectors: Agriculture and livestock, hunting, forestry and fishing, oil and natural gas extraction, metallic and non-metallic minerals, manufacturing, production and distribution of electricity, water and gas, construction and tourism (for investment capital) and intellectual property.

as Big Enterprise by the Bolivian index[6]. Henceforth, we will refer to productive credits as "credits", since we will focus exclusively to credits granted for productive purposes.

The Law 393 of Financial Services, promulgated in August 2013, introduced important regulatory changes for all productive credits. Specifically, the Law defined upper limits for interest rates of 6% for productive loans to companies, 6-7% for productive loans to SMEs, and 11.5% for productive microcredits. As of the effective application of the Law in August 2014, the nominal interest rates for new credit operations decreased and were set below the regulatory limits. However, the magnitude of the change in the rate was different within credit types and within types of financial institutions.

Figure 1 depicts interest rates for the three portfolios, granted by commercial banks[7] (banks hereafter) and MFIs[8]. Microcredits' rates charged by MFIs experienced a drop close to 600 basis points (on average) while banks' rates decreased less than 30 basis points. A similar situation is observed with SMEs and companies' portfolios, with a sharp drop in rates charged by MFIs and a less pronounced fall in banks' rates. It is worth noting that in all three cases, the interest rates charged by banks were near to those stablished by the Law, hence the modest changes after the ceilings were imposed. The situation was different for MFIs, who had to undertake major adjustments on their rates to comply with the limits.

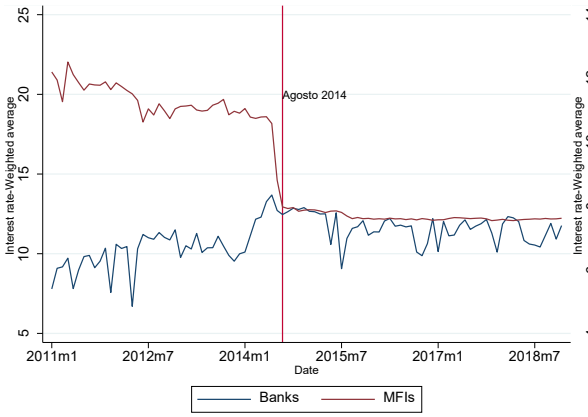
Figure 1: Regulated effective interest rates, by portfolio and type of bank

[6] The index can be found in '*Recopilación de Normas para Bancos y Entidades Financieras*', compiled and published by ASFI.

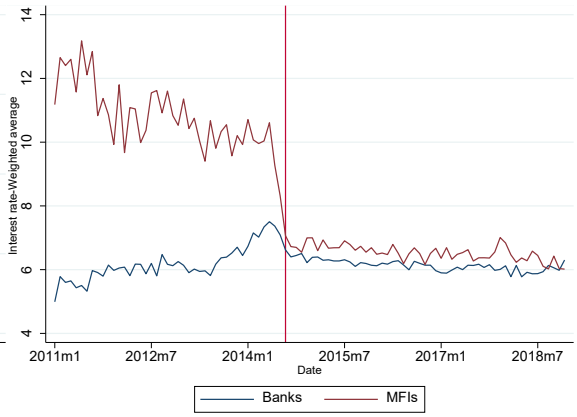
[7] We consider the following comercial banks: Banco BISA S.A., Banco Mercantil Santa Cruz S.A., Banco Nacional de Bolivia, Banco Económico S.A., Banco de Crédito de Bolivia S.A. Banco Ganadero S.A., Banco Unión S.A.

[8] We consider the following MFIs: Banco Sol S.A., Banco para el Fomento a Iniciativas Económicas S.A., Banco Fassil S.A., Banco Prodem S.A., Banco PYME de la Comunidad S.A., Banco PYME Ecofuturo S.A.

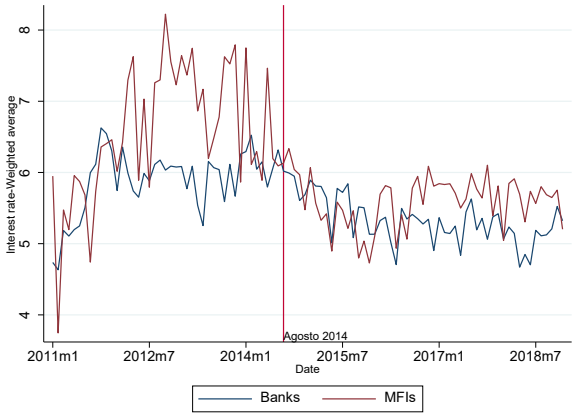
1a. Microcredits



1.b Credit to SMEs



1c. Credit to companies



Source: Prepared by the authors based on ASFI data.

The volatility of the interest rate of credits to companies granted by MFIs (Panel 1c) results from the fact that they hold a minor part of the total portfolio of this type of credits (close to 0.1% of the joint portfolio). This, in addition to the fact that credit to companies is out of the business scope of the MFIs, justify the exclusion of this part of the portfolio from the analysis we will develop.

The sharp drop in the microcredit and credits to SME interest rates charged by MFIs provides an ideal and unique quasi-experiment; one which allows us to estimate the causal effect of the imposition of the interest rate caps on those credits. Specifically, we compare

the microcredit and SMEs loans granted by MFIs (treatment group) with that of companies' portfolio granted by banks (control group), right after the ceilings were imposed. Our choice of companies' loans granted by banks as a control group is justified by the fact that both microcredit and credit to SMEs and corporate loans target the same type of clients and activities, namely entrepreneurs and productive credits. That is, loan submissions are tied to an economic activity or business model, and are disbursed mainly to pre-existing firms, ranging from large to micro-enterprises.

It is worth emphasizing that the classification of loans into companies, SMEs and microcredit is not arbitrary for the banks and MFIs since supervisory authority closely monitors the comply with the pre-stablished requirements. However, it can be argued that there are incentives to classify risky SME clients as microcredit loans to charge a higher rate. Therefore, we will study the joint evolution of these two types of credits. Given the requirements, it is not that easy to classify companies into the other categories, so we can analyze their portfolio separately. Also, the supervisory authority monitors the classification of credits into productive credits, minimizing the risk of commercial or service credits being reclassified as productive.

Besides the interest rate caps imposition, the Law established that at least 25% of the credit portfolio of banks was to be allocated for productive credits (whether to companies, SMEs, or microcredit). Likewise, MFIs had to allocate 50% of their portfolio to productive credits. The implementation of these quotas began in 2015, establishing intermediate annual goals until 2018, the year in which the definitive goals were to be met. To control for this and other policies that affected all productive credits, we use time and bank fixed effects in our empirical analysis.

2.3 Data

The database used in this study contains monthly information on new credit operations in local currency and balance sheet data for banks and MFIs, provided by the Central Bank of Bolivia. This information has a unique level of disaggregation that allows for a comprehensive identification and evaluation of financial system policies.

We use information on credits disaggregated by bank and MFI, portfolio (credit to companies, SMEs, and microcredit), and time (monthly). To capture the differences of banks and MFI's financial structure, we include indicators of liquidity, capitalization and size (Annex 1). The period covered by this experiment goes from January 2011 to December 2018, in order to capture the evolution of trends in the variables of interest three years before the implementation of the Law, and until the completion of the portfolio goals in 2018. The econometric estimations are made with a total of 1,970 observations. The panel is unbalanced because there are periods without records for some types of credits in specific banks or MFIs.

3. Empirical Methodology

We use a DID model to analyze the effect of the imposition of interest rate caps on productive credits. In this setting, we argue that the outcomes of the treatment and control groups have had parallel trends in absence of the intervention. As it was mentioned, the treatment group is the portfolio of microcredit and SMEs loans granted by MFIs[9], and the control group is the portfolio of loans grated to companies by banks.

[9] We also include the microcredit and SMEs portfolio of Banco Económico S.A. since its interest rate for these credits showed a sharp decrease after the regulation.

We follow the specification of the DID model suggested by Autor (2003) and Angrist and Pischke (2015), using bank-level data:

$$Y_{it} = \alpha + \theta_i + \lambda_t + \delta_{DD}\, D_{it} + \delta' X_{it} + \mu_{it} \quad (1)$$

where i represents the financial institution portfolio (bank or MFI) and t the time period (monthly). The endogenous variable, Y_{it}, denotes the logarithm of the balance[10] of loan portfolio or the logarithm of the mean size of credits.[11] Our main variable of interest, D_{it}, captures the effect of the intervention, where $D_{it} = 1$ for microcredit and SMEs portfolio granted by MFIs after the treatment ($t \geq August\ 2014$), and $D_{it} = 0$ otherwise. X_{it} is a vector of controls that includes bank characteristics, such as size, liquidity, and capitalization – which could affect the supply of credit (Kashyap et al., 2000; Díaz and Rocabado, 2018; Kishan et al., 2005). The terms θ_i and λ_t are fixed effects for financial institution and time period, respectively. Finally, μ_{ijt} is the error term, clustered by financial institution.

The identification strategy is valid if the parallel trend assumption is satisfied (Angrist and Piscke, 2008; 2015). It requires that in the absence of treatment, and conditional on a relevant history X_{jt}, the difference between treatment and control groups is constant over time prior to the intervention. In other words, the endogenous variables can differ in levels across treatment and control groups, but they cannot differ in changes (Bruhn and Love, 2014). If this assumption is violated, we could detect a positive effect of the new Regulation when no effect in fact occurred.

[10] The balance of loan portfolio includes all the outstanding loans that do not have any installment of principal past due. Broadly speaking, the balance includes the value of all the new loans granted in a given period plus all the current loans.

Table 1 presents average differences in means between treated and control groups prior to treatment, from January 2011 to July 2014. The table shows that the differences in levels for outcome and bank-specific variables are statistically significant, which confirms pre-existing differences between the two groups. By contrast, changes in the mean size of credits are not statistically significant, which supports our main identifying assumption that in the absence of Regulation imposition, the average difference between outcome variables across groups would have been the same pre and post August 2014. However, there is a statistically significant difference across treatment and control group in changes of the balance of loan portfolio[12]. Therefore, as suggested by Bruhn and Love (2014), when using the balance of loan portfolio as dependent variable, we control for different linear time trends to avoid biases.

Table 1: Pre-Treatment Differences (Full sample 2011m1-2014m7)

	Mean control	Mean treated	t	P. Value	
Outcome variables in changes: Log-differences					
Balance of loan portfolio	0.01	0.03	-2.53	0.011	*
Mean size of credits	0.02	0.03	-0.48	0.631	
Outcome variables in levels: Logs					
Balance of loan portfolio	20.64	19.04	19.05	0.000	***
Mean size of credits	15.06	11.31	53.73	0.000	***
Bank-specific variables in levels					
Size	9.11	7.98	21.00	0.000	***
Liquidity	32.91	48.48	-11.55	0.000	***
Capital	6.61	6.33	3.13	0.002	**

Note: ***, **, and * denotes statistical significance at the 1, 5, and 10 percent level respectively. The control group corresponds to companies' productive portfolio granted by banks while the treatment group corresponds to microcredit and SMEs productive portfolio granted by MFIs. The detail of the remaining indicators included is presented in Table A1 of Annex. Period of estimation: monthly data from January 2011 to July 2014.

In order to perform a rigorous validation of the identification strategy we carry out the following robustness exercises. First, as is common in the literature, we follow the test

[12] Nonetheless, for a smaller sample window, this difference becomes statistically non-significant (Table A2).

suggested by Angrist and Pischke (2009). This test analyzes whether, controlling for fixed effects, past values of the variable D_{it} predict present values of the outcome variable, while future values do not. Therefore, the null hypothesis is that the past coefficients of the intervention variable are jointly statistically equal to zero. Consequently, we estimate the following regression:

$$Y_{it} = \alpha + \theta_i + \lambda_t + \sum_{\tau=0}^{m} \delta_{DD-\tau} D_{it-\tau} + \sum_{\tau=1}^{q} \delta_{DD+\tau} D_{it+\tau} + \delta' X_{it} + \mu_{it} \quad (2)$$

in which under the parallel trend assumption, $\delta_{DD-\tau}$ should not be statistically significant. In addition, we conduct a graphical analysis of the resultant coefficients, setting m and q equal to 3. Specifically, we examine graphically whether estimated changes in outcome variables within the treatment group coincide with the time of the imposition of the Regulation. Then, we conduct a F-test to check whether the coefficients are jointly equal to zero (Ho: $\delta_{DD-1} = \delta_{DD-2} = \delta_{DD-3} = 0$).

Second, following Bruhn and Love (2014) we control for the possibility that bank specific linear time trends influence outcome variables. If the estimated effects are driven entirely by differences in trends, then these differences should disappear once we control for time trends in the regressions. In this regard, we test whether our results still hold once we control for these variables into our specifications. Finally, we perform a placebo study by replicating the same methodology but replacing the year of the treatment with a prior period unrelated with the intervention. If the 'placebo treatment' has a statistically significant effect, then the parallel trend assumption is invalidated (Bertrand, et al. 2004; Abadie and Gardeazabal, 2003).

4. Results

4.1. DID estimations

In this section we analyze the impact of interest rates ceiling on credit variables. Table 2 displays the DID results for equation (1) and different time windows[13], in which our coefficient of interest is labeled as "Treatment dummy" and corresponds to δ_{DD}. Following Bruhn and Love (2014), we control for the possibility that linear time trends in outcome variables differ between banks/MFIs. Columns (1) – (2) report the results for the outcome variables without a bank specific-time trend, while columns (3) – (4) show the effect of its inclusion. Overall, the results suggest that while the imposition of interest rate ceilings negatively affected the portfolio balance of microcredits and loans to SMEs granted by MFIs, it had a positive effect on the mean size of credits.

Specifically, the negative effect of the imposition of the policy on the balance of loan portfolio is statistically significant for all the time windows when the bank specific-time trend is included, while the mean size of credits displays a positive effect of the intervention that holds for all time windows and specifications.

Table 2: Impact of interest rates ceiling

	Balance of loan portfolio	Mean size of credits	Balance of loan portfolio	Mean size of credits
	(1)	(2)	(3)	(4)
	Full Sample: 2011M1-2018M12			
Treatment	0.00611	0.685***	-0.261*	0.389***
	(0.173)	(0.151)	(0.134)	(0.106)
Observations	2,016	1,970	2,016	1,970
R-squared	0.648	0.478	0.707	0.533
	Sample: 2012M8-2016M8			
Treatment	-0.171	0.511***	-0.359**	0.334***
	(0.105)	(0.132)	(0.153)	(0.102)
Observations	1,029	1,019	1,029	1,019
R-squared	0.415	0.412	0.540	0.462
	Sample: 2013M8-2015M8			
Treatment	-0.221***	0.322*	-0.253*	0.401***
	(0.0628)	(0.148)	(0.124)	(0.124)
Observations	525	524	525	524

[13] In order to check the validity of our results, we show our regression estimates for two alternative time windows: one and two years around the imposition of the interest rates ceilings.

R-squared	0.304	0.290	0.415	0.388
Bank-portfolio fixed effects	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes
Bank-specific linear trend	No	No	Yes	Yes

Note: ***, **, and * denotes statistical significance at the 1, 5, and 10 percent level respectively. Standard errors adjusted by clusters at bank level in parentheses. Dependent variables are expressed in logarithms. All regressions are controlled by the remaining bank-specific indicators included in Table A1.

For an average MFI in the period 2011-2018, the imposition of interest rate ceilings implied a reduction of 26.1% in the balance of microcredit and SMEs' loan portfolio granted by MFIs (relative to the company´s portfolio granted by banks). Opposite to the intention of the policy, the balance of loans meant to improve financial inclusion became less important in the overall portfolio. In line with Safavian and Zia (2018), our results show a significant decline in the balance due to a change in the composition of lending, away from microcredit and SMEs toward safer corporate clients.

Conversely, we find a positive effect of the regulation on the mean size of credits. As stated in Rojas and Ruesta (2019), the enlargement of the size of the credits is explained by the fact that MFIs increased their average amount per credit granted to maintain their profitability and reduce operational costs. However, caution should be taken when lending a causal interpretation to this last result, since, as we show in the next section, the parallel trend assumption holds only for the balance of total loans.

4.2. Robustness checks results

With the aim of validating the parallel trends assumption, crucial for identifying causal effects under the DID models, we perform statistical and graphical checks. Table 3 displays the statistical test proposed by Angrist and Pischke (2008) for equation (2), where the null hypothesis is that the coefficients are jointly equal to zero (Ho: $\delta_{DD-1} = \delta_{DD-2} = \delta_{DD-3} = 0$). Overall, results suggest at a 95% of confidence level that we do not reject the

null for the balance of loan portfolio, which implies that parallel trend assumption holds for this variable. At the same time, the graphical analysis for leads coefficients show no anticipatory effect of the policy (Figure 4). For the mean size of credits, the parallel trend assumption do not hold.

Table 3: Parallel trends test

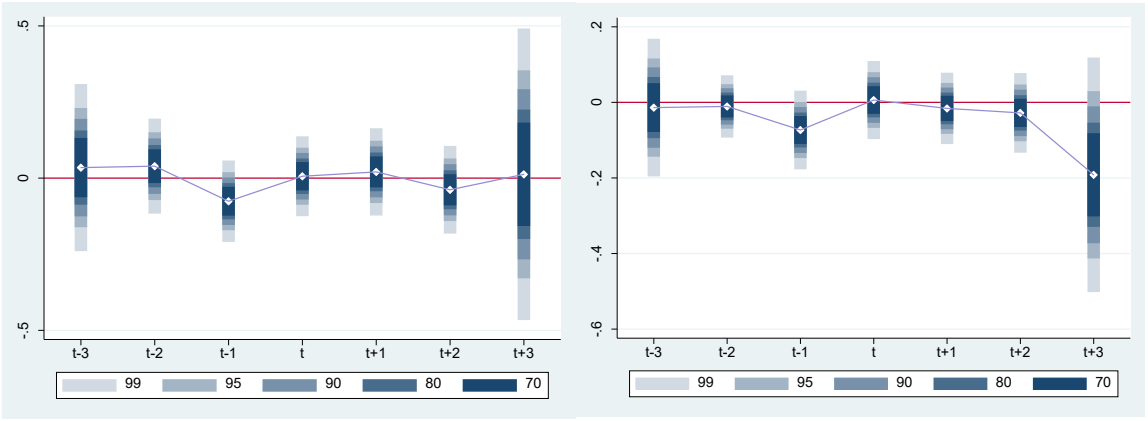
	Balance of loan portfolio	Mean size of credits	Balance of loan portfolio	Mean size of credits
	(1)	(2)	(3)	(4)
	Full Sample: 2011M1-2018M12			
Est. F	2.052	20.72	2.714	11.16
P-valor (F)	0.160	4.89e-05	0.0915	0.000870
Passed?	Yes	No	Yes	No
	Sample: 2012M8-2016M8			
Est. F	0.474	18.05	1.566	17.18
P-valor (F)	0.706	9.60e-05	0.249	0.000122
Passed?	Yes	No	Yes	No
	Sample: 2013M8-2015M8			
Est. F	2.361	12.56	2.920	31.17
P-valor (F)	0.123	0.000519	0.0775	6.03e-06
Passed?	Yes	No	Yes	No
Bank-portfolio fixed effects	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes
Bank-specific linear trend	No	No	Yes	Yes

Note: The Table presents the F-tests where the null hypothesis is that all coefficients previous to intervention are equal to zero. When the null hypothesis is not rejected at the 95% level of confidence indicates that the parallel trends assumption holds. All regressions are controlled by the remaining bank-specific indicators included in Table A1.

Figure 4: Graphical test

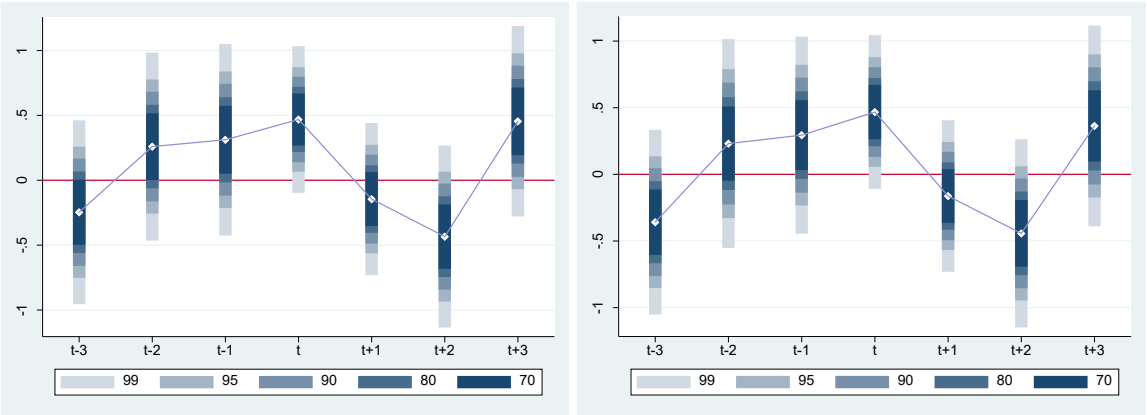
Balance of loan portfolio

without time trends **with time trends**



Mean size of credits

without time trends **with time trends**



Note: The figure displays the lag and lead coefficients for the treatment variable, accordingly to Table 3, columns (2) and (4), for the full sample.

Finally, we perform a placebo test by running our main specifications with a 'placebo treatment' where the actual year of the intervention (August 2014) is replaced by a prior unrelated date (August 2013). Table A3 displays the results of the estimations, with non-significant coefficients for the placebo treatments after controlling for bank-specific time trends. These results corroborate the validity of our parallel trend assumption for the balance of loan portfolio in all our specifications.

5. Conclusions

In the last decades financial access has increasingly become a priority for policymakers because of its potential to improve both the efficiency of the overall economy and the lives of individuals, especially the poorest. It is therefore essential to develop the appropriate financial inclusion interventions as well as understand their effects. In an attempt to shed light on this issue, in this paper we analyze one of the most controversial policies to promote credit access and to limit usury practices: the imposition of ceilings on the interest rates. We study the imposition of upper limits for interest rates for productive loans to SMEs and productive microcredits in Bolivia during 2014 and its effects on loan expansion. This policy

was part of a comprehensive government plan to promote financial inclusion in this country due to the low levels of access to credit from formal financial institutions.

Through a specification of DID models and in a natural experiment framework, we evaluate the effects of this interventions by comparing the difference between the microcredit and SMEs portfolio granted by MFIs (treatment group), and the productive loans to companies' portfolio granted by banks (control group), right after the imposition of the interest rates caps. The interest rates charged to loans for companies remained close to the previous values before the Law, while for microcredit and credits to SMEs, the rates sharply decreased. Our main findings suggest that the imposition of ceilings policy hindered access to microcredit and credit to SMEs. More specifically, the balance of the microcredit and SMEs' loan portfolio granted by MFIs relative to the company´s portfolio granted by banks, decreased 26.1% for an average MFI in the period 2011-2018. This effect is statistically significant for alternative time windows and specifications. In addition, the size of microcredits and loans to SMEs granted by MFIs increased, although the parallel trend assumption does not hold for this variable.

We conclude that interest rate controls could lead to harmful and unintended consequences on credit access. Therefore, seeking to promote financial inclusion in developing economies could be a complex policy objective and requires a full understanding of the specific market failures and underlying barriers to financial access. We stress the importance of continued progress in studying it, as well as the potential effects of credit access on the wellbeing of both individuals and societies. We hope the results of our study encourage researchers to further explore this line of investigation.

In this sense, our study has some specific limitations which will define future research. More empirical studies to quantify and collect data on other factors that could be affected by the imposition of interest rate caps policies are needed. Firstly, although we use a rich date base, it does not contain loan-specific information regarding maturity, risk rating (ex-ante probability of default), and number of non-performing days. This information will be valuable to evaluate the effect of the interest rate cap imposition on default rates. Also, it could provide information on whether the banks became more demanding in the risk profile of their clients, so the measure causes them to exclude relatively more risky clients who, in the absence of interest rate ceilings, could have obtained a loan. The related literature (Rojas and Ruesta, 2019) suggest that, as MFIs narrow their loan portfolio, they generally increase the average size of loans and exclude riskier agents. Portfolio risk could also be analyzed related to the reduction in the diversification of clients, since banks might be granting more loans or bigger loans to the same clients.

Furthermore, it will also allow for addressing the still inconclusive relation between financial inclusion and financial stability. This literature discusses to the extent to which the growing importance of institutions and instruments that promote financial inclusion, as in the case of MFI, could be considered a threat to the financial stability of developing economies. The risk may rise from rapid credit growth associated to this financial inclusion institutions and instruments, and from unregulated parts of the financial system (Roa, 2016).

Related with this last statement, data on informal credit will be also important to assess the effect of the ceilings policy on informal and non-regulated credit transactions. Some empirical evidence shows that after the implementation of the Law the informal credit increased, in particular for the poorest and smallest clients, as well as the presence of informal

financial institutions - previously displaced for the regulated MFIs (Rojas and Ruesta, 2019; Villafani-Ibarnegaray, 2019). Lastly, more granularity of the data regarding sociodemographic information of the clients (rural vs urban, age, gender, income, occupation, etc.), should be also useful to measure the potential effect of this measure on the well-being of the agents. Future research should therefore be orientated towards collating more data and integrate the different dimensions and effects of credit access interventions.

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Annex 1

Table A1: Detail of bank indicators

	Name	Formula
Name	***Bank specific variables***	
	A. Size	
Size	1. Bank size	*Ln(asset)*
	B. Liquidity	
Liquidity	1. Coefficient of short-term liquidity coverage with cash	*Cash / (Short-term obligations) * 100*
	C. Capital	
Capital 1	1. Coefficient of leverage	*(Capital + Reserves) / total asset * 100*

Note: The liquid assets of a bank is equal to the sum of cash, temporary investments without taking into account the reserve requirements of liquid assets and legal reserve account. Short-term obligations = demand deposits + savings + 30-day fixed-term deposits.

Table A2: Pre-Treatment Differences for different time windows

Sample: 2012M8-2016M8					
Outcome variables in changes: Log-differences					
Balance of loan portfolio	0.01	0.02	-1.52	0.130	
Mean size of credits	-0.01	0.03	-0.84	0.399	
Outcome variables in levels: Logs					
Balance of loan portfolio	20.69	19.31	12.83	0.000	***
Mean size of credits	15.13	11.46	39.08	0.000	***
Bank-specific variables					
Size	9.24	8.20	15.65	0.000	***
Liquidity	31.15	46.37	-8.50	0.000	***
Capital	6.63	5.94	6.68	0.000	***
Sample: 2013M8-2015M8					
	Mean control	Mean treated	t	P. Value	
Outcome variables in changes: Log-differences					
Balance of loan portfolio	0.01	0.01	0.61	0.544	
Mean size of credits	0.00	0.03	-0.49	0.624	
Outcome variables in levels: Logs					
Balance of loan portfolio	20.71	19.40	8.56	0.000	***
Mean size of credits	15.16	11.59	27.02	0.000	***
Bank-specific variables					
Size	9.32	8.30	11.00	0.000	***
Liquidity	28.60	37.34	-4.28	0.000	***
Capital	6.71	5.98	4.90	0.000	***

Note: ***, **, and * denotes statistical significance at the 1, 5, and 10 percent level respectively. The control group corresponds to companies' productive portfolio of banks while the treatment group corresponds to microcredit and SMEs productive portfolio of MFIs. The detail of the remaining indicators included is presented in Table A1 of Annex.

Table A3: Placebo test

	Balance of loan portfolio	Mean size of credits	Balance of loan portfolio	Mean size of credits
	(1)	(2)	(3)	(4)
Treatment	0.0345	0.595***	0.00899	0.189
	(0.158)	(0.181)	(0.136)	(0.139)
Size	1.617***	0.536**	1.238***	1.336***
	(0.167)	(0.190)	(0.230)	(0.396)
Liquidity	-0.000143	-0.000929	-0.000108	-0.00329**
	(0.00288)	(0.00208)	(0.00110)	(0.00143)
Capital	-0.147***	0.0472	-0.0409**	0.116**
	(0.0450)	(0.0470)	(0.0164)	(0.0424)
Constant	7.158***	7.476***	8.759***	2.804**
	(1.219)	(1.472)	(0.580)	(1.148)
Observations	2,016	1,970	2,016	1,970
R-squared	0.648	0.462	0.705	0.528
Bank-portfolio fixed effects	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes
Bank-specific linear trend	No	No	Yes	Yes

Note: ***, **, and * denotes statistical significance at the 1, 5, and 10 percent level respectively. Standard errors adjusted by clusters at bank level in parentheses. Dependent variables are expressed in logarithms.