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The effect of the expansion of microcredit amounts in 2009 on credit access

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THE EFFECT OF THE EXPANSION OF MICROCREDIT AMOUNTS IN 2009 ON CREDIT ACCESS

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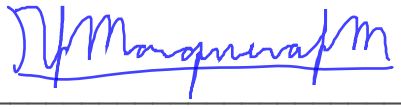

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A papá. A pesar de la adversidad, tu amor y apoyo incondicional han sido mi mayor fuerza. A mamá, por tu inquebrantable fe en mí. Les dedico este logro con todo mi amor y gratitud.

RESUMEN

Las políticas crediticias pueden influir en la dinámica de los mercados financieros y en los comportamientos de endeudamiento. Mediante el análisis de datos individuales exclusivos, este estudio examina el impacto de un cambio en la política sobre el acceso al crédito en Ecuador, centrándose en los efectos de la Resolución 184-2009, que incrementó los límites de los préstamos de microcrédito. Utilizamos un enfoque de diferencias en diferencias para comparar a individuos con y sin acceso previo al crédito, y descubrimos que la política resultó en un aumento del acceso al crédito. Los resultados revelan diferencias notables en los patrones de sustitución entre el crédito al consumo y el microcrédito. En particular, mientras que el crédito al consumo se vuelve consistentemente más atractivo, el impacto sobre el microcrédito varía de manera impredecible. El estudio también analiza las implicaciones del acceso al crédito sobre la mortalidad, sin encontrar un impacto significativo. Estos hallazgos subrayan cómo los cambios regulatorios pueden modificar los equilibrios del mercado crediticio y destacan la necesidad de más investigación para entender la compleja relación entre el acceso al crédito y los resultados a largo plazo.

ABSTRACT

Credit policies can influence financial market dynamics and borrowing behaviors. By analyzing proprietary individual-level data, this study explores the impact of a policy change on credit access in Ecuador, specifically focusing on the effects of Resolution 184-2009, which increased microcredit loan limits. We use a difference-in-differences approach to compare individuals with and without prior credit access and we find that the policy led to increased credit access. The results reveal notable differences in substitution patterns between consumer credit and microcredit. Specifically, while consumer credit consistently becomes more attractive, the impact on microcredit fluctuates unpredictably. The study also investigates the implications of credit access on mortality, revealing no significant impact. These findings highlight how regulatory changes can alter credit market equilibria and emphasize the need for further research to understand the complex relationship between credit access and long-term outcomes.

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1 Introduction

Microfinance has developed into a fundamental institution to increase low-income groups' access to credit (Banerjee et al., 2013, 2015). Access to credit plays a crucial role in enhancing numerous individuals' well-being and efficiently overseeing economic activities across both high- and low-income nations. It can enhance the autonomy of individuals in economically disadvantaged communities by furnishing them with financial means to invest in productive endeavors (Khandker, 2005; Meager, 2019). However, while microcredit may yield advantages under specific conditions, its efficacy in alleviating poverty can fluctuate, influenced by variables like local economic conditions, borrower attributes, and the structural frameworks of microfinance schemes (Banerjee et al., 2018, 2013). According to various economic theories, the effects of increasing access to credit among low-income individuals do not always have to be beneficial and could have adverse consequences (Meager, 2019). Indebtedness reduces the degree of autonomy accessible to impoverished individuals. Although financial services could enhance the capacities and prospects of the poor, high debt levels and reliance on various institutions could only sometimes translate into higher levels of autonomy (Sen, 1999). Overall, the effects of credit access on living conditions remain an empirical question to be answered.

This paper uses proprietary individual-level data from a financial services company in Ecuador to answer two questions. First, we document how a policy that could increase credit access affects a financial market characterized by binding interest rate ceilings. Specifically, we estimate the effects of Resolution 184-2009 on credit access. In May 2009, this resolution increased the loan amount limits for the different types of microcredit in Ecuador, effectively allowing for lending larger amounts at a higher interest rate. We estimate the effects of this policy on credit access using a difference-in-differences design that compares changes in credit access for two groups of people: individuals with prior

access during the period 2007-2008 and individuals without prior access during the same reference period. Second, we use this source of variation to estimate the effect of credit access on mortality.

The proprietary data allows us to study how the new regulation affected all types of loans granted to individuals. Given the interest rate constraints, relaxing access to one segment may have substitution effects in the other credit segments. Financial institutions change their lending strategies to maximize their profit. To mitigate risks, they modify not only the interest rates they offer to borrowers but also the mix of the financial products they offer (Angelucci et al., 2015). For example, the inability of lenders to distinguish between secure and risky borrowers in a market with binding interest rate ceilings can induce financial institutions to charge more to individuals who already have access to the credits with the highest ceilings (microcredit) and use this revenue to subsidize lower risk individuals who apply to consumer loans and who would not qualify for the loan in the absence of the subsidy. Also, research indicates that loans earmarked for uses like ventures or enhancing businesses are frequently used for personal expenses instead. For instance, Banerjee et al. (2013) point out that borrowers may use funds allocated for productive purposes for consumption. For these reasons, our preferred outcome is access to any loan. To understand potential substitution patterns, we estimate the effect on access to consumer and microcredit loans.

The results show that increasing the maximum loan amount for the different microcredit segments increased credit access. Consistent with the model's predictions, credit access for the group without prior access increased monthly from May 2009 onwards. In May, the point estimate suggests a 0.03 percentage point increase for the group that did not have previous access in 2007-2008. This effect increased over time to one percentage point in December 2009. The effect is robust to a series of robustness checks.

The results highlight significant differences in substitution patterns between consumer credit and microcredit. We observe a consistent upward trend in the treatment effect for consumer credit over the months. The effect starts at 0.0468 percentage points in May 2009 and rises steadily to 0.5530 percentage points by December 2009. On the other hand, the treatment effects for microcredit display considerable variability. Starting at 0.0572 percentage points in May 2009, the effect fluctuates throughout the year, with notable increases in November and December 2009. However, the effect decreases in August and September 2009, even showing a negative value in August. The different patterns in the effects of access to microcredit and consumer loans are consistent with substitution patterns in a financial market with binding interest rate ceilings. The patterns suggest that access is staying the same in microcredit. Instead, banks and other financial institutions use the increased loan amounts to charge a higher interest rate to microcredit customers who would have received a loan before the policy change and use the increased revenue to subsidize new customers who apply for consumer loans. These new customers' risk profiles were plausible riskier than what financial institutions would have taken before the policy change but less risky than new applicants for microcredit loans.

These contrasting patterns reveal that while the attractiveness of consumer credit increases consistently, the effect on microcredit varies unpredictably. The rising treatment effects for consumer credit, alongside the fluctuating effects for microcredit, demonstrate how interest rate caps can alter borrowing preferences. Consumers may shift to microcredit when consumer credit becomes less appealing but return to consumer credit as its relative attractiveness improves. Understanding these percentage point changes is essential for policymakers to effectively manage credit accessibility and the impacts of interest rate regulations.

We switch to a difference-in-difference specification that relies on variation across cohorts to examine the impact of credit access on mortality. The results do not demonstrate significant effects. The fact that consumer loans drive increased

access suggests that access to credit did not contribute to increased income. This would explain the lack of significant results on mortality. These findings highlight the necessity for further research to explore other variables and conditions that might better explain the impact of credit access on long-term health outcomes.

Previous research has examined the impacts of microcredit to understand its effectiveness as a development tool better. According to Banerjee et al. (2013), microcredit policies can have limited but positive effects on financial service access, often encountering inherent barriers related to demand and supply. The study highlights that while increasing microcredit amounts can improve credit access, the effects are generally more modest than initially expected. Banerjee et al. (2015) reveal a pattern of modestly positive effects, although these impacts are not transformative. Meager (2019) further explores the average impact of microcredit expansion using a Bayesian hierarchical approach across seven randomized experiments. Their evaluation indicates that while microcredit access does not significantly transform the lives of poor households as initially hoped, there is little evidence suggesting it leads to over-indebtedness or harms livelihoods due to credit bubbles. This comprehensive analysis reinforces the idea that microcredit's effects are generally modest and vary across different contexts. Furthermore, Crépon et al. (2015) indicate that the impacts of microcredit on credit access and economic well-being can vary greatly depending on the context and the specific characteristics of borrowers. This study provides a valuable framework for assessing the impact of microcredit expansion policies, emphasizing the importance of considering both the advantages and limitations of such policies in enhancing credit access.

In parallel, interest rate caps are a standard regulatory measure in consumer credit markets, yet their effects on market outcomes and consumer welfare are poorly understood (Avio, 1974; Caballero-Montes et al., 2021; Knittel & Stango, 2003; Lukas, 2019). Cuesta and Sepulveda (2018) find that while welfare typically declines under interest rate regulation, the negative effects are less severe in

more concentrated markets. This highlights the significance of market structure in shaping the outcomes of such regulations. Similarly, research by Karlan and Zinman (2011) demonstrates that increasing the amount of available loans can influence market dynamics and borrowers' ability to access credit. However, these benefits only sometimes significantly change borrowers' quality of life.

Along the same lines, Staten (2008) shows that changes in interest rates highly impact the number of credit transactions. When lenders impose a maximum interest rate, they experience a decrease in the credit price, leading them to extend less credit. According to Helms & Reille (2004), when institutions set interest rate caps too low, banks and financial institutions try to counteract this effect by raising fees unrelated to interest, such as credit insurance or other non-interest-related costs. These hidden fees reduce transparency and make it harder for borrowers to compare the true cost of credit across different institutions.

This paper contributes to understanding how regulations that bound the financial market affect access to credit. Our paper comprehensively analyzes how financial markets' equilibria adjust when exposed to binding interest rate caps. We specifically document how a policy that should have increased access to a particular loan type creates substitution effects between consumer credit and microcredit. The results suggest that the policy change did not lead to increased production, as most of the effect on credit access comes from consumer loans.

Previous studies primarily relied on experimental data to understand credit dynamics, which often faced limitations in capturing real-world market conditions. Experiments provide controlled environments that may not fully reflect the complexities and variabilities of actual financial markets. In contrast, our research utilizes observational data, which offers a more accurate picture of how borrowers and lenders behave under real-world constraints. By focusing on observational data, our study addresses the gap left by experimental approaches. It provides a

more nuanced understanding of the effects of microcredit expansion and interest rate caps on credit access.

Also, this analysis contributes significantly to the discussion on the impact of credit access on living conditions, even though the results on mortality were not statistically significant. The lack of significant findings encourages further examination of the underlying mechanisms and specific conditions that might affect the relationship between credit and health. This result suggests that the factors influencing credit and mortality may be more complex.

The rest of the paper is organized as follows. Section 2 discusses credit regulation in Ecuador. Section 3 briefly discusses the data. Section 4 describes the empirical strategy and outlines the research methodology for collecting and processing data. This is followed by the findings and analysis of the data, along with a discussion of the study's potential limitations. Finally, the policy recommendations and conclusions of the study are presented.

2 Microcredit Regulation in Ecuador

The regulation of microcredit in Ecuador has evolved significantly over the years. Microfinance in Ecuador has a history that dates back several decades. Although formal microfinance institutions were mainly established in the 1980s, informal lending practices among low-income communities and families have long existed (Bicciato, 2002). In the 1980s and 1990s, several microfinance institutions were founded in Ecuador, including savings and credit cooperatives, NGOs, and banks specializing in microcredit. These institutions played a crucial role in providing financial services to individuals and small businesses lacking access to traditional banking (Duran, 2016). During this period, the Ecuadorian government also implemented policies to promote microfinance and financial inclusion. Support programs and regulations were established to strengthen the microfinance sector

and ensure consumer protection. In the 2000s, microfinance in Ecuador experienced significant growth due to government policies that promoted financial inclusion and economic development (Bicciato, 2002). Over the years, new regulations were introduced to govern the sector, and competition among microfinance institutions was encouraged to improve the quality and accessibility of financial services.

Historically, the usury rate established in the Penal Code capped interest rates in Ecuador. The maximum allowable interest rate, beyond which usury was considered to have occurred, was set at 50%, well above the reference active rate. In July 2007, the Law on Regulating the Maximum Effective Cost of Credit amended the Law on the Monetary Regime and the State Bank, specifying in Article 12 that the maximum effective interest rate would be calculated by segments and sub-segments of credit (commercial, consumption, housing, microcredit). In July 2007, the Central Bank's Board set maximum interest rates for the four credit segments established by the Law (Banco Central del Ecuador, 2009). The Central Bank of Ecuador then introduced new credit segments through Regulation 148-2007 of August 2007, creating categories such as Corporate Commercial Credit, SME Commercial Credit, Retail Consumption, Subsistence Microcredit, Simple Accumulation Microcredit, Expanded Accumulation Microcredit, and Housing Credit.

In May 2009, Regulation 184-2009 updated the definitions and categories of credit segments. It redefined microcredit categories: Retail Microcredit, Simple Accumulation Microcredit, Expanded Accumulation Microcredit. This regulation also adjusted the maximum loan amounts allowed for each microcredit segment. Table 1 shows these adjustments. The lift in the microcredit amounts provides an ideal and unique quasi-experiment, allowing us to estimate the causal effect on credit expansion.

Table 1: Regulatory Changes in the Sub-segmentation of Microcredit

	Retail Microcredit	Simple Accumulation Microcredit	Expanded Accumulation Microcredit
December 2007	Amount per transaction and outstanding balance in microcredits equal to or less than USD 600.	Amount per transaction and outstanding balance in microcredits between USD 600 and USD 8,500.	Amounts exceeding USD 8,500.
May 2009	Amount per transaction and outstanding balance in microcredits equal to or less than USD 3,000.	Amount per transaction and outstanding balance in microcredits between USD 3,000 and USD 10,000.	Amounts exceeding USD 10,000.

3 Data

For this study, we have access to data from a financial services firm in Ecuador. The company provided us access to an anonymized dataset and authorized us to distribute it only for replication. The dataset includes information on a panel of 1,600,331 individuals from January 2007 to December 2009. The database contains financial information of individuals, including portfolios of receivables due, overdue portfolios, written-off portfolios, and portfolios that do not accrue interest. Additionally, the dataset encompasses demographic attributes, including gender, year of birth, marital status, highest level of education attained, and type of occupation.

Table 2: Sample means

	Individuals with prior access in 2007-2008	Individuals without prior access in 2007-2008	Difference
Proportion women	47.12%	50.97%	3.85%
Age	36.69	34.10	-2.59
Education			
None	1.33%	8.95%	7.62%
Elementary school	27.95%	45.55%	17.60%
High school	40.91%	32.79%	-8.12%
Bachelor's degree	29.79%	12.70%	-17.09%
Marital status			
Married	55.77%	41.51%	-14.26%
Single	26.61%	47.58%	20.97%
Divorced	14.27%	8.28%	-5.99%
Widowed	3.43%	2.61%	-0.82%
N	430,852	1.169,479	

The dataset includes differentiated information to analyze consumer credit and microcredits. Additionally, the dataset includes dummy variables indicating individuals who died before 2022 and during the pandemic. These variables will be used for the analysis of the effect of credit access on mortality,

The dependent variable in the estimation is an indicator of access to credit. We constructed this variable to reflect the month when the individual accessed a loan between December 2008 and December 2009. Once the person gains access, we assume they will continue to have access for the rest of the period, even if they fully paid their loan before December 2009.

4 The effect of the change of microcredit amounts in 2009 on credit access

4.1 Empirical strategy

This section details our strategy to estimate the causal effects of the 2009 change in Ecuador’s microcredit amounts on credit access.

4.1.2 Estimation and Identification

We need a valid comparison group to identify the effect of increasing the maximum loan amounts on credit access. In general, we can define two types of individuals in the population. The first type is individuals who have access to credit. These individuals demanded a loan, and financial institutions granted them one. The second type consists of individuals who have never had a loan. These individuals have never demanded a loan or applied, but financial institutions rejected them because they were deemed too risky. We, the researchers, only

observe that some individuals never had a loan in the period covered by the data. We do not know if it is because they never applied for one or because of financial institutions.

Suppose we observe two individuals. Both applied for a loan in the past, but only one was granted the loan. Sometime in the future, they both apply for a new loan. Assuming their inherent level of credit risk did not change, the first person should be more likely to receive a new loan. The second individual would be rejected in the absence of the policy change. Thus, if we compare individuals who had access to credit at some point in the past with individuals who never had access in the past, we should observe the following predictions:

- The probability of obtaining a loan in the future should be higher for the groups with previous access to credit, and this probability should grow at a higher rate over time than the probability of accessing credit for the group who did not have previous access. This difference in trends captures all the relevant differences between the groups that are not observable by the researchers. Thus, controlling for this trend should be sufficient to identify the effect.
- If changing the maximum loan amounts affected credit access, we should see a kink in the probability of accessing credit for the group that did not have previous access. This should close the gap between the groups that had previous access.

We use the period between January 2007 and September 2008 to identify all individuals with access to at least one loan. This includes all individuals with at least one loan, regardless of repayment status. On the other hand, within the group without prior access, two types can be identified: (i) individuals who did not require credit but could have accessed it and (ii) individuals who sought credit but could not obtain it. Table 2 presents descriptive statistics for these groups. As expected, we observe differences in variables used to construct credit scoring

models in Ecuador between the two groups. There is a 3.85 percentage point difference in the proportion of women between the two groups. The group with access to credit has an average age of 37 years, whereas the group without access has an average age of 34. The group with previous access is 17.09 percentage points more educated than those without previous access. Finally, the group with access to credit exhibits a higher proportion of married individuals; there is a 14.26 percentage point difference. The group without access shows a higher proportion of single individuals, with a 20.9 percentage point difference.

We then study how access to credit evolved between December 2008 and December 2009 for the two groups. Figure 1 presents the probability of having access to credit for the two groups. Before May 2009, the two groups exhibited differences in credit access, and these differences match the predictions mentioned above. The group with prior access is likelier to have access during the study period. Additionally, there is a difference in slopes: the group with prior access has a steeper slope than the group without prior access.

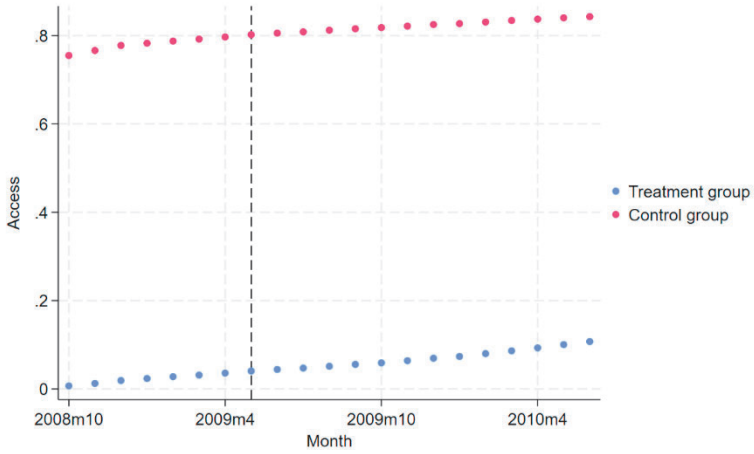

Figure 1: Credit access by groups

To make the difference in slope more apparent, we estimate an event study specification with dynamic effects over time. Figure 2 plots these estimates. Before May 2009, we can see that the point estimates were negative and increasing in absolute value. This indicates that the probability of credit access for the group without prior access (treatment group) grew slower than that for the group with prior access (control group). However, in May 2009, with the implementation of the policy, we can observe a breakpoint in the trend. The probability of credit access for the group without previous access grows faster, matching the prediction discussed above. This break in the trend corresponds to the causal effect of increasing the maximum loan amounts for microcredit on credit access.

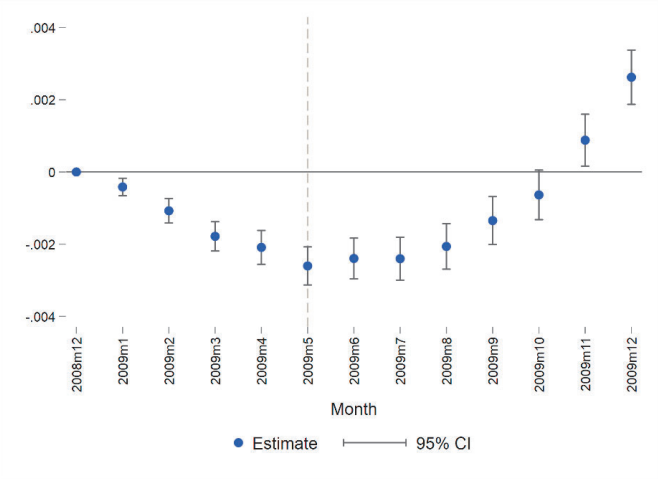

Figure 2: Standard DiD

To quantify the effect shown in Figure 2, we propose a difference-in-differences estimation where we control for differential trends between the two groups. As mentioned above, in this setting, the difference in trends captures the differences in unobserved factors determining credit access between the two groups. In this case, the identification assumption is that the slopes would not have changed in the absence of treatment. Without the change in the maximum loan amounts for

microcredit, the group with prior access would have had a steeper slope than the group without prior access. We estimate the following equation:

$$Access_{2009} = \beta_0 + \beta_1(Treated) + +\beta_2(Trend) + \beta_3(Trend * Treated) + \sum_{t=abr\,2009}^{dic\,2009} \beta_t D_t + \sum_{t=abr\,2009}^{dic\,2009} \theta_t D_t * Treated + \varepsilon$$

Where $Access_{2009}$ is a dummy variable for individuals accessing credit t$rend$ denotes linear trend variable, t$reated$ represents a dummy variable for the group without access, D_t is the month indicator dummy, and θ_t is the effect of increasing the maximum loan amounts on credit access. We cluster standard errors at the individual level.

This study also uses a credit cohort analysis approach to estimate the causal effect of credit access on mortality. We group loans into credit cohorts based on the specific month the individual got access for the first time, from December 2008 to December 2009. To evaluate the impact of credit access on mortality, we use two key variables: one indicating whether the individual died before 2022 and another specifying whether the individual died during the COVID-19 pandemic. This approach allows us to observe how credit conditions influence the quality of life and mortality.

To perform the estimation, we first identify which credit cohort each individual belongs to based on the period when they had access to credit. Then, we compare mortality rates between groups with credit access in different credit cohorts and those without while conducting robustness checks. This method enables us to assess whether credit access has significantly impacted mortality over time, thus suggesting improved living conditions. The analysis reveals how variations in credit policies and market conditions can affect long-term health outcomes.

4.2 Results

Figure 3 presents the estimates from Equation 1. We leave one point in the pre-period to show that controlling for linear trends accounts for the differences in Figure 2. After controlling for linear trends, in April 2009, there was no significant difference between the groups. Moving to the period after the regulation change, we can see a clear break in trends since May 2009, when the policy was implemented. In May 2009, the first month of treatment, credit access increased by 0.03 percentage points for the group with no prior access. This effect is not statistically significant, but as time passes, the effect becomes larger and significant at conventional levels. This effect continues to grow over time, reaching nearly one percentage point by December 2009.

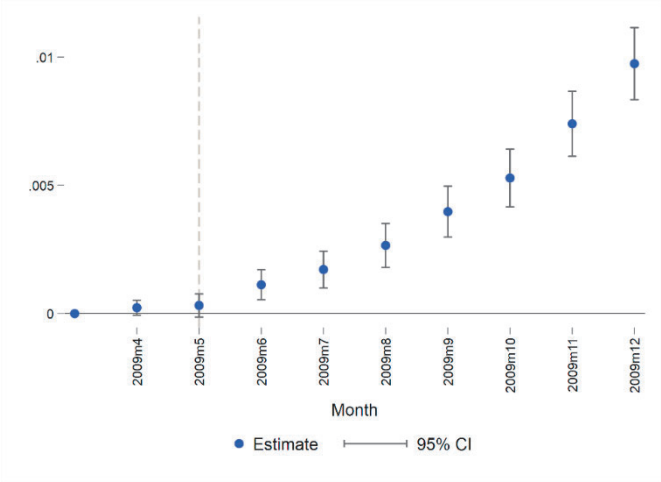

Figure 3: Linear trend

The impact of credit access on mortality reveals no significant effects. The results suggest that credit access did not lead to noticeable changes in mortality outcomes for both outcomes: the effect of credit access on mortality before 2022 (Figure 4) and the effect of credit access on mortality during Covid-19 (Figure 5).

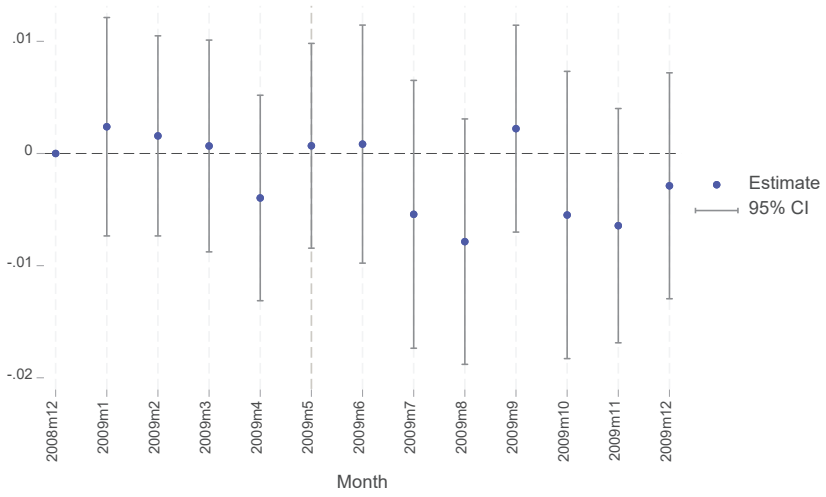

Figure 4: Effect of credit access on deceased before 2022

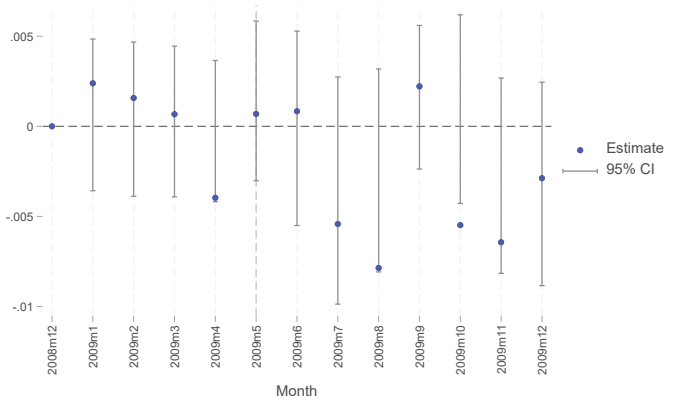

Figure 5: Effect of credit access on deceased during Covid-19

4.3 Further evidence for the validity of the research design

We report the results of various robustness checks in Table 3. In column 1, we present the main estimates from Equation 1. The results, shown in percentage points and presented in Column 1, indicate a gradual increase in the treatment effect over the months. The estimated effect in May 2009 was 0.023 percentage points, and it consistently increased every month, reaching 0.975 percentage points by December 2009. These coefficients show that the treatment's impact grew over time, with the most substantial effect appearing in the year's later months. In the second column, we employ a Difference-in-Differences (DiD) model, controlling for a linear trend, fixed effects, and age to analyze the treatment effects. The results are practically the same as the previous specification. In the third column, we present the results from a model that controls for a quadratic trend. This approach allows us to account for potential non-linear patterns in the data that a linear trend might not capture. By including a quadratic term, we can better understand how the treatment effect evolves, especially if the relationship between the treatment and the outcome changes non-linearly. Again, the results are robust to including this control. In the fourth column, we excluded those who always had access. This restriction allowed us to focus on the treatment effects by removing cases where credit access from January 2007 to September 2008 might influence the results. The results, shown in percentage points, reveal the estimated treatment effects for each month of 2009, starting from -0.0630 percentage points in May and increasing to 3.153 percentage points in December, similar to the main estimates in Column 1. In the fifth column, we use a Difference-in-Differences (DiD) model controlling for a linear trend to analyze the impact on microcredit. We observe the estimated treatment effects for each month from May to December 2009. The effects started at 0.0572 percentage points in May and fluctuated throughout the year, reaching 0.2245 in December. In the sixth column, we use a Difference-in-Differences (DiD) model controlling for a linear trend to study the effects on consumption. The results show the estimated treatment effects for each month of 2009, beginning

at 0.04678 percentage points in May and increasing to 0.5530 percentage points by December.

The study finds that increasing the maximum loan amounts for various microcredit segments enhanced overall credit access, particularly for those who previously lacked access. Over time, this led to a notable increase in credit availability for new borrowers. However, the impact differed significantly between consumer credit and microcredit. Consumer credit consistently became more accessible, while microcredit access showed considerable fluctuations. These patterns suggest that financial institutions adjusted their strategies in response to interest rate caps, raising rates on microcredit loans while using the extra revenue to support consumer loans for new, riskier borrowers. This resulted in a stable microcredit access but increased consumer credit availability. The findings highlight how interest rate regulations can shift borrowing preferences and underscore the need for policymakers to understand these dynamics to manage credit accessibility effectively.

Also, the study evaluates the robustness of results against potential differential trends through a regression analysis (Appendix Figure 4- Figure 11). The impact of the intervention is examined by differentiating between treated and untreated groups while also considering the effect of the months in which the treatment is applied. The analysis evaluates the robustness of the effect by testing it against deviations from the assumed linear trend. We estimate the effect using a linear trend and then assess its stability when deviating from this trend. Specifically, we consider deviations at two levels from the assumed linear trend. This approach reveals how the effect withstands more complex deviations from the linear trend. By examining the results under more substantial trend deviations, we assess the stability of the effect relative to the original linear trend assumption.

This approach allows for examining how the effects vary over time, providing a clear view of the treatment response at different times of the year. The resulting

graphs display confidence intervals for the estimated effects, distinguishing between pre-treatment and post-treatment periods. This procedure is repeated each month, resulting in a series of graphs detailing the treatment effects over time.

Table 3: Robustness checks

Monthly effects of treatment	(1) DiD with linear trend		(2) DiD with linear trend, individual fixed effects and age		(3) DiD with quadratic trend	
	beta	*standard error*	*beta*	*standard error*	*beta*	*standard error*
May 2009	0.000318	0.000231	0.000318	0.000232	0.000318	0.000232
Jun 2009	0.001125	0.000299	0.001126	0.000300	0.001125	0.000299
Jul 2009	0.001718	0.000366	0.001719	0.000367	0.001718	0.000366
Aug 2009	0.002659	0.000437	0.002660	0.000438	0.002659	0.000437
Sep 2009	0.003975	0.000507	0.003975	0.000509	0.003975	0.000507
Oct 2009	0.005287	0.000575	0.005287	0.000577	0.005287	0.000575
Nov 2009	0.007403	0.000646	0.007403	0.000648	0.007403	0.000646
Dec 2009	0.009747	0.000717	0.009747	0.000720	0.009747	0.000718

Monthly effects of treatment	(4) DiD excluding who always had access		(5) DiD with linear trend-impact on microcredit		(6) DiD with linear trend-impact on consumption	
	beta	*standard error*	*beta*	*standard error*	*beta*	*standard error*
May 2009	-0.000630	0.000700	0.000572	0.000190	0.000468	0.000193
Jun 2009	0.003410	0.000900	0.000432	0.000250	0.001134	0.000253
Jul 2009	0.008180	0.001100	0.000468	0.000308	0.002145	0.000310
Aug 2009	0.011510	0.001321	-0.000017	0.000368	0.002536	0.000374
Sep 2009	0.015460	0.001530	0.000015	0.000427	0.003250	0.000437
Oct 2009	0.021790	0.001738	0.000403	0.000485	0.004305	0.000495
Nov 2009	0.026750	0.001950	0.001267	0.000543	0.004870	0.000559
Dec 2009	0.031530	0.002160	0.002245	0.000601	0.005530	0.000622

The robustness checks confirm the reliability of the main findings regarding the impact of increased maximum loan amounts on credit access. The analysis, detailed in Appendix Figures 1-3, demonstrates a consistent increase in the treatment effect over time, with the most significant impact observed in the last months of 2009. Furthermore, the robustness analysis, including deviations from the assumed linear trend, provides additional assurance that the treatment effects reflect the true underlying dynamics of the model specification. The confidence intervals and graphical representations of the treatment effects across different months illustrate the stability and variability of the intervention's impact over time.

Also, we conducted several robustness tests to validate the effect of credit access on mortality. We used Difference-in-Differences (DiD) models, controlling for linear and quadratic trends and the following variables: sex, education, age, and marital status. Despite accounting for these factors, we did not find any significant effects.

5. Discussion

This study provides valuable insights into how credit regulation policies impact the financial market in a real-world context. We examine how lending behaviors and financial institutions' strategies adapt to regulatory changes to reveal the dynamics within the credit market.

The expansion of maximum microcredit amounts in Ecuador in 2009 significantly impacted credit access, particularly for those who previously lacked access. The results indicate increased loan amounts led to greater credit availability for new borrowers. From May 2009, a gradual increase in credit access was observed for the group without prior access, reaching nearly one percentage point by December 2009. However, the effect on microcredits was more variable compared to consumer credit. Consumer credit became consistently more accessible, while access to microcredits fluctuated considerably.

This fluctuating behavior suggests that, under interest rate caps, financial institutions adjust their strategies by raising rates for microcredits and using the additional revenue to subsidize new consumer credit borrowers. Borrowers tend to switch between types of credit in response to variations in their relative attractiveness. These findings underscore the importance of considering how interest rate regulations affect borrower preferences and credit access.

Regulatory changes in the credit market can alter borrower preferences and how banks allocate loans between different credit types. Evidence suggests that when consumer credit interest rates become less attractive, borrowers may turn to microcredits and vice versa. These substitution patterns highlight the need for policymakers to understand the underlying dynamics of credit accessibility and adjust regulations to manage borrower and financial institutions' preferences effectively. The research reveals that changes in interest rate caps can shift the equilibrium in the credit market, with significant implications for policy formulation.

Although the study also examines the impact of credit access on mortality, the results do not show significant effects. This finding suggests that the relationship between credit access and long-term health outcomes may be more complex than initially thought. The lack of significant effects on mortality indicates that other factors may influence how credit access affects living conditions and health. This underscores the need for further research to explore additional variables and conditions that may better explain the impact of credit access on health outcomes.

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Appendix

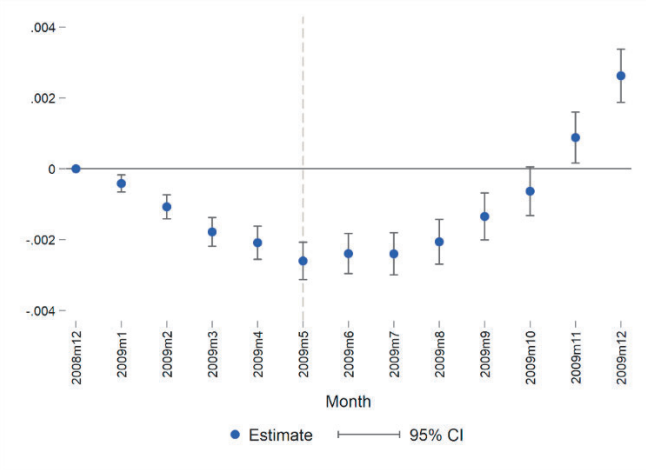

Figure 1: Standard DiD with fixed effects and age

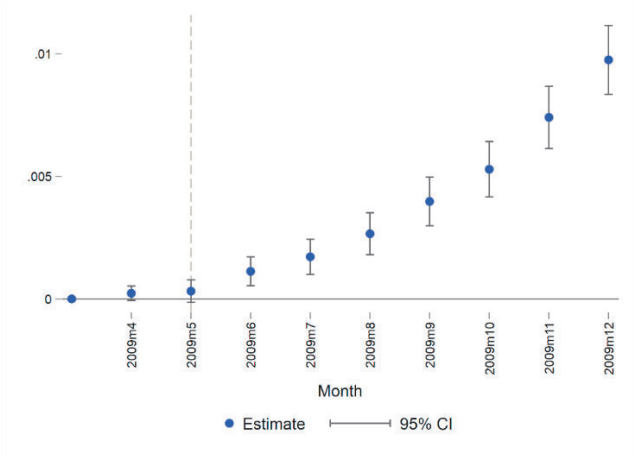

Figure 2: Quadratic trend

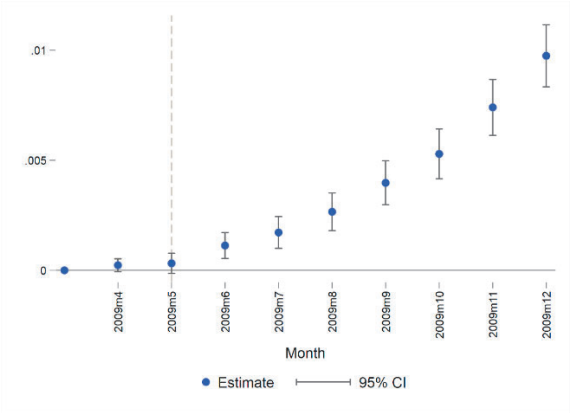

Figure 3: Linear trend with fixed effects and age

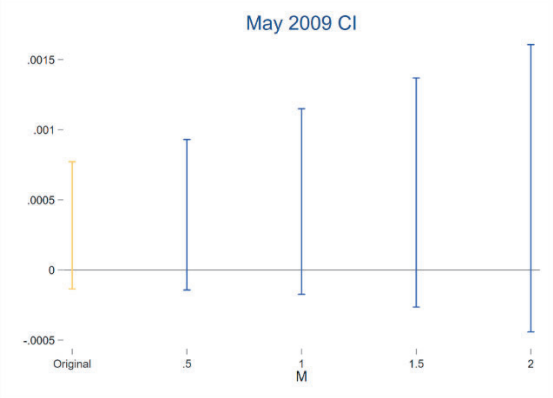

Figure 4: Robustness to differential trends- May 2009

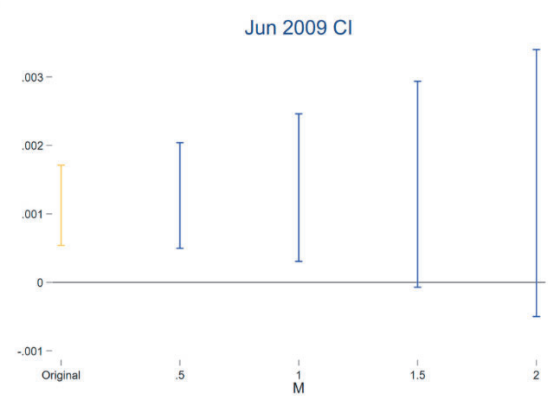

Figure 5: Robustness to differential trends- June 2009

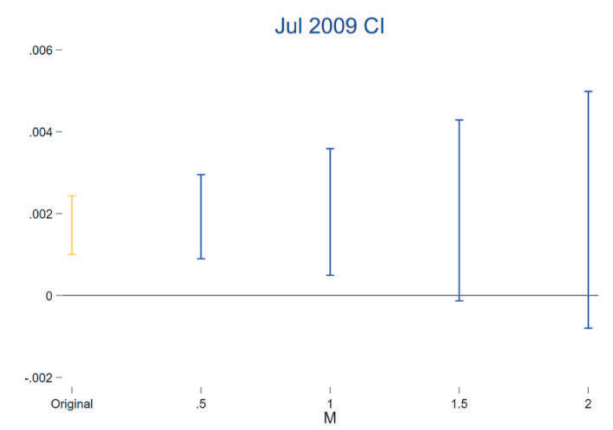

Figure 6: Robustness to differential trends- July 2009

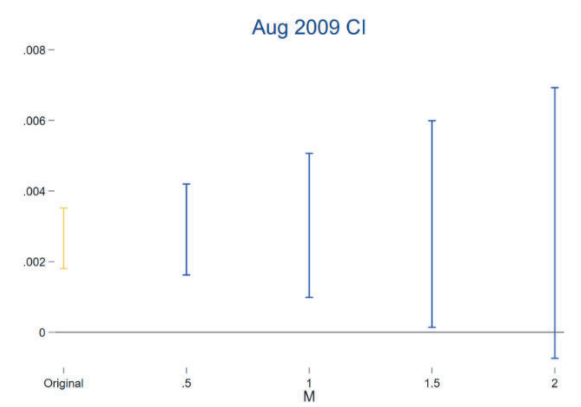

Figure 7: Robustness to differential trends- August 2009

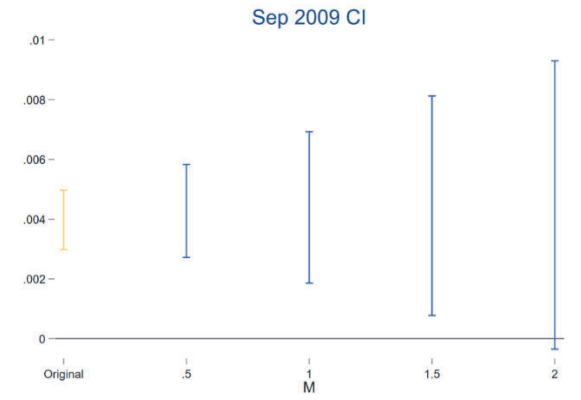

Figure 8: Robustness to differential trends- September 2009

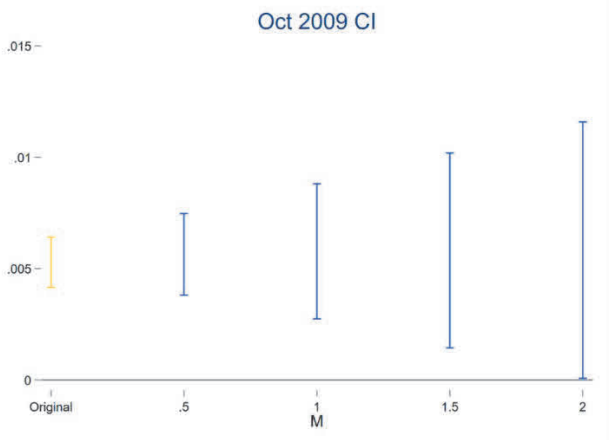

Figure 9: Robustness to differential trends- October 2009

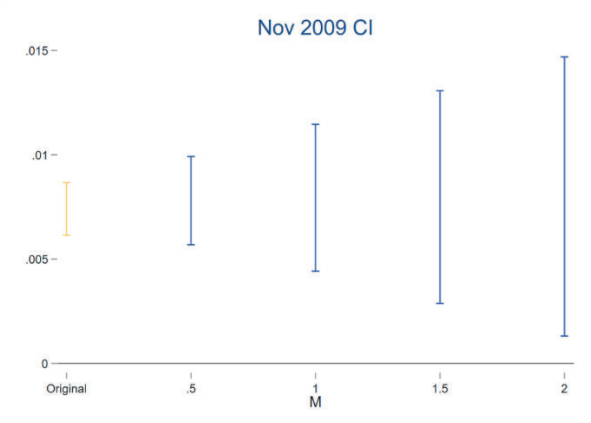

Figure 10: Robustness to differential trends- November 2009

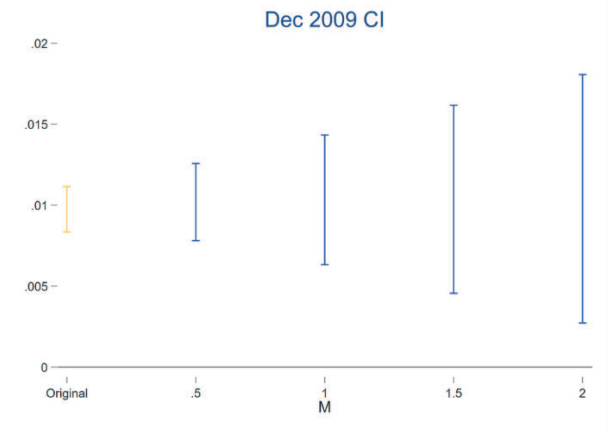

Figure 11: Robustness to differential trends- December 2009