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**Essays on Financial Inclusion and Banking in Colombia**

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Para Olivo y todos los que  
perdimos con la pandemia

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## 1. Introduction

As a centuries-old industry, the banking industry has faced many challenges and crises throughout history, coping with most of them without changing its business model considerably. The past decade has been different: Traditional banking has been tested in a way that may put at risk its long-run sustainability. Remarkably, there are three factors: a low-interest-rate environment (LIRE), regulation and digitalization, and technological advances, all three affecting the business models, profitability, and market structure (Carletti *et al.*, 2020).

The advent of the COVID-19 crisis has accentuated the previous LIRE and digitalization trends. On the one hand, the low economic growth linked to this exogenous shock has compelled monetary authorities worldwide to reduce interest rates to the lowest levels in history and keep them there for an extended period. Since maturity transformation is one of the primary income sources in the banking sector, the reduction of the interest margin has affected profitability and has pushed financial institutions to rely on new fee-revenue streams and other sources.

On the other hand, the pandemic has catalyzed financial technology (Fintech) adoption. Many users have decided to switch from traditional banking to purely digital services, particularly cashless payments and digital identification methods, aiming to reduce risk exposure inherent to physical branches. Moreover, policies enacted by different governments worldwide are based on social distancing and remote operations, playing fields in which these institutions might have comparative advantages (Berg *et al.*, 2020). Thus, Fintechs have become a significant player in the digital payment environment by helping to disperse cash transfers in isolated regions at lower costs and as a tool to perform risk management

strategies for households. In this sense, the incursion of Fintechs is menacing the incumbent's business models, profitability, and long-run sustainability (Ferrari, 2016).

Although the challenges above are similar globally, there are critical differences in developing countries. In Latin America, the net interest margins have been falling in the past decade due to declining inflation, anemic growth, and economic shocks like in developed countries. However, banks in this region have been benefiting from low-cost funding and pricing power on high-yielding loan portfolios, generating substantial interest rate margins revenues. Therefore, Latin America outperforms other global areas in terms of returns on equity (ROE), reaching average levels of 14%, more than doubling the 4–6% observed in developed regions (McKinsey & Co, 2019). This outstanding bank performance has brought competition to the market. New entrants, particularly neo banks and Fintechs, have been aware that the strategies used by incumbents have a narrowed focus on the middle and upper part of the income distribution. These population segments might increase the likelihood of asset quality deterioration. In addition, they have realized that the incumbents' ability to set prices due to market power is also excluding a significant portion of the population from payments and credit services, creating a business niche waiting to be exploited.

With the boost from the pandemic, Fintechs are disrupting the market by serving previously unattended individuals. From a development perspective, attending to this population goes in the right direction: Serving the unbanked through digital solutions might have essential effects by pushing innovative, inclusive, and sustainable growth, contributing to reducing inequality, a tool recognized in the goals of the UN 2030 Agenda for Sustainable Development. However, the positive effects of financial inclusion are not directly derived from the ownership of accounts but from their appropriate and consistent use (World

Economic Forum, 2018). Hence, it is vital to analyze if the improvement in financial inclusion from the pandemic has been translated into higher usage and economic empowerment.

This dissertation plans to delve into these challenges using the Colombian financial market data. Recently accepted by the OECD, this middle-income country has a resilient banking system that has resisted recent economic slowdowns, including the pandemic, reflecting adequate financial supervision and ample capital and liquidity (International Monetary Fund, 2018). The enactment of the Financial Inclusion Law in 2014, a regulation that allowed non-banking institutions (*Sociedades Especializadas en Depósitos y Pagos Electrónicos* -SEDPE) to offer low-cost electronic deposits, increased the competition in the financial sector.

This country will be the institutional setup to test different hypotheses related to household finances during the pandemic, government subsidies' role, Fintech adoption determinants, and interest rate regulation.

The first two chapters are highly influenced by the disruption caused by the COVID-19 crisis and the change this exogenous shock has been having in household finance and financial inclusion. For both chapters, we are partnering with MOVii: the first and largest digital wallet in the local market, operating under the framework of the Financial Inclusion Law. Since July 2018, MOVii has reached 2 million clients due to targeting campaigns on low-income populations, plus the upcoming demand arising from the social distancing measures. During the pandemic, MOVii was designated by the Government of Colombia to distribute unconditional cash transfers (G2P) to the population affected by the containment measurements. Most of the beneficiaries were unbanked when the program implementation was implemented, a condition that allows comparing to Fintech early adopters.

This financial institution agreed to share administrative information from its transactional database, including transfers, deposits, G2P disbursements, merchant payments, and basic demographic information. The granularity of this data allows a precise, dynamic, and timely diagnosis of how households reacted to this virus outbreak and how they used the government subsidies.

Therefore, the first chapter uses administrative records and different measurements of lockdown stringency, confinement, and mobility to study the effects of the COVID-19 pandemic and the G2P consumption supporting policies in the short term on different household finance indicators. The nature of MOVii's client portfolio provides a quasi-experiment setup since it allows tracking recipients and non-recipients before and after the G2P implementation. We find a significant causal effect on overall spending and savings from the G2P program, although the analysis of different spending sub-categories displays heterogeneous results. Moreover, it calculates the marginal propensity to consume from these subsidies as around 0.42, in line with recent literature.

The second chapter investigates the determinants of mobile-money usage and the effect of providing cash transfers. We designed and conducted a survey experiment to collect demographic and financial information on a representative sample of MOVii's clients. The study design includes an experimental phase survey in which respondents are randomly assigned into three different groups, each providing different financial incentives. The information from the survey is merged then with administrative data on deposits, cash-in/cash-out, and other transactional information at the user level.

This database helps to examine the association between demographics, risk management strategies, and other user characteristics on mobile account usage. In addition, it allows for

studying the effect of unconditional cash transfers on usage variables and self-reported information on prospective investment preferences and risk management strategies.

This study shows that the newly included population has different saving and transactional profiles, as they are more prone to cash out their subsidies rather than use their digital wallet for their financial activities. To promote cash, providing users with debit cards proves to be a very efficient tool to facilitate technology adoption. Furthermore, the amount of time a user has been using the MOVii app is positively associated with usage, which might implicate a learning curve that should be explored in further research. From the randomized experiment with cash transfers, causal evidence supports the hypothesis that unexpected income shocks might affect spending rather than cash-outs. This effect is more accentuated in G2P recipients.

Finally, the last chapter disentangles the interaction between interest rate caps, market power, and credit provision. We use the 2010 change in the calculation of the microcredit benchmark rate in a quasi-experimental framework. Using the consumer loans as the control group, we find that the flexibilization of the interest rate did not boost credit supply as intended by policymakers.

As observed, this doctoral dissertation focuses on financial agents, both incumbents and Fintechs, and their role in facilitating economic empowerment through credit, saving, and payment products. The public outreach of these results would enrich the policymaking process in Colombia.

The first chapter is highly relevant given the persistence of the pandemic. It validates the role of G2P as a temporary instrument designed to boost economic recovery. Moreover, it provides a clear view of non-pharmaceutical interventions such as lockdowns and other

containment orders on household finances. Proper calibration is needed to find a balance in a country where the economic stimulus is limited.

Similarly, the second chapter provides policy inputs regarding the distribution channels used to allocate G2P subsidies. Although there are challenges in usage, particularly from newly banked users, the extensive mobile money network put in place proves suitable to encourage usage. Particular attention should be placed on the mechanisms available to use these funds to boost the economic empowerment of actual financial health.

Furthermore, the final chapter allows to dispute the narrative of flexibilization, or deletion of usury rates will promote financial deepening. A future complete liberalization of the active interest rate will not be translated automatically into further financial deepening if there are agents with incentives to keep their current profit margins without venturing into riskier segments such as the currently unbanked. Without short and long-run policies aiming to protect from predating lending and other practices, allowing banks to freely price their risk would only be detrimental to consumer protection and overall welfare in the short run.

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## Show me the money:

### Household Finances and G2P payments in times of COVID-19<sup>1</sup>

#### Abstract

We explore how household finances responded to unconditional cash transfers and different lockdown measures using high-frequency financial data from a Fintech involved in the disbursement of a social protection program during the COVID-19 pandemic. We show how the pandemic induced withdrawals, fewer deposits, and more grocery shopping, while harsher restrictions to deal with virus propagation were positively associated with within-app transfers and card payments. Furthermore, exploiting a quasi-experimental setting, we found a sizeable positive effect on the total spending and savings from the program implementation. These results support implementing this kind of program as a consumption-supporting policy in vulnerable populations.

Keywords: Personal Finance, Consumption, Household Finance

JEL Classification: D14, E21, G5

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## 1. Introduction

The SARS-CoV-2 pandemic, an exogenous, sudden, and symmetric shock, has provoked unprecedented challenges in most of the world by halting the real economy. The combination of global chain disruptions affecting the supply, and containment measures shifting the demand, collapsed global economic activity in a way not experienced in more than a century.

Governments around the globe have implemented several types of policies aiming to contain the spread of the virus, leveraging on lockdowns measures that restricted mobility and affected specific economic sectors. These policies affected mainly low-income workers with less education, minorities, immigrants, and women (IMF, 2020).

Simultaneously, lockdowns forced significant changes in spending patterns. Trying to reduce exposure to the virus, individuals modified behaviors and detrimentally decreased mobility in contact-intensive sectors such as retail, tourism, and hospitality while triggering e-commerce and accelerated digital transformation (UNCTAD, 2021).

Financial services were one of the industries most impacted by these behavior changes. In response to rising infections, voluntary social distancing pushed users to demand more digital services and forced a transformation in many institutions with legacy information-technology operating systems. In this context, financial-technology firms (Fintech) offering cutting-edge solutions had a comparative advantage by offering completely digital financial services with higher efficiency and lower costs (EY, 2021).

Governments collaborated with Fintech and banks with robust digital platforms to implement economic relief programs in countries with significant welfare deterioration due to the pandemic. Hence, to reduce the effects of the pandemic on households, government



strategies relied on non-contributory cash transfers to support consumption for the most vulnerable population. In this setting, Fintech's scalability and reachability helped to disburse government-to-person (G2P) transfers through their mobile infrastructure to reach both banked and unbanked households.

Given the persistence of the pandemic and the application of lockdown measures seeking to tame it, we aim to evaluate the effects of G2P programs and lockdown measures on household financial behaviors. Specifically, we aim to study: i) the causal effects of the G2P program on the principal household finance indicators, ii) to calculate the marginal propensity to consume from this fiscal injection; and iii) how pandemic containment measures affecting mobility and working are associated with changes in financial behavior.

To delve into these research questions, we rely on administrative data from MOVii, Colombia's leading digital wallet provider and pioneer in digital payments. This Fintech has a high-frequency database at the individual level that measures spending, savings, and other financial outcomes. The emergence of this Fintech as an implementing partner of G2P programs provides a quasi-experimental setting that allows us to analyze subsidies' effects on recipients using regular users as a control group. Using these administrative records, along with different measurements of lockdown stringency, confinement, and mobility, we can study the effects of the COVID-19 pandemic and consumption-supporting policies in the short term on different household finance indicators.

We find a significant causal effect on overall spending and savings from the G2P program, although the analysis of different spending sub-categories displays heterogeneous results. The marginal propensity to consume (MPC) was estimated at 0.42, in line with recent literature. Moreover, the pandemic and its restrictions profoundly impacted household

finances: Harsher confinements increased the demand for cash and nudged a surge in grocery spending.

This paper contributes to two literature strains. First, this paper contributes to a growing literature on the effects of the COVID-19 pandemic and the subsequent lockdowns on household financial behaviors. Most of the works are set in developing countries such as the United States (Chetty *et al.*, 2020; Coibion, Gorodnichenko and Weber, 2020; Cox *et al.*, 2020; Karger and Rajan, 2020; S. Baker *et al.*, 2020), the United Kingdom (Carvalho *et al.*, 2021; Hacıoğlu-Hoke, Känzig and Surico, 2021) and Spain (García-montalvo and Querol, 2020). These papers found an association between stay-at-home measures and severe declines in income, spending, and debt payments.

Second, this study adds to the literature calculating the MPC of COVID-19 emergency stimulus payments. While some papers use direct elicitation, others make use of consumer data. A hypothetical one-time income payment in the UK shows an MPC of 11% (Crossley *et al.*, (2021), while a survey in the US shows that only 15% of the stimulus cheque recipients use them all (Coibion *et al.*, 2020). A similar exercise in six EU countries by Christelis *et al.*, (2020) shows a 0.3–0.5 MPC from a hypothetical disbursement.

Studies on the effect of a pandemic stimulus on consumption using administrative data calculate an MPC in a range between 0.15 and 0.5, with substantial heterogeneity based on observable characteristics such as age, income, and location; as well as homeownership, liquidity constraints (Karger and Rajan, 2020; Baker *et al.*, 2020; Kubota, Onishi and Toyama, 2021a).

To our knowledge, there is a lack of studies using data at the individual level to analyze the association between lockdown measures, subsidies, and household finance in a developing country setting such as Colombia. This study is an important policy input to determine how to enact further restrictions to minimize the impact on household finances given the mid-run horizon of this pandemic in developing countries with access barriers to vaccines. Furthermore, measuring the MPC might help policymakers design better programs to alleviate consumption declines in low-income populations.

This paper is organized into three parts. The following section explains the institutional context of the mobile wallets in Colombia and the cash transfer programs disbursed through these recently created financial institutions. The third section describes the novel dataset and provides descriptive information. Section 4 describes the empirical strategies used to test the different hypotheses to examine the impacts of cash transfer programs and COVID-19 containment measures on spending, savings, and other financial variables. Finally, Section 5 presents the results of the different estimations, and the last section presents a policy recommendation and concludes.

## **2. The COVID-19 pandemic in Colombia and Emergency Cash Transfers**

Colombia, a country of around 50 million people, has been one of the most affected countries by the COVID-19 pandemic. As of December 2021, the country has reported 5.2 million confirmed positive cases and 130,000 deaths, ranking as one of the worst places in the world in terms of excess mortality (Our World in Data, 2021).

After identifying the first case on March 6th, 2020, the National Government imposed a countrywide quarantine and lockdown on March 16th. The decision halted important sectors like construction, transport, tourism, nonfood retail, and hospitality, affecting 67% of the country's workforce. This massive negative shock forced the country into the worst economic

crisis in its republican history, pushing 1.45 million people back to poverty (World Bank, 2021a).

Before the pandemic, Colombia implemented different G2P cash transfer programs for social protection. Between *Familias en Acción* (program targeting lowest-income households), *Colombia Mayor* (low-income elderly), and *Jóvenes en Acción* (vulnerable youth), the policies implemented in the country covered around 4.5 million individuals every month (Cecchini, Filgueira and Robles, 2014). Most of these benefits were disbursed through basic bank accounts issued by the state-owned bank *Banco Agrario*, which provides debit cards that cannot be used outside of its branches or ATMs; a minor fraction is received through over-the-counter giros/transfers and cash-based payments that can be collected at specific points.

With the advent of the health crisis, the National Government implemented a new G2P program targeting informal workers in vulnerability: *Programa Ingreso Solidario* (ISP). ISP provides cash transfers (COP 160,000≈USD 40/household/month) to three million non-poor but vulnerable households every month. This amount is around 65% and 58 % of the national and US\$5.5 PPP per day poverty line, respectively (Blofield, Lustig and Trasberg, 2021).

ISP eligibility is determined by three conditions: i) beneficiaries must be informal workers, ii) they cannot be covered by other existing social assistance programs such as *Familias en Acción*, *Jóvenes en Acción* o *Adulto Mayor*; and iii), they must pass a vulnerability test using a standard cutoff score based on the *Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales* - SISBEN (Identification System for Potential Social Program Beneficiaries). The SISBEN is a multi-dimensional proxy means test of validated information for almost 40 million people, implemented through a national survey of income

and assets, which determines if one qualifies for many of Colombia's social protection programs (Rosero, Castanó and Sarmiento, 2012). With these conditions, the population covered by the ISP reaches 20% of the total population of informal workers.

Given the need to reduce mass gatherings and encourage social distancing, one of the main features of the ISP is its digital deployment features. In this sense, the program has a dual mandate: supporting consumption and promoting financial inclusion. Besides providing funds to vulnerable households, the Government wanted to use this crisis to increase access to financial services and encourage citizens to use the digital ecosystem. This policy would support consumption, reduce transaction costs, and diminish exposure to the virus.

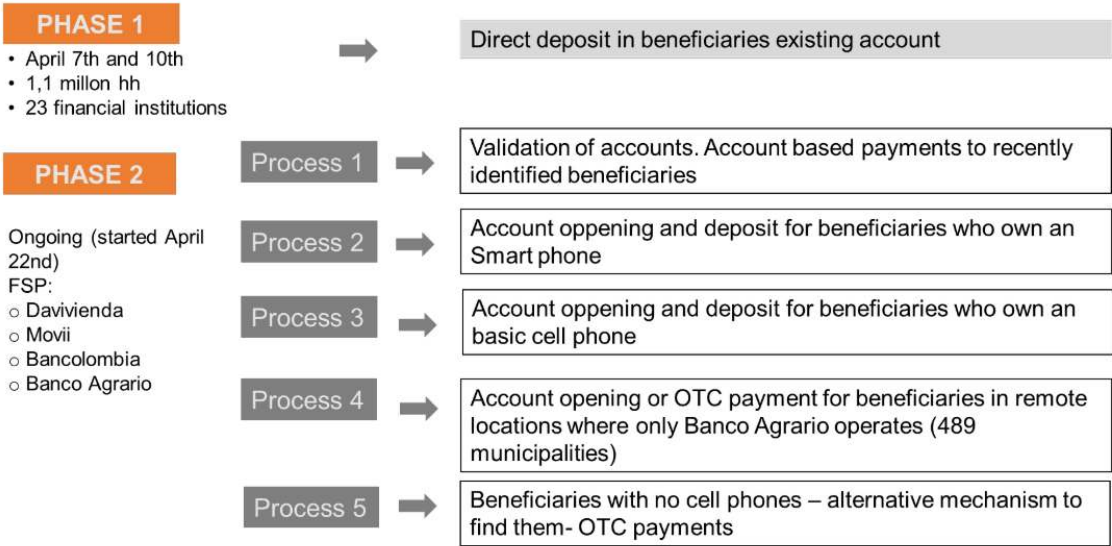
Therefore, unlike previous programs, ISP relies mainly on digital bank accounts and mobile wallets provided by the private financial sector. The program requires formal financial institutions to offer remote digital onboarding, data sharing protocols, and non-bank payment services (World Bank, 2020). Beneficiaries can use either existing deposit accounts or remotely create a new one to receive the emergency funds for those previously unbanked. These new accounts have balance and transaction limits, using a simplified customer due diligence process. The know-your-customer (KYC) process involves providing only the ID number, place and date of issue, the full name of the account holder, and the date of birth.

In addition to traditional and public banks, the ISP subsidies were also disbursed by the institutions called SEDPEs (Sociedades Especializadas en Depósitos y Pagos Electrónicos) were created with the Financial Inclusion Law in 2014 to allow high-volume, non-banking institutions to offer low-cost electronic deposits with simplified KYC requirements. SEDPEs cannot lend money and should keep depositors' money either in an account at the Central Bank (*Banco de la República*) or a traditional commercial bank. Other risk management requirements are asked for these new institutions to obtain a digital money license.

In particular, SEDPES were authorized to execute cash-in and cash-out operations through electronic deposit accounts while offering transfers, electronic payments, and nano-credits. SEDPEs can grant credit using a different legal vehicle and their equity, not using deposits from the public (Welch, Epting and Sullivan, 2017).

All in all, 3 million vulnerable households were expected to be covered by ISP, and from these, 1.1 million were previously unbanked. The dispersion endeavor implied a deployment of different levels of public-private partnerships to find an adequate dispersion mechanism. Given this scenario, the Government leveraged on the traditional banks, the public bank (*Banco Agrario*) and MOVii, the biggest SEDPE in the country.

Figure 1: ISP Payment Process



Source: World Bank, 2021

The program's first stage was to identify those with active deposit accounts in the financial sector. Of the total beneficiaries assigned to MOVii, 8.2% were already MOVii. Since these

users voluntarily opened an account before the pandemic, they will be called the G2P population throughout this paper.

Those recipients without a deposit account, the unbanked G2P, had to be found through media campaigns, crossing databases with telecommunications companies, and even with door-to-door campaigns aiming to reach communities with connectivity issues (URF, 2020).

Besides disbursing ISP, a countrywide initiative, MOVii also won the bid to disburse another G2P program at the municipal level: *Bogotá Renta Básica* (BRB). BRB guarantees a universal basic income to poor households in the city, providing economic support through monetary transfers delivered through financial operators. Bogotá benefited almost one million households in conditions of poverty and vulnerability during 2020. By 2021, the subsidy scheme provided COP 240,000 (USD 60) per month per vulnerable household. When referring to G2P programs, we refer to both ISP and BRB since MOVii disburses both.

In sum, the pandemic pushed national and local authorities in Colombia to deplete one of the country's most extensive social protection campaigns. Implementing G2P programs has been a significant improvement in public-private partnerships aiming to mitigate the effects of the COVID-19 pandemic and reduce public health risks while also promoting financial inclusion.

### **3. Data and summary statistics**

This paper relies on three datasets for the empirical analysis: MOVii's administrative records, the Oxford COVID-19 Government Response Tracker (OxCGRT), and Google's COVID-19 Community Mobility Reports.

Since the company's foundation in July 2018, MOVii has gained around 2 million clients through an innovative marketing campaign of differentiation from the traditional financial

sector. After signing a detailed non-disclosure agreement, the firm has agreed to share its anonymized proprietary database with the complete transactional information, including transfers, deposits, and payments.

This data allows us to evaluate household spending and saving behaviors. Given the granularity of the firm's information, this dataset enables a precise, dynamic, and timely diagnosis of how households reacted to this virus outbreak. Thus, this information allows us to understand how households had adjusted their finances to the exogenous shock, how beneficiaries used subsidies, when they began to react and how they modified their behavior when the Government relaxed/adjusted lockdown measures.

The user-level database includes two types of information: transactional data and account balances. The transactional database includes records from active MOVii clients from January 2020 to September 2021, recorded weekly. Around eight million data points were recorded for around 892,000 different users. An active user is defined as active if she has performed any operation in the past four weeks. The account balance database includes all users, active and inactive, from the same 21-month time window. In this period, 55 million observations for 945,000 different users were recorded.

This study will focus on three mutually exclusive populations: regular users, G2P banked, and G2P unbanked. We refer to regular users as those clients who are not receiving any governmental aid. We separate G2P recipients into two groups: those already enrolled at MOVii before the pandemic -banked- and those who were urged to open a digital wallet to receive subsidies -unbanked-. Table 1 shows descriptive statistics for these three groups and the overall sample.

Of the almost 900k active users, 66.9% are subsidy recipients. Regular users are younger than G2P recipients, are proportionally more women, and are more likely to have an active



MasterCard debit card to perform transactions (those without debit cards will do operations mainly through the app). The average number of transactions made by regular users is almost thrice of previously unbanked G2P users and twice the banked.

Table 1: Descriptive Statistics – Active Users

Variable	G2P Unbanked	G2P Banked	Regular user	Total
Age	29.6%	57.4%	61.1%	41.2%
Female	41.6	32.0	31.1	37.7
Foreign	3.9%	0.1%	4.6%	3.9%
Active card	13.4%	47.4%	49.5%	26.8%
Transactions	1.3	1.9	3.7	2.4
N	558,220	49,736	284,687	892,643

The transactional database includes other purchasing/spending categories besides the usual activity indicators such as cash-in, cash-outs, transfers, and deposits (account balances). These categories were created using a data mining SQL query on MOVii'sr transactional records stored on Amazon Redshift, which sorted the weekly amounts spent by each user based on the business in which the transaction was made. With the aid of this algorithm, we created approximate values of how much the user has spent each week on utilities, groceries, mobile top-ups, and other types of payments.

Table 2 presents weekly averages of transactional frequency and volumes by regular users and G2P recipients for the studied period. The transactional database only includes active users, implying it records a user only if she operates within the app. Otherwise, the user is considered inactive and appears in the second database: balances. Thus, users in this database, particularly G2P recipients, would be observed when the subsidy has been disbursed. There are two types of cash-out operations: The most common involves using an app to get a code used by non-bank correspondents to withdraw cash with a PIN code, and the second one refers to ATM cash withdrawals using a debit card.

There are noticeable differences in the transactional profile between beneficiaries and non-beneficiaries: The previously unbanked recipients predominantly withdraw money from their accounts and transfer money, while the banked use the digital ecosystem more consistently through card payments. These differences are even more pronounced with regular users who spend the highest share of their balances. On average, non-G2P users perform mainly mobile top-ups, P2P transfers, card payments (Other by card + PSE), digital content, and sports gambling, showing that these users find value in the product.

Table 2: Weekly Average Transaction Volume by type of User (Pesos)

Variables	G2P Unbanked		G2P Banked		Regular user	
	Mean	SD	Mean	SD	Mean	SD
G2P subsidy	182,069	95,856	158,717	94,092	-	-
Spending	5,351	26,769	21,879	60,365	62,919	183,886
Cash-out	120,665	105,930	57,752	91,735	45,381	423,095
Cash-in	1,810	19,662	9,868	61,560	105,338	412,920
Balance	105,621	158,550	121,683	223,996	55,265	280,418
P2P	62	4,806	279	10,243	9,120	80,086
Transfers	11,555	47,134	6,734	35,344	10,399	86,829
Giro	2	1,260	14	2,798	924	24,970
PSE	360	7,771	802	10,884	1,375	35,305
Other by card	1,958	16,423	12,592	48,098	42,765	147,756
Mobile top-ups	3	214	253	2,689	1,970	10,328
Digital content	66	1,955	306	5,526	1,050	17,685
Sports gambling	113	3,487	268	5,052	455	8,868

The information from the newly banked G2P population starts being recorded in April 2020. Before this date, only data for the previously banked and regular users are available, allowing the difference-in-difference empirical strategy explained in Section 4. Since all the G2P recipients were selected based on a means test-SISBEN- that collects information on living conditions and income, differences among the first two groups could be explained by more prolonged exposure to the app and the learning curve from using digital solutions. On

the other hand, differences in usage between G2P and regular users might rely on the socioeconomic characteristics of these populations. Since this database is scarce in demographic information, only age, nationality, and sex are collected. Transactional divergences might arise from different income levels, financial education, supply-side issues based on location, and mistrust of the app. The absence of this information was a motivation to explore further and motivated Chapter 2 of this dissertation.

Figure 2: Cash In/Cash out -CICO – Type of Users

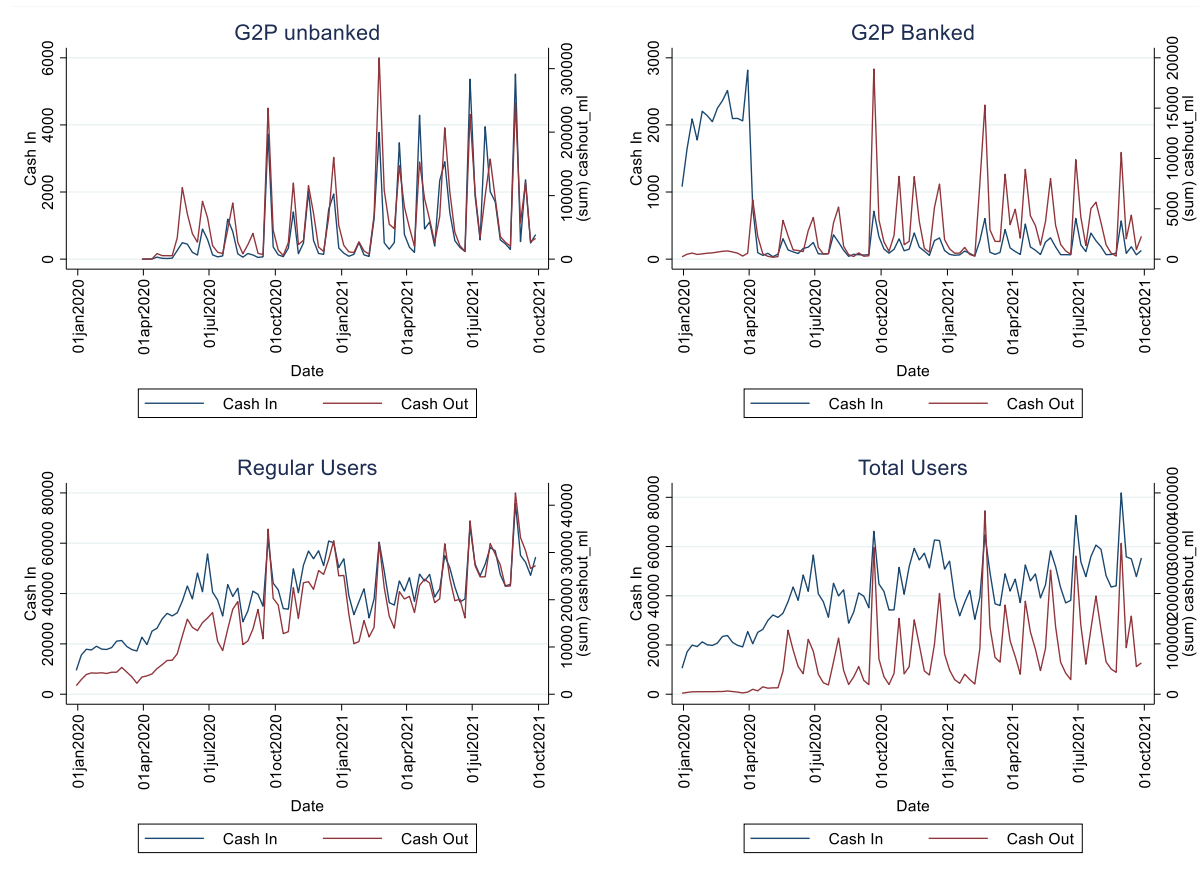


Figure 2 presents cash-in/cash-out (CICO) behaviors from different categories. There are relevant insights from these two-axes graphs where the cashout (right) ax is lower in scale: i) the pandemic reduced the capacity of banked G2P recipients to save, inferred by the decrease of cash-ins, reflecting the impact this exogenous shock had on household income.

ii) Regular users deposit more money than they withdraw, showing an appetite for digital money and a higher capacity to save. Moreover, iii) the volatility of cash-outs hiked after the pandemic, particularly for recipients.

Figure 3 presents the close relationship between total spending and subsidies. The total spending variable is calculated as the sum of all the app purchases plus all the cash-out operations that presumably will be used for personal consumption. The figure shows how dependent is spending on G2P disbursements, as this type of user generally does not deposit funds into their account in any other way. Additionally, it presents little evidence of intertemporal consumption, as balances are used almost entirely for spending after receiving the funds.

The last subset of the Fintech administrative information is the account balance database, which presents how the deposits evolved during the overall time of the study. The balances dataset is almost seven times richer in terms of observations than the transactional one since it includes inactive users, i.e., those who have not made any operation in the past four weeks.

Thus, this database allows us to examine saving behaviors timely and accurately. Figure 4 shows the heterogeneity of account balances by regular users and banked G2P users. These two types of users can be tracked even before the pandemic crisis, and the figure exhibits similar trends for both groups in this period. After the program was enabled, the volatility of deposits from G2P users picked up, reacting to the subsidy disbursements. For regular users, the volatility and levels increased as well, reflecting higher demand in this population for social distance services.

Figure 3: Cash Transfers and Total Spending – Type of Users

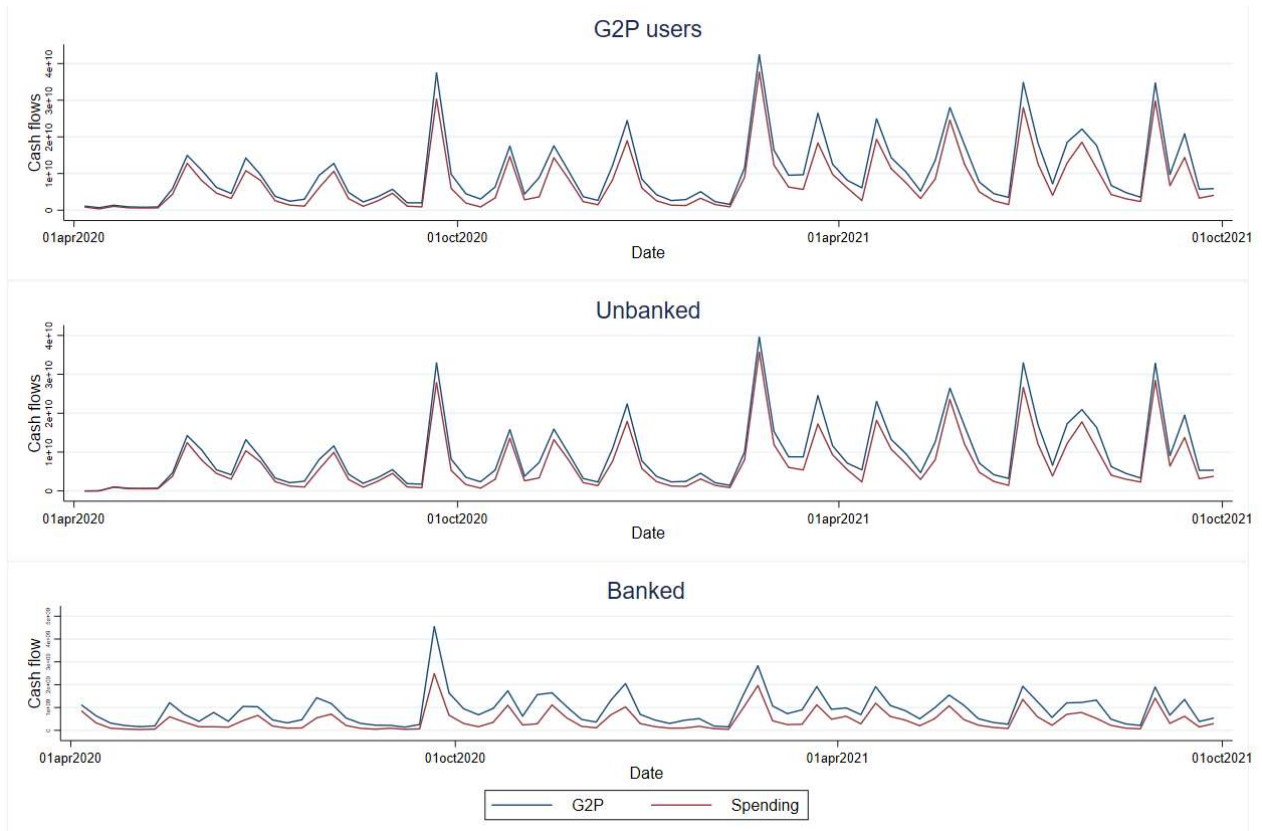
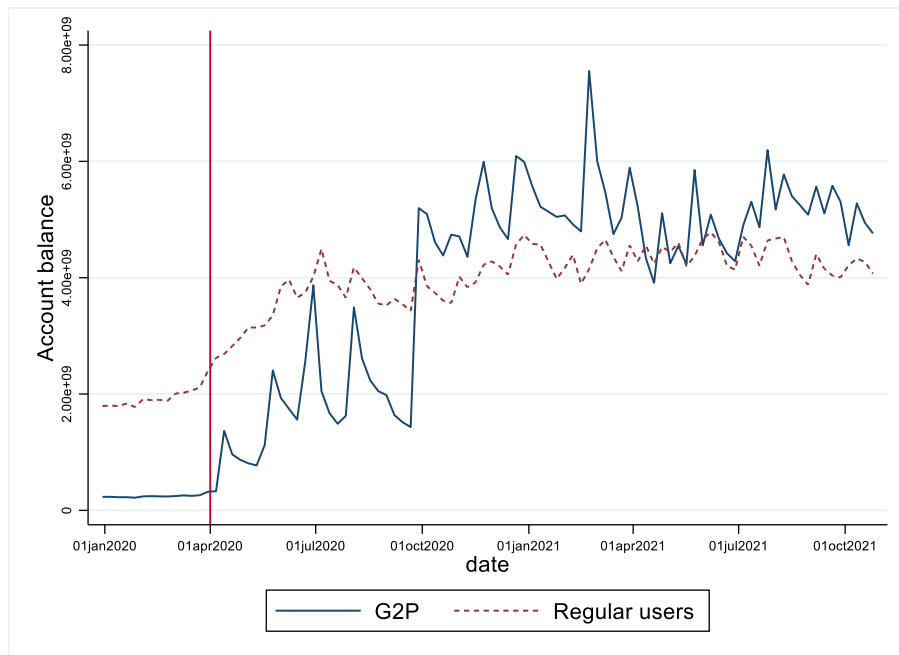


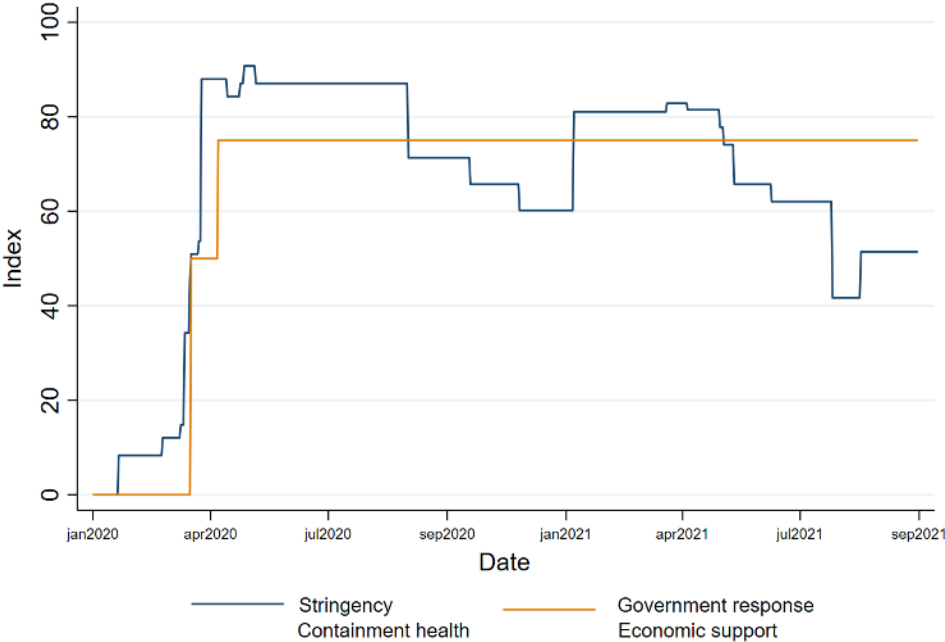
Figure 4: Account Balances – User Type



The second source of information is the Oxford COVID-19 Government Response Tracker (OxCGRT), compiled by Hale et al., (2021). This dataset provides a systematic set of cross-national, longitudinal measures of government responses since the pandemic's start, including 19 policy indicators for closure and containment, health, and economic policies. These indicators are combined into four composite indices reflecting the number and degree of policies in different jurisdictions.

Each policy indicator is a categorical variable that takes ordinal values based on their nature using 16 of the sub-indicators shown in Annex 2. Hale et al., (2020) standardized these levels by taking values from 1 to 3 and subtracting an extra half-point if the policy is general rather than targeted. Then these are rescaled to create a score between 0 and 100, with missing values contributing to zero.

Figure 5: OxCGRT Indices - Colombia



Source: (Hale et al., 2021), own calculations

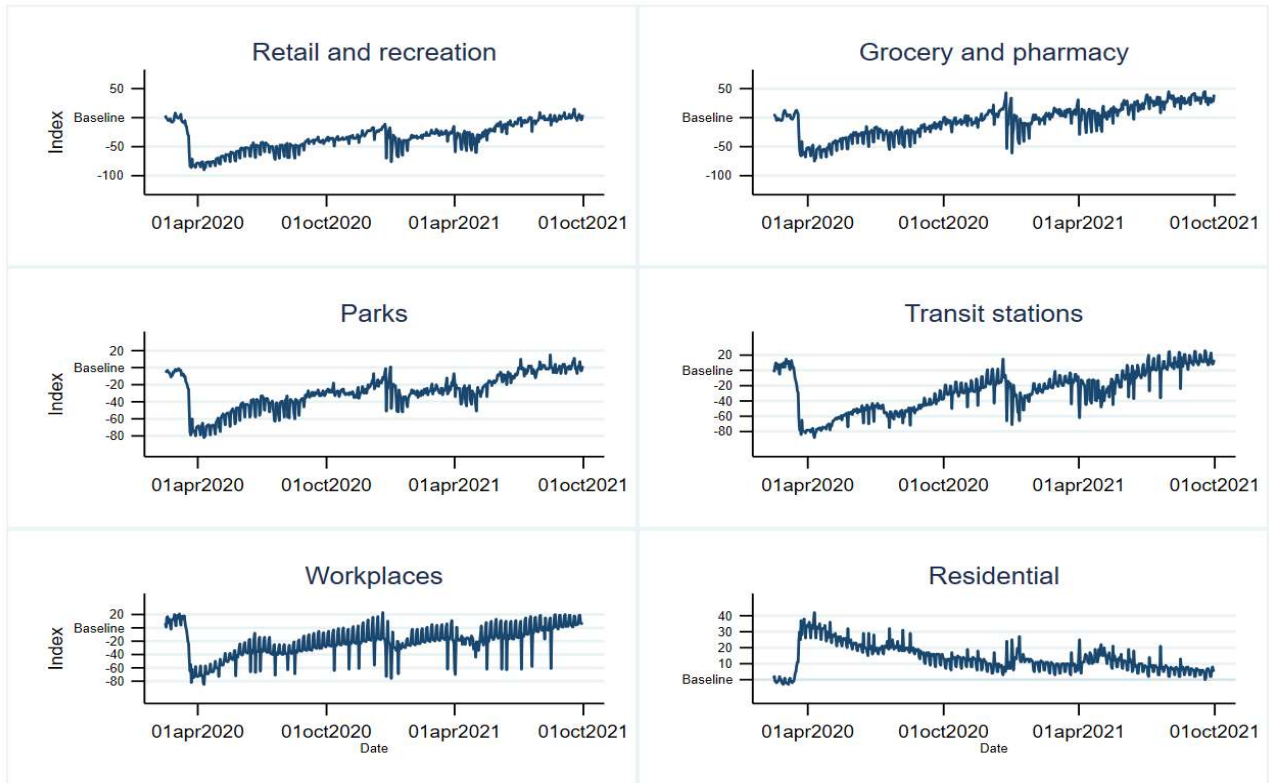
For this study, we are using two of the five OxCGRT: the Stringency Index (STR) and the Economic Support Index (ESI). The STR uses the full nine containment and closure indicators, plus public information campaign, making it the most accurate to measure mobility restrictions at any given point in time. This index has evolved from the different stages of the pandemic in Colombia, reflecting public policies made by the Government to tame the advances of the virus. The ESI measures public financial assistance to households, such as G2P programs. It comprises two ordinal indicators for income support and debt/contract relief for households.

Figure 5 shows the evolution of these two indexes throughout different COVID-19 waves. ESI rapidly hiked after the pandemic declaration in March 2020 and remained high, capturing the Government's determination to support consumption after the restrictions. On the other hand, the STR has shown more significant variance due to different epidemiologic cycles and political stances in dealing with the pandemic.

Finally, the last database used is the COVID-19 Community Mobility Reports produced by Google. Using data provided by Google Maps and other GPS tracking apps, the company has produced a dataset on how user mobility has changed after implementing measures to slow the spread of the virus by enforcing physical distance between people (Google LLC, 2021).

Google divides the mobility report into specific categories of location, e.g., retail and recreation, grocery and pharmacy, parks, workplaces, transit stations, and residential. Changes in the number of visitors to each place are compared to a baseline day, the median value over the five weeks from January 3rd to February 6th, 2020.

Figure 6: Google's COVID-19 Community Mobility Indexes



Source: Google LLC, own calculations

Figure 6 presents how peoples' movements have changed throughout the pandemic by category. After the virus outbreak, movement in all the places was reduced but in residential areas due to social distancing measures and remote working settings. Nonetheless, the relaxation of containment measures in the second half of 2020 and the total lift of different lockdown measures in April 2021 has increased mobility in the past months, reaching pre-pandemic levels.

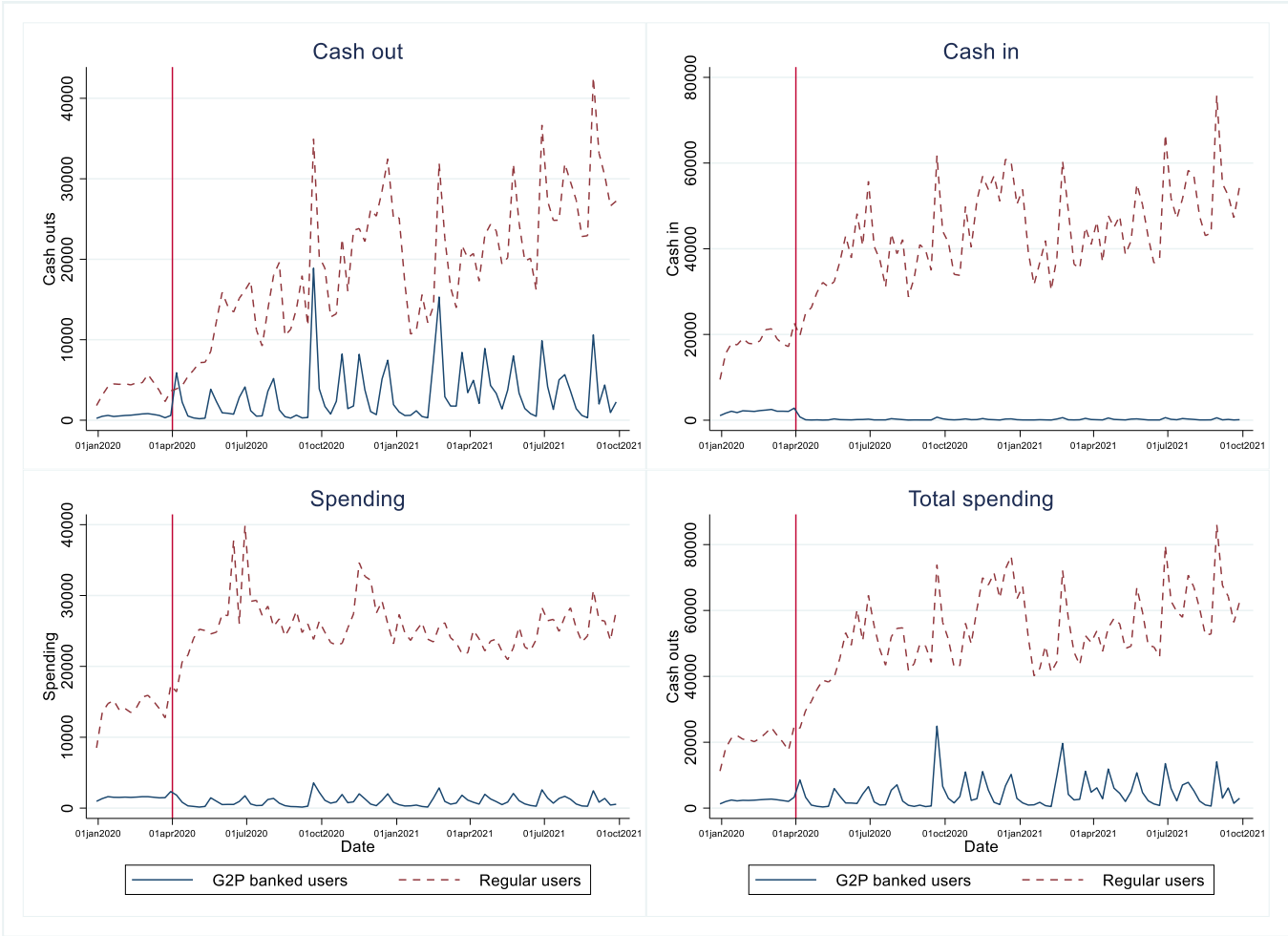
#### 4. Empirical Strategy

The two described datasets, collecting information on transactions and deposits, allow observing how households adjusted their finances to the exogenous shock, G2P subsidies,



and the effect of different lockdown requirements. With this data, two sets of empirical exercises are proposed: The first one aims to test the consumption supporting behavior capacity of the ISP: do beneficiaries increase their consumption due to the emergency cash transfers? The administrative database includes information on three types of users: Previously unbanked recipients, who opened their digital wallets due to the cash transfer program, recipients who were already MOVii before the pandemic crisis, and users regular users not enrolled in any G2P program.

Figure 7: Parallel Trends – Main household finance indicators



This setup allows a quasi-experiment environment, where the banked G2P is considered the treatment group, while non-recipients are the control group. For these two populations, we have observations since January 2020, allowing us to run a two-way linear fixed effects regression. Figure 7 shows the overall behavior of the aggregate variables in the overall study period. The visual inspection of the pre-treatment trends shows relatively stable behavior of the treatment and control groups before implementing ISP and other G2P programs.

The second estimation proposed is related to the MPC from these G2P funds. The studies focusing on MPC are separated between those relying on self-reported information from surveys (Coibion, Gorodnichenko and Weber, 2020; Feldman, Heffetz and Johnson, 2021; Kim and Lee, 2021) and those using high-frequency data from financial institutions (Karger and Rajan, 2020; Liu *et al.*, 2020; Feldman, Heffetz and Johnson, 2021). The information from MOVii falls in the second category, as this is a prompt and detailed registry of all financial activities performed by the recipients.

The third analysis seeks to analyze the role of the pandemic and different lockdown orders for the leading banking indicators. The main objective is to determine how sensitive transfers, CICO operations, and spending are to containment and mitigation policies and the pandemic figures at different moments in time.

This analysis follows recent literature on COVID economics. For instance, Kubota, Onishi and Toyama (2021), using a 2.8 million panel from a commercial bank in Japan, find a spending jump in the payment's week, followed by higher spending even after one month after payment disbursement. Baker *et al.*, (2020), using microdata from a Fintech, show how household spending reacts to anticipated income shocks from the pandemic.

## 4.1 Effects of the G2P Programs

In order to test the effect of the policy on the leading household finance indicators, we estimate the following two-way fixed effects model (TWFE) (Angrist *et al.*, 2009; Imbens and Wooldridge, 2009; Wooldridge, 2021):

$$Y_{ibt} = \alpha_t + \lambda_i + \beta_1 (G2P_i * DIS_t) + \varepsilon_{ibt} \quad [1]$$

Where the sub-index  $i$  represents the user,  $b$  denotes whether the user was a G2P recipient, and  $t$  the week. The granularity of the information allows us to analyze the effect of the cash transfer programs on different transactional variables. Therefore, the output variable  $Y_{it}$  captures the log of different categories, including spending, cash-outs, P2P, transfers, mobile top-ups, groceries, utility bills, and gambling.

The binary variable  $G2P_i$  takes the value of one for treated users (recipients) and zero for non-treated;  $DIS_{it}$  takes the value of one in the week the user starts receiving subsidies, which varies between recipients due to administrative processes; otherwise, it is zero. This one does not include control variables since the individual characteristics we obtain in this dataset do not vary throughout time. Nevertheless, time and individual fixed effects terms are included in the regression to control for time-invariant user-specific factors. Finally, the standard errors,  $\varepsilon_{ibt}$ , will be clustered at the individual level.

Given the disparities in terms of the size of the account balances database, the difference in difference regression will be run separately. A comparison with an OLS specification and a TWFE is included.

## 4.2 Marginal Propensity to Consume-MPC

In order to analyze the consumption supporting behavior of G2P, we calculate the marginal propensity to consume (MPC) of the subsidy recipient population. Following Fisher et al., (2020) and Baker (2018), an Euler equation [2] is set up to measure the MPC by regressing consumption on income. This regression, restricted to G2P beneficiaries, estimates the impact of cash transfers on a proxy variable of total consumption, including all the cash-outs, transfers, and aggregate spending.

$$Y_{it} = \alpha_t + \beta_1 X_{it} + \beta_2 G_{it} + \varepsilon_{it} \quad [2]$$

$Y_{it}$  is a set of proxy variables of consumption, and  $G_{it}$  is the amount received by the households on subsidies. Matrix  $X_{it}$  includes control variables at the individual level, such as age, sex, activated debit card, and nationality. Although all regressions include time-fixed effects, a pooled OLS is also regressed to analyze account balances. Standard errors are clustered by user ID.

## 4.3 Household Spending Response to the pandemic

The last quantitative analysis is centered on the effect of the COVID-19 crisis on household finances. Thus, we regress a set of dependent variables on indicators for lockdown ex-ante, ex-post periods following Baker et al., (2020), variables to capture mobility restrictions, the stage of the health crisis, and a wide range of measures taken by the Government to cope with it.

$$Y_{it} = \alpha_t + \beta_1 X_{it} + \beta_2 T_t + \varepsilon_{it} \quad [3]$$

The dependent variable includes financial indicators such as account balances (deposits), cash-in, P2P, cash-outs, and different spending categories, including utility services, digital services, gambling, and other broad spending categories possible to bundle in the dataset.

Finally, the  $T_t$  matrix is added in this regression, carrying a dummy variable taking the value of 1 after the pandemic was declared in the country (March 16th, 2020). The matrix  $X_{it}$  would include either the OxCGRT indexes or the Google mobility indexes. Individual fixed effects are included, and standard errors are also clustered at this level.

## 5. Results

### 5.1 Effects of the G2P Programs

This section resumes the effect of the unconditional cash transfers on the leading household finance indicators. The TWFE methodology proposed allows us to infer the causal effects of the G2P program by having users covered and not covered by this consumption-supporting policy. Given that beneficiaries do not start receiving the subsidies simultaneously, we use a difference in difference regression with variation in the treatment timing to estimate the average treatment effect. The estimator of interest is  $G2P_i * DIS_t$ , differentiating between treatment (banked G2P recipients) and control (regular users) groups while indicating when the treatment started being disbursed.

Table 3 shows the effect of the policy on the leading indicators such as cash-outs (CSO), cash-ins (CSI), spending (SPD), and total spending (TSP), which includes all transactions other than cash-outs and cash-ins. The main highlight is the significant effect on the overall spending, a measure that includes all the different alternatives in which users can use their subsidies. The difference in difference estimator shows the G2P programs had a positive effect of 55% on the total spending.

The subsidies also substantially affected CICO behaviors, almost doubling withdrawals and reducing cash inflows to the app almost by the same proportion. When a measurement of spending that does not include cash-outs and transfers is analyzed, it is shown that merchant operations decreased by 31% after implementing the G2P programs.

Table 3: Average Treatment Effects of G2P - Main Household Finance Indicators

VARIABLES	(1) CSO	(2) CSI	(3) SPD	(4) TSP
G2P*DIS	0.943*** (0.0234)	-0.975*** (0.0160)	-0.307*** (0.0213)	0.553*** (0.0199)
Constant	1.468*** (0.0195)	6.338*** (0.0385)	6.830*** (0.0284)	8.483*** (0.0255)
Observations	4,084,811	4,084,811	4,084,811	4,084,811
R-squared	0.005	0.005	0.001	0.005
Number of IDs	343,725	343,725	343,725	343,725
Individual FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The increase in cash-outs while merchant spending decreases SPD shows the preference in this type of vulnerable population for liquidity in times of distress, such as the pandemic. Demand for liquidity might explain the opposite coefficient signs of spending (SPD) and total spending (TSP): the latter reflects the overall increase in purchasing power due to the social safety initiative and preferences for more liquid forms such as cash.

Even though the R-squared presented in Table 3 and others through this study are low, these results do not invalidate the findings from the difference-in-differences estimation. Statistical analysis of microdata may present significant dispersions, given the variability in people's decision-making; Furthermore, there may be many unobservable characteristics

and unavailable explanatory variables, the non-inclusion of which does not invalidate the relevance of the included available characteristics whose contribution is different from zero.

While the R-squared indicates how strong the relationship is between the independent variables and the variable of interest, a low value does not imply that causal relationships that appear to be nonzero should be ignored. As the R-squared is not a formal hypothesis test to estimate this relationship, it is necessary to judge the model with criteria beyond the goodness of fit. The relevance of the independent variables, measured by the t-student statistic (or the resulting p-value), allows us to conclude that there is no statistically significant evidence to reject the null hypothesis raised about the variables of interest.

We disaggregate spending categories to analyze how the G2P program affects specific household expenses. Table 4 describes the regression estimates for an array of categories: The categories boosted by the program were grocery shopping (PTG) with a 16% increase, P2P transfers (CEX) at 8.8%, utility bill payments (UTL) at 5%, and digital content (CON) with 2%.

Table 4: Average Treatment Effects of G2P – Spending by Category

VARIABLES	(1) CEX	(2) UTL	(3) GAM	(4) PTG	(5) MOB	(6) CRE	(7) CON	(8) APO	(9) PTO	(10) TRS
G2P*DIS	0.087*** (0.0125)	0.048*** (0.0101)	-0.0288*** (0.00534)	0.155*** (0.0116)	-0.230*** (0.0100)	-0.0176*** (0.00152)	0.022*** (0.0048)	-0.00517*** (0.00111)	-0.219*** (0.0187)	-0.0962*** (0.0130)
Constant	0.787*** (0.0166)	0.473*** (0.0153)	0.0315*** (0.00382)	0.546*** (0.0188)	1.959*** (0.0235)	0.0253*** (0.00495)	0.127*** (0.0055)	0.104*** (0.00205)	4.426*** (0.0331)	1.035*** (0.0191)
Observations	4,084,811	4,084,811	4,084,811	4,084,811	4,084,811	4,084,811	4,084,811	4,084,811	4,084,811	4,084,811
R-squared	0.001	0.003	0.011	0.002	0.004	0.001	0.001	0.001	0.002	0.002
Number of id	343,725	343,725	343,725	343,725	343,725	343,725	343,725	343,725	343,725	343,725
Individual FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

On the other hand, there were sharp declines in mobile airtime top-ups (MOB) with a 23% fall, gambling (GAM) -by 3%, and other debit card payments (PTO) -by 22%.

Table 5: Average Treatment Effects of G2P - Deposits

VARIABLES	(1) OLS	(2) Fixed Effects	(3) Fixed Effects
G2P*DIS	2.793*** (0.0181)	3.982*** (0.0220)	3.272*** (0.0225)
Constant	4.819*** (0.00596)	4.725*** (0.00175)	3.427*** (0.00987)
Observations	26,168,275	26,168,275	26,168,275
R-squared	0.030	0.066	0.089
Number of id		365,874	365,874
Individual FE	NO	YES	YES
Week FE	NO	NO	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Furthermore, we apply the TWFE methodology to the deposit/balance database, which includes active and inactive users. This regression is restricted to the treatment and control groups, consisting of 26.2 million observations from more than 365,000 users. The difference in difference estimator for G2P\*DIS is statistically significant for the three proposed specifications, showing that the program nudged balances in their digital wallets by almost tripling savings on a given week, as observed in Table 5. These results support the role of the G2P as social safety program by increasing spending and savings, which translates to a reduction of vulnerability.



## 5.2 Marginal Propensity to Consume

As observed in the previous section, ISP and other G2P supporting consumption programs significantly affected beneficiaries' spending compared to non-recipients. This exercise aims to quantify the marginal propensity to consume from these government programs following the literature on the matter only on the recipient population.

Table 6 presents the Euler equation estimates for the relationship between consumption and income. The coefficient of the subsidy increases based on which output variable is chosen. Columns 1 and 3 include only spending gauges, while Columns 2 and 4 use a more comprehensive figure that, on top of spending, includes other ways the user can potentially consume the subsidy, such as withdrawing it. Columns 1 and 2 use a pooled OLS regression over the 19-month observation period, while 3 and 4 consider time fixed effects.

Table 6: Euler Equation for G2P recipients

VARIABLES	(1) Spending	(2) Total Spending	(3) Spending	(4) Total Spending
G2P	0.00944*** (0.000380)	0.495*** (0.00263)	0.0140*** (0.000442)	0.419*** (0.00306)
Constant	1,586*** (121.5)	24,306*** (515.2)	23,069*** (2,085)	55,778*** (2,713)
Observations	4,441,225	4,441,225	4,441,225	4,441,225
R-squared	0.068	0.213	0.077	0.268
Controls	YES	YES	YES	YES
Time FE	NO	NO	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Using these specifications, the MPC is estimated between 0.42 and 0.5, meaning that for every peso spent in a G2P program, the user consumes around half of it. This result is consistent with the 0.2 to 0.6 MPC ranges found in the recent literature (Carroll *et al.*, 2017; Fisher *et al.*, 2020).

### 5.3 Household Spending Respond to a pandemic

The final quantitative exercise aims to analyze how household financial behavior responded to the onset of the COVID-19 pandemic. We are particularly interested in the sensitivity of spending, CICO, and saving behaviors to the stage of the health crisis, mobility restrictions, and containment interventions that might have affected households to perform operations.

The first set of regressions uses the log of the confirmed number of COVID-19 cases and deaths as independent variables to understand how this information regarding the pandemic stage at different times affects financial behavior. The other covariates include a dummy indicator for the time the pandemic crisis was declared in Colombia and two OxCGRT indexes: the stringency index and the economic support index. These two indicators capture the severity of the lockdown measures and the robustness of economic programs put in place to deal with the economic consequences of the containment procedures.

The results from the estimations are shown in Table 7. The pandemic indicator shows heterogeneity in the health crisis's effect on different spending components. The most significant impacts were observed in cash-ins (-124%), cash-outs (52%), and grocery shopping (22%) which is coherent with stricter lockdowns restricting depositing cash, the availability of subsidies, and panic buying induced by the outbreak.

Other social distancing-related behaviors had significant increases, such as digital content (29%), airtime top-ups (6%), and utility bills (21%). Transfers and P2P increased around

25%, showing more trust in the digital ecosystem and lower demand for physical transactions. Finally, spending for the whole users decreased by almost 80%, including payments with cards, reflecting the considerable income shock that the pandemic implied.

The figures of the stage of the pandemic -cases and deaths- are publicly published in different media outlets and discussed by citizens. The estimates for these numbers show different effects on the spending categories. While an increase in death announcements strongly incentivizes mainly cash-outs, transfers, and mobile top-ups, the opposite effect is observed for COVID-19 case announcements.

The two OxCGRT indexes, ranging from 0 to 100, show significant effects in most transactional variables. The stringency index has significant positive effects on P2P and card payments. This result means the more potent the signaling containment measures taken in the country, the more the users are incentivized to perform digital operations with the cards and user other physically reduced operations. On the other hand, the economic support index, an overall measure of financial assistance to households, is positively associated with spending on groceries and utility bill payments while affecting gambling.

The second set of regressions uses Google Mobility indexes as covariates. The firm creates specific location categories to analyze how individuals changed mobility due to the pandemic and subsequent containment measures. We are particularly interested in those indexes capturing the mobility in workplaces and residential areas, as these reflect changes in income sources and demand for social distancing services. As observed in Table 8, the estimates for residential mobility show that an increase of the index 1% closer to the baseline is associated with increases in utility bill payments (8.2%), spending (7%), and transfers (5.2%). The items negatively associated with the stay-at-home orders are gambling (6.7%), cash-outs (4.7%), airtime top-ups (2.9%), and digital content (2.1%).

Table 7: Response to the Pandemic – OxCGRT Indexes on Spending Categories

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	CEX	UTL	CSI	GAM	PTG	MOB	CRE	CON	APO	PTO	CSO	SPD	TRS
Pandemic	0.247*** (0.0450)	0.214*** (0.0373)	-1.238*** (0.0828)	-0.611*** (0.0136)	0.216*** (0.0470)	0.0658 (0.0497)	-0.0590*** (0.00813)	0.285*** (0.0186)	-0.00617 (0.00643)	-0.916*** (0.0701)	0.521*** (0.0594)	-0.803*** (0.0635)	0.266*** (0.0522)
Stringency Index	0.00187*** (9.87e-05)	0.00017*** (6.33e-05)	-6.88e-05 (0.00012)	0.000732*** (3.84e-05)	0.00087*** (8.75e-05)	0.00039*** (8.50e-05)	3.93e-05*** (1.49e-05)	0.00057*** (3.50e-05)	7.1e-05*** (1.57e-05)	0.0012*** (0.00012)	0.00486*** (0.000153)	-0.00061*** (0.000119)	0.00096*** (0.000116)
Economic Support Index	-0.0029*** (0.000280)	0.00237*** (0.000242)	0.0052*** (0.00053)	-0.00033*** (5.64e-05)	0.00271*** (0.000294)	-0.0011*** (0.000308)	-0.00013*** (4.88e-05)	-0.00095*** (0.000126)	-1.54e-05 (3.47e-05)	0.0032*** (0.00044)	-0.0011*** (0.000372)	0.00122*** (0.000401)	0.000777** (0.000321)
Deaths (log)	0.0740*** (0.0107)	-0.0365*** (0.00886)	-0.263*** (0.0196)	-0.123*** (0.00293)	0.0551*** (0.0113)	0.0282** (0.0122)	-0.00769*** (0.00189)	0.0595*** (0.00413)	0.000529 (0.00148)	-0.117*** (0.0168)	0.328*** (0.0139)	-0.184*** (0.0151)	0.0869*** (0.0125)
Cases (log)	-0.0658*** (0.0103)	-6.83e-05 (0.00838)	0.227*** (0.0184)	0.144*** (0.00310)	-0.0661*** (0.0108)	-0.0554*** (0.0116)	0.00962*** (0.00186)	-0.0578*** (0.00400)	0.000897 (0.00143)	0.156*** (0.0159)	-0.279*** (0.0135)	0.204*** (0.0144)	-0.0676*** (0.0120)
Constant	0.890*** (0.00814)	0.307*** (0.00607)	3.834*** (0.0150)	-0.0619*** (0.00328)	0.392*** (0.00884)	1.269*** (0.0109)	0.0221*** (0.00214)	0.0413*** (0.00278)	0.0434*** (0.00112)	2.291*** (0.0141)	5.020*** (0.0107)	3.756*** (0.0118)	0.867*** (0.00969)
Observations	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243	7,994,243
R-squared	0.000	0.001	0.000	0.004	0.000	0.002	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Number of id	917,453	917,453	917,453	917,453	917,453	917,453	917,453	917,453	917,453	917,453	917,453	917,453	917,453

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 8: Response to the Pandemic – Google Mobility Indexes on Spending Categories

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	CEX	UTL	CSI	GAM	PTG	MOB	CRE	CON	APO	PTO	CSO	SPD	TRS
Retail & recreation	.00250*** (.000521)	.00233*** (.000362)	.00664*** (.000776)	-.0089*** (.000228)	-.000400 (.000488)	.00450*** (.000460)	4.96e-05 (6.92e-05)	.00135*** (.000189)	-.00053*** (.000101)	-.0048*** (.000666)	-.029*** (.00083)	.0016** (.000655)	.0012* (.000610)
Grocery & pharmacy	.00095*** (.000310)	-.00167*** (.000223)	.00399*** (.000427)	.00527*** (.000130)	-.0011*** (.000261)	-.0041*** (.000249)	.000725*** (5.38e-05)	.00036*** (.000106)	.000910*** (7.50e-05)	.00391*** (.000376)	.000723 (.00051)	-4.96e-05 (.000378)	.00414*** (.000360)
Parks	-.000293 (.000383)	-.00082*** (.000253)	-.0093*** (.000545)	.00033*** (.000125)	-.0010*** (.000352)	.000467 (.000324)	-.00048*** (5.22e-05)	-.0016*** (.000133)	8.91e-05 (6.74e-05)	-8.92e-05 (.000479)	.0029*** (.0006)	-.000187 (.000472)	-.000140 (.000442)
Transit stations	-.0048*** (.000276)	-.0007*** (.000194)	-.004*** (.000393)	.00346*** (9.61e-05)	.00083*** (.000243)	-.005*** (.000241)	4.81e-05 (3.58e-05)	-.0013*** (9.54e-05)	-.00063*** (5.04e-05)	.00195*** (.000341)	.0067*** (.00043)	.00481*** (.000336)	-.0043*** (.000319)
Workplaces	.00228*** (.000141)	.00168*** (9.49e-05)	.00119*** (.000181)	-.0027*** (5.64e-05)	.00038*** (.000120)	.00278*** (.000114)	-.00017*** (2.05e-05)	.00030*** (4.71e-05)	.00016*** (2.36e-05)	-.0021*** (.000166)	.0022*** (.00021)	-.0017*** (.000164)	.0016*** (.000160)
Residential	.00099* (.000560)	.00820*** (.000363)	.000686 (.000707)	-.0067*** (.000244)	7.61e-05 (.000496)	-.0029*** (.000490)	.000748*** (8.36e-05)	-.0021*** (.000201)	-3.29e-05 (8.93e-05)	-.0075*** (.000694)	-.047*** (.00085)	.00698*** (.000663)	.00517*** (.000651)
Constant	0.913*** (.00907)	0.335*** (.00695)	3.863*** (.0173)	-.0591*** (.00330)	0.396*** (.0101)	1.257*** (.0120)	.0182*** (.00214)	.0364*** (.00299)	.0456*** (.00117)	2.322*** (.0158)	4.952*** (.0120)	3.739*** (.0134)	0.879*** (.0107)
Observations	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927	8,087,927
R-squared	.000	.001	.001	.005	.000	.002	.000	.000	.000	.001	.002	.000	.000
Number of id	916,755	916,755	916,755	916,755	916,755	916,755	916,755	916,755	916,755	916,755	916,755	916,755	916,755

Robust standard errors in parentheses

\*\*\* p<.01, \*\* p<.05, \* p<0.1

The decrease in spending following the pandemic is coherent with other studies analyzing the determinants of consumption during this crisis. As developed in Immordino et al., (2022), the channels that explained the fall in consumption are mainly the lockdown measures, the temporary drop in earnings; and two changes in consumer behavior: the increase of precautionary savings motivated by the uncertainty of the crisis and an infection-concern motive, where individuals delay consumption to avoid in person contagion. The evidence from the MOVii data fits with these mechanisms, particularly the effects of the Oxford and Google indexes on spending gauges.

Table 9: Response to the Pandemic – Account Balances

VARIABLES	(1) OxCGRT	(2) Google Mobility Indexes
Stringency Index	-0.00517*** (9.49-05)	
Economic Support Index	0.014*** (0.00016)	
Workplaces		-0.006*** (.00013)
Residential		0.004*** (.00061)
Observations	54,413,232	54,691,521
Number of id	944,985	944,985
R-squared	0.018	0.142
Controls	YES	YES
Individual FE	YES	YES
Week FE	NO	NO

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Finally, Table 9 shows the results of the regressions using the account balances as the dependent variable. These regressions are run for the complete set of active and inactive users. These estimates have shown a strong association with higher government support and savings (14%), while more strict lockdown measures affect deposit buffers (5.2%). Furthermore, the estimates from the Google Mobility Indexes present a significant correlation between spending more time at home with more savings (4%) while higher mobility in office spaces reduced them by 6%.

## 6. Conclusions

The COVID-19 pandemic has been one of the sharpest exogenous shocks ever hit the global economy. By combining supply and demand shocks, the outbreak required governments to put containment measures that affected production and mobility.

Like many other countries, Colombia expanded its social safety networks to reduce the vulnerability in the lowest quintiles of the income distribution and prevent further damage to the productive fabric of society. Since April 2020, *Ingreso Solidario* and *Bogotá Renta Básica* have been attempting to support consumption and reduce the effects of the income shock by disbursing monthly subsidies to more than 3 million households.

This paper intends to study the effects of these G2P programs on the principal household finance indicators in a causal framework, given the possibility of observing treated and not treated users. Furthermore, we calculate the MPC of these funds and analyze the effects of lockdown orders on household financial behavior. This analysis is possible due to the magnitude and granularity of the dataset, which allows a precise, dynamic, and timely diagnosis of how households reacted to this virus outbreak and different government policies, including those aiming to support consumption in vulnerable populations.

We found a substantial positive effect of the G2P programs on the overall spending expected after increasing purchasing power. When a measurement of spending that does not include cash-outs and transfers is analyzed, it is shown that merchant operations decreased by 31% after implementing the G2P programs. After disentangling this figure, it is possible to conclude that the program depressed airtime top-ups, gambling, and other unassorted debit card payments. However, the program incentivized grocery shopping, P2P transfers, utility bill payments, digital content, and account balances. Savings in the digital wallet trifold, supporting the role of the G2P programs as a social safety initiative, which translates to a reduction of vulnerability.

Restricting the sample to the G2P recipients, we estimate the MPC at 0.42, meaning that for a peso spent in subsidies, the user consumes less than half of it. This result is consistent with the 0.2 to 0.6 MPC ranges found in the recent literature (Carroll *et al.*, 2017; Fisher *et al.*, 2020).

Finally, we found that the pandemic and its restrictions affected household finances differently. The most drastic effects are observed in the decrease of cash-ins, the increase of cash-outs, and grocery shopping. These trends are coherent with stricter lockdowns restricting depositing cash, the availability of subsidies, and panic buying induced by the outbreak.

The stringency index has displayed a positive association with P2P and card payments. This result means the more potent the containment measures are taken in the country, the more the users are incentivized to perform digital operations with the cards and other physically reduced operations. On the other hand, the economic support index, an overall measure of financial assistance to households, is positively associated with spending on groceries and utility bill payments while affecting gambling.



Using the Google Mobility Indexes as covariates, we found a significant correlation between the time at home with more savings, utility bill payments, spending, and transactions. Further estimations show a strong association with higher government support and savings, while stricter lockdown measures affect deposit buffers.

The sample size of this study reaches 900,000; more than half of these are beneficiaries of unconditional cash transfers. Being a recipient implies being part of a vulnerable population at high risk of vulnerability, although it is not the poorest. Given that the estimated population with a digital wallet in Colombia is around 25 million, and the total beneficiaries of G2P are 3 million (SFC, 2021), we can generalize the findings of this study to a broader Colombia context.

The results from this paper are relevant as public policy inputs, given the persistence of the pandemic. On the one hand, it is of utmost importance to evaluate the role of G2P programs in supporting consumption and kickstarting the economy. These results validate the benefits obtained from this fiscal effort. On the other hand, it provides a clear view of pandemic containment interventions such as lockdowns and other social distancing orders on household finances. Proper calibration is needed to find a balance in a country where the economic stimulus is limited.

## 7. References

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## Appendix 1

### OxCGRT Indicators

ID	Name	Type
Containment and closure		
C1	School closing	Ordinal
C2	Workplace closing	Ordinal
C3	Cancel public events	Ordinal
C4	Restrictions on gathering size	Ordinal
C5	Close public transport	Ordinal
C6	Stay-at-home requirements	Ordinal
C7	Restrictions on internal movement	Ordinal
C8	Restrictions on international travel	Ordinal
Economic response		
E1	Income support	Ordinal
E2	Debt/contract relief for households	Ordinal
E3	Fiscal measures	Numerical
E4	Giving international support	Numerical
Health systems		
H1	Public information campaign	Ordinal
H2	Testing policy	Ordinal
H3	Contact tracing	Ordinal
H4	Emergency investment in health care	Numerical
H5	Investment in COVID-19 vaccines	Numerical
H6	Facial coverings	Ordinal
H7	Vaccination policy	Ordinal

Source: (Hale *et al.*, 2021)

Some of them want to use you:  
Mobile money usage in Colombia <sup>2</sup>

**Abstract**

Despite improvements in the access to digital accounts due to the pandemic, countries worldwide have struggled to increase usage since cash withdrawals are preferred. Using a novel dataset that combines survey methods, administrative microdata, and an experimental design, we examine the factors influencing mobile banking adoption in Colombia. The field experiment shows that cash transfers nudge mobile money take-up and found a positive association between usage and debit cards and longer exposure to digital financial services.

Keywords: Fintech, Decision making in Financial Markets, Household Finance

JEL Classification: G2, G41, G5, O16

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## 2. Introduction

The COVID-19 health crisis has been a catalyzer for financial technology (Fintech) adoption. Many users have decided to switch from traditional banking to purely digital services, particularly cashless payments and digital identification methods, aiming to reduce risk exposure inherent to physical branches. Moreover, policies enacted by different jurisdictions worldwide have focused on social distancing and remote operations, playing fields in which Fintech have comparative advantages as they can support inclusive growth and efficient government operations (Prady *et al.*, 2020).

Thus, Fintechs have become a significant player in the digital payment environment by helping to disperse cash transfers in isolated regions at lower costs and as a tool to perform risk management strategies for households. Many countries have observed a significant increase in the number of accounts opened and the digital payments made or received (World Bank, 2021b). This upward trend could be explained by different factors: social distancing measures, an unprecedented demand for remote services (Cambridge Centre for Alternative Finance; World Bank; World Economic Forum, 2020), and pandemic-related policies using digital accounts to disburse government-to-person programs (G2P).

From a development perspective, attending to the unbanked population goes in the right direction: Serving the unattended empowers them to participate in long-term investment activities, promotes efficient allocation of resources, reduces the cost of capital, smooths consumption after unexpected shocks, and enhances household finances (Beck and Demirgüç-Kunt, 2008; Demirgüç-Kunt *et al.*, 2015, 2020).

One of the first Fintech business models, mobile money, has been an essential catalyzer of financial inclusion in developing countries, even before the pandemic. This innovation has shown a significant role in boosting welfare gains through improvements in risk-sharing,

food security, consumption smoothing, business profitability savings, and a better channel to disburse G2P programs than cash (Aker and Mbiti, 2010; Jack and Suri, 2014; Aker *et al.*, 2016; Suri, 2017; Riley, 2018; Suri, Bharadwaj and Jack, 2021).

However, the positive effects of financial inclusion are not directly derived from the ownership of accounts but from their appropriate and consistent use. Notably, digital banking accounts, besides reducing transaction costs, have the potential of substituting credit scoring and reducing asymmetric information, empowering women financially, and assisting SMEs to grow in the formal sector (Davidovic *et al.*, 2020).

In this sense, this paper study the role of cash transfers and other idiosyncratic factors on mobile money usage. We perform an online survey on 2,523 clients of MOVii, one of the biggest mobile money providers in Colombia. The survey includes an experiment that allows studying the transfer effect in a causal inference framework. Thus, survey respondents were randomly assigned into three different groups, each providing different levels of financial incentives to answer an online form. The effect of transfers is measured on transactional usage and self-reported information on prospective investment preferences and risk management strategies.

The survey data collection process compiled information on demographics, socioeconomic status, risk management, assets, financial education, and perceptions of mobile money's usefulness and ease of use. This information is then merged with administrative data from MOVii, linking the same users from the survey with transactional data on spending, transfers, and cash-in/cash-out operations.

We find that the treatment intervention had a sizable impact on usage, measured with transactional data. The treatment group, those regular users receiving a cash transfer,

increased their transactions in the digital ecosystem by 42% compared to the control group. This effect is more accentuated in G2P recipients, who doubled their average spending.

Furthermore, the survey provides a comprehensive characterization of the mobile money user in Colombia, including G2P beneficiaries, since MOVii was chosen to allocate pandemic-related emergency cash assistance through its mobile money platform. We found that this newly included population has different saving and transactional profiles, as they are more prone to cash out their subsidies rather than use the digital wallet for their financial activities. To promote cash, providing users with debit cards proves to be a very efficient tool to facilitate technology adoption. Moreover, the amount of time a user has been using the MOVii app is positively associated with usage, which might implicate a learning curve that should be explored in further research.

This paper contributes to the existing literature on mobile money adoption and its role in financial inclusion. As described in the literature survey made by Ahmad, Green and Jiang, (2020), most works on the determinants of the take-up of mobile money have been highly descriptive, with endogeneity problems and focused on Africa.

This study also adds to the existing literature on financial inclusion, particularly the strain focused on access and usage of financial instruments. Most of these works have used the World Bank's Global Findex dataset, a cross-country data set on how adults save, borrow, pay, and manage risk (Demirgüç-Kunt *et al.*, 2020). Using this information, Allen *et al.*, (2016) found that older, urban, educated people have a higher probability of owning an account. Furthermore, they have observed that banking costs and proximity to branches are associated with increased access to financial services.

Similar analyzes have been made for specific jurisdictions. (Zins and Weill, 2016) find that income, education, and age in 37 countries in Africa significantly affect financial inclusion.

Similar conclusions were found for China, a country with limited use of formal credit, where also income and education affect the use of alternative sources of borrowing (Fungáčová and Weill, 2015). In India, Dar and Ahmed (2020) expand the analysis from formal accounts ownership to savings, credit, and debit cards. As the gender, age, education, and income impact ownership, they recommend focusing on the female population and enhancing literacy and income to promote inclusive inclusion.

In this sense, this paper focuses on a middle-income country, Colombia, using a randomized intervention that identifies the causal effects of the cash transfers in variables within the database. Furthermore, the novel dataset presented here merges survey methods with administrative data for the first time: Besides collecting data on how users use mobile money and manage risks, this survey adds new modules on technology adoption and financial literacy. Instead of relying on self-reported data on how users save, borrow, and pay, this database replaces it with transactional data from MOVii.

From a policy perspective, this type of study demand-side study serves as an input for the discussion regarding using smoothing consumption programs with the double goal of increasing financial inclusion. Given the recent advancements in access, policymakers should focus now on usage and economic empowerment to improve long-run wellbeing. The positive effects of financial inclusion are not directly derived from the ownership of accounts, but they come from their appropriate and consistent use (World Economic Forum, 2018). Hence, it is essential to analyze how the recently banked are using their financial accounts and what influences higher usage to ensure financial inclusion and economic empowerment.

### 3. Background

After the outbreak of the SARS-COV2 virus, the Government of Colombia decided to include in its public social assistance programs a new vulnerable population segment affected by lockdown measures. This new initiative, *Ingreso Solidario* -ISP, protects 3 million people not already covered by existing cash transfer programs by providing COP 160,000 (around USD 40) per month to households defined by a multi-dimensional proxy means test (SISBEN). This program started running in April 2020, and it has fiscal appropriations until December 2022.

To execute ISP, the government at different levels had to use existing social protection infrastructure to identify and reach these beneficiaries, many of whom were not contacted before. In a different approach than other programs disbursing aid through the state bank and money orders, this policy approached digitally oriented financial institutions to distribute the pandemic-related emergency cash assistance through mobile money.

The decision to channel the unconditional cash transfer through digital channels, as in many other countries, was taken based on: i) The difficulty of reaching distant parts of the national territory, ii) the need to enhance existing social protection systems to offset the effects of lockdown measures promptly, and iii) the necessity to encourage physical distancing (FAO, 2021).

The ISP considered that those recipients with an active bank account would be transferred directly. However, many of the beneficiaries were previously unbanked; thus, this G2P program implied to include a significant part of the population financially. National and local governments partnered then with the leading national mobile money operators to create digital wallets associated with the beneficiary's phone number.



The push from G2P initiatives at the municipal level and an unprecedented demand for remote services explained the significant dynamism observed in the digital accounts during 2020 and 2021. The number of active electronic deposit accounts raised from 2.1 million to 7.6 million from December 2019 to December 2020 (Superintendencia Financiera de Colombia, 2021).

MOVii does not have physical branches. Its services are offered through a digital wallet platform where users can pay utility bills and invoices, shop online, and transfer money at no cost to the client. Cashin/cash-out (CICO) operations are performed countrywide at different points of sale (PoS), including supermarket chains, drugstores, and betting booths. Users can receive a debit card to perform in-presence purchases and ATM cash-outs by paying an extra fee. Cash-outs have a cost based on the channel unless the user is a G2P beneficiary, a case in which it is free for 30 days or until the next subsidy arrives.

While writing this paper, MOVii reached a milestone of 2 million mobile wallets opened, more than 650,000 of these performing transactions. The total number of G2P recipients using MOVii reached 240,000 users, scattered throughout the national territory.

#### **4. Data**

This paper's novelty lies in the fact that it is one of the few demand-side studies on mobile banking in Colombia. Moreover, it focuses on a new population segment that accessed financial services for the first time due to a pandemic-related cash emergency program. The information from recipients and non-recipients comes from two sources: a survey conducted on a subsample of MOVII's users and the administrative data from the same Fintech company.

The survey and its pilot were conducted between August-September 2021. At this time, Colombia was exiting its third wave of COVID-19, reducing from 9,000 cases a day in early

August to 1,500 in middle September. Most of the restrictions were eliminated in June, especially lockdown measures and constraints on large gatherings. Mask mandates were still imposed indoors and in public spaces, including bank branches and retail commerce.

### 3.1 Questionary

The questionnaire builds on the Global Findex, a global initiative from the World Bank and the Bill and Melinda Gates Foundation to measure access and use of formal and informal financial services. This survey, applied in 140 countries since 2011, quantifies financial inclusion systematically and comparably (Demirgüç-Kunt *et al.*, 2015). Thus, the survey compiles demographics, socioeconomic status, risk management, assets, and financial behaviors such as saving and borrowing. This paper substitutes, when feasible, questions found in the Global Findex to measure account ownership, payments, use of accounts and savings, credit, and financial resilience, with administrative data for accuracy purposes (see Annex 1 for the complete list of questions).

Mainly, the instrument collects information on socioeconomic stratification - spatial classification of housing districts based on amenities and building qualities -, the highest level of education completed, and income bracket - starting from the medium monthly income of COP 250,000 ( $\approx$ USD 65) with gradual increases up to COP 5,000,000 ( $\approx$ USD 1,300). The survey also captures household size, the number of children, municipality, and status as head of household. With the municipality, it is possible to categorize users between urban and rural, a vital feature to control the availability of infrastructure to make digital transactions. Table 1 provides basic summary statistics for the two types of G2P users, banked and unbanked and regular users.

**Table: 1 – Summary Statistics by Type of Users**

	Banked	Unbanked	Regular	Total
Household size	3.99	4.03	3.67	3.85
Number of children	0.81	1.84	0.67	1.13
Head of Household	50.2%	74.4%	43.1%	55.8%
Female	39.1%	67.5%	31.0%	45.9%
Migrant	0.0%	8.3%	4.5%	5.4%
Married	37.1%	47.3%	32.1%	38.5%
Rural	5.0%	7.4%	5.0%	5.9%
Financial Literacy	1.11	1.00	1.24	1.13
Highschool or more	68.2%	30.8%	64.5%	52.1%
Employed (formal and informal)	60.5%	48.5%	57.2%	54.3%
Income < 250k	26.4%	46.5%	30.8%	36.3%
Income < Min Wage	42.5%	71.6%	46.2%	55.4%
Self-employed	23.4%	23.7%	27.0%	25.3%

The sample shows that in the unbanked G2P population, a higher proportion of females, foreigners, married, rural, less financially educated, and poorer households are present. The overall sample is balanced regarding user gender and formal employment but not in terms of rurality.

The differences between the first two groups are noteworthy, given that all G2P populations, banked and unbanked, are selected to receive economic support based on a means test-SISBEN. Since both are beneficiaries, these two users are expected to have similar living conditions and incomes. However, the differences between all variables in the first two columns of Table 1 are statistically significant at the 5% level.

Besides demographics, the survey includes questions exploring how and why users save, what type of assets they hold, which financial products they have, and their ability to meet unexpected expenses. In this sense, the questionnaire requires users to inventory their assets, including household appliances, housing, and motor vehicles. They are asked about their

motivations to save and which formal and informal financial products they currently have solicited previously.

This instrument included modules not found in the Global Findex to obtain more comprehensive information on the financial consumer: Financial literacy and users' perceptions of mobile money. The financial literacy module captures households' familiarity with the basic concepts of financial decision-making: i) ability of interest rate computations and understanding of interest compounding; ii) grasping the concept of inflation, and iii) comprehending risk diversification. These questions are recognized in the literature as an appropriate test to measure financial literacy (Lusardi and Mitchell, 2014).

The module on acceptance of technology is based on users' perceptions and approaches to technology. Hence, fourteen Likert scale questions, using a 5-point psychometric scale, aim to measure if users agree or disagree with various statements. These statements seek to capture the factors that influence customer acceptance and levels of trust in innovation. This module is based on the hypothesis that perceived usefulness and ease of use are the main two factors that motivate an individual's intention to use new technology (Hill, Fishbein and Ajzen, 1977; Davis, 1989; Davis, Bagozzi and Warshaw, 1992). Factor analysis is performed on this set of ordinal variables to create two dependent variables that explain most of the variance.

With the information from the survey, two indexes will be developed. The first one uses appliances ownership to create a household asset-based wealth index - ABWI is built using a principal components analysis, as depicted in Ngo and Christiaensen (2019).

### 3.2. Data Collection Process

The initial pilot for the study tested the questionnaire on 100 users, including a focus group with 10 of them via telephone to polish wording and length. The final version of the survey was conducted between July and September of 2021.

Data for the sample selection came from MOVii's 600,000 active users (a user is defined as active when she has performed any operation in the last month). Using an individual-level random process stratified by gender and G2P reciprocity status, around 50,000 MOVii were selected to receive an SMS with an invitation to complete the online survey.

For the experimental part of this study, the chosen 50,000 users were furthermore assigned to one of four different groups based on different values of monetary incentives that users would receive for participating in the survey. Thus, the randomization process assigned them zero, COP 5,000, COP 10,000, or COP 20,000. These amounts are equivalent to EUR 1.25, 2.5, and 4 at current exchange rates. These values are also approximately 39%, 78%, and 155% of the mean daily income in Colombia (Cardenas, 2020). The reported response rate was almost zero during the pilot when no monetary incentives were provided. However, given the low marginal cost of sending the SMSs, 12,500 invitations with no incentive were dispatched.

In the SMS, users receive the link to fill the survey and information on the amount of the cash transfer they would receive after submitting it. The link brings the user to Typeform, an online platform where the user will answer the questionnaire. The text messages were sent in eight different waves to process payments properly for two months.

After this process, completed in around a month and a half, we collected information on 2,523 users, a representative sample for MOVii users, and the national digital account holder population.

### 3.4 Administrative Information

This study merges a financial inclusion survey with transactional information from the respondents. This data includes the transactions made by the survey respondents, including regular users and G2P recipients, which allows a higher accuracy on outcome usage variables constructed and robustness checks for personal information.

The source of the outcomes variables is MOVii's administrative records. Given that this paper is focused on usage, the variables retrieved capture all mobile banking transactions performed on the app or debit card associated with the account since January 2020 or since they opened their account, in case this happened after this date. The database captures transactions from users, including deposits (cash-in), withdrawals (cash-outs), transfers and P2P (transfers to other MOVii users), airtime top-ups, the overall number of transactions, and amounts spent on merchant purchases. The information is recorded weekly; if the users perform no transactions, even with a positive account balance, the observation is taken as a missing value.

The administrative dataset contains only a few idiosyncratic characteristics that will be used instead of the self-reported information for accuracy, nationality, sex, G2P reciprocity status, and debit card holding. Furthermore, account information such as the opening date was included to control for prolonged app exposure.

## 5. Empirical Strategy

Two analyses are proposed to delve into the research questions using the information mentioned in Section 3. The first analysis evaluates the effect of unconditional cash transfers on different usage, investment, and risk management measures. The effect of transfers is measured on transactional usage and self-reported information on prospective investment preferences and risk management strategies. Given that the treatments are randomly

assigned, there is a clear identification of the causal effects of providing the incentives that emulate cash transfers.

The second analysis aims to identify the factors that influence the usage of mobile banking services, using as covariates the individual characteristics of the survey and different measures of usage of mobile banking services as dependent variables.

**a. Field experiment**

As discussed in Section 3.2, this paper includes a field experiment where the treatment is composed of different financial incentives emulating cash transfers. Users were randomly assigned to four different types of financial incentives: none, COP 5,000, COP 10,000, and COP 20,000. The survey response rate is almost zero when no incentive is provided; therefore, this group is not analyzed. Therefore, those receiving 5k will be considered the control group (the reservation price found in the pilot), while the treatment groups are composed of those receiving 10k and 20k. If no statistical difference is found between the treatment groups for specific outcome variables, they will be bundled into one.

A multivariate, fixed effects OLS regression is used on these specifications to control for any socioeconomic imbalances between treatment and control groups, improve estimates' precision, and reduce standard errors (Deaton and Cartwright, 2018). The average treatment effect from cash transfers will be studied on two types of output variables. The first set is collected from MOVii's administrative information, and the second is from questions found in the survey.

For the output variables built on transactional data, all recorded transactions performed by each survey respondent are bundled into four categories: spending, transfers, cash-in, and cash-outs. The baseline is built by those transactions performed before the treatment – the deposit of the financial incentive and the follow-up by those operations performed after the

deposit. The treatment time varies between users because the SMSs were sent in different waves. All transactions from the same category are summed up for each user and time-weighted. Afterward, each category is now bundled in:

*Ex-ante*: Includes all operations made from the account opening until the incentive deposit.

*Ex-post*: Includes all transactions made from the incentive deposit until the 28th of October 2021.

On average, from the deposit date to the end of the study, 1.6 months have passed. The output variables for the regressions are the logarithmic transformation of the differences between baseline and post-treatment values.

The second set of output variables is constructed on self-reported variables from the survey instrument, reflecting investment preferences and risk management strategies. There are two questions in the survey capturing these behaviors, and with their replies, binary variables are built: i) users are asked to choose between assets in an alternative portfolio, including the option of not investing at all due to risk. These novel investment instruments are explained straightforwardly, using everyday language. ii) Aiming to understand risk management strategies, one question asks users how they would get the money to deal in case an emergency occurs? Further replies are bundled into four categories of risk management strategies: those that enclose reducing consumption or savings (rm1), those that imply increasing informal debt (rm2), requesting formal loans (rm3), and no strategy at all (rm4).

The specification observed in [1] is used for both types of output variables, although given the nature of the output variables, the first set will use an OSL, while the second relies on a Probit model instead.



$$Y_{it} = \beta_0 + \beta_1 X_i + \beta_2 T_i * status_i + \varepsilon_i \quad [1]$$

The set of output variables  $Y_i$ , are built using MOVii's administrative data to create four categories: cash-outs, cash-ins, transfers (gyros, transfers between MOVii users -P2P- and also with other financial institutions), and spending (the total of merchant payments including airtime top-ups, utility bills, gambling, digital content, grocery shopping, and any other types of in-store and online payments). For each category, an output variable is set using the following equation

$$Y_{it} = \ln ( Y^1_{it} - Y^0_{it} ) \quad [2]$$

Equation [2] includes the subscript  $t$  to consider the treatment's administrative data obtained ex-ante and ex-post.  $Y^0_i$  is the average value of the outcome variable measured before the treatment, while  $Y^1_i$  captures the same variable after the treatment.

The dichotomous variable  $T_i$  in [1] captures the treatment, i.e., receiving the financial incentive, making  $\beta_2$  the individual treatment effect on  $i$ . No statistical differences are found in the regression using admin data between those receiving 10k and 20k. Therefore, these two populations will be bundled as a unique treatment group in this case. The vector  $status_i$  captures if the user is a regular user or a G2P recipient, either previously banked or unbanked. The multiplication term  $T_i \times status_i$  captures the interaction effects between the treatment and reciprocity status.

Matrix  $X_i$  is fed by the different modules from the survey and MOVii's user information provided in the know-your-customer process. Demographics and socioeconomic variables are taken from the survey, while age, sex, nationality, G2P reciprocity status are administrative data. Finally, the standard errors  $\varepsilon_i$  will be estimated using a robust variance estimator.

**b. Determinant analysis**

This study examines the factors associated with adoption using the survey and administrative data. Two specifications will be used based on the type of dependent variable. The first specification uses dichotomic dependent variables for which we perform Probit estimations following Zins and Weill (2016):

$$P(Y_i=1)=F(\beta_0 + \beta_1 X_i + \varepsilon_i) \quad [3]$$

The binary dependent variables,  $Y_i$ , are the administrative outcome variable of interest for user  $i$ , which takes the value of 1 if the user has performed different usage operations since her account opening. The array of output variables includes cash-outs, cash-ins, transfers, and merchant payments. Cash-outs are not considered a usage variable since withdrawing funds reflects an appetite for cash, but it will be considered an output variable to analyze what influences this financial behavior.

Matrix  $X_i$  contains the same user characteristics displayed in [1], but adds additional information on assets, risk management, financial behaviors, and exposure to the MOVii app, i.e., the length of time from the account creation to the completion of the survey come from the administrative data.

Remarkably, the survey collects information on fixed and movable assets, including household appliances, savings, and types of borrowing instruments. With the information from appliances ownership, a household asset-based wealth index is built using a principal components analysis, as depicted in (Ngo and Christiaensen, 2019). Furthermore, matrix  $X_i$  includes the results from the factor analysis using the questions on mobile money's usefulness and ease of use to calculate the Technology Acceptance Model (TAM). The pattern matrix found in Appendix 1.2 shows that the first factor (usefulness) is defined mainly by those variables related to how useful the user finds the app, while the second one

(trends) is related to questions capturing the importance of early adoption technology in general and internet connection. Given the difficulty of interpreting the estimators from this model, only the signs of the betas will be considered. Matrix  $X_i$  contains the same variables as in [1].

## 6. Results

### a. Randomized experiments

The experimental stage examines the effects of cash transfers on usage, risk aversion, and risk management strategies. Users were randomly assigned to one of three different types of financial incentives: COP 5,000, 10,000, or 20,000. Those receiving the lower amount are considered the control group, given that 5k was the reservation price found in the pilot, while two randomly assigned treatments are considered.

The first experiment focuses on the effect of cash transfers on usage gauges. As described in 4.1, four output variables are created from the administrative data. These variables capture the average amount of total cash-in, cash-out, transfers, and spending that the user allocated before and after the treatment.

Table 2 shows the effect of unconditional cash transfers on the four transactional categories. Using the non-treated regular users as the baseline, we found a significant effect of the transfers, particularly spending. The treatment increased spending by 42% on regular users, 115% on the banked, and 134% on the unbanked. Those G2P recipients, both unbanked and banked, who received the transfer also present levels of more than double the ex-ante level, with increasing rates of 111% and 105%, respectively. On average, the whole treatment group increased their deposits by 26.5%, while their spending increased by more than 39.7% compared to the control group.

Table 2: RCT –Administrative Records on Usage

VARIABLES	(1) Ln(cash-out)	(2) Ln(cash-in)	(3) Ln(spending)	(4) Ln(transfers)
Non-treated# G2P Unbanked	1.067*** (0.167)	0.181 (0.440)	1.032*** (0.212)	0.850** (0.374)
Non-treated# G2P Banked	1.047*** (0.214)	-0.807 (0.603)	1.117*** (0.364)	0.272 (0.907)
Treated# Regular users	-0.0702 (0.184)	0.228* (0.129)	0.422*** (0.115)	-0.0745 (0.219)
Treated# G2P Unbanked	1.109*** (0.161)	0.649** (0.299)	1.354*** (0.218)	0.947*** (0.312)
Treated# G2P Banked	1.046*** (0.204)	0.0657 (0.313)	1.148*** (0.208)	0.820* (0.487)
Observations	1,129	610	1,039	305
R-squared	0.211	0.063	0.076	0.157
Controls	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

It is important to note that the regressions from Table 2 are limited to individuals that had at least one transaction before or after the treatment, reducing the sample size of each regression in each case. This condition limits the external validity of the results but provides relevant insight into the mechanisms individuals use to spend unexpected income shocks.

Table 3: RCT- Alternative Investment

VARIABLES	(1) Rather save	(2) Cryptos	(3) Crowdfunding	(4) P2P Lending
<b>Sample mean</b>	<b>44.7%</b>	<b>15.5%</b>	<b>20.8%</b>	<b>19.0%</b>
COP 10,000	0.00840 (0.0218)	0.00851 (0.0161)	0.0317* (0.0180)	-0.0489*** (0.0180)
COP 20,000.	0.0442* (0.0264)	-0.0144 (0.0188)	0.0265 (0.0218)	-0.0576*** (0.0211)
Observations	2,492	2,492	2,492	2,492
Controls	YES	YES	YES	YES

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

The second experiment examines the effect of cash transfers on self-reported information on investment alternatives and risk management strategies. Once again, those receiving 5k make up the baseline group, but this time we are analyzing the effects of two levels of cash transfers, 10k and 20k, since we found statistical differences between those groups. These novel investment instruments are explained straightforwardly, using everyday language, and the replies are binary. Almost half of the respondents answered that they prefer to save instead of investing due to risk aversion, which is expected given their low propensity to save in low-income communities.

Table 4 summarizes the effect of the transfers on the prospective demand for unconventional finance instruments. Providing users with higher cash transfers affect their preferences to invest in crowdfunding – a way of funding new ventures and entrepreneurs-. The probability of investing in crowdfunding increases by 3.2% when 10k are granted. On the other hand, the effect on the probability of choosing P2P lending is monotonic-decreasing in the incentive level. This result shows that the one-time cash transfers affect the propensity to cooperate.

Table 4: RCT - Risk Management Strategies

VARIABLES	(1) Savings /Consumption	(2) Informal debt	(3) Formal debt	(4) Out of options
<b>Mean</b>	<b>84.4%</b>	<b>16.3%</b>	<b>14.4%</b>	<b>10.8%</b>
COP 10,000	-0.000885 (0.0163)	-0.0300* (0.0167)	-0.0263* (0.0157)	-0.0102 (0.0139)
COP 20,000.	-0.00406 (0.0198)	-0.0237 (0.0200)	-0.0346* (0.0185)	0.000506 (0.0172)
Observations	2,492	2,492	2,492	2,492
Controls	YES	YES	YES	YES

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

In order to analyze the effects of the transfers on risk management strategies, we use the question from the survey stating: *how would get the money to deal in case an emergency occurs*. Different survey answers are bundled into four categories of risk management strategies: i) reducing consumption or savings, ii) increasing informal debt, iii) requesting traditional loans, and iv) having no strategy at all to face the emergency. Table 8 summarizes the estimates from this regression.

Providing individuals with 10k in cash transfers reduces their expected demand for informal credit instruments by 3%. Transfers also reduce demand for formal credit: higher amounts further decrease the perception of vulnerability, which likely explains the need for this type of insurance.

## 5.2 Determinant analysis

This section shows the results of two sets of regressions. The first one uses four binary dependent variables: Each variable takes the value of 1 if the user has made at least one transaction, cash-outs, cash-ins, transfers, or merchant operation since they have opened the account.

We split the results from the overall Probit regression base on the type of covariates to ease the analysis. The sample size for these regressions is 2,532, and the asterisk symbols represent the usual p-values levels of confidence. The average marginal effects for those variables coming from the administrative data are shown in Table 5.

The estimates establish a solid association between G2P recipients and lower usage. Compared to regular users, the previously unbanked population is less likely to perform operations than regular users, particularly 34.2% fewer merchant transactions, 29.1% fewer bank transfers, and 78% fewer cash-in operations. Moreover, this population is 26.5% more

likely to withdraw money than regular users. The same trend is observed with the G2P banked population, but the gap between this population and regular users is narrower.

Table 5: Determinants of usage – Administrative Data

VARIABLES	(1) Cash-out	(2) Cash-in	(3) Spending	(4) Transfers
Age	-0.000637 (0.00401)	-0.00139 (0.00296)	0.00170 (0.00341)	-0.0145*** (0.00497)
Age <sup>2</sup>	-3.41e-05 (4.98e-05)	2.23e-06 (3.55e-05)	-3.97e-05 (4.03e-05)	0.000178*** (6.12e-05)
Female	-0.0276 (0.0176)	0.00433 (0.0132)	-0.0181 (0.0153)	0.0185 (0.0207)
Unbanked	0.265*** (0.0204)	-0.780*** (0.0206)	-0.342*** (0.0248)	-0.291*** (0.0267)
Banked	0.126*** (0.0274)	-0.468*** (0.0346)	-0.276*** (0.0289)	-0.292*** (0.0309)
Migrant	-0.0134 (0.0364)	0.0497* (0.0284)	0.0650** (0.0305)	0.155*** (0.0429)
Time using MOVii	0.00117 (0.00142)	-0.00266** (0.00133)	0.00606*** (0.00140)	0.00337* (0.00174)
Debit card	-0.0869*** (0.0182)	0.0729*** (0.0127)	0.237*** (0.0133)	0.0421* (0.0219)

The longer the person has been exposed to the mobile money app, the higher their transactional profile. Each additional month they had had their account opened, the likelihood of using the app for purchases and transfers increased by 6.1% and 3.4% per year. Another user characteristic that shows to be positively correlated to usage but inversely to withdrawals is the possession of an active debit card. Compared to those that only have the app for online purchases and PoS withdrawals, users provided with a card have a 23.7% higher probability of spending, 4.2% of transferring, and 7.3% of depositing. Conversely, users with debit cards have a lower probability of withdrawing by 8.7%.

Table 6: Determinants of usage – Survey Data

VARIABLES	(1) Cash-out	(2) Cash-in	(3) Spending	(4) Transfers
Head of Household	0.0169 (0.0197)	-0.00883 (0.0146)	0.0186 (0.0173)	-0.0146 (0.0232)
Married	0.0228 (0.0187)	0.0428*** (0.0133)	0.00426 (0.0155)	0.0719*** (0.0212)
Highschool or more	-0.0226 (0.0177)	0.0165 (0.0131)	0.0172 (0.0157)	-0.0266 (0.0210)
Number of children	0.0209** (0.00941)	-0.00138 (0.00570)	-0.00856 (0.00666)	0.0110 (0.00940)
ABWI	-0.0808 (0.0616)	-0.0216 (0.0511)	0.104* (0.0592)	-0.203*** (0.0763)
Income <Min Wage	0.0654*** (0.0198)	0.0121 (0.0146)	0.0285 (0.0176)	0.0624*** (0.0233)
Unemployed	-0.0393* (0.0229)	-0.0126 (0.0176)	-0.0177 (0.0189)	-0.0842*** (0.0269)
Financial Education	0.000246 (0.0103)	-0.00738 (0.00787)	-0.0144 (0.00939)	-0.00409 (0.0125)
Self-employed	0.0222 (0.0185)	0.0355** (0.0139)	0.0345** (0.0166)	0.0510** (0.0219)
Rural	0.0788** (0.0362)	-0.0977*** (0.0246)	-0.0189 (0.0297)	0.0177 (0.0384)

Table 6 presents the regression estimates from those covariates extracted from the survey reflecting idiosyncratic user characteristics. The rural dummy variable takes the value of 1 if the user lives in a rural environment or zero otherwise. It is correlated negatively with cash-ins (-9.8%) and positive with cash-outs (7.9%). One interpretation is that individuals living in rural areas have more difficulty finding payment terminals to use their cards. Hence, they prefer to use cash instead.

The asset-based wealth index ABWI created using factor analysis positively correlates with spending and lower transfers and provides a similar story that the variable that captures the effect of those earning less than the monthly minimum wage. Those earning less or equal



to the minimum wage (COP 950,000≈USD 250 per month) display a higher probability of transferring (6.2%) and also of cashing out their funds (6.5%). Being unemployed also negatively affects the probability of transferring funds (8.4%) or withdrawing them (3.9%). Finally, self-employment is positively correlated with all three usage variables, ranging between 3.5% and 5.1%.

The last module in this regression covers financial information and users' perception of technology. The only user characteristic associated with spending is reporting to have informal loans, which is negatively correlated with spending (5.6%). Having more savings, either with formal or informal instruments, increase the likelihood of transferring by 7.5% and 4.3%.

Table 7: Determinants of usage – Financial Services and TAM

VARIABLES	(1) Cash-out	(2) Cash-in	(3) Spending	(4) Transfers
Formal loans	0.0578** (0.0281)	-0.00251 (0.0187)	-0.0327 (0.0231)	0.0521 (0.0327)
Informal loans	0.0411 (0.0277)	0.00684 (0.0189)	-0.0555** (0.0239)	0.0259 (0.0329)
Formal savings	0.0169 (0.0174)	0.0278** (0.0135)	0.0125 (0.0158)	0.0753*** (0.0211)
Informal savings	-0.00415 (0.0173)	0.0130 (0.0137)	0.00869 (0.0163)	0.0428** (0.0206)
TAM- usefulness	0.0164** (0.00812)	0.00612 (0.00580)	0.00825 (0.00665)	0.0114 (0.00927)
TAM-trends	0.00294 (0.00846)	-0.000831 (0.00611)	0.0198*** (0.00716)	-0.000821 (0.00993)

Finally, the estimators for the technology adoption variables showed evidence to support the hypothesis that peer effects and trends have small but significant effects on spending, as the variable built to capture trends shows an association with higher spending.

### 5.3 Robustness Checks – Discrete Usage Variables

In order to examine if the trends observed with the Probit models maintain using different dependent variables, we are running a regression that uses the total number of transactions as the output variable. This discrete quantitative variable requires a count model that accounts for its dispersion, i.e., its unconditional mean of our outcome variable is much lower than its variance. Thus, the generalized version of the Poisson model, the negative binomial regression, suits this data. The estimation is not bounded between zero and one for this variable type. Thus, the equation is regressed by [4].

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i \quad [4]$$

$Y_i$  takes different discrete values depending on the transaction category. The transactions are counted from the time each user opened her account. Given the prevalence of zeros in the dataset, we run a negative binomial regression model with robust standard errors, following Bergsagel and Kuehl (2003). The regression will only use covariates from the administrative dataset to facilitate the interpretation of the estimates.

Adjustments are considered given that model the exposure time for each user is different, i.e., they have been using the digital wallet for different lengths of time (Cameron *et al.*, 2013). The results from the count model, displayed in Table 8, reinforce the findings from the previous Probit models. When the user is a G2P recipient, the difference in the logs of expected transactions would be expected to decrease by 1.4 units, holding the other variables constant. Analogously, migrants and debit cardholders perform more transactions. The interaction effect of debit cards on G2P recipients/regular users shows that cardholders perform, on average, 0.4 more transactions. At the mean of all variables, the predicted number of average transactions for the whole duration of her time using MOVii is 20.6,

compared to 81.5 of regular users. Debit cardholders perform 49.2 transactions on average, compared to 33.5 for those without it.

Table 4: Negative Binomial Model – Total Transactions

VARIABLES	(1) Baseline	(2) Interactions
Non-G2P#No card		0 (0)
Non-G2P #Card		0.364* (0.210)
G2P#No card		-1.399*** (0.242)
G2P#Card		-0.998*** (0.228)
Migrant	0.485*** (0.0884)	0.482*** (0.0911)
G2P	-1.378*** (0.128)	
Card	0.384*** (0.0938)	
Controls	YES	YES
Observations	2,530	2,530

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 5 Conclusions

Like many other countries, Colombia observed a significant increase in digital accounts during 2020 and 2021 due to social distancing measures, an unprecedented demand for remote services, and pandemic-related policies leveraging digital accounts to disburse government-to-person programs. The next step for policymakers is to focus on mobile money take up as it helps households achieve financial health, understood as the ability to build

resilience from shocks, manage income and expenses, and create long-term assets and economic opportunities (World Economic Forum, 2018).

In this sense, this paper focuses on mobile usage take-up. We are particularly interested in how to nudge merchant operations and cash-ins. We examine whether a cash transfer program influences users to use their digital wallets and study the idiosyncratic factors associated with usage. Field experiment shows that transfers positively affect spending more than cash-outs, an effect accentuated in G2P unbanked recipients.

The same experiment collects previously undisclosed user information. With this in-house survey and transactional data from a leading Fintech, we show that the previously unbanked population has different saving and transactional profiles than the regular user, as they are more prone to cash out their subsidies than using the digital wallet for their financial activities. Those in rural areas are less likely to perform merchant transactions, indicating a supply issue to be addressed.

The lack of connectivity is related to the association between usage and the variable *trends* obtained from the Technology Acceptance Model (TAM) factor analysis. This variable captures the importance of early technology adoption in general and internet connection. Since many of the rural areas, where both regular users and G2P recipients are based, have deficiencies in their availability of a digital ecosystem -internet connection, electricity, and points of sale-which decrease the relative cost of performing cash operations.

Providing users with debit cards proves to be a very efficient tool to facilitate technology adoption. The determinant analysis also shows a strong association between the amount of time a user has been using the digital wallet and transactional usage, which might implicate a learning curve that should be explored in further research.

These results have specific policy implications. Disbursing the G2P program subsidies using the extensive mobile money network proves suitable to encourage take-up. However, particular attention should be placed on exposing users, particularly G2P recipients, to the digital ecosystem and debit cards that enable them to it. Moreover, policymakers should consider supply issues such as the availability of points of sale and a countrywide internet connection, both conditions necessary to unleash mobile money's potential to boost economic empowerment.

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## Appendix 2

### Appendix 2.1: Survey questions

1. First things first. What's your name?
2. Your cellphone number is
3. How do you identify yourself?
  - a. Woman
  - b. Man
  - c. Other
4. What type of ID document do you have?
  - a. Citizenship card
  - b. Identity Card
  - c. Special residence permit
  - d. Foreign ID
  - e. Other
5. Write down your document number here (This field is required)
6. What city / municipality do you live in?
7. In which department is it located? (This field is required)
8. What is your marital status?
  - a. Separated / Divorced
  - b. Unmarried cohabitation
  - c. Single
  - d. Married
  - e. Widowed
9. What socioeconomic strata do you belong to?
  - a. 1
  - b. 2
  - c. 3
  - d. 4
  - e. 5
  - f. 6
10. What is the highest educational level you achieved?

- a. Primary School
  - b. High School
  - c. Technical trainee
  - d. Technical degree
  - e. Bachelor's degree
  - f. Postgraduate degree
11. How do you spend your time?
- a. Working as an employee
  - b. Self-employment
  - c. Looking for a job
  - d. Studying
  - e. Doing household work
  - f. Other activity
12. How much income do you receive in a month in COP?
- a. Up to 250.000
  - b. Between 250.000 and 500.000
  - c. Between 500.000 and 1 mil
  - d. Between 1 mil and 2 mil
  - e. Between 2 mil and 3 mil
  - f. Between 3 mil and 5 mil
  - g. More than 5 mil
13. How many people live in your household?
14. Are you the head of your household?
- a. Yes
  - b. No
15. How many children do you have?
- a. 0
  - b. 1
  - c. 2
  - d. 3
  - e. 4
  - f. 5
  - g. 6
  - h. 7
  - i. 8

- j. 9
  - k. 10
  - l. More than 10
16. What type of debt do you have?
- a. I owe it to friends or family
  - b. Shark loans
  - c. Bank loans
  - d. Mortgage
  - e. Student Loans
  - f. Credit card
  - g. Microloans
  - h. I Have no debts
17. In the last 2 years, how many times have you applied for a loan?
- a. 0
  - b. 1
  - c. 2
  - d. 3
  - e. 4
  - f. More than 4
18. Have you had a credit application rejected in the last two years?
- a. Yes
  - b. No
19. Do you know why your application was rejected?
- a. Employment situation
  - b. Lack of guarantees
  - c. Lack of debt capacity
  - d. Not enough income
  - e. Didn't have enough credit history
  - f. Being reported in credit bureaus
  - g. Never got an explanation
  - h. Other
20. Are you currently a homeowner?
- a. Yes
  - b. No
21. From the following list, what assets do you have in your house?



- a. Computer
  - b. TV
  - c. Fridge
  - d. Washing machine
  - e. Microwave
  - f. Dryer
  - g. Electric/gas stove
  - h. Cellphone
  - i. Motorcycle
  - j. Car
  - k. Stereo
  - l. Air conditioning
22. How do you save?
- a. I don't earn enough money to save
  - b. I Buy assets (Gold, animals, etc)
  - c. Cash (under mattress)
  - d. Financial investment products
  - e. In term certificate of deposit and saving accounts in banks
  - f. In digital wallets as MOVii, Nequi or Daviplata
  - g. Buy Crypto currencies (Bitcoin, Ethereum, etc.)
23. What are you saving for?
- a. Buying a house
  - b. For retirement
  - c. To start/Improve my business or entrepreneurship
  - d. Buying a car /motorcycle or appliances
  - e. For vacations
  - f. In case of calamity
  - g. For self-education or family members
  - h. Other
24. If you had an emergency in your family, how would you get the money to solve the situation?
- a. Savings
  - b. Help from family or friends
  - c. Working more time
  - d. Reduce spending

- e. Credit card
  - f. Bank loans
  - g. Shark loans
  - h. Sell or pawn valuable objects
  - i. Out of options
25. In the last month your expenses have been
- a. Bigger than your earnings
  - b. Smaller than your earnings
  - c. You are not sure
26. Do you have credit cards?
- a. Yes
  - b. No
27. Do you have any accounts in a financial institution other than MOViiF
- a. Yes
  - b. No
28. If you had the opportunity to invest your savings in the following options, receiving higher interest than those offered by a bank, but with the risk of losing, which one would you be interested in?
- a. Lending to people like you, who need funding for emergencies and other needs
  - b. Lend to companies with entrepreneurship, and businesses that want to grow
  - c. Invest in risky assets such as stocks or bitcoin (cryptocurrencies)
  - d. It seems very risky to me and I prefer an account that cannot lose my savings
29. Suppose you have \$ 100,000 in a savings account, which pays 1% interest per year. You also know that the inflation rate is 2% per year. After 1 year, how much could you buy with the money in this account?
- a. More than today
  - b. Exactly the same
  - c. Less than today
  - d. I don't know
30. Do you think the following statement is true or false: "It is safer to bet \$ 100,000 on one soccer team to win than to bet \$ 25,000 on 4 different teams to win"?
- a. True
  - b. False

- c. I don't know
31. Suppose you have \$ 100,000 in a savings account with an annual interest rate of 2%. After 5 years without touching that account, how much money do you think you would have?
- a. More than 102.000
  - b. 102.000
  - c. Less than 102.000
  - d. Doesn't know
32. Why don't you have accounts in other financial institutions?
- a. They are far away
  - b. They charge a lot
  - c. They are not willing to open an account for me
  - d. I'm not interested
  - e. Other
33. Why did you decide to sign up for and use MOVii?
- a. Recommendation from a friend
  - b. I receive a government subsidy (Ingreso solidario, Bogotá Solidaria en Casa, other G2P)
  - c. Easy to open/use
  - d. Because I can use the card for online purchases
34. For the following statements, please choose on a scale from 1 to 5, 1 being not at all agree and 5 being strongly agreeing:
- a. MOVii helps me make transactions faster
  - b. Using MOVii is beneficial for me
  - c. I think it is easy to learn how to use the MOVii application
  - d. I think the MOVii app is easy to use
  - e. I use MOVii because I have constant internet access
  - f. I use MOVii because I have my own cell phone
  - g. I feel safe using a cell phone to access content.
35. For the following statements, please choose on a scale from 1 to 5, 1 being not at all agree and 5 being strongly agreeing
- a. People whose opinions I value prefer me to use the MOVii app
  - b. Among my acquaintances, I am usually the first one to try new technologies
  - c. My colleagues greatly value my opinion about new technologies

- d. I believe that the regulation that applies to MOVii protects me as a consumer
  - e. I use MOVii because I have constant internet access
  - f. I believe that MOVii acts honestly when capturing, processing and managing my personal data
  - g. I trust MOVii to protect my savings
36. Do you have a MOVii card?
- a. Yes
  - b. No

Appendix 2.2 - Pattern matrix of Principal Component Analysis for Movii's perceptions and trends

Variables	Useful Factor1	Trends Factor2	Uniqueness
Movii helps me make transactions faster	0.7823	0.2577	0.3215
Using Movii is beneficial for me	0.8406	0.2185	0.2456
I think it is easy to learn how to use the Movii application	0.8713	0.2215	0.1918
I think the Movii app is easy to use	0.8611	0.2209	0.2096
I use Movii because I have constant internet access	0.4285	0.6194	0.4327
I use Movii because I have my own cell phone	0.5504	0.5193	0.4275
I feel safe using a cell phone to access content	0.5950	0.5082	0.3878
People whose opinions I value prefer me to use the Movii app	0.4474	0.4665	0.5822
Among my acquaintances, I am usually the first one to try new technologies	0.1229	0.7822	0.3731
My colleagues greatly value my opinion about new technologies	0.2442	0.7652	0.3548
I believe that the regulation that applies to Movii protects me as a consumer	0.4885	0.6499	0.3390
I use Movii because I have constant internet access	0.2847	0.7864	0.3006
I believe Movii acts honestly when capturing, processing, and managing my personal data	0.6145	0.5615	0.3071
I trust Movii to protect my savings	0.6071	0.5452	0.3341

Appendix 2.3: Determinants of usage – Administrative data

VARIABLES	(spd) Spending	(trs) Transfers	(csn) Cash-in	(cst) Cash-out
Age	0.000532 (0.00345)	-0.0158*** (0.00501)	-0.00327 (0.00302)	-0.000917 (0.00400)
Age <sup>2</sup>	-2.64e-05 (4.09e-05)	0.000196*** (6.18e-05)	2.02e-05 (3.58e-05)	-2.30e-05 (4.96e-05)
Female	-0.0205 (0.0153)	0.0203 (0.0206)	-0.00393 (0.0132)	-0.0192 (0.0176)
G2P	-0.264*** (0.0131)	-0.277*** (0.0196)	-0.414*** (0.00838)	0.196*** (0.0181)
Migrant	0.0645** (0.0307)	0.165*** (0.0428)	0.0242 (0.0277)	0.00610 (0.0355)
Time from account opening	0.00739*** (0.00118)	0.00343** (0.00159)	0.00268** (0.00110)	-0.00126 (0.00138)
Active debit card	0.239*** (0.0132)	0.0430** (0.0218)	0.0865*** (0.0131)	-0.0931*** (0.0182)
Head of household	0.0154 (0.0173)	-0.0167 (0.0232)	-0.0152 (0.0150)	0.0165 (0.0196)
Marital status	0.00328 (0.0155)	0.0707*** (0.0212)	0.0439*** (0.0135)	0.0197 (0.0184)
Professional degree	0.0197 (0.0157)	-0.0259 (0.0209)	0.0272** (0.0133)	-0.0325* (0.0176)
Number of children	-0.0103 (0.00673)	0.00998 (0.00938)	-0.00439 (0.00590)	0.0224** (0.00946)
HAWI	0.118** (0.0594)	-0.198*** (0.0763)	0.00236 (0.0539)	-0.0820 (0.0617)
Minimum wage	0.0253 (0.0176)	0.0647*** (0.0233)	0.00198 (0.0149)	0.0762*** (0.0199)
Unemployed	-0.0197 (0.0190)	-0.0880*** (0.0270)	-0.0140 (0.0180)	-0.0468** (0.0228)
Financial literacy	-0.0434 (0.0282)	-0.0101 (0.0374)	-0.0273 (0.0248)	0.00687 (0.0310)

Entrepreneur	0.0346** (0.0167)	0.0475** (0.0220)	0.0342** (0.0142)	0.0171 (0.0186)
Rural	-0.0180 (0.0298)	0.0231 (0.0385)	-0.105*** (0.0267)	0.0811** (0.0364)
Formal loan	-0.0384 (0.0235)	0.0464 (0.0330)	0.00233 (0.0193)	0.0463 (0.0284)
Informal loans	-0.0630*** (0.0243)	0.0208 (0.0333)	0.00737 (0.0200)	0.0313 (0.0281)
Formal savings	-0.0289 (0.0291)	0.0531 (0.0397)	-0.00848 (0.0252)	0.0378 (0.0333)
No debt	0.0203 (0.0151)	0.0430** (0.0202)	-5.30e-05 (0.0133)	0.0495*** (0.0169)
Informal savings	0.0375 (0.0241)	0.0754** (0.0296)	0.0387* (0.0208)	0.0394 (0.0250)
Loan app rejected	0.0322 (0.0235)	0.0428 (0.0289)	0.0171 (0.0206)	0.0183 (0.0240)
No savings	0.0384 (0.0274)	-0.00439 (0.0349)	0.0150 (0.0240)	0.0340 (0.0297)
TAM- usefulness	0.00840 (0.00668)	0.0111 (0.00925)	0.00435 (0.00595)	0.0171** (0.00807)
TAM-trends	0.0195*** (0.00717)	-0.00168 (0.00993)	-0.000861 (0.00626)	0.00285 (0.00843)
Observations	2,532	2,532	2,532	2,532

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Losing Interest: An Evaluation of the Flexibilization of Interest Rate Caps and its Interaction with Market Power

## Abstract

This paper disentangles the interaction between interest rate caps, market power, and credit provision. Using a natural experiment produced by the flexibilization of the microcredit benchmark rate used to calculate the interest rate cap in Colombia, we found that this policy did not increase loan volume, inducing credit rationing behaviors. Banks with relatively higher market power increased loan disbursements after the policy, rejecting the hypothesis that banks prefer a quiet life after the policy was enacted.

Keywords: Interest rate caps, financial inclusion, market power

JEL Classification: L140, G21, G38

*"If someone takes usury, he commits violent robbery (rapina), and he shall not live."*

Sant'Ambrogio di Milano (339-397 AD)

## 5. Introduction

Interest rate ceilings or caps are a distorting price policy that is justified when it aims to reduce the capacity of lenders with dominant market positions to negatively affect borrowers' well-being (Dewatripont and Tirole, 1994). In order to influence prices or loan volumes, financial institutions and other informal lenders need a particular market structure allowing them to lend at interest rates higher than those found in a competitive market. These market conditions are commonplace in the banking industry: Given the barriers to entry, switching costs and established relationships, imperfect competition, and price settling, lenders with market power are inherent to the banking sector (Carletti and Vives, 2009).

Interest rate caps are a widespread tool to protect consumers around the world. According to the World Bank, 40% of the countries currently enforce interest rate caps on loans, with higher prevalence in Sub-Saharan Africa and Latin America. However, this policy is also widespread in developed countries, as 11 Western European countries, Australia, Canada, and the United States, use this policy to protect consumers from predatory rates and improve access to finance (Maimbo and Gallegos, 2014).

Critics of these price-constraining measurements argue that this policy hinders financial inclusion and increases financial repression (Mckinnon, 1990). According to this argument, caps prevent lenders from adequately absorbing the costs associated with non-performing loans (NPL) and screening expenses from the riskiest individuals. Thus, lenders would focus on safer loan portfolios that dilute fixed costs, crowding out low-income individuals, thus reducing financial inclusion (Miller, 2013).



Moreover, advocates of the abolition of caps argue that jurisdictions with interest rate ceilings grow slowly, exhibit lower transparency about costs as lenders charge hidden fees, and reduce their presence in rural areas and other segments with deeper information asymmetry issues (Helms and Reille, 2004). Therefore, these financially unserved households are relegated to informal credit markets, known as loan sharks or payday lending, facing even higher interest rates or extortionary conditions (Banerjee, 2003).

Given the prevalence of markets with both interest rate caps and price-setting banks, it is essential to understand: i) how the market reacts to modifications of the interest rate caps; ii) if market power heterogeneity plays a role in these responses. In particular, we would like to test if a flexibilization of the interest rate cap, allowing lenders to charge higher rates, would increase lending volumes. Moreover, we would test the hypothesis that banks with higher market power disburse lower loans after the flexibilization of the rate cap. This hypothesis is known in the literature as the Quiet Life Hypothesis – QLH.

To delve into these questions, we rely on a natural experiment in Colombia in October 2010, when the methodology to calculate the microcredit interest rate cap was modified to boost lending. Before this date, the interest rate ceiling was specified by an administrative decree as up to 1.5 times a discretionally set level, and it was, therefore, unrelated to any market rate. After the change in 2010, the rate cap was set up to 1.5 times the average market rate rather than a discretionally set level, as was already the case in other lending segments like commercial or consumer finance. Thus, this regulatory modification made the cap more flexible to market fluctuations. This policy did not intend to abolish the cap but to allow market participants to price loans closer to the actual risk, which was expected to incentive disbursements.

The empirical identification of the effect of interest rate caps and bank lending is a challenging one. Many confounding factors interact with banks' disbursements and pricing decisions. Our analysis addresses this challenge using a difference-in-difference estimation using consumer loans as the control group, unaffected by the policy. Using this methodology, we find that the flexibilization of the interest rate cap allowed banks to charge higher interest rates and curbed the credit supply instead of expanding it. These results are evidence of credit rationing, understood as a supply-side phenomenon in which lenders are unwilling to provide additional loans to borrowers at the current market interest rate (Stiglitz and Weiss, 1981).

We found that average interest rates went up due to the change in the benchmark. However, those banks with higher market power lent relatively more and charged relatively lower rates than those with lower market power, rejecting the hypothesis that banks with a higher ability to set prices are more risk-averse and thus prefer a "quiet life" (Hicks, 1935) by avoiding providing credit to the riskier populations.

This paper contributes to the empirical literature studying the effect of interest rate caps on market outcomes in developing countries. Similar studies on how interest rate caps affect lending are recently found in Chile, where the maximum legal interest rate for consumer loans was reduced in 2013 (Hurtado, 2016; Córdova and Toro, 2019; Cuesta and Sepúlveda, 2021). However, the regulatory modification in Chile differentiated interest rate caps based on loan sizes, while the one in Colombia applied to all loans in the same loans segment, making this paper different.

To our knowledge, this particular policy in Colombia has not been evaluated; thus, this paper provides relevant input for policymakers deciding whether interest rate caps should be further flexibilized, even abolished. The results support the decision to keep interest rate

caps since this policy protects consumers in highly concentrated banking markets without adversely affecting disbursements due to credit rationing behaviors.

This paper is structured as follows. Section 2 places the paper in the literature, while Section 3 presents the institutional context and dataset and introduces the evaluated policy. Section 4 describes the methodology used to test the hypotheses and presents the results of the estimations. Finally, Section 5 concludes and provides a policy recommendation.

## **2. Literature Review**

This short literature review aims to substantiate, from a theoretical and empirical view, why credit rationing behaviors in the loan market reduce the impact of price-distorting mechanisms such as interest rate caps. Furthermore, it also revises the literature on the Quiet Life Hypothesis, applied to the highly concentrated banking sector.

### **2.1 Theoretical Literature**

This paper contributes to two strands of the literature. First, it studies the effects of interest rate caps on credit provision. Unlike traditional markets that follow the classical competitive theory, credit markets do not have a price to clear supply and demand since agents are not usually price takers (Jaffee and Stiglitz, 1990). This characteristic implies that an exogenous increase in interest rates will not necessarily translate into lower borrowing volumes.

Interest rate caps, an exogenous price rigidity, can be a source of credit rationing. Jaffe and Stiglitz (1990) argue that a usury ceiling set up exogenously to restrict interest rates below the Walrasian equilibrium level could have a similar market outcome as a credit rationing, i.e., an excess of loan demand.

Initially addressed by Hodgman (1960), the loan market phenomenon known as credit

rationing is a lender's rational response to risk: Banks decide to lend based on the return-expected loss ratio, a function of the maximum repayment the borrower can pay. Hence, lenders will not raise their rates even if they face an excess demand for loans or, conversely, will not expand lending when rates are up since their expected losses become higher than the expected return after specific interest rates. (Jaffee and Modigliani, 1976) assumed that lenders could discriminate prices between consumers and firms based on size and risk. In their model, credit rationing arises when similar borrowers in terms of risk and size are charged the same interest rate.

Modern credit rationing theory departed from explanations based on credit market imperfections such as price rigidities or non-competitive market structure to focus on the prevalence of information asymmetry between borrowers and lenders. In a seminal theoretical work, Stiglitz and Weiss (1981) show how in the presence of adverse selection/hidden information, borrowers cannot secure a loan at any given interest rate even if they are willing to pay more than the competitive market rate.

Interest rates play a role in the loan contract as high-interest rates attract risky borrowers that lenders cannot differentiate easily and influence borrowers' actions by changing their incentives. This interest rate role implies that the relationship between the lender's rate of return per dollar loaned and the interest rate is not monotonic, i.e., the bank's expected return declines as the interest rate rises. Due to excess loan demand, the market is not cleared with lower lending incentives.

This phenomenon has several implications as it causes an under-provision of loans at any given rate. It provokes misallocation of resources as financial institutions do not undertake profitable investment projects and avoid risky borrowers with high NPL. Credit rationing affects firms' fixed capital, housing investments, and household consumption expenditures

(Jaffe and Stiglitz, 1990). Thus, due to credit rationing and information asymmetry, making interest rate caps more flexible or abolishing them may negatively affect disbursements due to credit rationing behavior. Moreover, competitive credit markets could be rationed even without capping interest rates as long as imperfect information exists.

The second hypothesis we would like to test is the QHL, also known as the Galbraith-Caves hypothesis. Hicks (1935) described how managers in monopolistic firms have lower incentives to perform their duties optimally. "The best of all monopoly profits is a quiet life," he wrote, suggesting avoiding difficult decisions and reducing the managers' utility. This behavior implies that firms in monopolistic markets are more risk-averse than those in competitive markets. This shift in risk aversion affects firm efficiency through foregone revenues or increases in costs.

Building on Hicks' argument, Caves (1970) discusses that large firms present uncertainty-avoidance behavior attributable to greater market power. The rationale behind this argument is based on two notions: i) larger firms usually exert higher market power, making them able to forge excess profits instead of taking less risk, i.e., a more "quiet life."; ii) larger firms are more likely to have a risk-averse administration since "managerial personnel may distribute themselves between large and small firms based on their differing marginal rates of substitution between the level of returns" and risk. Cave meant that managers have different utility functions, and since they are not rewarded proportionate to the firm's profit, they choose to pursue their individual risk preferences.

Applied to the credit market, the QHL states that banks with market power have no incentives to serve new clients even if the interest rate increases, given the additional risk that these might entail and the current level of profits they are already earning. This risk

preference might induce non-profit maximizing behavior, restricting loan volumes and increasing social losses relative to the competitive equilibrium (Berger and Hannan, 1998).

Banks enjoying the quiet life modify their behavior to reach less than optimal equilibria, affecting loan provision and interest rates. Two mechanisms might explain this phenomenon in the banking sector. First, market power influences risk preference behavior through bank risk-taking, as they are willing to trade off higher profits for less risk (Rhoades and Rutz, 1982). Second, market structure affects cost efficiency: The mark-up over the competitive interest rates and the absence of other disciplining mechanisms allow monopolistic firms to maximize other functions than firm profits. For instance, administrators might use funds to keep market power through lobbying, execute excessive expenditure, reduce their work effort, or, more generally, allow inefficient practices affecting firm value (Berger and Hannan, 1998; Yermack, 2006).

## 2.2 Empirical Literature

In recent years, there have been substantial efforts to shed light on the contextual factors influencing the effects of ceilings, aiming to prescribe formulas to boost financial inclusion in developing countries. However, policy memos and reports from multilateral development agencies and international organizations are deluged with selection problems as they lack methodologies to identify a causal relationship. In addition, these types of policy inputs are primarily based on cross-country aggregate data, susceptible to being affected by economic or institutional factors.

An excellent example of this type of policy paper is the review from Maimbo and Gallegos (2014) for the World Bank. The authors provide a negative recommendation on the effects of interest rate caps around the world based on anecdotal evidence from countries that, after adopting this policy, suffered setbacks in different dimensions. They report countries

experiencing a withdrawal of financial institutions from poor segments, hikes in illegal lending, decreases in the licensing of new lending institutions, increased fees and commissions, and reduced product diversity.

Nevertheless, this is not the only policy report on interest rate ceilings suggesting this market intervention creates several problems such as a reduction in financial intermediation, more predatory lending, and a reduction in transparency (Helms and Reille, 2004; Campion, Ekka and Wenner, 2010; Heng, 2015; Alper *et al.*, 2019). The common denominator of these reports is that they do not present any counterfactual analysis of what would have happened in these countries if these measures had not been adopted, weakening most of the conclusions and recommendations.

Aware of these gaps, the academic empirical literature has focused on works studying the effect of this market intervention using innovative empirical strategies. Most recent works use natural experiments, i.e., exogenous policy changes that allow producing counterfactuals, as an identification strategy that allows scholars to examine the effect of these policies in their whole dimension. One of the first works on this research question using a causal empirical strategy was done by Rigbi (2013), who uses the heterogeneity in U.S. state caps and regulatory schemes between them, and finds that higher interest rate caps increase the probability that a loan will be granted.

In this sense, the adoption in Chile in 2013 of a regulation reducing the maximum legal interest rate for consumer loans from 53.9% to 36.9% has been an extensively studied regulatory modification given the features of the policy. Interestingly, it split the cap for consumer loans into two categories based on the loan size: Consumer loans larger in size than a specific threshold were subject to a lower interest rate cap than those of smaller ones.

Madeira (2019) uses this Chilean setup to run a detailed regression discontinuity design where similar individuals in different categories are compared over time above and below the threshold. Households above the regulatory threshold reduced access to credit by 8.7%, while 9.7% of the borrowers in the margin were excluded from consumer loans. This effect was accentuated in the young, less educated, and poorer households.

Cuesta and Sepúlveda (2021), using a difference-in-difference regression, find that the same policy reduced interest rates by 9% and the number of loans by 19%. Moreover, they estimate the supply and demand curves to perform a welfare analysis, finding a trade-off between consumer protection and credit access. The consumer surplus from protecting borrowers from bank market power was offset by reducing credit access.

Other studies of the same Chilean policy have acknowledged the role of the regulation in decreasing the bank market power by showing improvements in consumer protection (Hurtado, 2016; Córdova and Toro, 2019; Cuesta and Sepúlveda, 2021). For instance, Hurtado (2016), using bank-level data, finds that a lower interest rate cap affected the loan volume (intensive margin) but not the number of loans provided (extensive margin).

Papers addressing how market structure and interest rate caps are limited in Colombia. Tovar, Jaramillo and Hernández (2007) review the relationship between interest rates, concentration, and market power. Using the Lerner index as a proxy for market power, they find a direct positive effect of concentration, meaning that the ability to exercise market power increases with consolidated markets. Furthermore, their results suggest intense credit rationing when interest rates are higher.

Capera-Romero, Murcia and Estrada (2011) explore the relationship between the interest rate caps and financial deepening using aggregated data from Latin-American countries. They acknowledge the possibility of a credit rationing and conclude that even though a



more flexible interest rate ought to increase access to financial services, a policy is incomplete if it does not involve incentives for competition and a revision of banking costs.

Using a quasi-experiment, Cubillos-Rocha et al., (2018) analyze the effect of the discrete increase of the microcredit usury rate in Colombia in 2007. Given the setting provided by the sharp modification of the interest rate ceiling and information at the loan level from the complete credit registry, they find that the increase from 20% to 33% explained an expansion in loan volume of 28%.

In sum, there is an under-provision of empirical papers testing how interest rate caps and credit provision use causal inference frameworks. There is limited literature linking the prior relationship and the role of market power in promoting quiet life behaviors. This paper will fill this gap by understanding their interconnection, providing input for interest rate liberalization in highly concentrated markets. Moreover, this particular policy in Colombia has not been evaluated to our knowledge, which might be a relevant input for policymaking.

### **3. The Colombian Credit Market**

This paper is set up in Colombia, a middle-income OECD country. Since the policy we are studying in this paper was enacted in October 2010, the market overview in this section will focus on the period 2010-2014.

According to the local supervisor, the Financial Superintendence (SFC), the penetration of the Colombian banking industry, measured as the total loan volume as a percentage of GDP, reached 35% in 2010. The total loan portfolio reached 166 billion Colombian Pesos (COP) in 2010 (around USD 41 billion at Jan 2022 foreign exchange rates), divided into four main loan segments: commercial, consumer, mortgage, and microcredit.

Table 1: Risk Indicators by Credit Segment

Month	Commercial		Consumption		Microcredit		Total Loans in COP millions
	% of Total Loans	NPL	% of Total Loans	NPL	% of Total Loans	NPL	
Dic-08	25,88%	2,71%	4,45%	7,21%	0,64%	6,15%	28.150.524
Dic-09	21,31%	3,09%	5,04%	6,51%	0,34%	5,75%	33.434.430
Dic-10	22,55%	2,05%	5,86%	4,45%	0,38%	4,38%	43.227.064
Dic-11	18,43%	1,65%	9,67%	4,23%	0,75%	4,01%	26.643.679
Dic-12	21,26%	1,87%	11,45%	4,81%	0,86%	5,20%	25.051.257
Dic-13	18,26%	2,02%	10,61%	4,46%	0,88%	6,37%	28.218.827
Dic-14	20,04%	2,22%	12,88%	4,38%	0,93%	7,45%	33.129.425

Source: SFC

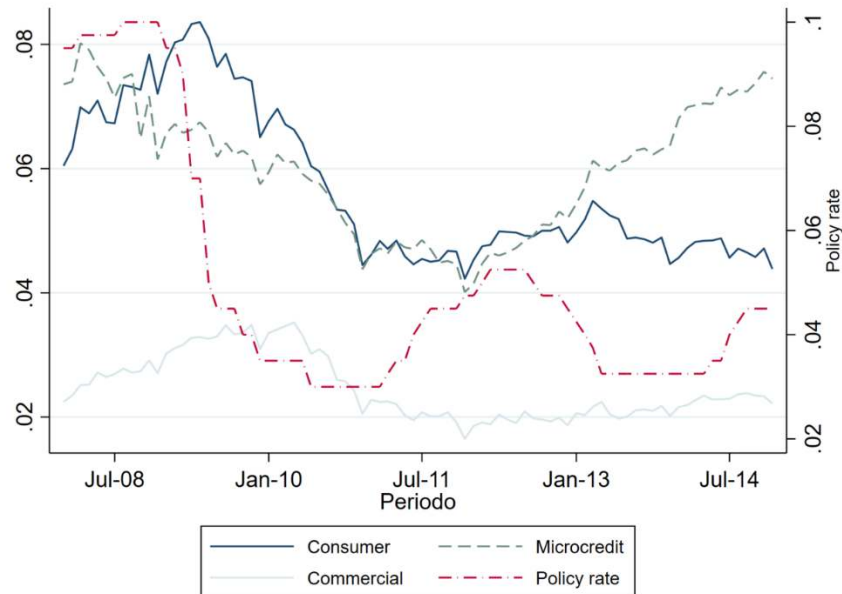
This study focuses on two loan segments: Microcredit and consumer, both delimited by regulation. Microcredit loans are intended for those entrepreneurs and SMEs without credit history or collateral to apply for a commercial loan. Lenders offering microcredits can perform non-traditional underwriting processes, including visits, audits, and interviews. Given that intensive screening and monitoring costs are higher in microcredit than other underwriting processes and the greater inherent risk, the regulator allows banks operating in this segment to charge higher interest rates.

Consumer loans are granted to individuals whose purpose is to finance the acquisition of consumer goods and services. The bank requires no collateral for this type of loan but a creditworthiness assessment. Due to lower interest rates and expedited disbursement procedures, analysts at the local supervisor have noted that this type of loan has been used to fund SMEs and self-employment ventures instead of approaching microcredit lenders.

Figure 1 shows the average market interest rates charged by the different market segments. Consumer and microcredit lending rates are significantly higher than those of other segments, reflecting the trade-offs SMEs and entrepreneurs face in using consumer loans

rather than commercial or microcredit. It is essential to highlight the contractionary monetary policy from February 2011 to July 2012, overlapping with our study period. However, this increase in funding costs affected all loan segments.

Figure 1: Average Weighted Interest Rates by Loan Segment and Policy Rate



Source: SFC, Central Bank, own calculations

### 3.1 Interest Rate Regulation

Colombia is one of the many countries applying interest rate caps to protect consumers. This policy is applied to a banking sector with monopolistic competition (Bardey et al., 2013), where few financial conglomerates own most financial assets (OECD, 2016). Banks and other stakeholders have been advocating intensively about eliminating the interest rate caps or further flexibilize them based on the arguments that caps have adverse effects on financial deepening and deterring bank profit (ANIF, 2019).

In the Colombian context, interest rate caps serve as a ceiling price for credit institutions and the price charged to overdue loans. These caps are known as usury rates since any overcharge above these levels is defined as a criminal offense.

Interest rate caps are calculated as 1.5 times (1.5x) a benchmark rate, which varies for each loan segment. Commercial and consumer loans share the same benchmark rate, while the regulation considers specific rates for microcredit and mortgages.

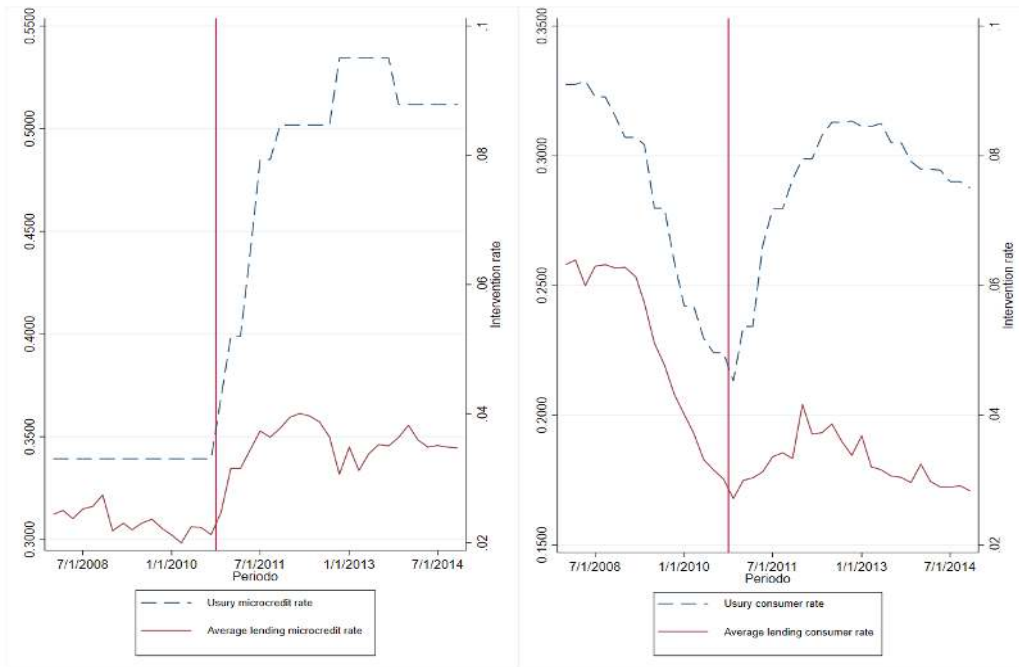
In this study, we are interested in two particular segments: Consumer and microcredit. The consumer benchmark rate has been calculated using a three-month moving average of all weighted market transactions since 1993. By contrast, the benchmark rate for the microcredit usury rate has been changing over time. In the first years after the segment was created in 2006, banks were allowed to price loans by a usury rate defined by governmental decree as up to 1.5 times a discretionally set level, and it was therefore unrelated to any market rate.

In October 2010, the National Government issued a regulatory modification (Decree 3590 standardizing the methodology for calculating the benchmark rate for microcredit with the other loan segments. This policy implied setting up the cap to 1.5 times the average market rate rather than a discretionally set level, as was already in other lending segments like commercial or consumer finance. According to the government, this methodology change was primarily intended to expand microcredit to unbanked populations. Policymakers expected that allowing financial institutions to make their pricing strategy more flexible would boost financial inclusion. The industry celebrated the policy.

From the moment Decree 3590 was enacted, the benchmark for microcredit was pegged to market rate averages in the same way the interest rate caps for consumer loans were

calculated. In practice, this policy flexibilized the interest rate cap for the microcredit segment, making it easier for financial institutions to price risk correctly.

Figure 3: Usury and average market rates: Microcredit and Consumer



Source: SFC

Figure 3 shows the usury rates and average interest rates for microcredit (left panel) and consumer (right panel) segments. Both segments experienced a significant increase in rates: in the case of microcredit, it started right after the policy treatment, while in the consumer segment, it took three additional months. The increase in the consumer loan rate is influenced by the Central Bank's contractionary monetary policy, which started increasing the policy rate in February 2011 for more than 18 months. The hike in consumer loan rates was transitory, while microcredit rates remained 16% higher than their pre-policy levels even after the monetary policy shifted to a more dovish stance. The detachment of

microcredit rates from the policy rate, as observed in Figure 1, allows us to examine in isolation the role of the policy change in bank behavior.

### **3.2 Data**

This paper studies the natural experiment created by the flexibilization of the benchmark rate used to calculate the interest rate cap in the microcredit segment in 2010 in Colombia. We analyze how this policy treatment changed loan disbursements and how market power interacted.

In order to create a comprehensive database to analyze this policy, this paper uses a mix of public and non-disclosed administrative data provided by the local financial supervisor-SFC- to create monthly bank-level panel data from the period 2010-2012. In this period, 52 banks and other credit institutions were operating in the microcredit and consumer segments.

Three sources feed this database. First is the weekly Form 088 -Active Interest Rates from the SFC. This form captures bank-level underwriting information by segment without disclosing individual-level loans. It includes market transactions, keeping accounts of weighted and non-weighted average interest rates, and total loan disbursement volume (PxQ) for commercial, consumer, microcredit, and mortgage loans. The number of loan applications granted has been recorded in Form 88 only since 2011, thus not covering the intervention studied in this paper.

The second data source is the monthly financial statements and balance sheets that provide financial information for each financial institution. The variables used from the income and expense statements are the revenues from interest-bearing assets and the cost of servicing liabilities to calculate a net interest income index. The database includes loan performance,

coverage ratio, financial performance, and weight of the microcredit segment. The particular indexes are the NPL ratio calculated as the 30+ days past due loans over total loans; the total loss provisions over the risky non-A rated- loan portfolio, the Return on Assets- ROA, and Return on Equity -ROE.

Third, the last variable included in the dataset is the Lerner index proxy for bank-level market power and competition. This indicator, also known as the price-cost margin (PCM), captures the heterogeneity in the bank-level market power over time. Theoretically designed by Lerner in 1934 based on neoclassic theory, it identifies the social loss from monopoly as the difference between price and marginal cost. In the social optimum reached in perfect competition, the price and the marginal cost should be equal and diverge in less competitive markets. A wider gap implies a higher ability of the firm to set prices and hence, greater monopoly power. The PCM is calculated with the equation [1], where  $P_{bt}$  is the price charged by bank  $b$  in period  $t$  and  $MC_{bt}$  its marginal cost.

$$PCM_{bt} = \frac{P_{bt} - MC_{bt}}{P_{bt}} \quad [1]$$

Besides being recognized in industrial organization literature as a benchmark indicator for monopolistic and imperfect competition, the PCM has been used in different jurisdictions to measure market power in banking contexts (Elzinga and Mills, 2011; Leon, 2015; Ryan et al., 2014).

To calculate the PCM index, a continuous, time-variant variable, we use each bank's average monthly interest rate in the ordinary and microcredit segments, weighted by volume, provided by Form 88. The marginal cost is calculated as the passive interest rate charged between banks for overnight funding. For simplicity, we will assume that the

marginal cost is homogenous for all banks and defined by the average interest rate on 90-day deposit certificates.

Trends in PCM for each financial institution in the dataset in the months of study are observed in Figure 4. With levels between 0.65 and 0.85, the individual market power for the Colombian financial institutions is considered high compared with other studies in developing countries. However, a downward trend in the indicator is noticeable at the analysis time.

Figure 4: PCM Index by Bank

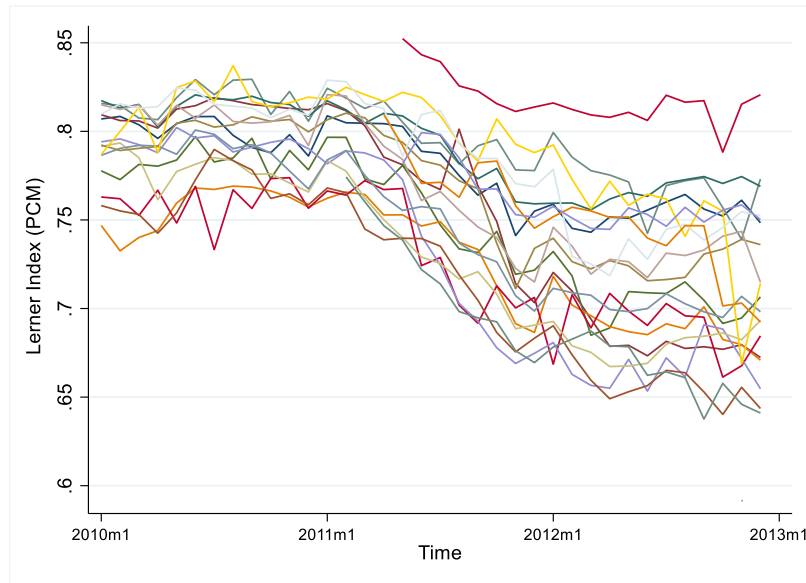


Table 2 shows the average values of the critical variables collected, divided into two groups based on position in the Lerner index distribution, i.e., separated by banks with lower market power from those with higher. Banks with higher market power exhibit higher returns, measured in the ROA and ROE indicators. Moreover, these banks' PCM display a more risky business model, as their coverage ratio (provisions/NPL) are lower, and their NPL ratios are higher than those posed by banks with lower PCM.



Table 2: Summary Statistics

<u>Variable</u>	<u>Low PCM</u>	<u>High PCM</u>	<u>Total</u>
Non-performing loans NPL	3.30%	4.13%	3.79%
Coverage ratio	1.55	1.41	1.47
Total loan portfolio in microcredit	2.02%	17.31%	11.04%
ROA	1.65%	1.75%	1.71%
ROE	13.97%	14.00%	13.99%
Lerner Index PCM	0.72	0.80	0.76

Given this setup, we define microcredit loans as the treatment group for our difference-in-difference estimation since this was the only credit segment covered by the policy. Consumer loans will be counterfactual because the benchmark rate was already pegged to market rates since 1993. The unit of analysis is the bank: Each credit institution can offer loans in both portfolios, making it possible to analyze the disbursement behavior of the same bank in both consumer and microcredit segments.

Also, we use consumer loans as the control group since individuals also use these loans to fund entrepreneurship; hence the credit risk is similar. Interviews with the different analysts at the local financial supervisor (SFC) confirm that entrepreneurs and SMEs use personal loans to fund businesses even though consumer loans are intended to purchase consumer goods and services.

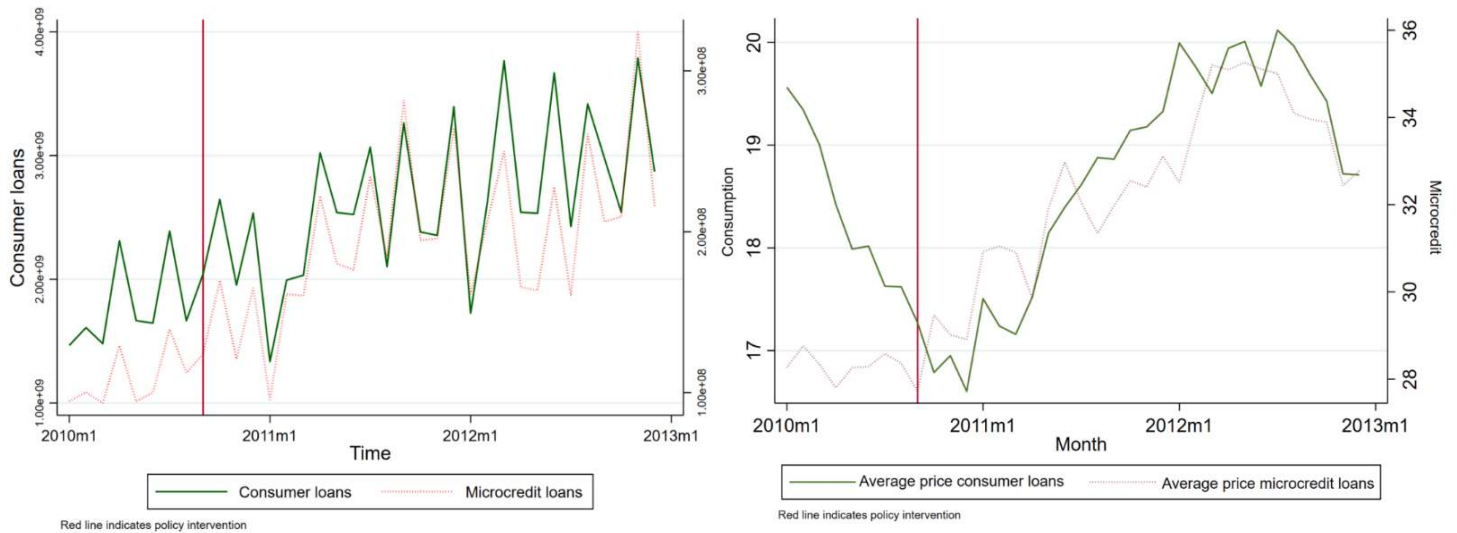
Individuals use consumer loans instead of commercial/microcredit loans because the former require fewer documents, the disbursement is faster, the interest rates are lower, and banks usually do not require collateral. Personal loans have been recognized in the literature as an alternative funding source for SMEs and self-employment projects (Kneiding and Kritikos, 2013),

The left panel from Figure 5 shows the monthly loan disbursements trends for the treatment and control groups. Microcredit loans, the treatment group, are represented with the red

dotted line on the right axis, while consumer loans, the control group, are observed as the green line on the left axis. Pre-intervention level trends exhibit a parallel trend. Similar trends are observed in the logarithmic form of the output variable, which will be used for the regression analysis.

On the other hand, the right panel presents the average microcredit and consumer loans price. After enacting the policy, the interest rates show an acute increase. In the case of microcredit, the treatment group, this hike happened because the treatment allowed banks to price higher risk. The average rate in the control group increased a few months after the treatment, responding mainly to changes in monetary policy. However, it is essential to note that the rates for the two segments do not have a parallel trend before the intervention, representing an obstacle to identifying causal effects for prices.

Figure 5: Monthly Loan Disbursements and Average Interest Rate



## 4. Estimation

### 4.1 Identification Strategy and Results

This paper has two main objectives: i) test if a flexibilization of the interest rate cap, allowing lenders to charge higher rates, would increase lending volumes, and ii) test the hypothesis that banks with higher market power disbursed lower loans after the same policy was enacted.

Many confounding factors may interact with the bank's disbursement and pricing decisions. There is an essential heterogeneity of business models, risk appetite, and market niches that affect pricing at the firm level. The economic environment shaped by employment conditions and monetary policy decisions also influences interest rates at the macro level.

In order to test these hypotheses, this paper uses the natural experiment setting described in Section 3.1. when an exogenous regulatory modification of the methodology to calculate the benchmark rate to calculate the interest rate cap for the Colombian microcredit segment occurred in 2010.

Given this scenario, we define those loans categorized as microcredit as the treatment group since this was the only credit line covered by the policy. The unit of analysis is the bank: Each credit institution can offer loans in any portfolio, making it possible to analyze the disbursement behavior of the same bank in both consumer and microcredit segments.

This paper uses a difference-in-difference regression (Angrist *et al.*, 2009; Imbens and Wooldridge, 2009) to test the aforementioned research questions. In order to test the effect of the policy on loan disbursements, equation [2] estimates the average treatment effect on the treated:

$$Y_{ibt} = \beta_0 + \beta_1 D_b + \beta_2 Policy_t + \beta_3 (D_b \times Policy_t) + \beta_4 X_{ibt} + \alpha_i + \lambda_t + \varepsilon_{ibt} \quad [2]$$

The sub-index  $b$  represents the bank,  $i$  is the credit portfolio, either microcredit or consumption loans, and  $t$  the month.  $Y_{ibt}$  is the output variable, the logarithm of the monthly loan disbursements.  $D_b$  is a binary variable for the credit portfolio, taking the value of one for treatment (microcredit), zero for control (consumption loans);  $Policy_t$  takes the value of one in the month the policy was enacted and afterward; otherwise is zero.  $D_b \times Policy_t$  is our variable of interest, capturing the effect of the treatment on the treated after the policy was implemented. Vectors  $\alpha_i$  and  $\lambda_t$  are bank and time intercepts included to capture possible omitted variables.

Finally, Matrix  $X_{ibt}$  includes idiosyncratic control variables at the bank level, including the provision ratio, NPL as the % of the loans not performing, net interest margin relative to the total interest income, coverage ratio as provisions to non-performing loans, profit/losses, the relevance of the microcredit segment, ROA and ROE.

Table 2 shows the difference in difference regression outputs. Columns I and II differ in the fixed effects used to control unobserved time-invariant confounders. The regression from Column III includes bank-level covariates. The regression coefficients for the effect of the intervention are statistically significant and estimated around minus 13-15%.

This result means the policy that flexibilized the usury rate decreased microcredit loan disbursements instead of boosting them. The complete estimation tables with all the control variables are found in the Annex. From the bank-level covariates, the impact of NPL and the level of earnings on loan disbursements are noteworthy. Higher non-performing loans negatively affect loan volumes, while higher earnings allow disbursements.

Table 2: Policy Evaluation - Disbursements (log)

VARIABLES	I	II	III
$D_b \times Policy_t$	-0.134** (0.0674)	-0.131** (0.0626)	-0.153** (0.0684)
Constant	17.78*** (0.123)	17.63*** (0.136)	17.71*** (0.203)
Controls	YES	YES	YES
Observations	953	953	953
R-squared	0.962	0.972	0.973
Bank FE	YES	YES	YES
Time FE	NO	YES	YES

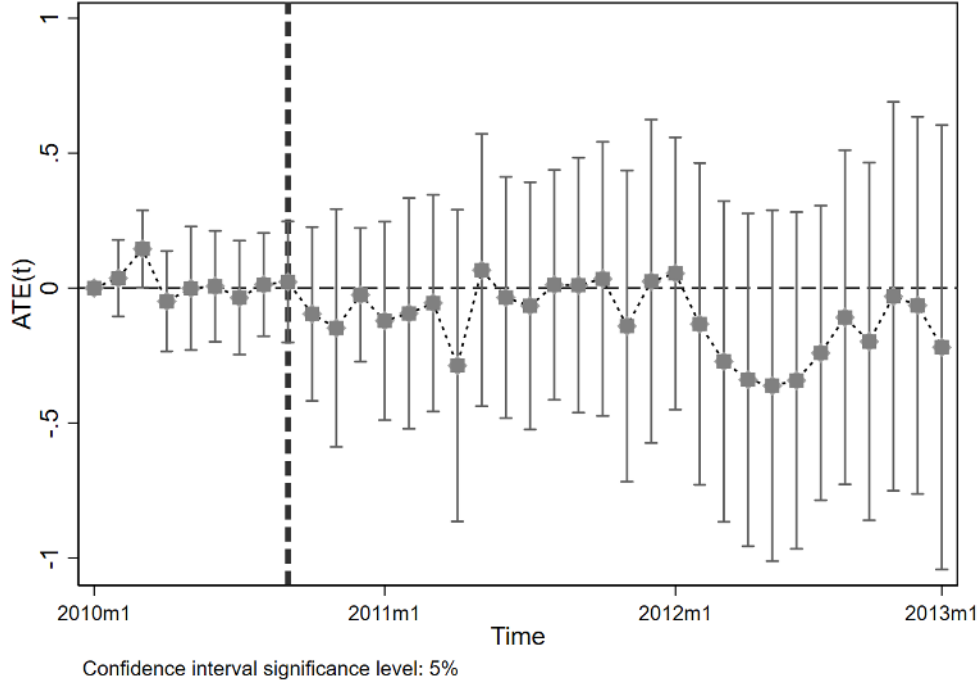
Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

In order to check the parallel trend assumption, the necessary condition for the identification of causal effects of the flexibilization, we will use a graphical representation of the estimated causal effects. Figure 7 shows the Average Treatment Effect (ATE) conditional to the time  $t$ , ex-ante, and ex-post regulatory change. Before enacting the regulation (thick dotted line), ATE oscillates around zero, with a slight negative bias likely due to anticipatory effects since the policy was discussed with the banks and other agents.

Before the policy implementation, the ATE displayed low standard errors around zero, supporting the parallel trend assumption. After the treatment, the figure displays ATEs skewed below zero, with standard errors widening throughout time. The visual examination of the ATE in the two years after the policy shows that the policy did not increase lending in the microcredit segment as intended. Moreover, ATEs are below zero, in line with the findings from regressing equation [2].

Figure 7: Average Treatment Effects – Loan Volumes



In order to test the QLH, i.e., if banks with higher market power decrease disbursements after the policy treatment, we will use a three-way interaction difference in difference estimation. This specification adds another layer of heterogeneous treatment effect, i.e., the differences across banks with different levels of market power. Therefore, we run the following equation:

$$\begin{aligned}
 Y_{ibt} = & \beta_0 + \beta_1 D_b + \beta_2 Policy_t + \beta_3 D_b \times Policy_t + \beta_4 Policy_t \times PCM_{bt} \\
 & + \beta_5 D_b \times PCM_{bt} + \beta_6 D_b \times Policy_t \times PCM_{bt} + \beta_7 X_{ibt} + \alpha_i + \lambda_t + \epsilon_{ibt} \quad [3]
 \end{aligned}$$

Variables in this equation are defined similarly to equation [2], including the Lerner Index (PCM) and its interaction with the policy ( $D_b \times Policy_t$ ). Matrix  $X_{ibt}$  is the same as equation [2]. The coefficient of interest is the triple interaction term  $\beta_6$ , which captures the dynamics between the policy and market power.

Table 3: Market Power and Disbursements (log)

VARIABLES	I	II
$D_b \times Policy_t$	-0.195** (0.0784)	-3.685*** (0.981)
$D_b \times Policy_t \times PCM$		4.577*** (1.258)
Constant	16.94*** (1.006)	17.96*** (0.929)
Controls	YES	YES
Observations	859	859
R-squared	0.973	0.973
Bank FE	YES	YES
Time FE	YES	YES

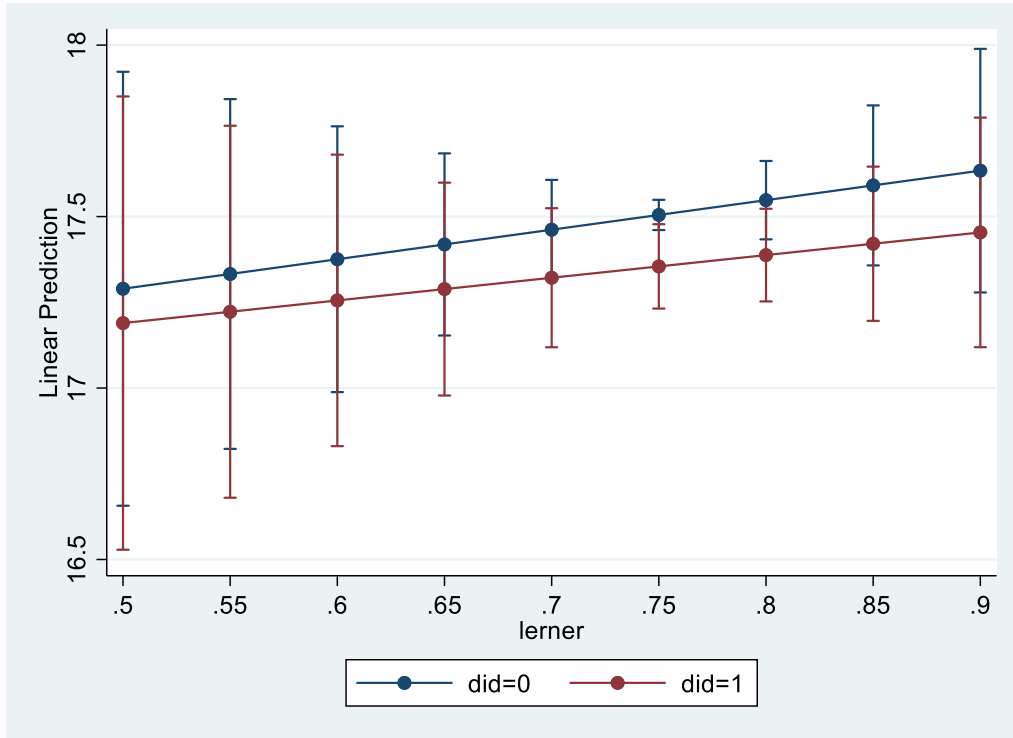
Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 3 shows the regression that tests the QHL. Column I is set up using the difference-in-difference specification from [2] but adding the heterogeneity in market power, and Column II builds on it but includes covariates. Estimates for the  $D \times Policy$  term, evaluating the effects of the policy on lending, keep the negative direction obtained in the previous regressions. The estimates for the triple interaction term are statistically significant and positive in both specifications, rejecting the QHL, meaning that banks with a higher ability to set prices provided relatively further loan volume after the policy implementation.

Figure 8 examines the relationship between the market power proxy and the expected loan disbursements by predicting margins. This figure calculates predicted loan values before and after the policy enactment at different levels of market power. The chart shows how the policy ( $did = D_b \times Policy_t$ ) reduced loan disbursement, but the slope remains similar, which means that before and after the policy, banks with higher market power supplied relatively more loans than those with less ability to set prices.

Figure 8: Predictive Margins Loan Disbursements 95% CI



Finally, in the final set of regressions, we aim to understand the effects of the policy on rates rather than on loan volumes, although the parallel trend assumption is weak for this variable. The specification mimics the equation [3], regressing the same independent variables on the monthly average interest rate charged.

Coefficient estimates for the difference-in-differences estimator,  $D \times \text{Policy}$ , show the positive impact that the policy had on prices. Column I shows the results from the regression without the role of market power, where  $D \times \text{Policy}$  presents a rate increase of around 12%. As results from Column II show, we also reject the QHL as banks with higher market power increased rates relatively more minor after the policy enactment.



Table 4: Effects on Prices - Log

VARIABLES	I	II
D x Policy	0.122** (0.0554)	1.388* (0.684)
D <sub>b</sub> x Policy <sub>t</sub> x PCM		-1.660* (0.838)
Constant	1.649* (0.835)	1.279** (0.538)
Controls	YES	YES
Observations	859	859
R-squared	0.952	0.961
Bank FE	YES	YES
Time FE	NO	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Figure 9 delves into this result emphasizing market power heterogeneity using predicting margins. This chart shows a shift in the slope between market power and predicted interest rates: Banks with lower market power charged relatively more after the policy was implemented. Those at the higher end of the PCM/Lerner distribution kept pricing loans similarly.

The visual examination of the average treatment effects of the policy treatment shows the confidence intervals for the ATE after October 2010 are positive and different from zero, as observed in Figure 10. Indeed, the interest rates presented an upward trend before the policy, and the treatment accelerated this process, which suggests banks took advantage of the opportunity to change their pricing strategy to overcome the previously binding interest rate cap. However, given that the ATE before the treatment is different from zero, it is not viable to interpret the coefficients in the difference-in-difference estimation for the rates.

Figure 9: Predictive Margins Loan Disbursements 95% CI

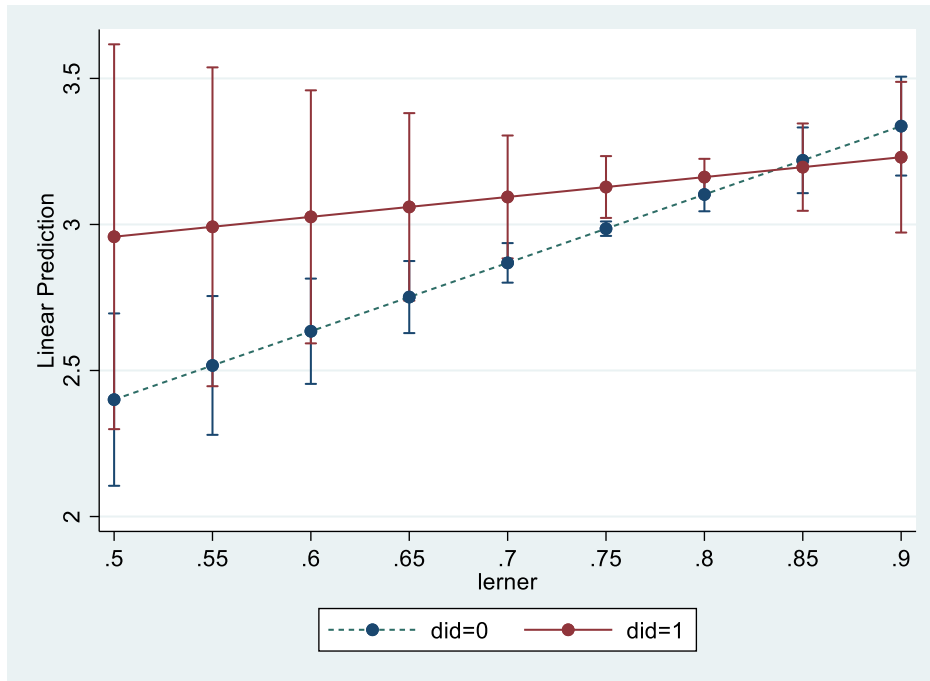
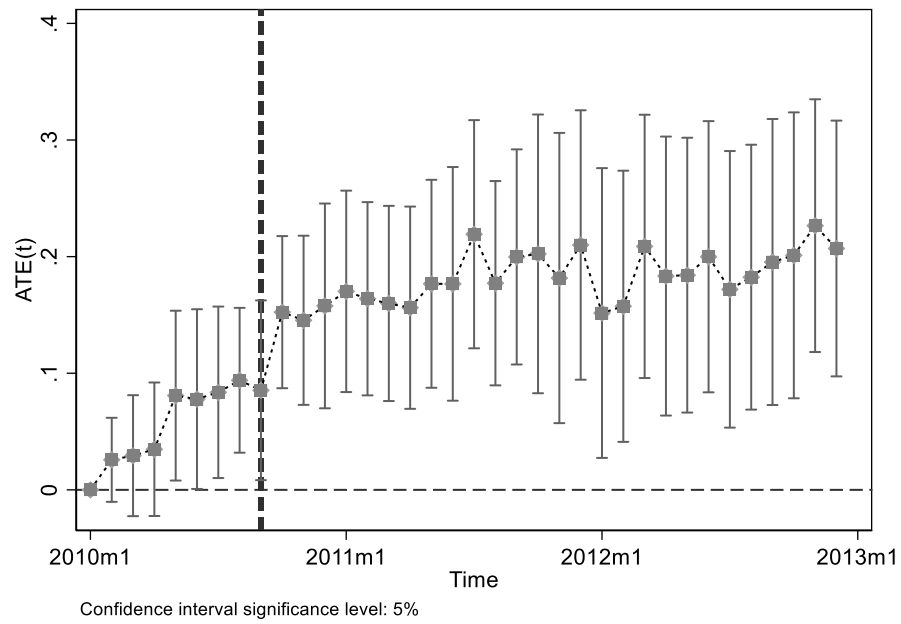


Figure 10: Average Treatment Effects – Interest Rates



## 5. Conclusions

Developing countries face different trade-offs in order to promote financial inclusion. Removing interest rate caps has been portrayed as an easy fix to promote lending at the pyramid's base. According to the opponents of this government intervention, caps restrict market development, innovation, and access to financial services since they hinder optimal pricing.

This paper addresses this issue by relying on a natural experiment in Colombia in 2010 that modified the benchmark rate used in the microcredit usury rate calculation. We rely on a causal inference framework for this analysis, where microcredit loans were considered the treatment group and consumer loans as the control group since the policy did not affect the latter.

We found evidence to support credit rationing behaviors: The flexibilization of the interest rate cap, as expected, allowed banks to price loans higher, around 12%. Nevertheless, even at higher rates, borrowers could not find more loans. In fact, the microcredit loan volume decreased by 13% after the policy.

Given the prevalence of market power in the banking sector, particularly in developing countries, we include this feature in the analysis. We tested the QLH, i.e., whether banks with higher market power disbursed relatively after the policy implementation. We rejected this hypothesis, as banks with higher market power increased loan supply while keeping prices relatively stable. However, one interesting finding is that lenders with lower power caught up and pushed prices up, which explains the overall increase in interest rates in the period studies.

From a policy perspective, these results are relevant since they dispute the narrative of this type of regulation, i.e., flexibilization or deletion of interest rate caps will promote lending and, therefore, financial inclusion and deepening. Complete liberalization of the active interest rate will not be translated automatically into further financial deepening if agents are incentivized to keep their current profit margins without venturing into riskier segments such as the currently unbanked.

Hence, implementing mechanisms to protect financial consumers' welfare is necessary if usury rates are removed. Without short and long-run policies aiming to protect from predating lending and other practices, allowing banks to freely price their risk would only be detrimental to consumer protection and overall welfare in the short run.

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## Appendix 3

### Appendix 2A: Policy Evaluation - Disbursements (log)

VARIABLES	I	II	III
Net Interest Margin			0.0353* (0.0186)
NPL			-3.590* (1.840)
Coverage Ratio			0.0420 (0.0692)
ROA			0.802 (2.926)
ROE			0.631 (0.458)
Earnings or Losses %			0.00278*** (0.000899)
Interest income			7.17e-08* (3.99e-08)
Policy <sub>t</sub>	0.288*** (0.0326)	0.372*** (0.142)	0.220 (0.164)
D <sub>b</sub>	-1.641*** (0.141)	-1.600*** (0.128)	-1.750*** (0.151)
D <sub>b</sub> x Policy <sub>t</sub>	-0.134** (0.0674)	-0.131** (0.0626)	-0.153** (0.0684)
Constant	17.78*** (0.123)	17.63*** (0.136)	17.71*** (0.203)
Observations	953	953	953
R-squared	0.962	0.972	0.973
Bank FE	YES	YES	YES
Time FE	NO	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Appendix 3A: Market Power and Disbursements (log)

VARIABLES	I	II
Net Interest Margin	0.0518** (0.0228)	0.0279 (0.0219)
NPL	-3.269 (2.119)	-3.234 (2.164)
Coverage Ratio	0.216** (0.108)	0.201* (0.107)
ROA	-9.401 (8.208)	-9.383 (8.466)
ROE	1.085 (0.871)	0.888 (0.897)
Earnings or Losses %	0.00187* (0.000969)	0.00164* (0.000959)
Interest income	8.00e-08* (4.66e-08)	1.06e-07** (4.87e-08)
PCM	0.844 (1.246)	-0.334 (1.167)
Policy <sub>t</sub>	0.284 (0.227)	0.225 (0.226)
D <sub>b</sub>	-1.762*** (0.181)	-1.832*** (0.180)
D <sub>b</sub> x Policy <sub>t</sub>	-0.195** (0.0784)	-3.685*** (0.981)
D <sub>b</sub> x Policy <sub>t</sub> x PCM		4.577*** (1.258)
Constant	16.94*** (1.006)	17.96*** (0.929)
Observations	859	859
R-squared	0.973	0.973
Bank FE	YES	YES
Time FE	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Appendix 4A: Effects on Prices - Log

VARIABLES	I	II
Net Interest Margin	-0.0124 (0.0108)	-0.00366 (0.00520)
NPL	-1.986 (1.850)	-1.999 (1.992)
Coverage Ratio	-0.0219 (0.0324)	-0.0164 (0.0276)
ROA	1.203 (1.116)	1.196 (1.224)
ROE	-0.247 (0.182)	-0.175 (0.156)
Earnings or Losses %	-9.41e-05 (0.000154)	-9.22e-06 (0.000137)
Interest income	1.63e-08 (1.05e-08)	6.76e-09 (1.54e-08)
PCM	1.914* (0.942)	2.341*** (0.564)
Policy <sub>t</sub>	0.0745 (0.0748)	0.0962 (0.0592)
D <sub>b</sub>	0.507*** (0.0644)	0.532*** (0.0619)
D <sub>b</sub> x Policy <sub>t</sub>	0.122** (0.0554)	1.388* (0.684)
D <sub>b</sub> x Policy <sub>t</sub> x PCM		-1.660* (0.838)
Constant	1.649* (0.835)	1.279** (0.538)
Observations	859	859
R-squared	0.952	0.961
Bank FE	YES	YES
Time FE	NO	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1