Financial Access Under the Microscope

Sumit Agarwal
National University of Singapore

Thomas Kigabo
National Bank of Rwanda

Camelia Minoiu
Federal Reserve Board

Andrea Presbitero
International Monetary Fund and MoFiR

André F. Silva
Federal Reserve Board

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Abstract

We examine the impact of a large-scale microcredit expansion program on financial access and the transition of previously unbanked borrowers to commercial banks. Using administrative data on the universe of loans from a credit register accessible to all lenders nationwide, we show that the program improved access to credit, especially in underdeveloped areas, with positive effects on business creation and long-term mortgage lending. These newly-created microfinance institutions provided dynamic incentives but still faced substantial lending constraints. Importantly, the program also generated positive spillover effects to the commercial banking sector. A sizable share of first-time borrowers obtained subsequent loans—that are larger, cheaper, and longer-term—from banks, which expanded their branch network in under-served low-risk areas with a lag. These individuals graduating from MFIs to commercial banks are not riskier than existing bank borrowers. Overall, our results suggest that the microfinance sector, coupled with a credit reference bureau, can substantially mitigate information frictions in credit markets.

JEL Codes: G21, O12, O55

Keywords: Financial inclusion, microfinance, loan expansion program, credit reference bureau

*Authors’ emails: ushakri@yahoo.com; kthomas@bnr.rw; camelia.minoiu@frb.gov; apresbitero@imf.org and andre.f.silva@frb.gov. We are grateful to Shashwat Alok (discussant), Thorsten Beck, Martin Brown, Miriam Bruhn (discussant), Ralph De Haas (discussant), Jens Hagendorff (discussant), Martin Kanz (discussant), Tumer Kapan, W. Blake Marsh (discussant), Maria Soledad Martinez Peria, Jonathan Morduch, Felix Noth (discussant), Steven Ongena, Paolo Volpin, and participants at the IMF-DFID Conference on “Financial Inclusion: Drivers and Real Effects” (Washington, D.C.), University of Chicago Conference on “Consumer Finance: Micro and Macro Approaches” (Chicago), Chicago Financial Institutions Conference 2019 (Chicago), 12th Swiss Winter Conference on Financial Intermediation (Lenzerheide), Reserve Bank of India/Imperial College London Conference on Financial Intermediation in Emerging Economies (Mumbai), 33rd European Economic Association Conference (Cologne), 2018 Africa Meeting of the Econometric Society (Cotonou), IBEFA at the 2019 ASSA Meetings (Atlanta), CSAE Conference 2018 (Oxford), 7th NCID Research Workshop (Pamplona), 2018 Development Economics and Policy Conference (Zurich), 1st Endless Summer Conference on on Financial Intermediation and Corporate Finance (Larnaca), 8th International Research Workshop in Microfinance (Oslo), 6th Emerging Scholars in Banking and Finance Conference (London), MFA Annual Meeting 2019 (Chicago), as well as seminar participants at the International Monetary Fund, Villanova University, Trinity College Dublin, National Bank of Rwanda, and Economic Policy Research Network Rwanda for useful comments and suggestions. We also thank the National Bank of Rwanda and the Rwandan Credit Reference Bureau for providing the data used in this study and for assisting with queries. This research is part of a project on Macroeconomic Research in Low-Income Countries (project ID 60925) supported by the U.K.’s Department for International Development (DFID). The views expressed herein are those of the authors and should not be attributed to the National Bank of Rwanda, DFID, Board of Governors of the Federal Reserve System, or anyone else associated with the Federal Reserve System, the International Monetary Fund, their Executive Boards, or their management.
1 Introduction

The microfinance sector is responsible for much of the progress towards financial inclusion in developing countries, where weak institutions and scarce collateral make information frictions in credit markets particularly costly (Morduch, 1999; Kaboski and Townsend, 2012). A key but unanswered question is to what extent and under which conditions a healthy microfinance sector can facilitate access to credit by commercial banks. In this paper, we examine the effects of a large-scale microcredit expansion program on financial access and the transition of previously unbanked borrowers to commercial banks. We show that the microfinance institutions (MFIs) created by the program, in the presence of a credit reference bureau that monitors individual borrowing activities and is accessible to all lenders, enable first-time borrowers to build credit history and signal their creditworthiness, attenuating information frictions (Pagano and Jappelli, 1993; Padilla and Pagano, 1997). Thus, the expansion of microcredit serves as a pathway for low-risk first-time borrowers to commercial banks, which are able to grant them larger, cheaper, and longer-term loans.

In detail, we analyze the impact of a nationwide government-subsidized microcredit expansion program that created an extensive network of community-focused savings and credit cooperatives (Umurenge SACCOs, henceforth “U-SACCOs,” part of the microfinance sector) across the 416 municipalities in Rwanda. The program resulted in more than 90% of Rwandans residing within 3 miles of a U-SACCO (AFI, 2014). Despite an official launch in 2009, different U-SACCOs initiated their lending operations in different months starting in late 2011, giving rise to a staggered implementation of the program. Our identification strategy exploits time-series variation in the opening of U-SACCOs across municipalities, coupled with high-frequency microdata on the lending activities of all financial institutions operating in the country. The data come from a comprehensive credit register with detailed information on the universe of loans to individuals for a total of 9 years around the implementation of the program (2008–2016). The dataset includes more than 4 million observations on bank-borrower loan exposures on a monthly basis for 177,829 individual borrowers.

Our empirical strategy hinges on the identifying assumption that the program roll-out is uncorrelated with local unobserved factors at the municipality level, including credit demand i.e., our

\footnote{Rwanda is representative of other developing countries. In 2015 Rwanda had a credit-to-GDP ratio of 21.3%, compared to an average of 24% for sub-Saharan African economies and 19% for low-income countries.}
results could be spurious if U-SACCOs were more likely set up in more dynamic and economically developed areas with greater loan demand. We rule out potential concerns about non-random time-series variation in program implementation by showing that the timing of U-SACCO openings is unrelated to a wide range of local economic characteristics, including ex-ante municipality-level bank presence, economic development, poverty rate, and remoteness from the capital—as a proxy for the ability of government agencies to reach the branches for training and inspections.

We first show that the microcredit expansion program significantly raised the probability of obtaining a loan for previously-unbanked individuals, particularly in rural and less developed areas with lower bank presence. This effect is largely driven by the U-SACCOs that were set up during the program. In addition, the program had positive effects on business lending at the extensive margin, as measured by the number of business loans to either private firms or individuals. We also show that repeated borrowers at U-SACCOs obtain better loan terms (e.g., subsequent loans are larger, cheaper, and longer-term when compared to the first one) as their relationship with U-SACCOs mature, consistent with dynamic repayment incentives—that is, the promise of repeated and larger loans (Armendáriz and Morduch, 2010; Shapiro, 2015)—as well as relationship banking (Boot and Thakor, 1994; Bharath, Dahiya, Saunders and Srinivasan, 2011). One year into the program, commercial banks expand their presence in under-banked low-risk areas and grant loans to previously unbanked borrowers that had their first loan at U-SACCOs. In fact, a sizable share of U-SACCO borrowers—over 9%—who need additional loans obtain them from commercial banks.

We also examine the transition of U-SACCO borrowers to commercial banks and the information role of the credit reference bureau. When previously-unbanked individuals obtain loans from MFIs, this information is submitted to the credit register, which tracks all lending activities in the formal banking sector. The credit register is maintained by a private credit reference bureau that supplies borrower information on payment history and defaults (that is, both positive and negative information) to any lender against a fee. The microdata allows us to distinguish between U-SACCO borrowers who become clients of commercial banks (“switchers”) and U-SACCO borrowers who continue borrowing from U-SACCOs (“non-switchers”). We show that switchers obtain larger, cheaper,

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2 According to the World Bank’s 2013 Global Financial Development Report, 77% of countries in sub-Saharan Africa have a functioning public credit register or private credit bureaus, with almost two-thirds of these collecting both positive and negative borrower information.
and longer-term loans from commercial banks compared to similar non-switching borrowers at U-SACCOs, suggesting that their demand for credit is not fully met by U-SACCOs and consistent with the presence of regulatory and capacity constraints at micro lenders (Cull, Demirgüç-Kunt and Morduch, 2014). Using defaults as a measure of ex-post borrower risk, we find that switchers are less risky than similar non-switching borrowers, suggesting that commercial banks “cream-skim” low-risk borrowers from the pool of newly-banked individuals. In addition, switchers graduating from U-SACCOs to commercial banks are as risky as similar borrowers already at banks. Together, our results suggest MFIs play a key (though underdocumented) role of alleviating information frictions in thin credit markets where commercial banks find it difficult to serve the unbanked population using traditional lending technologies (Castellanos, Jimenez-Hernandez, Mahajan and Seira, 2019).

Our paper builds on an influential literature analyzing the effects of bank branch expansion programs on financial inclusion and economic development. Burgess and Pande (2005) and Burgess, Pande and Wong (2005) show that a large state-led banking expansion program in India significantly reduced rural poverty through increased savings mobilization and credit provision. A recent analysis of the largest financial inclusion program in India (Jan Dhan Yojana) by Agarwal, Alok, Ghosh, Ghosh, Piskorski and Seru (2017) shows that regions more exposed to the program experienced an increase in the availability of credit, with previously unbanked households substituting informal lending for less expensive bank credit. Focusing on the branch network expansion by Banco Azteca in Mexico, Bruhn and Love (2014) find that access to finance boosts labor market activity and incomes, particularly among poor individuals and in areas with lower bank presence. Brown, Guin and Kirschenmann (2016) show that the expansion of an East European commercial microfinance bank in low-income areas increased the share of banked households. Finally, Allen, Carletti, Cull, Qian, Senbet and Valenzuela (2017) examine the branch expansion of Equity Bank in Kenya into low-income and under-served regions and show it increased the likelihood of households having bank accounts and obtaining loans.\textsuperscript{3}

\textsuperscript{3}Problems of financial inclusion are not exclusive to developing countries. According to the most recent estimates for the U.S., for instance, 6.5% of households—corresponding to 14.1 million adults—do not have a checking or savings account. Even more strikingly, 19.7% of households do not have any credit product, even though 15.8% of these one in every five households showed interest in having credit access. There are also substantial differences by race and ethnicity, with 36% of black households and 31.5% of Hispanic households not having any form of credit (FDIC, 2018). Furthermore, a number of studies document positive effects of increased bank branch density on financial inclusion and economic outcomes in advanced economies (e.g., Gilje, Loutskina and Strahan, 2016; Brown, Cookson and Heimer, 2019; Nguyen, 2019). In particular, Celerier and Matray (2019) show that the U.S. interstate bank
A common feature of previous studies is that they rely on survey data to measure access to and usage of financial services, as well as economic outcomes. However, surveys may not be representative and questions about finance may suffer from reporting biases. Furthermore, the data is often aggregated at the district or state level, inviting questions on whether the outcomes are being driven by a particular financial institution that is expanding its branch network as part of a specific program or instead by its competitors. In other words, analyses of aggregate data cannot establish if the increase in bank accounts, credit, or the improvements in real outcomes following branch expansion programs are due to the targeted institutions or other banks. In fact, although banks tend to impose barriers to entry through minimum account balances or large overdraft fees (Barr and Blank, 2008; Ho and Ishii, 2011), the expansion of banks to poorer (rural) areas can have indirect effects on financial inclusion through increased competition with existing micro lenders and other credit institutions that are attracted by profitable opportunities in those areas. To the best of our knowledge, this is the first paper that employs microdata from a supervisory credit register to examine the impact of a financial inclusion program. These administrative data on the lending activities of all microfinance institutions and commercial banks in a country helps overcome challenges related to aggregation and reporting biases. In addition, the data enables us to gauge not only which banks are driving gains in access to credit, but also to track individuals’ borrowing activities over time and across lenders, measure the duration of the lender-borrower relationship, determine borrowers’ risk profile based on loan performance, and analyze lending terms. Finally, the data extends several years into the program so we can examine not only short-term, but also medium-term effects of the program on financial access.

Our paper also relates more broadly to a long-standing literature on banks and financial development — deregulation increased financial inclusion and improved economic conditions for low-income households through asset accumulation and enhanced financial security.

4It is important to note that our data does not cover informal credit such as loans from family and friends or informal groups such as village savings and loans associations, which are common in Rwanda and other developing countries. While most of the adult population have access to informal credit (61% of the population according to the FinScope (2016) survey, compared to only 17% who have access to formal credit), informal credit typically bears sizable interest rates and transaction costs (Giné, 2011). Therefore, the presence of a first-time borrower in the credit register indicates the first time that individual takes a loan from a formal creditor—whether or not they had access to informal credit before. Our dataset also does not include mobile money providers that carry out financial transactions on behalf of financial institutions. However, while digital credit through mobile phones (mostly in the form of small and short-term loans) may improve household resilience to negative shocks, it does not substitute other forms of credit and there is no evidence that it plays a transformative role in economic development—for instance by boosting entrepreneurship and asset-holdings (Bharadwaj, Jack and Suri, 2019).
opment as key drivers of economic growth (e.g., King and Levine, 1993; Jayaratne and Strahan, 1996; Beck, Levine and Loayza, 2000). Earlier studies argue that financial inclusion—access to basic banking services and loans—is a necessary condition for economic development, as credit provision enables consumption smoothing and sustains entrepreneurship. The evidence on the impact of microfinance presents an interesting contrast with studies of one-time randomized evaluations or aggregate data. While randomized control trials (RCTs) generally reveal “a consistent pattern of modestly positive, but not transformative effects” (Banerjee, Karlan and Zinman, 2015; Meager, 2019), studies based on aggregated household survey data show, as we do, relatively larger impacts (Bruhn and Love, 2014; Brown, Guin and Kirschenmann, 2016; Allen, Carletti, Cull, Qian, Senbet and Valenzuela, 2017). A potential explanation for these mixed results on the quantitative importance of the microfinance sector for development is that the RCT literature has only “scratched the surface of identifying spillover and general equilibrium effects” (Banerjee, Karlan and Zinman, 2015). From this perspective, our analysis with administrative data on the universe of loans in a country complements the RCT literature, as we are able to document the positive spillovers of a microcredit expansion program on the commercial banking sector, and hence emphasize the role of microfinance as a pathway of previously unbanked borrowers to commercial banks.

In a related paper, Breza and Kinnan (2018) examine the real effects of a contraction in the supply of microcredit in India using district-level variation in exposure to a negative financial shock. In contrast, our analysis assesses the effects of at a positive shock—an expansion of the microfinance sector branch network—on financial access both at micro lenders and commercial banks. Our results suggest that the expansion of U-SACCOs can foster local development not only directly through the provision of financial services to the underprivileged population, but also indirectly by allowing low-risk previously unbanked individuals to build credit history and graduate to commercial banks who grant them larger, cheaper, and longer-term loans.

Our analysis of switchers—first-time U-SACCO borrowers who become clients of commercial banks—also closely relates to an influential paper by Ioannidou and Ongena (2010). Using data from the Bolivian credit register, the authors show that firms which switch across commercial banks initially obtain lower loan rates, but these rates subsequently increase, suggesting adverse selection and a hold-up problem (Sharpe, 1990; Rajan, 1992; von Thadden, 2004). We extend this line of
research by documenting, for the first time, the transition of individual borrowers from credit cooperatives to commercial banks and hence emphasizing the screening role played by the microfinance sector in an economy with costly information frictions in lending. In addition, we analyze the terms of consumer (as opposed to business) loans—including size, interest rates, and maturity—and compare the default risk of switching and non-switching borrowers. Our analysis thus sheds light on the risks associated with the transition of newly-banked individuals from microfinance institutions to commercial banks. Given that switchers are on average less risky than non-switchers, U-SACCOs face the challenge of having increasingly riskier borrowers in the medium run. Accordingly, we show that non-performing loans increase at U-SACCOs in the outer years of the program, posing potential risks for the long-term sustainability of the micro lender business model and financial stability.

Finally, our paper contributes to the literature on the positive effects of mandatory sharing of borrower information among financial institutions. Liberti, Seru and Vig (2016) document that the expansion of the Argentinean credit register improved the efficiency of bank credit allocation by easing lending terms for previously-excluded high-quality borrowers. Bos, de Haas and Mil lone (2015) show that the introduction of a credit register in Bosnia and Herzegovina reduced loan defaults, particularly among first-time borrowers, and that repeated borrowers received larger, cheaper, and longer-term loans due to their ability to signal creditworthiness to competing lenders. Our results support the view that credit bureau availability can mitigate moral hazard and adverse selection—bringing safe borrowers into the credit market—with potentially positive effects on financial inclusion and credit supply (Pagano and Jappelli, 1993; Padilla and Pagano, 1997).

The remainder of the paper is organized as follows. In Section 2 we present institutional details for Rwanda’s financial sector and microcredit expansion program. Section 3 describes our data sources. Section 4 reports our baseline results on the impact of the program on financial access and additional results on business and mortgage lending. In Sections 5 we explore regulatory and capacity constraints at microcredit cooperatives and in Section 6 we document the transition of first-time borrowers from U-SACCOs to commercial banks. Section 7 concludes.

5 By examining how loan conditions change for repeated U-SACCO borrowers, our work also adds to the literature on dynamic incentives in microfinance (Armendáriz and Morduch, 2010; Shapiro, 2015).

6 Cross-country evidence indicates that information sharing is associated with improved availability and lower cost of credit (Djankov, McLiesh and Shleifer, 2007; Jappelli and Pagano, 2002; Brown, Jappelli and Pagano, 2009), as well as lower bank risk-taking (Houston, Lin, Lin and Ma, 2010).
2 Institutional Background

2.1 Rwandan Economy and Financial Sector

Rwanda is a landlocked country in East Africa with a population of around 12 million as of 2016. The country has a large rural population and few natural resources. Following a range of business-friendly reforms in the early 2000s, Rwanda experienced competitiveness gains, strong economic growth, and poverty reduction. Annual GDP growth averaged 7.8% and per capita income doubled between 2008 and 2016 (IMF, 2017a,b). The 2018 World Bank’s Doing Business survey ranks Rwanda 2nd in Africa and 41st in the world according to the ease of doing business, while the 2016–2017 World Economic Forum’s Global Competitiveness Index ranks it 52nd among 138 countries, outperforming the Sub-Saharan Africa (SSA) average on all dimensions other than market size.

In recent years, Rwanda’s commercial banking sector developed rapidly. Total bank assets grew from 22% to 39% of GDP from 2008 to 2016, while bank credit to the private sector grew at an annual average of 13% in real terms over the same period (IMF, 2017a). Commercial banks represent about two-thirds of total banking sector assets. The banking sector is relatively concentrated, with the 3 largest commercial banks (out of 17) accounting for more than half of total bank assets, loans and deposits. Most banks are foreign-owned, but the majority of bank funding is domestic and comes from local deposits, limiting the banking system’s exposure to external shocks. There are also 523 microfinance institutions (MFIs), including the 416 municipal credit cooperatives (U-SACCOs) set up through the microcredit expansion program examined in this paper (i.e., one U-SACCO in each municipality), with some only providing savings accounts and others also granting loans. Aggregate statistics from the National Bank of Rwanda show that MFIs accounted for 10% of total bank assets in 2016.

Over the past decade, Rwanda also made notable strides towards financial inclusion. Access to formal financial services increased from 21% to 68% of the adult population between 2008 and 2016, and access to formal credit from 5% to 17% over the same period (FinScope, 2012, 2016). According
to statistics across 26 countries where FinScope surveys measure financial access and use of financial products, Rwanda is ranked 2nd in terms of the share of adult population with access to formal financial services. These developments are partly the result of policies and regulations aimed at expanding financial access for the unbanked population, particularly the nationwide microcredit expansion program we analyze in this paper.

2.2 Microcredit Expansion (U-SACCO) Program

We examine the effects of the Umurenge SACCO (U-SACCO) program, which set up one “savings and credit cooperative” (SACCO) in each of Rwanda’s 416 municipalities. The program aimed to provide financial services at low transaction costs, especially in rural communities. U-SACCOs were allowed to provide financial services to all individuals, but in practice targeted the unbanked population. The program was launched in March 2009 and initially focused on providing access to savings accounts, with U-SACCOs starting granting their first loans only in late 2011. In 2008, before the launch of U-SACCOs, there were no formal lending institutions in more than half of the 416 municipalities. The program significantly improved the availability of financial services across the country, with 1.6 million new customers and more than 90% of Rwandans residing within 3 miles of a U-SACCO branch (AFI, 2014), a larger share than in similar countries such as Kenya (86%), Uganda (77%), and Nigeria (56.5%).

Municipality-specific U-SACCOs are financial intermediaries owned by their members. They are legally set up as microfinance institutions with the main objective to provide credit and savings facilities exclusively to members, and are financed mainly from their own resources. These credit cooperatives operate according to the Finance and Cooperative laws and are supervised by the

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8In terms of financial inclusion, Rwanda fares well compared to its regional peers. The share of adult population with access to formal financial services (68% in 2016) places Rwanda above its East African peers such as Kenya (67% in 2013), Tanzania (57% in 2013), Uganda (54% in 2013), and Mozambique (24% in 2014). The Economist Intelligence Unit’s Global Microscope, which ranks countries based on policies for financial inclusion, put Rwanda in the 8th position among 55 countries in 2016.

9Municipalities (translated in Kinyarwanda as “Umurenge”) are administrative subdivisions of the 30 districts that make up 5 provinces. In Rwanda there are also 64 non-Umurenge SACCOs that already existed prior to the Umurenge program and where members come from the same profession. In the analysis, non-Umurenge SACCOs are part of the “other MFIs” sample.

10Both U-SACCOs and other MFIs have the legal status of cooperatives and are microfinance institutions in the sense that they pursue social goals and serve underprivileged groups. U-SACCOs differ from other types of SACCOs in the sense that they target borrowers based on their geographical location (the municipality) while other SACCOs target borrowers based on employment type (MFR, 2015).
Rwanda Cooperative Agency and the National Bank of Rwanda. They are located in both rural and urban areas, with the vast majority only having one branch with membership drawn from the local community (Brown, Mackie and Smith, 2015). Although established as private cooperatives, U-SACCOs received subsidies from the government before reaching the break-even point. By the end of 2013, 85% of U-SACCOs were profitable and stopped receiving subsidies (AFI, 2014).

It is generally believed that the U-SACCO program significantly raised the share of the population with access to bank accounts, boosting financial inclusion especially in economically underprivileged areas. We document the rise in the share of banked population using data from the 2012 and 2016 FinScope surveys. As shown in Table A11, between 2012 and 2016 the share of individuals with a savings account rose from 31.9% to 36.4%, while the share of individuals who were granted loans doubled from 4.6% in 2012 to 8.1% in 2016. Data from the credit register (covering 336 municipalities that are part of our sample) depict a similar picture, as the share of individuals with an outstanding loan (in total adult population) increased substantially across the country. By end-2010, before the program was rolled out, more than 60% of loans were from commercial banks, while the rest were from other MFIs. When the program started, the number of loans granted by U-SACCOs increased dramatically, accounting to 37% of total loans in the credit register at end-2016 (the end of our sample period). As a result, the market share of commercial banks declined to 39% (Figure A1). In terms of loan volumes, the market share of U-SACCOs is smaller—reflecting the average smaller loan size—but it increased sharply and reached 8% by end-2018 (beyond our sample period). These statistics suggest that the program coincided with significant gains in financial inclusion and are consistent with government and news reports (e.g., Randall, 2014).

Our analysis takes the next step and examines whether the microcredit expansion program had deeper effects than simply increasing access to basic financial services such as account ownership. Specifically, we are interested in the program’s impact on previously unbanked individuals’ ability to take up loans from U-SACCOs, the terms of those loans, borrowers’ ability to build credit history and reveal creditworthiness through the credit reference bureau, and eventually to borrow from commercial banks, with possible beneficial effects on local economic activity.

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11At set-up, U-SACCOs were required to maintain a liquidity ratio of 80%, which was reduced to 30% after December 2013. The minimum capital requirement is about USD 8,000. U-SACCOs generally hold high levels of capital, in excess of 30% of total assets (MFR, 2015).
3 The Credit Register Data

Our study employs detailed loan-level data from all credit institutions operating in Rwanda. The country has a well-functioning and detailed credit register that is maintained by the Credit Reference Bureau (CRB), a private credit bureau solutions provider with operations across Africa, under the supervision of the National Bank of Rwanda.\textsuperscript{12} The credit register collects data on the loans granted by deposit-taking institutions that are supervised by the central bank, including commercial banks, U-SACCOs, and other MFIs. Reporting institutions provide loan-level information on a monthly basis with no threshold for loan size—a crucial element when examining microfinance. Our period of analysis is January 2008 to December 2016. The credit register is highly representative of total banking sector loans, as shown in Figure A2.\textsuperscript{13}

In our baseline analysis we consider all loans to individuals, corresponding to 4.1 million observations at the lender-borrower-municipality-month level. For each loan we also know the amount in arrears, the borrower’s location (municipality and district), and other characteristics such as age, gender, marital status, and sector of employment (government or non-government).\textsuperscript{14} After cleaning the data, we have information on the local currency lending activities of banks, U-SACCOs, and other MFIs in relation to 177,829 unique individuals in 336 municipalities.\textsuperscript{15} Borrowers are identified with a unique numerical code which allows us to track their lending activity over time and across lenders.

Summary statistics for the key variables used in the regression analysis are reported in Table 1 for the sample of loans with complete information (except interest rates). We show the figures for all financial institutions and separately for U-SACCOs, commercial banks, and other MFIs. The

\begin{footnotesize}
\begin{enumerate}
  \item The original provider was a subsidiary of CRB Africa that was taken over in 2015 by TransUnion Africa Holdings, an international credit and information management provider.
  \item The figure compares total bank credit in billions of Rwandan francs (RWF) for all commercial banks operating in Rwanda from the credit register with aggregate statistics from the banks’ balance sheets. Aggregate bank balance sheet figures, representing total credit to individuals and firms, are available for the 16 active commercial banks operating in Rwanda over our sample period at quarterly frequency. To ensure comparability between the two series, we compute total bank credit in the credit register using loans to both individuals and firms in each quarter from the same 16 banks.
  \item The non-government employee category contains all individuals who do not work in the public sector.
  \item To ensure that we identify the borrower’s location correctly, we exclude from our analysis all borrowers in the 80 (out of 416) municipalities where (i) municipalities have the same name as districts (e.g., Nyarugenge); or (ii) municipalities have the same name as provinces (e.g., Kigali); or (iii) municipalities are not uniquely assigned to one district (e.g., Murambi). We also exclude loans extended in foreign currency, which account for less than 1% of total loans.
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average loan balance amounts to 2.8 million Rwandan francs (RFW) (approximately USD 3,000) and the average interest rate on outstanding loans is 18.4%. U-SACCOs provide smaller, shorter-term, and more expensive loans than other credit institutions. Commercial banks have the highest market share, accounting for half of all granted loans. U-SACCOs account for 24.7% of loans, and other MFIs for the remaining 25.2%. More than one third of borrowers are female, 23% are younger than 30 years old, and 10% are government employees.

Turning to municipality-level descriptive statistics, we collect four indicators of local economic and financial development (three of which are measured before the program and the fourth is time-invariant). To compare the differential impact of the program on financial access in regions with varying degrees of ex-ante (pre-program) bank presence, we use the number of bank branches per 1,000 adults measured in 2011, before the microcredit expansion program. On average, there are 5 branches per 100,000 adults, with significant spatial variation. Absent of indicators on output or consumption, we measure local economic activity with the share of population living in poverty—specifically, the poverty headcount ratio—and with night-time luminosity, a standard measure of economic activity at the national and sub-national levels (Henderson, Storeygard and Weil, 2012; Pinkovskiy and Sala-i Martin, 2016). The average poverty headcount ratio across municipalities is 42%, with a standard deviation of 13%. Night-time luminosity is computed using data from satellite images for 2011 (from the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce) and exhibits a great degree of spatial heterogeneity. Finally, we use remoteness from the country’s capital Kigali as a proxy for the ability of government agencies to reach municipalities for staff training and inspections of credit cooperatives. Distance to Kigali is measured as the travel time (in hours) by car on the shortest route from Kigali to the municipality centroid, computed through OpenStreetMaps.

4 The Microcredit Expansion Program and Financial Access

4.1 Empirical Strategy

We identify the effect of the microcredit expansion program on access to credit by exploiting the staggered implementation of the program generated by different U-SACCOs granting their first
loans in different months starting in late 2011. The time-series variation in exposure to the program is illustrated in Figure 1, which shows the number of institutions that granted their first loan each month. U-SACCOs started giving out loans in 297 out of 336 municipalities during our sample period (January 2008–December 2016), with the first two U-SACCOs doing so in November 2011 and the last one in April 2016.

A key identification assumption is that the timing of the program roll-out across municipalities is unrelated to (unobserved) credit demand. A systematic correlation between the timing of the implementation of the program and credit demand could arise if U-SACCO were set-up earlier in relatively more dynamic and economically developed areas, with potentially higher credit demand. In that case, endogeneity bias would lead to a spurious positive correlation between the opening of a U-SACCO and access to credit. Anecdotal evidence (including from discussions with the supervisory authority) suggests that the timing of U-SACCO openings was largely related to random logistical and administrative issues. To check this identifying assumption, we examine the correlation between the timing of U-SACCO openings and a wide range of observable local economic characteristics (namely, bank presence, night-time luminosity, and poverty). To this end, we estimate a survival model (Cox, 1972) in which the dependent variable is the waiting time (in months) until the granting of the first loan (the “event”) in a given municipality. For the 39 (\(= 336 - 297\)) municipalities in our sample that do not extend credit during the sample period, the model takes the “event” as not occurring. As seen in Table 2 (columns 1-3), the results reveal no statistical association between the timing of program implementation and local economic development. We also wish to rule out that the timing of the program implementation is related to the capacity of institutions such as government agencies and the central bank to reach municipalities for program-related inspections and assessments. Therefore, we include our measure of distance from Kigali (defined as travel time between the municipality and Kigali by car). Once again, the results show that there is no association between the timing of U-SACCO openings and remoteness from the capital (column 4).\(^{16}\)

The validity of our identifying assumption is robust to including these local economic characteristics separately or in a multivariate setting (column 5), as well as to including district fixed effects (top vs. bottom panel). These results suggest that the timing of the staggered implementation of the

\(^{16}\)The results are robust to measuring this distance using the shortest car route from Kigali in km or the geodesic distance in km between each municipality and Kigali.
microcredit expansion program is indeed “as good as random”.

Next we move to the program’s effects on access to finance. As discussed in Section 2.2, data from the FinScope surveys show that the microcredit expansion program coincided with an increase in financial inclusion for the overall population (Table A11). Here we ask if the program impacted access to finance by raising the probability of loan granting for previously unbanked individuals. Using a (balanced) panel dataset at the borrower-municipality-month level, we estimate the following specification:

\[
P(\text{Loan}_{imt}) = \nu + \beta \text{Post U-SACCO}_{mt} + \delta' X_i + \alpha_m + \phi_t + \epsilon_{imt}
\]  

where \(i\) denotes the individual, \(m\) the municipality, and \(t\) the year-month.\(^{17}\) \(\text{Loan}_{imt}\) is equal to 1 if individual \(i\) in municipality \(m\) has an outstanding loan with any financial institution at time \(t\), and 0 otherwise. \(X_i\) are time-invariant individual characteristics, including gender, marital status, age, and sector of employment (government or non-government). Our main variable of interest is the dummy variable \(\text{Post U-SACCO}_{mt}\), which is equal to 1 after a U-SACCO starts its lending activities in a given municipality \(m\) at time \(t\), and 0 beforehand. Municipality fixed effects \(\alpha_m\) control for unobserved time-invariant spatial factors that might correlate both with the timing of U-SACCO openings and with financial access. Time (year:month) fixed effects \(\phi_t\) absorb common time-varying shocks, such as changes in economic conditions affecting all municipalities at the same time. The coefficient of interest \(\beta\) is identified by comparing the probability of borrowers in municipality \(m\) having a loan before or after the U-SACCO in that municipality starts operating, relative to individuals in other municipalities that do not yet have an active U-SACCO. In other words, the control group comprises all the individuals in municipalities that do not have U-SACCOs which give out loans at time \(t\), even if they start doing so later on. In more demanding specifications, we add municipality-specific time trends—both linear and quadratic—to make sure our estimates are not confounded by differential trends in financial access across municipalities, or other unobserved time-varying municipality attributes e.g., credit demand, urbanization, economic development. We estimate 2 as a linear probability model with standard errors clustered at the municipality level.

\(^{17}\)We also examine the robustness of our results to setting up the balanced panel at yearly or quarterly frequency, see Table A2 and related discussion in Section 4.4.
4.2 Baseline Results

The baseline results reported in Table 3 show a positive and statistically significant impact of the microcredit expansion program on the probability that an individual obtains a loan. The first three columns refer to loans granted by all institutions (U-SACCOs, commercial banks, and other MFIs) and report results that sequentially add municipality and time (year:month) fixed effects (column 1), borrower controls (column 2), and municipality-specific linear time trends (column 3). The coefficient $\beta$ is precisely estimated across specifications and the point estimate becomes larger when the specifications include municipality-specific time trends such that the effect is identified by a deviation from trend in financial access that differs by municipality.\textsuperscript{18} The estimates indicate that the U-SACCO program raised the probability of an individual having an outstanding loan by 3.7 percentage points and this effect if statistically significant at the 1% level. This effect is economically sizable given that on average the share of individuals with an outstanding loan in the pre-program period is only 9.6%.\textsuperscript{19} Figure 2 illustrates this result by plotting the share of individuals in each municipality before and after the roll-out of the program.

To rule out potential anticipation effects which could undermine our identification strategy, we explore the dynamic effects of the U-SACCO program during the sample period. Specifically, we split the $\beta$ coefficient by the time that elapsed before and after the implementation of the program, considering intervals of one, two, and more than two years. The estimated coefficients and associated confidence intervals are depicted in Figure 3. The estimates show that the likelihood of having a loan is higher after the program and rises over time. The increasing magnitude of the effect over time suggests that the program had sustained effects on financial access as opposed to a one-off (transitory) effect. The chart also shows that the parallel trends assumption is likely to hold in our setting given that the point estimates before the program are close to zero and statistically insignificant.\textsuperscript{20}

During the roll-out of the program, the U-SACCOs likely compete for new clients with other

\textsuperscript{18}The results are robust to the inclusion of more flexible, non-linear quadratic municipality-specific time trends, which could pick up more complex convergence dynamics—see Table A3.

\textsuperscript{19}The coefficients on control variables indicate that male, single, older individuals, as well as government employees, are more likely to have access to credit.

\textsuperscript{20}Column 1 of Table A4 shows the estimated coefficients illustrated in Figure 3.
lenders in the local financial system. Therefore, the overall effect of the program may not be exclusively driven by U-SACCOs but also by other financial intermediaries (such as banks and other MFIs) through local competition effects. To explore this issue, we examine loans from U-SACCOs, commercial banks, and other MFIs separately in our preferred specification with municipality-specific time trends as in column 3 of Table 3. That is, the dependent variable is a dummy equal to 1 for individuals who have a loan at each given type of financial institution in a specific month. The results in columns 4–6 suggest that the rise in financial access is, on average, mostly driven by U-SACCOs themselves.

We plot the dynamics of this average effect for each type of lender in Figure 4. In addition to a lack of differential trends before the program for either type of financial institution, the figure shows two other important results. First, the main program effect is driven by U-SACCOs, with the likelihood of an individual having an outstanding loan rising in the first two years of the program and subsequently stabilizing at about 10 percentage points higher than in the pre-program period. Second, there are “spillover” effects of the program to commercial banks, which catch up with a lag. In fact, starting in the second year of the program, the probability of obtaining a loan from a commercial bank increases up to 3.5 percentage points more than in the pre-program period.

The lagged effect of bank lending is consistent with the idea that commercial banks reached out to a new customer base taking advantage of the fact the U-SACCO program, with the presence of the credit register reducing information asymmetries and allowing previously unbanked individuals to obtain credit, build credit history, and signal their creditworthiness. In fact, in a context of multiple and competing borrowers, the simple act of start borrowing (at U-SACCOs) could transmit a positive signal to other lenders (commercial banks), allowing borrowers to build a credit history (Kovrijnykh, Livshits and Zetlin-Jones, 2019). In addition, the fact that the lag with which commercial banks start lending is longer that the standard maturity of a U-SACCO loan (the median maturity is 12 months and banks start lending in the second year of the program) would suggest that they actually observe the repayment capacity to assess borrowers' creditworthiness.

Consistent with this notion, we observe that commercial banks expand their branch network in

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21 Columns 2 to 4 of Table A4 shows the estimated coefficients illustrated in Figure 4.
22 This is consistent with the descriptive evidence showing that most of the increase in the share of individuals with a loan—especially at U-SACCOs—happens in the first 18 months after the program roll-out (Figure A3).
the years following the roll-out of the microcredit expansion program, increasing their presence relatively more in municipalities with lower pre-program bank presence (measured by the number of branches per capita, see Figure 5, panel A). This expansion has also been concentrated in low-risk municipalities, defined as those with a low share of non-performing loans (Figure 5, panel B). The expansion of the branch network is also reflected in a reduction of the distance between borrowers and commercial bank branches. According to the FinScope surveys, the share of individuals for whom it takes less than 30 minutes to reach the nearest bank increased from 21% in 2012 to 25% in 2016 (FinScope, 2012, 2016).

The spillover effects to commercial banks could be the result of balance sheet capacity constraints faced by U-SACCOs, due to their relatively smaller size, insufficient funding, and borrowing limits, compared to commercial banks. As a result, U-SACCOs may be less able than commercial banks to improve loan terms as the relationship with a specific borrower matures (Cull, Demirgüç-Kunt and Morduch, 2014). We analyze this issue in detail in Section 6, which documents the transition of borrowers from U-SACCOs to commercial banks.

4.3 Spatial Heterogeneity

Our baseline results point to a significant positive average effect of the loan expansion program on access to credit. However, this effect likely varies with municipality attributes such as the level of financial inclusion prior to the introduction of U-SACCOs. In line with the literature highlighting the importance of higher branch intensity in demographic and geographic terms for economic development (e.g., Beck, Demirguc-Kunt and Martinez Peria, 2007), Bruhn and Love (2014) show that the positive impact of Banco Azteca’s opening of 800 bank branches on employment

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23 Using detailed bank-level data on the location of bank branches at the municipality level for the 16 active commercial banks in Rwanda from 2011 to 2016, we find that commercial banks increased the number of branches by 5.7% in high bank presence municipalities and by 11.2% in low bank presence municipalities—where low (high) bank presence municipalities are defined as those below (above) the 75th percentile of the distribution of the number of bank branches per 1,000 adults in the pre-program period.

24 All MFIs have to meet specific requirements as set up by the National Bank of Rwanda in the regulation of microfinance activity. In particular, “a microfinance institution, union or federation may not grant guarantees or loans, including overdrafts or credit facilities to the same natural person or legal entity or group for an amount exceeding 5% of its total net worth as established in its most recent financial statements. The ceiling is set at a maximum of 10% for savings and credit cooperatives whose non-performing overdue loans are under 5%. In no case may a single loan exceed 2.5% of the total deposits of the microfinance institution.” Moreover, U-SACCOs are generally not able to offer long-term loans as their funding consists almost entirely by callable deposits (the average maturity is about 5 months and the maximum maturity does not exceed 4 years).
and income is concentrated in Mexican municipalities that were relatively underserved by banks, as measured by branch penetration. Similarly, Agarwal, Alok, Ghosh, Ghosh, Piskorski and Seru (2017) show that the government-led Jan Dhan Yojana financial inclusion program in India increased account openings and bank lending relatively more in regions with lower bank branch presence and a higher share of unbanked households. As a result, we expect the increase in access to credit to be relatively larger in areas with lower financial access prior to the U-SACCO program.

To examine spatial heterogeneity in the average program effect, we first exploit variation across municipalities according to the pre-program number of bank branches per 1,000 adults in a given municipality. Then, we identify high- and low-income municipalities based on two alternative measures: the average night-time luminosity and the poverty headcount ratio, both measured before the program. Finally, we identify municipalities that are distant from the capital Kigali considering the travel time by car. In all cases, we follow Bruhn and Love (2014) and split each continuous variable around the 75th percentile of its distribution to create a low (below the 75th percentile) and high (above the 75th percentile) dummy variable, considering less developed and more remote areas as those below the 75th percentile.

The results are reported in Table 4. Across all measures, we observe that the program’s average effect on lending by U-SACCOs is much stronger in municipalities with lower ex-ante levels of financial and economic development and in more remote areas (panel A). These findings suggest that the impact of the loan expansion program was driven by increased access to credit to previously under-served individuals. The coefficients on the interaction term between the Post U-SACCO and the different dummy variables are all positive and significant, and generally larger in size than the standalone coefficient of the Post U-SACCO variable, meaning that the effect of the programs are at least as twice as large in less developed and remote areas than in more developed areas and in municipalities closer to Kigali. For instance, the probability of having a loan increased by 4.1 percentage points in low bank presence municipalities after the program, compared to 2 percent in high bank presence municipalities, a sizable increase given that the average share of individuals with a loan in the pre-program period in low bank presence municipalities was 7%. These differences are larger when considering the other measure of spatial heterogeneity. By contrast, when considering loans from other MFIs or commercial banks, there is almost no evidence of spatial heterogeneity.
4.4 Robustness and Falsification Tests

We run a series of robustness tests of our main results, which we report in the Appendix. First, we assess the sensitivity of our findings to different aggregations of the data. To this end, we organize the data as a balanced panel at the borrower-municipality-quarter or borrower-municipality-year levels (instead of borrower-municipality-month). The results are shown in Table A2 and indicate that the baseline effect of the program as well as the role of U-SACCOs are robust to these alternative data structures.

Second, we ensure our results are not driven by the (small number of) municipalities for which we never observe a U-SACCO active in the credit market during the sample period. As mentioned in Section 4.1, in the credit register we observe the lending activities of individuals residing in 336 municipalities. Among these municipalities, there is no loan-granting U-SACCO in 39 municipalities. To ensure our results are not driven by municipalities with loan-granting but non-reporting U-SACCOs, we drop these 39 municipalities from the sample. As shown in Table A5, our results are unchanged.

Third, we conduct a falsification test to rule out the potential concern that our results are driven by coincident events other than the implementation of the U-SACCO program. In this test we randomly assign the treatment across municipalities and over time. That is, for each municipality we randomly assign the program implementation date in the interval January 2008–December 2016 and repeat this exercise 100 times. Table A6 reports the average coefficients across simulations corresponding to the 100 random assignments of the $Post U$-SACCO variable across municipalities. The average estimated coefficient is very close to zero and statistically insignificant, suggesting that our main findings are not driven by a spurious correlation between the roll-out of the program and access to credit.

Fourth, we test the external validity of our results in a completely different dataset. We assemble data in the form of two cross-sections of individual-level financial access information from the 2012
and 2016 FinScope surveys. The main differences from the baseline analysis is that (i) we only have two time periods: 2012 and 2016; and (ii) borrower location is only available at the district (rather than municipality) level. The dependent variable is either a dummy equal to 1 for survey respondents with a savings account from a U-SACCO or a commercial bank, or for respondents with a loan from a U-SACCO or a commercial bank. Although we cannot exploit the staggered implementation of the program due to the low frequency of the data, we instead compare changes in access to savings and credit before and after program implementation across districts. The results, shown in Table A12, suggest that the probability of having a savings account and that of being granted a loan increased between 2012 and 2016 and that these results are driven by U-SACCOs, not commercial banks. This out-of-sample test confirms our previous micro-evidence that the loan expansion program increased access to finance.

4.5 Effects on Business Lending and Housing

To further document the economic impact of the microcredit expansion program, we test in this section whether the program is associated with an increase in local economic activity, measured by lending to formal firms, business lending to individuals, and mortgage lending. First, we use the data on borrowing firms in the credit register to test whether the increase in access to finance translates into a higher number of borrowing firms. Second, to further examine the effects on entrepreneurship, we look at individuals who take out loans for business purposes i.e., all loans classified as trade, business, or commerce. Third, we look at longer-term lending considering individuals with a mortgage, whose average maturity is 55 months, more than twice the average loan maturity in the sample (Table 1).
We run our tests exploiting the cross-sectional variation in the timing of the program roll-out and estimate the following specification on a panel dataset at the municipality-month level:

\[
Y_{mt} = \nu + \beta Post U-SACCO_{mt} + \delta' X_{mt} + \alpha_m + \phi_t + \epsilon_{mt}
\]

The dependent variable \(Y_{mt}\) is either: (i) the number of borrowing firms in municipality \(m\) at time \(t\) per 1000 adult population in the same municipality \(m\); (ii) the number of individuals (scaled by 1000 adult population) with loans for business purposes in municipality \(m\) at time \(t\); or (iii) the number of individuals (scaled by 1000 adult population) with a mortgage. As in the borrower-level regressions, the variable of interest is \(Post U-SACCO_{mt}\), which is equal to 1 in the post-program period starting when the U-SACCO begins its lending activities in a given municipality, and 0 in the pre-program period. The vector \(X_{mt}\) includes a set of control variables, constructed by averaging the individual characteristics used throughout the analysis (gender, marital status, age, and sector of employment) at the municipality-month level. Time fixed effects (\(\phi_t\)) absorb common shocks, while municipality fixed effects \(\alpha_m\) control for unobserved factors that may be correlated with the timing of U-SACCO openings and with the number of borrowing firms and of individuals taking out business loans or mortgages. The presence of potential different linear trends across municipalities is taken into account adding municipality-specific time trends.

The estimates of equation 2, with standard errors clustered at the municipality level, are reported in Table 5. For each dependent variable, we report the overall post-program effect (odd columns) and the effect split over time (even columns). The results indicate that the number of borrowing firms increases over time and becomes significantly higher than in the pre-program period two years after the roll-out of the microfinance expansion program. The effect of individual business loans and on mortgage lending materializes earlier and it is already evident one year after the program. This evidence suggests that the program has not only been able to foster access to credit by previously unbanked individuals, but it also generated spillovers to the local economy, in terms of formal and informal business creation as well as long-term mortgage lending.
5 Capacity Constraints at U-SACCOs

Dynamic incentives are a common feature of credit contracts in developing countries, especially in microfinance (Armendáriz and Morduch, 2010; Giné, Goldberg and Yang, 2012; Shapiro, 2015). Thus, before zooming in on switching loans, we look at repeated borrowing within U-SACCOs to test whether credit conditions—loan size, interest rate, and maturity—improve with the length of the lender-borrower relationship and how these conditions compare to what the borrower obtains when switching to a commercial bank. In other words, so far our analysis has focused on the effects of the microcredit expansion program on loan provision on the extensive margin—that is, to new borrowers. In this section, we instead focus on the intensive margin and examine how access to credit progressively changes after individuals obtain their first loan from a U-SACCO. Lacking collateral and with limited information sharing, a continuous sequence of loans could potentially help mitigate information asymmetries and translate into larger and better term loans.

Among first-time U-SACCO borrowers in our sample, we observe that 34 percent borrow more than once from the same U-SACCO. Specifically, we find that 21 percent of borrowers have 2 loans, 8 percent have 3 loans, and 5 percent have 4 or more loans. Among the group of first-time U-SACCO borrowers, 9 percent are also able to switch to commercial banks. In particular, 49 percent of those who move to commercial banks keep also their existing relationship with U-SACCOs, while the remaining 51 percent start borrow exclusively from banks. For the purpose of our analysis we treat these individuals as part of the same pool of switchers. Finally, we observe a very limited number of opposite transitions from commercial banks to U-SACCOs. Here we focus on the sub-sample of these individuals who switch and start borrowing from commercial banks. Specifically, we analyze how loan terms vary with the length of the lender-borrower relationship, and compare U-SACCOs with commercial banks. Given that informational opaqueness likely affects the majority of individuals in our sample, who have zero or limited credit history, we expect loan terms to improve with the length of the lending relationship, in the absence of hold-up problems (Bharath, Dahiya, Saunders and Srinivasan, 2011; Bos, de Haas and Millone, 2015).

To test for the presence of dynamic incentives at U-SACCOs, we compare how the loan amount, interest rate, and maturity evolve when individuals take out subsequent loans. Comparing loans
to the same borrower—the second, third, or fourth and subsequent loans to the first one obtained at a U-SACCO—we find that loan size and maturities tend to increase as the borrower-lender relationship matures (Table 6, panel A). In particular, the second loan is RWF 0.14 million larger and 21 days longer than the first loan. This effect increases progressively and the fourth (and subsequent loans) are, on average, RWF 0.8 million larger and 8 months longer than the initial loan. Considering that the average U-SACCO loan is of RWF 0.85 million and has a maturity of 15 months (Table 1), these effects are economically large. In terms of pricing, we do not observe any significant reduction in interest rates for the second and third loans, while from the fourth onward there is an average decrease of 2.3 percentage points, which correspond to about 10% of the average interest rate charged by U-SACCOs.

The increase of loan size and maturity and the reduction of loan rates as the length of the relationship between borrowers and the U-SACCO matures are in line with the presence of dynamic incentives in microfinance (Tedeschi, 2006; Shapiro, 2015), and with a large literature emphasizing the benefits of relationship lending, especially for informationally opaque borrowers and in a presence of a credit register (Boot and Thakor, 1994; Bharath, Dahiya, Saunders and Srinivasan, 2011; Bos, de Haas and Millone, 2015).

However, comparing the last loan obtained at the U-SACCO with the first loan that the same borrower gets from a commercial bank suggests that institutional and balance sheet constraints limit U-SACCOs’ capacity to set loan terms close to what commercial banks can offer. Considering all switchers, the comparison shows that the premium offered by commercial banks in terms of loan size, interest rate, and maturity is as large as what borrowers can obtain after taking at least four loans at U-SACCOs (Table 6, panel A). Interestingly, if we split the sample between individuals who switch to commercial banks after only one loan at U-SACCOs and those who switch after multiple loans, we see that the premium that they get when borrowing from commercial banks is larger for latter, consistent with the idea that repeated U-SACCO borrowers are able to benefit from building a longer credit history.
6 Switching to Commercial Banks

The first part of our analysis documents the impact of the microcredit expansion program on financial inclusion. We show that the program increased the probability of a borrower’s access to loans, particularly in less developed municipalities, and largely through the newly set-up U-SACCOs. Importantly, we also find that U-SACCOs face balance sheet constraints in meeting increased loan demand and show that commercial banks expanded their branch network and credit after the first year of the program. Together, these findings point towards the presence of positive spillover effects from microfinance expansions to commercial banks—a novel result in the literature.

In this section, we go a step further and examine in detail the transition of first-time borrowers—that is, borrowers who obtained their first loan from a U-SACCO set up through the microcredit expansion program—from the microfinance to the commercial banking sector. Specifically, we examine the characteristics of loans to borrowers who switch from U-SACCOs to commercial banks relative to loans granted to similar borrowers who did not switch and kept borrowing from U-SACCOs, or similar borrowers who were already at commercial banks. In line with the framework of Ioannidou and Ongena (2010), we define switching loans as new loans granted to individuals who (i) had a borrowing relationship with a U-SACCO; and (ii) established a new borrowing relationship with a commercial bank. Using this definition, we identify 2,186 switching loans from first-time borrowers at U-SACCOs to commercial banks, corresponding to 9% of first-time borrowers at U-SACCOs who were granted a subsequent loan. To put this figure into perspective, it is important to highlight that switching banks is rare in both developing and developed economies. Specifically, according to Novantas only 4% and 8% of UK and US customers, respectively, switch bank in a given year (Economist, 2019). This figure is also comparable with previous studies focusing exclusively on the switching activity of firms e.g., 4.5% per year in Bolivia (Ioannidou and Ongena, 2010), 5.9% per year in Portugal (Bonfim, Nogueira and Ongena, 2017).

A visual inspection of the data shows that the switching from MFIs (U-SACCOs and other MFIs combined) to commercial banks increased substantially after the microcredit expansion program (Figure 6). This result holds also in a more formal regression analysis, similar to the baseline but run at the municipality-month level as in Table 5. Taking the number of switching loans (or its
share over the total number of borrowers or population) as dependent variable, the results reported in Table A7 show that the program leads to an increase in the number of individuals who move from MFIs (U-SACCOs and other MFIs) to commercial banks. Consistent with the evidence shown on the spillover effects of the program to commercial banks, we find that the switching activity kicks-in starting in the second year after the microcredit expansion program.

6.1 Switching Analysis: Empirical Strategy

To precisely pin down the effect of switching on credit conditions, ideally we would like to compare the terms of switching loans (loans to a borrower \( i \) that was in a relationship with a given U-SACCO but that switches and takes up a new loan at time \( t \) from a commercial bank) with those of loans offered by the U-SACCO to the same borrower \( i \) in the same period \( t \). Given that we are unable to observe the loan conditions offered by the U-SACCO at the same time \( t \) to the vast majority of borrowers that graduate to banks, we compare switching loans with two alternative control groups: (i) new loans granted by U-SACCOs to similar borrowers who do not switch (non-switching borrowers); and (ii) new loans extended by banks to similar existing bank borrowers.

Loan conditions across switchers (treated group) and other borrowers (control groups) may vary for multiple reasons, including borrower characteristics and economic conditions. To alleviate potential concerns that such factors may bias our results, we use the Abadie and Imbens (2011) bias-corrected nearest-neighbor matching estimator throughout. Specifically, we match loans that are granted in the same month to borrowers of the same age group, gender, marital status, and employment status. Within the set of borrowers who are matched “exactly” on these characteristics, we select the nearest-neighbours of each switching loan based on the loan amount, interest rate and/or maturity, the number of months during which the individual has been in a credit relationship, the number of lenders the borrower has, as well as the (pre-program) characteristics of the municipality where the borrower resides (bank presence, economic development, poverty, and distance from Kigali).\(^{28}\)

\(^{28}\)The results are robust to the use of propensity score matching. Specifically, in the first step we match “exactly” loans across treated and control groups granted in the same month. Within this sample of loans, we carry out propensity score matching that incorporates the same set of borrower, loan, and municipality-level characteristics as in our baseline specification—see Table A8.

24
Table 7 reports summary statistics for the treatment group and the two alternative control groups. Consistent with the evidence of Table 6, switching loans given by commercial banks to borrowers who switched from U-SACCOs are larger, have lower interest rates and longer maturities compared to new loans given by SACCOs to non-switchers. By contrast, switching loans are on average considerably smaller than new loans to individuals already at banks, namely, RWF 1.563 million (around USD 1,750) compared to RWF 3.852 million.

6.2 Results for Switching Loans

First, we examine the loan terms of switching loans (new loans to borrowers who switch from a first-time loan at U-SACCOs to a commercial bank) compared to similar borrowers who do not switch and obtain similar loans from any U-SACCOs in the same month (non-switchers). As shown in columns 1–3 of Table 8, switchers obtain significantly larger, cheaper, and longer-term loans relative to non-switchers, consistent with the presence of capacity constraints at microlenders. These effects are economically sizable: the coefficient magnitudes suggest that switching loans are on average larger by RWF 0.453 million, cheaper by 249 basis points, and their maturity is longer by 5 months. These findings are robust to further restricting the control group to loans that are granted by the same U-SACCO the switching borrower left—see columns 4–6 of Table 8. In this case, the results on interest rates are significantly larger, as the discount from switching is 564 basis points.

Next, we compare switching borrowers from a U-SACCO to a commercial bank with new loans granted by the same bank in the same month to borrowers who were already in commercial banks. Table 9 reports the results. Switching loans have similar interest rates to loans granted to the control group, but considerably longer maturities and smaller principal amounts. The coefficients in columns 1 and 3 indicate that switching loans are on average smaller by RWF 1 million and have a 2.1 months longer maturity than loans granted by commercial banks to their existing borrowers. Given that loan conditions tend to improve as the bank-borrower relationship matures, these results could be driven by differences in relationship length between switchers and individuals already in a relationship with the switchers’ destination banks. We take into account this possibility defining a narrower control group comprising new loans granted by the same bank in the same month to
borrowers who were already in commercial banks, but who switched from another commercial bank that month (i.e., U-SACCO-to-bank A switchers vs. bank B-to-bank A switchers). As shown in columns 4–6 of Table 9, the coefficients on loan amount and maturity maintain the same sign, but results lose statistical significance, suggesting that the reduction in loan size at the beginning of the relationship is not specific to the borrower who switch from U-SACCOs to banks, but instead common across all switchers to a new bank.

Non Performing Loans. A key question when analyzing the transition of borrowers from the microfinance sector to commercial banks is borrower riskiness.\textsuperscript{29} On the one hand, if borrowers who switch from MFIs to commercial banks are riskier than existing bank borrowers, a rapid expansion in access to microcredit could affect the asset quality of commercial banks, possibly threatening financial stability. On the other hand, commercial banks could take advantage of the screening role played by microlenders and select the most creditworthy individuals from the pool of microfinance borrowers.

We examine the issue of borrower riskiness using loan outcomes. Specifically, we treat a loan as non performing (NPL) if it goes into arrears for more than 90 days. We consider three different windows: arrears emerging within 1 year from loan origination, within 2 years, or any time until maturity. Comparing the performance of switching and non-switching loans as reported in Table 10, we find that switching loans are less likely to become non-performing compared to similar loans extended by U-SACCOs (columns 1-3). In addition, switching loans are not riskier than similar loans granted by commercial banks (columns 4-6). One may argue that loans extended to switchers are less likely to become non-performing than similar loans granted to similar individuals who do not switch because switchers use the new loan obtained by the bank to pay off their U-SACCO loan. To test for this hypothesis, we replicate the analysis dividing the switchers between those that start lending at a bank keeping their lending relationship at the U-SACCO and those who substitute U-SACCO lending with bank lending. We find that the overall effect shown in Table 10

\textsuperscript{29}Recent literature emphasizes the risks associated with rapid expansions of microfinance and credit provision (e.g., Banerjee, 2013; Zinman, 2014). Chen, Rasmussen and Reille (2010) document that NPLs reached 7% in Bosnia-Herzegovina, 10% in Morocco, 12% in Nicaragua, and 13% in Pakistan in 2009. Most prominently, the state of Andhra Pradesh in India saw a major crisis in the MFI sector in 2010 following a rapid expansion of the microcredit sector. The characteristics of the crisis resemble those of a classical credit boom and bust cycle, where the high growth and profitability of Indian MFIs led to excessive borrowing and indebtedness among low-income clients (Beck, 2015).
is confirmed regardless of the switchers keeping or not the existing relationship with the U-SACCO (Table A9). Interestingly, we confirm that switchers are not riskier than existing bank borrowers, even considering separately those who maintain or not the relationship with the U-SACCO.

Overall, these results suggest that borrowers who switch from U-SACCOs to commercial banks have credit demand that cannot be met by U-SACCOs. When they switch to commercial banks, these borrowers obtain larger and longer-term loans than the loans they might have obtained from U-SACCOs. Furthermore, commercial banks seem to engage in “cream-skimming” behavior when they select new clients from the U-SACCO borrower pool, focusing on low-risk borrowers as measured by ex-post loan performance. This result is reflected in the aggregate statistics, which show an increase in the ratio of NPLs over total loans for U-SACCOs between December 2014 (7.1%) and June 2016 (12.5%), while NPLs in the banking system remained flat (National Bank of Rwanda, 2016).

**Results for Post-Switching Loans.** To further analyze the transition of SACCO borrowers to commercial banks, we also exploit the time dimension of the credit register and analyze subsequent loans that switching borrowers obtain from their new commercial bank. Using a similar approach to the previous section, we compare the terms of all subsequent loans granted to a U-SACCO-to-bank switcher with the terms of the first loan granted to the same switcher by the same commercial bank. Overall, we do not find any significant effect of the length of the relationship on loan terms (Table A10). The lack of difference between the interest rate spread (interest rate minus the repo rate) charged on initial and subsequent loans (Panel B) is particularly interesting given that the discount switchers enjoy for their first loan at a commercial bank persists during the lending relationship. This result is inconsistent with a hold-up problem (as documented by Ioannidou and Ongena (2010) for firms in Bolivia), but it is consistent with Gietzen (2016), who shows that information sharing mitigates hold-up problems in the African context.

30 However, loans extended to borrowers who keep the lending relationship with the U-SACCO are less likely to become non-performing than those granted to who starts borrowing exclusively from banks. This result would suggest that a part of the effect, even if small, could be due by the fact that the bank loan is used to repay the U-SACCO loan.

31 Formally, we take an exact matching approach of the loans within borrower and bank. Subsequent loans are grouped into buckets depending on the date the loan was granted (less than 6 months, 7 to 12 months, 13 to 24 months, and more than 24 months after the first loan).
7 Conclusion

We exploit the staggered implementation of a large-scale government-supported microfinance expansion program to analyze the program’s effects on financial access and the transition of previously unbanked individuals to commercial banks.

Using data from a large administrative dataset comprising the universe of individual loans granted by all financial institutions in Rwanda between 2008 and 2016, we show that the microfinance expansion program raised the likelihood of access to bank loans for the previously unbanked population, especially in underdeveloped municipalities. The overall program effect is driven by the newly set-up savings and credit cooperatives (U-SACCOs) and has positive effects on local economic activity, as shown by the increase in long-term mortgage lending and in loans to firms and individual entrepreneurs. Importantly, we also document positive spillover effects of the program on commercial banks, which increased lending at the extensive margin by expanding their branch network in under-served low-risk areas starting about one year after the roll-out of the program.

Our evidence also suggests that there are dynamic incentives in microfinance, even though the returns to relationship lending at U-SACCOs are lower than what a borrower can obtain by switching to commercial banks. As a result, and consistent with commercial banks’ pick-up one year into the program, a significant share of first-time borrowers at U-SACCOs who need additional loans switch to banks, which grant them larger, cheaper, and longer-term loans than the loans they might have received from U-SACCOs. Commercial banks grant loans to borrowers who are the least risky among U-SACCO borrowers, with these switchers being as risky as similar existing bank borrowers.

Our analysis supports the notion that microfinance institutions which target low-income individuals have an important screening role for the unbanked population and help them building a credit history through lending. In addition, creditworthiness is signaled to commercial banks through the credit reference bureau, which provides lenders with access to information on individuals’ borrowing and payments history, including defaults. In turn, commercial banks increase their branch network in previously under-served areas and expand their customer base by cream-skimming low-risk borrowers from the microfinance sector and offering more attractive loan terms.

Our findings suggest that the expansion of microfinance sector, coupled with a well-functioning
credit reference bureau, can mitigate information frictions in credit markets and play a crucial role in financial development. At the same time, given the transition of the least risky borrowers to commercial banks, such expansion may have the unintended consequence of leaving microlenders with the pool of the most risky borrowers, undermining the financial viability of their business model and potentially posing future financial stability risks.

References


ZINMAN, J. (2014). Consumer credit: Too much or too little (or just right)? *The Journal of Legal Studies, 43* (S2), S209–S237.
Figure 1: Staggered Implementation of SACCO Program

Notes: The figure plots the number of U-SACCOs that granted their first loan in a given month. Data source: Rwandan Credit Reference Bureau.
Figure 2: Share of individuals with a loan before and after the U-SACCO program

Notes: The figure shows, by municipality, the number of individuals with an outstanding loan per 1,000 adult inhabitants, before and after the microcredit expansion program. The pre- and post-program period are defined using as a threshold the month in which the U-SACCO grants its first loan in a given municipality. Data source: Rwandan Credit Reference Bureau.
Figure 3: Probability of getting a loan, before and after the program

Notes: The figure shows the effect of the U-SACCO program on the probability of individual having a loan in any institution (U-SACCOs, other MFIs, or commercial banks). The chart plots the estimated coefficients and the associated 90 percent confident intervals of the interaction terms between the U-SACCO variable and a set of time dummies, as reported in Table A4. The vertical line corresponds to the month in which each U-SACCO granted the first loan in the municipality. Data source: Rwandan Credit Reference Bureau.
Figure 4: Probability of getting a loan, by institution, before and after the program

Notes: The figure shows the effect of the U-SACCO program on the probability of individual having a loan, separately, in U-SACCOs, other MFIs, and commercial banks. The chart plots the estimated coefficients and the associated 90 percent confident intervals of the interaction terms between the U-SACCO variable and a set of time dummies, as reported in Table A4. The vertical line corresponds to the month in which each U-SACCO granted the first loan in the municipality. Data source: Rwandan Credit Reference Bureau.
Figure 5: Commercial banks’ branch expansion after the program

(a) Low vs high bank presence municipalities

(b) Role of NPLs

Notes: The figure in Panel (a) shows the growth of branches of commercial banks in municipalities with low (solid line) vs. high (dotted line) bank presence in the pre-program period. The number of branches are calculated relative to the year the U-SACCO started operating in a given municipality—set at 100 for both low and high bank presence municipalities. Low (high) bank presence municipalities are defined as those below or equal to (above) the 75th percentile of the distribution of bank branches per 1,000 adults in the pre-program period (as of 2011). The figure in Panel (b) further decomposes the low and high bank presence municipalities in those with low and high non-performing loans (NPLs). Low (high) NPLs municipalities are defined as those for which the share on NPLs over total loans is below or equal to (above) the 75th percentile of the sample distribution. Data source: Rwandan Credit Reference Bureau.
Figure 6: Switching activity before and after the U-SACCO program

Notes: The figure shows, by municipality, the number of individuals who switch from a MFI (U-SACCO and other MFIs) to a commercial bank per 1,000 borrowers, computed before and after the microcredit expansion program. The pre- and post-program period are defined using as threshold the month in which the U-SACCO grants its first loan in a given municipality. Data source: Rwandan Credit Reference Bureau.
Table 1: Summary Statistics

Notes: The table presents summary statistics for the main variables in our sample for which all information is available (except interest rates). The sample period is 2008:M1 to 2016:M12 and includes 177,853 unique individuals in 336 municipalities who borrow from commercial banks, U-SACCOs, and other MFIs. Loan exposure and principal amounts are expressed in million of Rwandan franc (RWF). The dummy variable Female is equal to 1 for female borrowers and 0 for male borrowers. The dummy variable Young takes value 1 for individuals below 30 years of age, and 0 otherwise. The Single dummy is equal to 1 for single individuals and 0 for any other marital status. Government Employee is a dummy equal to 1 for government employees and 0 for any other occupation as well as for those unemployed. Bank Presence is measured by the number of bank branches per 1000 adult population in the pre-program period (2011). The municipality-specific nightlights intensity is calculated before the program (2011), while the poverty headcount ratio refers to 2013. Distance to the capital is measured as travel time (in hours) by car of the shortest route from Kigali to the municipality centroid. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA), OpenStreetMaps.

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Table 2: The Timing of the U-SACCO Program and Local Conditions

Notes: The table presents the coefficient estimates of a proportional hazard model (Cox, 1972) where the dependent variable is the time (in months) until the occurrence of the first loan extended by a U-SACCO in a given municipality. The explanatory variables are defined at the municipality level and are measured in the pre-period (i.e., before the first U-SACCO loan in the municipality): (i) Bank presence is defined as the number of bank branches per 1000 adult inhabitants in 2011; (ii) Nightlights measure night-time luminosity in 2011 as a proxy of local economic development; (iii) Poverty is defined by the headcount ratio; and (iv) Distance to the capital, measured as travel time (in hours) by car of the shortest route from Kigali to the municipality centroid. Standard errors clustered at the municipality level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA), OpenStreetMaps.

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|                               | (1)   | (2)   | (3)   | (4)   | (5)   |
| Bank Presence                 | -1.1717 | -1.2524 |
|                               | (1.010) | (1.061) |
| Nightlights                   | -0.0046 | -0.0076 |
|                               | (0.008) | (0.010) |
| Poverty Headcount Ratio       | -0.0018 | -0.0070 |
|                               | (0.005) | (0.006) |
| Distance to the Capital       | 0.0105  | 0.0001 |
|                               | (0.061) | (0.064) |
| District FE                   | Yes   | Yes   | Yes   | Yes   | Yes   |
| No. Observations              | 336   | 336   | 336   | 336   | 336   |
Table 3: Impact of the U-SACCO Program on Access to Credit

Notes: The table presents coefficient estimates of model 2 where the dependent variable is a dummy equal to 1 for individuals who, at time $t$, have an outstanding loan with any financial institution (columns 1-3) or specifically U-SACCOs (column 4), commercial banks (column 5), or other MFIs (column 6). Post U-SACCO is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month, and 0 otherwise. Borrower characteristics include a set of dummies for gender (equal to 1 for females and 0 for males), marital status (equal to 1 for single individuals and 0 for any other marital status), age (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). As indicated in the bottom rows, different specifications include a different set of municipality and time fixed effects, and municipality-specific linear time trends. The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Data source: Rwandan Credit Reference Bureau.

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Municipality FE | Y | Y | Y | Y | Y | Y
Time (Year:month) FE | Y | Y | Y | Y | Y |
Borrower Controls | N | Y | Y | Y | Y |
Municipality Time Trends | N | N | Y | Y | Y |
No. Observations | 19,205,532 | 19,205,532 | 19,205,532 | 19,205,532 | 19,205,532 | 19,205,532 |
No. Municipalities | 336 | 336 | 336 | 336 | 336 | 336 |
No. Individuals | 177,829 | 177,829 | 177,829 | 177,829 | 177,829 | 177,829 |
Adjusted $R^2$ | 0.169 | 0.201 | 0.206 | 0.143 | 0.112 | 0.155 |
Table 4: Impact of the U-SACCO Program on Access to Credit – Cross Sectional Heterogeneity

Notes: The table presents coefficient estimates of model 2 where the dependent variable is a dummy equal to 1 for individuals who, at time \( t \), have an outstanding loan with a U-SACCOs (panel A), or commercial banks or other MFIs (panel B). Post U-SACCO is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month, and 0 otherwise. The Post U-SACCO dummy is interacted with a set of dummy variables which identify municipalities: (i) with low bank presence; (ii) with low economic development; (iii) with high poverty; and (iv) distant from the capital Kigali. To define the low bank presence and low economic development municipalities, we split the continuous variables around the 75\(^{th}\) percentile of the sample distribution. Specifically, Low Bank Presence is equal to 1 if the number of bank branches per 1000 adults in the pre-period is below the 75\(^{th}\) percentile, and 0 otherwise; Low Economic Development is equal to 1 if nightlights in the pre-period is below the 75\(^{th}\) percentile, and 0 otherwise; High Poverty is equal to 1 if the inverse of the poverty headcount ratio in the pre-period is below the 75\(^{th}\) percentile, and 0 otherwise; Long Distance is equal to 1 if the inverse of the travel time by car from Kigali to a municipality centroid in the pre-period is below the 75\(^{th}\) percentile, and 0 otherwise. Each regression includes municipality and time fixed effects, as well as municipality-specific time trends. Borrower characteristics include a set of dummies for gender (equal to 1 for females and 0 for males), marital status (equal to 1 for single individuals and 0 for any other marital status), age (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA).

<table>
<thead>
<tr>
<th>Panel A: U-SACCOs</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dummy = 1 if individual has a Loan in a U-SACCO</td>
<td>0.0201** (0.00956)</td>
<td>0.0160* (0.00866)</td>
<td>0.0157* (0.00837)</td>
<td>0.0160* (0.00875)</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.0214** (0.00922)</td>
<td>0.0271*** (0.00858)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Low Bank Presence</td>
<td>0.0276*** (0.00818)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Low Development</td>
<td>0.0274*** (0.00867)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Banks and Other MFIs</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dummy = 1 if individual has a Loan in a Bank or Other MFI</td>
<td>0.0117* (0.00644)</td>
<td>0.00516 (0.00614)</td>
<td>0.00802 (0.00616)</td>
<td>0.00134 (0.00643)</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>-0.00725 (0.00611)</td>
<td>0.00107 (0.00576)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Low Development</td>
<td>-0.00265 (0.00588)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Long Distance</td>
<td></td>
<td></td>
<td></td>
<td>0.00607 (0.00608)</td>
</tr>
</tbody>
</table>

| Municipality FE & Time Trends | Y | Y | Y | Y |
| Time (Year:month) FE | Y | Y | Y | Y |
| Borrower Controls | Y | Y | Y | Y |
| No. Observations | 19,205,532 | 19,205,532 | 19,205,532 | 19,205,532 |
| No. Municipalities | 336 | 336 | 336 | 336 |
| No. Individuals | 177,829 | 177,829 | 177,829 | 177,829 |
Table 5: Impact of the U-SACCO Program on Business and Mortgage Lending

Notes: The table presents coefficient estimates of a regression at the municipality-month level where the dependent variable is, alternatively: (i) the number of borrowing firms in the credit register in a given municipality and month, scaled by total population in the municipality (columns 1–2); (ii) the number of individuals in a given municipality and month with loans for business purposes, scaled by total population in the municipality (columns 3–4); and (iii) the number of individuals with a mortgage in a given municipality and month, scaled by total population in the municipality (columns 5–6). Post U-SACCO is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month, and 0 otherwise. In even columns, the coefficient on the Post U-SACCO dummy is split by time that elapsed since the program implementation. All regressions include municipality and time fixed effects, municipality-specific linear time trends, and a set of additional control variables including the share of borrowers who are female, single, young (defined as those who are less than 30-year old) and government employed, computed at the municipality-month level. Standard errors, clustered at the municipality level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data source: Rwandan Credit Reference Bureau.

<table>
<thead>
<tr>
<th></th>
<th>Borrowing Firms</th>
<th>Individual Business Loans</th>
<th>Mortgages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># firms/population</td>
<td># business loans/population</td>
<td># mortgages/population</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.0792</td>
<td>0.0680</td>
<td>0.0280</td>
</tr>
<tr>
<td></td>
<td>(1.720)</td>
<td>(0.0609)</td>
<td>(0.0217)</td>
</tr>
<tr>
<td>Post U-SACCO [t+0,t+12]</td>
<td>0.683</td>
<td>0.0847</td>
<td>0.0288</td>
</tr>
<tr>
<td></td>
<td>(1.729)</td>
<td>(0.0609)</td>
<td>(0.0223)</td>
</tr>
<tr>
<td>Post U-SACCO [t+13,t+24]</td>
<td>3.898</td>
<td>0.404***</td>
<td>0.0957**</td>
</tr>
<tr>
<td></td>
<td>(3.302)</td>
<td>(0.103)</td>
<td>(0.0388)</td>
</tr>
<tr>
<td>Post U-SACCO [&gt; t+24]</td>
<td>7.724*</td>
<td>0.506***</td>
<td>0.0999*</td>
</tr>
<tr>
<td></td>
<td>(4.435)</td>
<td>(0.122)</td>
<td>(0.0537)</td>
</tr>
<tr>
<td>Municipality FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Time (Year:month) FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Borrower Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Municipality Time Trends</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>No. Municipalities</td>
<td>336</td>
<td>336</td>
<td>336</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.956</td>
<td>0.956</td>
<td>0.725</td>
</tr>
</tbody>
</table>
Table 6: Multiple Loans at U-SACCOs and Switching to Banks

Notes: The table presents within-borrower mean comparison tests of loan terms (loan amount, interest rate spread, and loan maturity). The interest rate spread is the interest rate on the loan minus the repo rate. In panel A we consider individuals with multiple loans at the U-SACCO before they switch to commercial banks and compare: (i) the second loan at the U-SACCO with the first one; (ii) the third loan at the U-SACCO with the first one; and (iii) the fourth loan at the U-SACCO (or the average of loan terms of the fourth and any subsequent loans) with the first one. In panel B we consider the same individuals who switched from U-SACCOs to commercial banks but instead compare the switching loan at the bank with the last loan obtained at the U-SACCO before switching. We consider all switchers (first column) and then separately individuals who switched after only one loan at the U-SACCO and those who switched after having taken multiple loans at the U-SACCO. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data source: Rwandan Credit Reference Bureau.

**Panel A: Subsequent Loans vs. First Loan at U-SACCO Before Switching**

<table>
<thead>
<tr>
<th></th>
<th>2nd – 1st loan</th>
<th>3rd – 1st loan</th>
<th>4th (&amp; more) – 1st loan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan Amount</td>
<td>0.139***</td>
<td>0.318***</td>
<td>0.772***</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.055)</td>
<td>(0.079)</td>
</tr>
<tr>
<td>No. Subsequent Loans</td>
<td>725</td>
<td>273</td>
<td>2,373</td>
</tr>
<tr>
<td>No. First Loans</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
</tr>
<tr>
<td>Interest Rate Spread</td>
<td>1.299</td>
<td>-0.397</td>
<td>-2.362***</td>
</tr>
<tr>
<td></td>
<td>(0.917)</td>
<td>(2.063)</td>
<td>(0.580)</td>
</tr>
<tr>
<td>No. Subsequent Loans</td>
<td>244</td>
<td>87</td>
<td>1,136</td>
</tr>
<tr>
<td>No. First Loans</td>
<td>1,056</td>
<td>1,056</td>
<td>1,056</td>
</tr>
<tr>
<td>Loan Maturity</td>
<td>0.699***</td>
<td>1.220**</td>
<td>8.289***</td>
</tr>
<tr>
<td></td>
<td>(0.243)</td>
<td>(0.499)</td>
<td>(0.399)</td>
</tr>
<tr>
<td>No. Subsequent Loans</td>
<td>725</td>
<td>273</td>
<td>2,373</td>
</tr>
<tr>
<td>No. First Loans</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
</tr>
</tbody>
</table>

**Panel B: Switching Loan at Bank vs. Last Loan at U-SACCO**

<table>
<thead>
<tr>
<th></th>
<th>All Switchers</th>
<th>Switchers with multiple loans</th>
<th>Switchers with one loan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan Amount</td>
<td>0.718***</td>
<td>0.625***</td>
<td>0.906***</td>
</tr>
<tr>
<td></td>
<td>(0.078)</td>
<td>(0.067)</td>
<td>(0.194)</td>
</tr>
<tr>
<td>No. Switching Loans</td>
<td>2,186</td>
<td>1,461</td>
<td>725</td>
</tr>
<tr>
<td>No. Previous Loans</td>
<td>2,186</td>
<td>1,461</td>
<td>725</td>
</tr>
<tr>
<td>Interest Rate Spread</td>
<td>-2.602***</td>
<td>-2.165***</td>
<td>-2.819***</td>
</tr>
<tr>
<td></td>
<td>(0.606)</td>
<td>(0.691)</td>
<td>(1.066)</td>
</tr>
<tr>
<td>No. Switching Loans</td>
<td>981</td>
<td>685</td>
<td>296</td>
</tr>
<tr>
<td>No. Previous Loans</td>
<td>981</td>
<td>685</td>
<td>296</td>
</tr>
<tr>
<td>Loan Maturity</td>
<td>8.309***</td>
<td>7.996***</td>
<td>8.879***</td>
</tr>
<tr>
<td></td>
<td>(0.413)</td>
<td>(0.474)</td>
<td>(0.731)</td>
</tr>
<tr>
<td>No. Switching Loans</td>
<td>2,186</td>
<td>1,461</td>
<td>725</td>
</tr>
<tr>
<td>No. Previous Loans</td>
<td>2,186</td>
<td>1,461</td>
<td>725</td>
</tr>
</tbody>
</table>
Table 7: Switching Analysis – Treatment vs. Control Groups

Notes: The table presents average loan and borrower characteristics for the treatment (column 1) and control groups (columns 2-3) in the switching analysis described in Section 6. Column 1 refers to borrowers who switch from a U-SACCO to a commercial bank, column 2 to U-SACCO borrowers who do not switch, and column 3 to all commercial bank borrowers. The dummy variable Young Borrower takes value 1 for individuals below 30 years of age, and 0 otherwise. The dummy variable Female Borrower is equal to 1 for female borrowers and 0 for male borrowers. The Single Borrower dummy is equal to 1 for single individuals and 0 for any other marital status. Government Employee is a dummy equal to 1 for government employees and 0 for any other occupation as well as for those unemployed. The Number of Months the Borrower is Banked measures the time since an individual has taken the first loan with any financial institution. Multiple Banking Relationships is a dummy that identifies individuals with more than one banking relationship in a given month. Bank Presence in a Municipality is measured by the number of bank branches per 1000 adult population in the pre-program period (as of 2011). Nightlights in a Municipality is the nightlight intensity calculated before the program (as of 2011), while the Poverty Headcount Ratio refers to 2013. Distance to the Capital is measured as travel time (in hours) by car of the shortest route from Kigali to the municipality centroid. The loan amount is expressed in million of Rwandan franc (RWF), the interest rate in percentage points and the maturity in months. The dataset captures new loans. *** p<0.01, ** p<0.05, * p<0.1 for two-sided t-tests of equality of means between the treatment and control group. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA), OpenStreetMaps.

<table>
<thead>
<tr>
<th></th>
<th>Switching Loans (U-SACCO → Banks)</th>
<th>New Loans from U-SACCOs to Non-Switchers</th>
<th>New Loans from Banks to Non-Switchers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=2,186)</td>
<td>(n=46,143)</td>
<td>(n=175,097)</td>
</tr>
<tr>
<td>Young Borrower</td>
<td>0.194</td>
<td>0.224***</td>
<td>0.226***</td>
</tr>
<tr>
<td>Female Borrower</td>
<td>0.268</td>
<td>0.263</td>
<td>0.4***</td>
</tr>
<tr>
<td>Single Borrower</td>
<td>0.096</td>
<td>0.099</td>
<td>0.113***</td>
</tr>
<tr>
<td>Government Employee</td>
<td>0.090</td>
<td>0.075**</td>
<td>0.125***</td>
</tr>
<tr>
<td># Months the Borrower is Banked</td>
<td>19.402</td>
<td>10.87***</td>
<td>13.438***</td>
</tr>
<tr>
<td>Multiple Banking Relationships</td>
<td>0.471</td>
<td>0.132***</td>
<td>0.096***</td>
</tr>
<tr>
<td>Bank Presence in Municipality</td>
<td>0.052</td>
<td>0.053</td>
<td>0.101***</td>
</tr>
<tr>
<td>Nightlights in Municipality</td>
<td>3.410</td>
<td>3.473</td>
<td>14.114***</td>
</tr>
<tr>
<td>Poverty Headcount Ratio in Municipality</td>
<td>40.038</td>
<td>40.893***</td>
<td>30.454***</td>
</tr>
<tr>
<td>Distance to Capital from Municipality</td>
<td>88.257</td>
<td>88.855</td>
<td>71.066***</td>
</tr>
<tr>
<td>Loan Amount</td>
<td>1.563</td>
<td>0.672***</td>
<td>3.852***</td>
</tr>
<tr>
<td>Loan Interest Rate</td>
<td>20.343</td>
<td>24.976***</td>
<td>19.804***</td>
</tr>
<tr>
<td>Loan Maturity</td>
<td>20.956</td>
<td>12.406***</td>
<td>20.039***</td>
</tr>
</tbody>
</table>
Notes: The table reports estimates of the Abadie and Imbens (2011) bias-corrected nearest-neighbor matching estimator where the dependent variable is, alternatively, loan size, loan interest rate, and loan maturity. The treatment group consists of loans to borrowers who switch from U-SACCOs to commercial banks i.e., switching loans. The control group in columns 1–3 are new loans by all U-SACCOs to non-switcher borrowers, while in columns 4–6 are new loans by the same “inside” U-SACCO (the U-SACCO the switcher switched from) to non-switcher borrowers. We match loans that are granted in the same month to borrowers of the same age group, gender, marital status, and employment status. Within the set of borrowers who are matched “exactly” on these characteristics, we select the nearest-neighbors of each switching loan based on the loan amount, interest rate and/or maturity, the number of months during which the individual has been in a credit relationship, the number of lenders the borrower has, as well as the (pre-program) characteristics of the municipality where the borrower resides (bank presence, economic development, poverty, and distance to the capital). The loan amount is expressed in million of Rwandan franc (RWF), the interest rate in percentage points and the maturity in months. The dataset captures new loans. *** p<0.01, ** p<0.05, * p<0.1 for two-sided t-tests of equality of means between the treatment and control group. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA), OpenStreetMaps.

<table>
<thead>
<tr>
<th></th>
<th>Control Group: New loans by all U-SACCOs to non-switcher borrowers in the same month</th>
<th>Control Group: New loans by inside U-SACCO to non-switcher borrowers in the same month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loan Amount (1)</td>
<td>Interest Rate (2)</td>
</tr>
<tr>
<td>Switching Loan – Other Loans</td>
<td>0.373***</td>
<td>-2.488***</td>
</tr>
<tr>
<td></td>
<td>(0.094)</td>
<td>(0.681)</td>
</tr>
</tbody>
</table>

Matching Variables:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment</th>
<th>Control</th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year:Month of Loan Initiation</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>U-SACCOs</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Inside U-SACCO</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Young Borrower</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Female Borrower</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Single Borrower</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Government Employee</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td># Months the Borrower is Banked</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Multiple Banking Relationships</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Bank Presence in Municipality</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Economic Development in Municipality</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Poverty in Municipality</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Distance to Capital from Municipality</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Loan Amount</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Loan Interest Rate</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Loan Maturity</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>No. Switchers (Treated)</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
<td>433</td>
</tr>
<tr>
<td>No. Untreated Borrowers</td>
<td>46,143</td>
<td>46,143</td>
<td>46,143</td>
<td>46,143</td>
</tr>
</tbody>
</table>
Table 9: Analysis of Switching Borrowers – Comparison with Commercial Banks

Notes: The table reports coefficients estimates of the Abadie and Imbens (2011) bias-corrected nearest-neighbor matching estimator where the dependent variable is, alternatively, loan size, loan interest rate, and loan maturity. The treatment group consists of loans to borrowers who switch from U-SACCOs to commercial banks i.e., switching loans. The control group in columns 1–3 are new loans by the same commercial bank the U-SACCO borrower switched to, while in columns 4–6 are new loans to bank-to-bank switchers by the same commercial bank the U-SACCO borrower switched to. We match loans that are granted in the same month to borrowers of the same age group, gender, marital status, and employment status. Within the set of borrowers who are matched “exactly” on these characteristics, we select the nearest-neighbors of each switching loan based on the loan amount, interest rate and/or maturity, the number of months during which the individual has been in a credit relationship, the number of lenders the borrower has, as well as the (pre-program) characteristics of the municipality where the borrower resides (bank presence, economic development, poverty, and distance to the capital). The loan amount is expressed in million of Rwandan franc (RWF), the interest rate in percentage points and the maturity in months. The dataset captures new loans. *** p<0.01, ** p<0.05, * p<0.1 for two-sided t-tests of equality of means between the treatment and control group. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA), OpenStreetMaps.

<table>
<thead>
<tr>
<th>Switching Loan – Other Loans</th>
<th>Control Group: New loans by the same commercial bank the U-SACCO borrower switched to</th>
<th>Control Group: New loans to bank-to-bank switchers by the same commercial bank the U-SACCO borrower switched to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loan Amount (1)</td>
<td>Interest Rate (2)</td>
</tr>
<tr>
<td></td>
<td>-1.089***</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(0.331)</td>
<td>(0.285)</td>
</tr>
</tbody>
</table>

Matching Variables:

- Year:Month of Loan Initiation
- Outside Commercial Bank
- Switchers
- Young Borrower
- Female Borrower
- Single Borrower
- Government Employee
- # Months the Borrower is Banked
- Multiple Banking Relationships
- Bank Presence in Municipality
- Economic Development in Municipality
- Poverty in Municipality
- Distance to Capital from Municipality
- Loan Amount
- Loan Interest Rate
- Loan Maturity

<table>
<thead>
<tr>
<th>Switching Loan – Other Loans</th>
<th>Control Group: New loans by the same commercial bank the U-SACCO borrower switched to</th>
<th>Control Group: New loans to bank-to-bank switchers by the same commercial bank the U-SACCO borrower switched to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Switchers (Treated)</td>
<td>No. Untreated Borrowers</td>
</tr>
<tr>
<td></td>
<td>2,186</td>
<td>175,097</td>
</tr>
</tbody>
</table>
Table 10: Analysis of Switching Borrowers – Non-Performing Loans

Notes: The table reports coefficients estimates of the Abadie and Imbens (2011) bias-corrected nearest-neighbor matching estimator where the dependent variable is a dummy equal to one if a loan becomes non-performing within 1 year, within 2 years, or until maturity, and 0 otherwise. The treatment group consists of loans to borrowers who switch from U-SACCOs to commercial banks i.e., switching loans. The control group in columns 1–3 are new loans by all U-SACCOs to non-switcher borrowers, while in columns 4–6 are new loans by the same commercial bank the U-SACCO borrower switched to. We match loans that are granted in the same month to borrowers of the same age group, gender, marital status, and employment status. Within the set of borrowers who are matched “exactly” on these characteristics, we select the nearest-neighbors of each switching loan based on the loan amount, interest rate and/or maturity, the number of months during which the individual has been in a credit relationship, the number of lenders the borrower has, as well as the (pre-program) characteristics of the municipality where the borrower resides (bank presence, economic development, poverty, and distance to the capital). The dataset captures new loans. *** p<0.01, ** p<0.05, * p<0.1 for two-sided t-tests of equality of means between the treatment and control group. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA), OpenStreetMaps.

<table>
<thead>
<tr>
<th>NPL definition:</th>
<th>Control Group: New loans by all U-SACCOs to non-switcher borrowers in the same month</th>
<th>Control Group: New loans by the same commercial bank the U-SACCO borrower switched to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) within 1 year</td>
<td>(2) within 2 years</td>
</tr>
<tr>
<td>Switching Loan – Other Loans</td>
<td>-0.021*** (0.008)</td>
<td>-0.033*** (0.009)</td>
</tr>
</tbody>
</table>

Matching Variables:

| Year:Month of Loan Initiation | Y | Y | Y | Y | Y | Y |
| U-SACCOs | Y | Y | Y |
| Outside Commercial Bank | Y | Y | Y |
| Young Borrower | Y | Y | Y |
| Female Borrower | Y | Y | Y |
| Single Borrower | Y | Y | Y |
| Government Employee | Y | Y | Y |
| # Months the Borrower is Banked | Y | Y | Y |
| Multiple Banking Relationships | Y | Y | Y |
| Bank Presence in Municipality | Y | Y | Y |
| Economic Development in Municipality | Y | Y | Y |
| Poverty in Municipality | Y | Y | Y |
| Distance to Capital from Municipality | Y | Y | Y |
| Loan Amount | Y | Y | Y |
| Loan Interest Rate | Y | Y | Y |
| Loan Maturity | Y | Y | Y |

| No. Switchers (Treated) | 2,186 | 2,186 | 2,186 | 2,186 | 2,186 | 2,186 |
| No. Untreated Borrowers | 46,143 | 46,143 | 46,143 | 175,097 | 175,097 | 175,097 |
A-I Additional Figures

Figure A1: Number of loans of U-SACCOs, Other MFIs, and Commercial Banks

Notes: The figure shows the evolution over time of the number of loans by U-SACCOs, other MFIs, and commercial banks. Data are computed from the credit register and aggregated at a monthly frequency. Data source: Rwandan Credit Reference Bureau.
Figure A2: Credit Register Representativeness

Notes: The figure shows total bank credit in billions of Rwandan francs (RWF) for all commercial banks operating in Rwanda from the credit register (in blue) and aggregate statistics from the banks’ balance sheets (in red). Data sources: Rwandan Credit Reference Bureau, National Bank of Rwanda.
Figure A3: Market Shares of U-SACCOs, Other MFIs and Commercial Banks

Notes: The figure shows the share of borrowers who have a loan with U-SACCOs, commercial banks, and other MFIs over time. Data are computed from the credit register and aggregated at 6-month intervals before and after the implementation of the program (t=0, as shown by the vertical dashed line). Data source: Rwandan Credit Reference Bureau.
A-II  Borrower Heterogeneity

We further exploit the richness of our microdata to explore heterogenous effects of the program based on borrower characteristics. While the credit register does not collect information on borrower (or household) income, consumption, or assets, it has information on the individuals’ age, gender, marital status, and sector of employment. We use these borrower attributes to analyze the program impact using a number of additional dummy variables. Given the limited borrower-level information available to us and most individuals borrowing from a single bank, the results should be interpreted keeping in mind that we are unable to fully control for credit demand at the borrower level.

As shown in column 1 of Table A1, our results suggest that the program mainly increased credit provision (through U-SACCOs) to non-government employees (panel A). By contrast, the expansion of banks has been directed towards government employees (panel B). Assuming government employees are more creditworthy due to the stability of their labor contracts, this result suggests the program was able to reach out to riskier borrowers who were otherwise unable to obtain loans. The specifications in the remaining columns show that the U-SACCOs improved access to credit predominantly to older borrowers, single individuals, and men, compared to lending towards younger and married individuals and women. On the other hand, the increase in lending by banks and other MFIs after the program is concentrated among the young, the singles and women.
Table A1: Impact of the U-SACCO Program on Access to Credit – Borrower Heterogeneity

Notes: The table presents coefficient estimates of model 2. The dependent variable is a dummy equal to 1 for individuals who, at time $t$, have an outstanding loan with: a U-SACCOs (panel A), or commercial banks and other MFIs (panel B). Post U-SACCO is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month, and 0 otherwise. The Post U-SACCO dummy is interacted with a set of dummy variables which identify borrowers depending on: (i) sector of occupation (with a dummy equal to one for government employees and zero for any other occupation and unemployed); (ii) age (with a dummy equal to one for individuals less than 30-year old); (iii) marital status (with a dummy equal to one for single individuals and zero for any other status); and (iv) gender (with a dummy equal to one for women and zero for men). These borrower characteristics are also included as standalone variables. Each regression includes municipality and time fixed effects, and municipality-specific time trends. The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data sources: Rwandan Credit Reference Bureau.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: U-SACCOs</strong></td>
<td>Dummy =1 if individual has a Loan in a U-SACCO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.00101</td>
<td>0.0399***</td>
<td>0.0356***</td>
<td>0.0564***</td>
</tr>
<tr>
<td></td>
<td>(0.00541)</td>
<td>(0.00459)</td>
<td>(0.00458)</td>
<td>(0.00466)</td>
</tr>
<tr>
<td>Post U-SACCO x Non-Government Employee</td>
<td>0.0399***</td>
<td>(0.00381)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Young</td>
<td>-0.00670***</td>
<td>(0.00160)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Single</td>
<td>0.0137***</td>
<td>(0.00290)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Female</td>
<td>-0.0525***</td>
<td>(0.00336)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Panel B: Banks and Other MFIs</strong></td>
<td>Dummy =1 if individual has a Loan in a Bank or Other MFI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.228***</td>
<td>-0.0109***</td>
<td>0.00214</td>
<td>0.00295</td>
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<tr>
<td></td>
<td>(0.00850)</td>
<td>(0.00402)</td>
<td>(0.00392)</td>
<td>(0.00438)</td>
</tr>
<tr>
<td>Post U-SACCO x Non-Government Employee</td>
<td>-0.246***</td>
<td>(0.00908)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Young</td>
<td>0.0382***</td>
<td>(0.00365)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Single</td>
<td>0.0390***</td>
<td>(0.00632)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO x Female</td>
<td>0.00821**</td>
<td>(0.00375)</td>
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<td></td>
</tr>
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<td>Municipality FE</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Time (Year:month) FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Borrower Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Municipality Time Trends</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>No. Observations</td>
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<td>19,205,532</td>
<td>19,205,532</td>
<td>19,205,532</td>
</tr>
<tr>
<td>No. Municipalities</td>
<td>336</td>
<td>336</td>
<td>336</td>
<td>336</td>
</tr>
<tr>
<td>No. Individuals</td>
<td>177,829</td>
<td>177,829</td>
<td>177,829</td>
<td>177,829</td>
</tr>
</tbody>
</table>
A-III Additional Results
Table A2: Impact of the U-SACCO Program on Access to Credit – Alternative Data Structure

Notes: The table presents coefficient estimates of model 2 collapsing the original dataset at the borrower-municipality-month level to a quarterly (columns 1–4) or yearly (columns 5–8) frequency. The dependent variable is a dummy equal to 1 for individuals who, at time $t$, have an outstanding loan with: any institutions (columns 1 and 5) or specifically in U-SACCOs (columns 2 and 6), commercial banks (columns 3 and 7) or other MFIs (columns 4 and 8). Post U-SACCO is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month and 0 otherwise. Each regression includes municipality and time fixed effects, and municipality-specific time trends. Borrower characteristics include a set of dummies for gender (equal to 1 for females and 0 for males), marital status (equal to 1 for single individuals and 0 for any other marital status), age (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data source: Rwandan Credit Reference Bureau.

<table>
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<th>Data frequency:</th>
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<th>Yearly</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Any Inst.</td>
<td>U-SACCO</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>0.0366***</td>
<td>0.0374***</td>
</tr>
<tr>
<td></td>
<td>(0.00613)</td>
<td>(0.00463)</td>
</tr>
</tbody>
</table>

| Municipality FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Time (Year:quarter) FE | Y | Y | Y | Y | N | N | N | N |
| Time (Year) FE | N | N | N | N | Y | Y | Y | Y |
| Borrower Controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Municipality Time Trends | Y | Y | Y | Y | Y | Y | Y | Y |
| No. Observations | 6,401,844 | 6,401,844 | 6,401,844 | 6,401,844 | 1,600,461 | 1,600,461 | 1,600,461 | 1,600,461 |
| No. Individuals | 177,829 | 177,829 | 177,829 | 177,829 | 177,829 | 177,829 | 177,829 | 177,829 |
| Adjusted $R^2$ | 0.204 | 0.145 | 0.110 | 0.153 | 0.191 | 0.154 | 0.100 | 0.142 |
Table A3: Impact of the U-SACCO Program on Access to Credit – Quadratic Time Trends

Notes: The table presents coefficient estimates of model 2. The dependent variable is a dummy equal to 1 for individuals who, at time $t$, have an outstanding loan with: any institutions (column 1) or specifically in U-SACCOs (column 2), commercial banks (column 3) or other MFIs (column 4). Post U-SACCO is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month and 0 otherwise. Borrower characteristics include a set of dummies for gender (equal to 1 for females and 0 for males), marital status (equal to 1 for single individuals and 0 for any other marital status), age (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). Each regression includes municipality and time fixed effects, and municipality-specific quadratic time trends. The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data source: Rwandan Credit Reference Bureau.

<table>
<thead>
<tr>
<th>Dummy $= 1$ if individual has a loan with:</th>
<th>Any Institution</th>
<th>U-SACCO</th>
<th>Bank</th>
<th>Other MFI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.0359***</td>
<td>0.0360***</td>
<td>0.00411</td>
<td>0.00110</td>
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<tr>
<td></td>
<td>(0.00620)</td>
<td>(0.00439)</td>
<td>(0.00346)</td>
<td>(0.00187)</td>
</tr>
<tr>
<td>Female</td>
<td>-0.0345***</td>
<td>-0.0214***</td>
<td>-0.0179***</td>
<td>0.00149</td>
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<tr>
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<td>(0.00159)</td>
<td>(0.00151)</td>
<td>(0.00250)</td>
<td>(0.000962)</td>
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<tr>
<td>Single</td>
<td>0.0220***</td>
<td>0.00496***</td>
<td>0.0222***</td>
<td>0.000355</td>
</tr>
<tr>
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<td>(0.00254)</td>
<td>(0.00114)</td>
<td>(0.00249)</td>
<td>(0.00117)</td>
</tr>
<tr>
<td>Young</td>
<td>-0.0365***</td>
<td>-0.00447***</td>
<td>-0.0183***</td>
<td>-0.0166***</td>
</tr>
<tr>
<td></td>
<td>(0.00298)</td>
<td>(0.000663)</td>
<td>(0.00312)</td>
<td>(0.000753)</td>
</tr>
<tr>
<td>Government Employee</td>
<td>0.221***</td>
<td>-0.0176***</td>
<td>0.0274***</td>
<td>0.244***</td>
</tr>
<tr>
<td></td>
<td>(0.00469)</td>
<td>(0.00157)</td>
<td>(0.00360)</td>
<td>(0.00692)</td>
</tr>
</tbody>
</table>

| Municipality FE | Y | Y | Y | Y |
| Time (Year:month) FE | Y | Y | Y | Y |
| Borrower Controls | Y | Y | Y | Y |
| Municipality Quadratic Time Trends | Y | Y | Y | Y |
| No. Observations | 19,206,504 | 19,206,504 | 19,206,504 | 19,206,504 |
| No. Municipalities | 336 | 336 | 336 | 336 |
| No. Individuals | 177,838 | 177,838 | 177,838 | 177,838 |
| Adjusted $R^2$ | 0.206 | 0.144 | 0.112 | 0.155 |
Table A4: Impact of the U-SACCO Program on Access to Credit – Effects Over Time

Notes: The table presents coefficient estimates of model 2. The dependent variable is a dummy equal to 1 for individuals who, at time $t$, have an outstanding loan with: any institutions (column 1) or specifically in U-SACCOs (column 2), commercial banks (column 3) or other MFIs (column 4). $Post \text{ } U-SACCO$ is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month and 0 otherwise. The coefficient on the $Post \text{ } U-SACCO$ dummy is split by time elapsed before and after program implementation, using six dummies equal to 1 for: (i) more than 2 years before the program, (ii) two years before the program; (iii) one year before the program; (iv) one year after the program; (v) two years after the program, and (vi) more than 2 years after the program. Each regression includes municipality and time fixed effects, and municipality-specific time trends. Borrower characteristics include a set of dummies for gender (equal to 1 for females and 0 for males), marital status (equal to 1 for single individuals and 0 for any other marital status), age (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data source: Rwandan Credit Reference Bureau.

<table>
<thead>
<tr>
<th>Dummy =1 if individual has a loan in:</th>
<th>Any Institution (1)</th>
<th>U-SACCO (2)</th>
<th>Bank (3)</th>
<th>Other MFI (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post U-SACCO [$&lt; t-24$]</td>
<td>0.0156</td>
<td>0.0122</td>
<td>0.00506</td>
<td>-0.0001</td>
</tr>
<tr>
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<td>(0.0135)</td>
<td>(0.00882)</td>
<td>(0.00756)</td>
<td>(0.00339)</td>
</tr>
<tr>
<td>Post U-SACCO [$t-13,t-24$]</td>
<td>-0.00183</td>
<td>0.00192</td>
<td>-0.00381</td>
<td>0.000267</td>
</tr>
<tr>
<td></td>
<td>(0.00849)</td>
<td>(0.00602)</td>
<td>(0.00448)</td>
<td>(0.00246)</td>
</tr>
<tr>
<td>Post U-SACCO [$t-1,t-12$]</td>
<td>-0.00541</td>
<td>-0.00292</td>
<td>-0.00264</td>
<td>-0.000480</td>
</tr>
<tr>
<td></td>
<td>(0.00335)</td>
<td>(0.00241)</td>
<td>(0.00201)</td>
<td>(0.000933)</td>
</tr>
<tr>
<td>Post U-SACCO [$t+1,t+12$]</td>
<td>0.0361***</td>
<td>0.0370***</td>
<td>0.00387*</td>
<td>0.000504</td>
</tr>
<tr>
<td></td>
<td>(0.00397)</td>
<td>(0.00319)</td>
<td>(0.00203)</td>
<td>(0.00123)</td>
</tr>
<tr>
<td>Post U-SACCO [$t+13,t+24$]</td>
<td>0.0960***</td>
<td>0.0939***</td>
<td>0.0161***</td>
<td>-0.000789</td>
</tr>
<tr>
<td></td>
<td>(0.0107)</td>
<td>(0.00804)</td>
<td>(0.00602)</td>
<td>(0.00346)</td>
</tr>
<tr>
<td>Post U-SACCO [$&gt; t+24$]</td>
<td>0.119***</td>
<td>0.102***</td>
<td>0.0349***</td>
<td>-0.00258</td>
</tr>
<tr>
<td></td>
<td>(0.0150)</td>
<td>(0.00920)</td>
<td>(0.0103)</td>
<td>(0.00499)</td>
</tr>
</tbody>
</table>

| Municipality FE                     | Y                    | Y           | Y         | Y             |
| Time (Year:month) FE               | Y                    | Y           | Y         | Y             |
| Borrower Controls                  | Y                    | Y           | Y         | Y             |
| Municipality Time Trends           | Y                    | Y           | Y         | Y             |
| No. Observations                   | 19,205,532           | 19,205,532  | 19,205,532| 19,205,532    |
| No. Municipalities                 | 336                  | 336         | 336       | 336           |
| No. Individuals                    | 177,829              | 177,829     | 177,829   | 177,829       |
| Adjusted $R^2$                     | 0.207                | 0.146       | 0.112     | 0.155         |
Table A5: Impact of the U-SACCO Program on Access to Credit – Excluding municipalities where U-SACCOs never operated

Notes: The table presents coefficient estimates of model 2. The sample exclude the 39 municipalities where no U-SACCO granted any loan during the sample period. The dependent variable is a dummy equal to 1 for individuals who, at time t, have an outstanding loan with: any institutions (columns 1–2) or specifically in U-SACCOs (columns 3–4), commercial banks (columns 5–6) or other MFIs (columns 7–8). Post U-SACCO is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month and 0 otherwise. In odds columns, the coefficient on the Post U-SACCO dummy is split by time elapsed before and after program implementation, using six dummies equal to 1 for: (i) more than 2 years before the program, (ii) two years before the program; (iii) one year before the program; (iv) one year after the program; (v) two years after the program, and (vi) more than 2 years after the program. Each regression includes municipality and time fixed effects, and municipality-specific time trends. Borrower characteristics include a set of dummies for gender (equal to 1 for females and 0 for males), marital status (equal to 1 for single individuals and 0 for any other marital status), age (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data source: Rwandan Credit Reference Bureau.

<table>
<thead>
<tr>
<th>Dummy =1 if individual has a loan in</th>
<th>Any Institution</th>
<th>U-SACCO</th>
<th>Bank</th>
<th>Other MFI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.0305***</td>
<td>0.0326***</td>
<td>0.00228</td>
<td>0.000304</td>
</tr>
<tr>
<td></td>
<td>(0.00695)</td>
<td>(0.00508)</td>
<td>(0.00357)</td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO [&lt; t-24]</td>
<td>-0.00513</td>
<td>0.00130</td>
<td>-0.00815</td>
<td>0.00234</td>
</tr>
<tr>
<td></td>
<td>(0.0185)</td>
<td>(0.0139)</td>
<td>(0.00772)</td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO [t-13,t-24]</td>
<td>-0.00613</td>
<td>-0.0091</td>
<td>-0.00544</td>
<td>0.00186</td>
</tr>
<tr>
<td></td>
<td>(0.0125)</td>
<td>(0.00941)</td>
<td>(0.00544)</td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO [t-1,t-12]</td>
<td>-0.00477</td>
<td>-0.00324</td>
<td>-0.00216</td>
<td>-5.23e-05</td>
</tr>
<tr>
<td></td>
<td>(0.00462)</td>
<td>(0.00352)</td>
<td>(0.00234)</td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO [t+1,t+12]</td>
<td>0.0324***</td>
<td>0.0349***</td>
<td>0.00181</td>
<td>0.000884</td>
</tr>
<tr>
<td></td>
<td>(0.00449)</td>
<td>(0.00305)</td>
<td>(0.00198)</td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO [t+13,t+24]</td>
<td>0.0816***</td>
<td>0.0834***</td>
<td>0.00832*</td>
<td>0.00271</td>
</tr>
<tr>
<td></td>
<td>(0.0107)</td>
<td>(0.00871)</td>
<td>(0.00493)</td>
<td></td>
</tr>
<tr>
<td>Post U-SACCO [&gt; t+24]</td>
<td>0.0867***</td>
<td>0.0790***</td>
<td>0.0163**</td>
<td>0.00552</td>
</tr>
<tr>
<td></td>
<td>(0.0125)</td>
<td>(0.00999)</td>
<td>(0.00719)</td>
<td></td>
</tr>
</tbody>
</table>

Municipality FE: Y, Y, Y, Y, Y, Y, Y, Y; Time (Year:month) FE: Y, Y, Y, Y, Y, Y, Y, Y; Borrower Controls: Y, Y, Y, Y, Y, Y, Y, Y; Municipality Time Trends: Y, Y, Y, Y, Y, Y, Y, Y; No. Observations: 16,906,428, 16,906,428, 16,906,428, 16,906,428, 16,906,428, 16,906,428, 16,906,428; No. Municipalities: 297, 297, 297, 297, 297, 297, 297; No. Individuals: 156,541, 156,541, 156,541, 156,541, 156,541, 156,541, 156,541; Adjusted $R^2$: 0.213, 0.213, 0.139, 0.140, 0.101, 0.101, 0.164, 0.164.
Table A6: Impact of the U-SACCO Program on Access to Credit – Falsification Tests

Notes: The table presents coefficient estimates of model 2 where the dependent variable is a dummy equal to 1 for individuals who, at time $t$, have an outstanding loan with any financial institution (column 1) or specifically U-SACCOs (column 2), commercial banks (column 3), or other MFIs (column 4). $Post\ U-SACCO$ is a dummy constructed by randomly assign the treatment across municipalities and over time. Specifically, for each municipality we randomly assign the program implementation date in the interval 2008:M1–2016:M12 and we repeat this exercise 100 times. The table reports the average coefficients of the simulation. Each regression includes municipality and time fixed effects, and municipality-specific time trends. Borrower characteristics include a set of dummies for gender (equal to 1 for females and 0 for males), marital status (equal to 1 for single individuals and 0 for any other marital status), age (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Data source: Rwandan Credit Reference Bureau.

<table>
<thead>
<tr>
<th>Dummy =1 if individual has a Loan in:</th>
<th>Any Institution</th>
<th>U-SACCO</th>
<th>Bank</th>
<th>Other MFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>-0.00028</td>
<td>-0.00005</td>
<td>-0.00008</td>
<td>-0.00038</td>
</tr>
<tr>
<td>(0.00636)</td>
<td>(0.00389)</td>
<td>(0.0037)</td>
<td>(0.00177)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>19,208,124</td>
<td>336</td>
<td>177,853</td>
<td>0.205</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.00005</td>
<td>-0.00008</td>
<td>-0.00038</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00389)</td>
<td>(0.0037)</td>
<td>(0.00177)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table A7: Impact of the U-SACCO Program on Switching

Notes: The table presents coefficient estimates of a regression at the municipality-month level. The dependent variable is, alternatively, the number of switches from MFIs (U-SACCOs and other MFIs) to banks (columns 1–2), the number of switches from MFIs (U-SACCOs and other MFIs) to banks divided by the total number of MFI borrowers in the municipality (columns 3–4), the number of switches from MFIs (U-SACCOs and other MFIs) to banks divided by the total number of borrowers in the municipality (columns 5–6), and the number of switches from MFIs (U-SACCOs and other MFIs) to banks divided by total adult population in the municipality (columns 7–8). Post U-SACCO is a dummy equal to 1 after a U-SACCO starts its lending activities in a given municipality and month and 0 otherwise. In even columns, the coefficient on the Post U-SACCO dummy is split by time elapsed since the program implementation, using 3 dummies equal to 1 for: (i) one year after the program; (ii) two years after the program, and (iii) more than 2 years after the program. All regressions include municipality and time fixed effects, municipality-specific linear time trends, and a set of borrowers characteristics including dummies for gender (equal to 1 for females and 0 for males), marital status (equal to 1 for single individuals and 0 for any other marital status), age (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data source: Rwandan Credit Reference Bureau.

<table>
<thead>
<tr>
<th>Post U-SACCO</th>
<th># switches</th>
<th># switches/MFI borrowers</th>
<th># switches/borrowers</th>
<th># switches/population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.0105</td>
<td>0.00006</td>
<td>0.00002</td>
<td>0.00020</td>
</tr>
<tr>
<td></td>
<td>(0.0176)</td>
<td>(0.00000)</td>
<td>(0.00000)</td>
<td>(0.00000)</td>
</tr>
<tr>
<td>Post U-SACCO [t+0,t+12]</td>
<td>0.0317</td>
<td>0.000115</td>
<td>0.00004</td>
<td>0.000851</td>
</tr>
<tr>
<td></td>
<td>(0.0195)</td>
<td>(0.00000)</td>
<td>(0.00000)</td>
<td>(0.000745)</td>
</tr>
<tr>
<td>Post U-SACCO [t+13,t+24]</td>
<td>0.108***</td>
<td>0.0004**</td>
<td>0.00017***</td>
<td>0.00348**</td>
</tr>
<tr>
<td></td>
<td>(0.0415)</td>
<td>(0.000173)</td>
<td>(0.00000)</td>
<td>(0.00156)</td>
</tr>
<tr>
<td>Post U-SACCO [&gt; t+24]</td>
<td>0.243***</td>
<td>0.00077***</td>
<td>0.00031***</td>
<td>0.0076***</td>
</tr>
<tr>
<td></td>
<td>(0.0758)</td>
<td>(0.000270)</td>
<td>(0.000111)</td>
<td>(0.00271)</td>
</tr>
</tbody>
</table>

| Municipality FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Time (Year:month) FE | Y | Y | Y | Y | Y | Y | Y | Y |
| Borrower Controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Municipality Time Trends | Y | Y | Y | Y | Y | Y | Y | Y |
| Adjusted R² | 0.187 | 0.188 | 0.103 | 0.104 | 0.085 | 0.085 | 0.142 | 0.143 |
Table A8: Analysis of Switching Borrowers—Propensity Score Matching

Notes: The table reports coefficients estimates using propensity score matching where the dependent variable is, alternatively, loan size, loan interest rate, and loan maturity. The treatment group consists of loans to borrowers who switch from U-SACCOs to commercial banks i.e., switching loans. The control group in columns 1–3 are new loans by all U-SACCOs to non-switcher borrowers, while in columns 4–6 are new loans by the same commercial bank the U-SACCO borrower switched to. The dataset captures new loans. *** p<0.01, ** p<0.05, * p<0.1 for two-sided t-tests of equality of means between the treatment and control group. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA), OpenStreetMaps.

<table>
<thead>
<tr>
<th>Control Group: New loans by all U-SACCOs to non-switcher borrowers in the same month</th>
<th>Control Group: New loans by the same commercial bank the U-SACCO borrower switched to</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switching Loan – Other Loans (propensity score matching)</strong></td>
<td><strong>Switching Loan – Other Loans (without matching)</strong></td>
</tr>
<tr>
<td>Loan Amount</td>
<td>Interest Rate</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>0.759***</td>
<td>-4.620***</td>
</tr>
<tr>
<td>(0.085)</td>
<td>(0.669)</td>
</tr>
<tr>
<td>0.891***</td>
<td>-4.633***</td>
</tr>
<tr>
<td>(0.025)</td>
<td>(0.462)</td>
</tr>
</tbody>
</table>

**Matching Variables:**

| Year:Month of Loan Initiation | Y | Y | Y | Y | Y | Y |
| U-SACCOs | Y | Y | Y |
| Inside U-SACCO | Y | Y | Y |
| Outside Commercial Bank | Y | Y | Y |
| Young Borrower | Y | Y | Y | Y | Y | Y |
| Female Borrower | Y | Y | Y | Y | Y | Y |
| Single Borrower | Y | Y | Y | Y | Y | Y |
| Government Employee | Y | Y | Y | Y | Y | Y |
| # Months the Borrower is Banked | Y | Y | Y | Y | Y | Y |
| Multiple Banking Relationships | Y | Y | Y | Y | Y | Y |
| Bank Presence in Municipality | Y | Y | Y | Y | Y | Y |
| Economic Development in Municipality | Y | Y | Y | Y | Y | Y |
| Poverty in Municipality | Y | Y | Y | Y | Y | Y |
| Distance to Capital from Municipality | Y | Y | Y | Y | Y | Y |
| Loan Amount | Y | Y | Y | Y | Y | Y |
| Loan Interest Rate | Y | Y | Y | Y | Y | Y |
| Loan Maturity | Y | Y | Y | Y | Y | Y |
| No. Switchers (Treated) | 2,084 | 2,084 | 2,084 | 2,084 | 2,084 | 2,084 |
| No. Switchers (Treated) | 2,186 | 2,186 | 2,186 | 2,186 | 2,186 | 2,186 |
| No. Untreated Borrowers | 46,143 | 46,143 | 46,143 | 175,097 | 175,097 | 175,097 |
Table A9: Analysis of Switching Borrowers – Non-Performing Loans, Borrowers Keeping or Not the Relationship with the U-SACCO

Notes: The table reports coefficients estimates of the Abadie and Imbens (2011) bias-corrected nearest-neighbor matching estimator where the dependent variable is a dummy equal to one if a loan becomes non-performing within 1 year, within 2 years, or until maturity, and 0 otherwise. In Panel A, the treatment group is limited to switchers who kept their lending relationship with the U-SACCO after switching to commercial banks, while in Panel B the treatment group is comprised of switchers that did not keep the lending relationship with the U-SACCO after switching to commercial banks. The control group in columns 1–3 are new loans by all U-SACCOs to non-switcher borrowers, while in columns 4–6 are new loans by the same commercial bank the U-SACCO borrower switched to. We match loans that are granted in the same month to borrowers of the same age group, gender, marital status, and employment status. Within the set of borrowers who are matched “exactly” on these characteristics, we select the nearest-neighbors of each switching loan based on the loan amount, interest rate and/or maturity, the number of months during which the individual has been in a credit relationship, the number of lenders the borrower has, as well as the (pre-program) characteristics of the municipality where the borrower resides (bank presence, economic development, poverty, and distance to the capital). The dataset captures new loans. *** p<0.01, ** p<0.05, * p<0.1 for two-sided t-tests of equality of means between the treatment and control group. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA), OpenStreetMaps.

<table>
<thead>
<tr>
<th>Control Group:</th>
<th>New loans by all U-SACCOs to non-switcher borrowers in the same month</th>
<th>New loans by the same commercial bank the U-SACCO borrower switched to</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPL definition:</td>
<td>within 1 year, within 2 years, until maturity</td>
<td>within 1 year, within 2 years, until maturity</td>
</tr>
<tr>
<td><strong>Panel A: Only switchers that kept their lending relationships with the U-SACCO after switching to banks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching Loan – Other Loans</td>
<td>-0.036***, -0.051***, -0.052***</td>
<td>-0.021*, -0.017, -0.021</td>
</tr>
<tr>
<td></td>
<td>(0.013), (0.015), (0.015)</td>
<td>(0.011), (0.013), (0.013)</td>
</tr>
<tr>
<td>No. Switchers</td>
<td>1,072, 1,072, 1,072</td>
<td>1,072, 1,072, 1,072</td>
</tr>
<tr>
<td><strong>Panel B: Only switchers that did not keep their lending relationships with the U-SACCO after switching to banks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching Loan – Other Loans</td>
<td>-0.010, -0.020**, -0.025**</td>
<td>-0.004, -0.003, -0.006</td>
</tr>
<tr>
<td></td>
<td>(0.009), (0.010), (0.010)</td>
<td>(0.008), (0.010), (0.010)</td>
</tr>
<tr>
<td>No. Switchers</td>
<td>1,114, 1,114, 1,114</td>
<td>1,114, 1,114, 1,114</td>
</tr>
</tbody>
</table>

Matching Variables:

| Year:Month of Loan Initiation | Y | Y | Y | Y | Y | Y |
| U-SACCOs                      | Y | Y | Y | Y | Y | Y |
| Outside Commercial Bank       | Y | Y | Y | Y | Y | Y |
| Young Borrower                | Y | Y | Y | Y | Y | Y |
| Female Borrower               | Y | Y | Y | Y | Y | Y |
| Single Borrower               | Y | Y | Y | Y | Y | Y |
| Government Employee           | Y | Y | Y | Y | Y | Y |
| # Months the Borrower is Banked| Y | Y | Y | Y | Y | Y |
| Multiple Banking Relationships | Y | Y | Y | Y | Y | Y |
| Bank Presence in Municipality | Y | Y | Y | Y | Y | Y |
| Economic Development in Municipality | Y | Y | Y | Y | Y | Y |
| Poverty in Municipality       | Y | Y | Y | Y | Y | Y |
| Distance to Capital from Municipality | Y | Y | Y | Y | Y | Y |
| Loan Amount                   | Y | Y | Y | Y | Y | Y |
| Loan Interest Rate            | Y | Y | Y | Y | Y | Y |
| Loan Maturity                 | Y | Y | Y | Y | Y | Y |
| No. Switchers (Treated)       | 2,186, 2,186, 2,186 | 2,186, 2,186, 2,186 |
| No. Untreated Borrowers       | 46,143, 46,143, 46,143 | 175,097, 175,097, 175,097 |
Table A10: Switching Analysis – Subsequent Loans

Notes: The table presents within-borrower mean comparison tests of loan terms—loan amount (Panel A), interest rate spread (Panel B), and loan maturity (Panel C)—grouped in buckets depending on the time elapsed since the first loan. The interest rate spread is the interest rate on the loan minus the repo rate. The comparison between additional and the original loans is done for the same lender-borrower pair. The dataset captures new loans. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data source: Rwandan Credit Reference Bureau.

<table>
<thead>
<tr>
<th>Time since the switching loan:</th>
<th>1 to 6 months</th>
<th>7 to 12 months</th>
<th>12 to 24 months</th>
<th>24+ months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Loan Amount</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Loan – Original Switching Loan</td>
<td>0.169</td>
<td>0.274</td>
<td>-0.496</td>
<td>0.112</td>
</tr>
<tr>
<td></td>
<td>(0.176)</td>
<td>(0.176)</td>
<td>(0.455)</td>
<td>(0.147)</td>
</tr>
<tr>
<td>No. Future Loans of Switchers</td>
<td>527</td>
<td>290</td>
<td>127</td>
<td>944</td>
</tr>
<tr>
<td>No. Switching Loans</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
</tr>
<tr>
<td><strong>Panel B: Interest Rate Spread</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Loan – Original Switching Loan</td>
<td>-1.284</td>
<td>1.183*</td>
<td>-2.683**</td>
<td>-0.726</td>
</tr>
<tr>
<td></td>
<td>(0.824)</td>
<td>(0.681)</td>
<td>(1.301)</td>
<td>(0.614)</td>
</tr>
<tr>
<td>No. Future Loans of Switchers</td>
<td>510</td>
<td>275</td>
<td>123</td>
<td>908</td>
</tr>
<tr>
<td>No. Switching Loans</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
</tr>
<tr>
<td><strong>Panel C: Loan Maturity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Loan – Original Switching Loan</td>
<td>0.909</td>
<td>0.410</td>
<td>-4.409***</td>
<td>0.040</td>
</tr>
<tr>
<td></td>
<td>(0.787)</td>
<td>(1.175)</td>
<td>(1.929)</td>
<td>(0.724)</td>
</tr>
<tr>
<td>No. Future Loans of Switchers</td>
<td>527</td>
<td>290</td>
<td>127</td>
<td>944</td>
</tr>
<tr>
<td>No. Switching Loans</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
<td>2,186</td>
</tr>
</tbody>
</table>
The Microcredit Expansion Program and Financial Access: Additional Evidence from Survey Data

In this appendix section, we test whether the U-SACCO microcredit expansion program increased financial access using survey data from the 2012 and 2016 rounds of the FinScope surveys run by Access to Finance Rwanda as part of a cross-country project developed by FinMark Trust. The purpose of the FinScope surveys is to describe levels of access to and take-up of financial products and services in the formal and informal sectors. Summary statistics are shown in Table A11.

We employ a slightly different identification strategy than in the baseline analysis as we only have two cross sections of data and given that borrower location is available at the district rather than municipality level. Since we cannot exploit the staggered roll-out of the program across municipalities as we did in the baseline analysis, we consider the 2012 survey data as the pre-program period and the 2016 survey data as the post-program period, and then compare changes in access to finance before and after the program across districts.32 We estimate the following specification, which controls for observable borrower characteristics, as in the loan-level analysis, and absorb unobserved local heterogeneity through district fixed effects:

\[ \Pr(\text{Access})_{idt} = \beta Post_t + \delta' X_i + \alpha_d + \varepsilon_{idt} \] (A-I)

where the dependent variable is alternatively the probability that individual i in a district d has a savings account or a bank loan in year t (where \( t = 2012 \) or \( t = 2016 \)), and \( \alpha_d \) are district fixed effects. \( X_i \) are individual-level characteristics controlling for gender, age, marital status, and level of education.

The results, shown in Table A12, show that U-SACCOs increased the likelihood that a given individual has a savings account (top panel) and a loan (bottom panel). The effects are both statistically and economically significant. Interestingly, the point estimate on the likelihood of having a loan at a U-SACCOs is similar to that in the loan-level analysis.

32 Ideally, we would have used the 2008 survey as baseline, but the microdata is not available. It is important to note, however, that using 2012 as the benchmark will likely underestimate the effects of the program given that its implementation started in 2011.
Table A11: Descriptives on U-SACCO Program and Financial Inclusion—Survey Evidence

Notes: The table presents descriptive statistics for two key financial inclusion variables: (i) an indicator variable for individuals with a savings account; and (ii) an indicator variable for individuals with a loan. The dataset consists of repeated cross-sections of borrowers in the 2012 and 2016 FinScope surveys. Source: FinScope Survey, 2012 and 2016 rounds.

<table>
<thead>
<tr>
<th></th>
<th>Finscope 2012 (n=6,150)</th>
<th>Finscope 2016 (n=12,480)</th>
<th>Finscope 2012 and 2016 (n=18,630)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>Savings Account in a:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank or U-SACCO</td>
<td>0.305</td>
<td>0.460</td>
<td>0.343</td>
</tr>
<tr>
<td>Bank</td>
<td>0.153</td>
<td>0.360</td>
<td>0.120</td>
</tr>
<tr>
<td>U-SACCO</td>
<td>0.192</td>
<td>0.394</td>
<td>0.258</td>
</tr>
<tr>
<td><strong>Loan in a:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank or U-SACCO</td>
<td>0.040</td>
<td>0.195</td>
<td>0.067</td>
</tr>
<tr>
<td>Bank</td>
<td>0.022</td>
<td>0.145</td>
<td>0.025</td>
</tr>
<tr>
<td>U-SACCO</td>
<td>0.019</td>
<td>0.138</td>
<td>0.044</td>
</tr>
</tbody>
</table>
### Table A12: Impact of U-SACCO Program on Financial Access—Survey Evidence

Notes: The table presents coefficient estimates from a regression of an indicator variable for individuals who have a savings account (top panel) or a loan (bottom panel) on a Post U-SACCO dummy (equal to 1 for the 2016 survey, and 0 for the 2012 survey) as well as borrower characteristics (gender, age, marital status, and level of education). The dataset consists of repeated cross-sections of borrowers in the 2012 and 2016 FinScope surveys. Standard errors are clustered at the district level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: FinScope Survey, 2012 and 2016 rounds.

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Dummy =1 if Individual has a Savings Account in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bank or U-SACCO</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.0105</td>
</tr>
<tr>
<td></td>
<td>(0.0162)</td>
</tr>
<tr>
<td>District FE</td>
<td>Y</td>
</tr>
<tr>
<td>Individual-level controls</td>
<td>Y</td>
</tr>
<tr>
<td>Observations</td>
<td>18,630</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.096</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Dummy =1 if Individual has a Loan in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bank or SACCO</td>
</tr>
<tr>
<td>Post U-SACCO</td>
<td>0.0285***</td>
</tr>
<tr>
<td></td>
<td>(0.00648)</td>
</tr>
<tr>
<td>District FE</td>
<td>Y</td>
</tr>
<tr>
<td>Individual-level controls</td>
<td>Y</td>
</tr>
<tr>
<td>Observations</td>
<td>18,630</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.034</td>
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</tbody>
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