

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

André F. Silva

Federal Reserve Board

October 2019

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, we show that the program improved access to credit, especially in underdeveloped areas, with positive effects on business and mortgage lending. The program also generated positive spillovers to the commercial banking sector. As the newly-created microfinance institutions (MFIs) faced lending constraints, a sizable share of first-time borrowers obtained subsequent loans—that were larger, cheaper, and longer-term—from commercial banks, which expanded their branch network in under-served low-risk areas. The individuals switching from MFIs to banks were less risky than non-switchers and not riskier than existing bank borrowers. Overall, our results suggest that the microfinance sector, coupled with a credit reference bureau, can mitigate information frictions in credit markets and serves as a pathway for first-time borrowers to commercial banks.

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 Meghana Ayyagari, Shashwat Alok, Haelim Anderson, Thorsten Beck, Martin Brown, Miriam Bruhn, Ralph De Haas, Jens Hagendorff, Martin Kanz, Tumer Kapan, Amartya Lahiri, W. Blake Marsh, Maria Soledad Martinez Peria, Jonathan Morduch, Felix Noth, Steven Ongena, Ben Roth, Miri Stryjan, Sergio Vicente, Paolo Volpin, Nan Yang, and participants at the University of Chicago Conference on Consumer Finance: Micro and Macro Approaches (Chicago), IMF-DFID Conference on Financial Inclusion: Drivers and Real Effects (Washington, DC), 2019 FIRS Conference (Savannah), 1st CUHK-RCFS Conference on Corporate Finance and Financial Intermediation (Hong Kong), Chicago Financial Institutions Conference 2019 (Chicago), 12th Swiss Winter Conference on Financial Intermediation (Lenzerheide), 1st Endless Summer Conference on Financial Intermediation and Corporate Finance (Larnaca), Reserve Bank of India/Imperial College London Conference on Financial Intermediation in Emerging Economies (Mumbai), NEUDC 2019 (Northwestern), 46th European Financial Association Annual Meeting (Lisbon), 33rd European Economic Association Conference (Cologne), 2019 NOVAFRICA Conference on Economic Development in Africa (Lisbon), 2018 Africa Meeting of the Econometric Society (Cotonou), 2019 IBEFA/ASSA Meeting (Atlanta), CSAE Conference 2018 (Oxford), 7th NCID Research Workshop (Pamplona), 2018 Development Economics and Policy Conference (Zurich), 8th International Research Workshop in Microfinance (Oslo), 6th Emerging Scholars in Banking and Finance Conference (London), MFA Annual Meeting 2019 (Chicago), 2019 EFiC Conference in Banking and Corporate Finance (Essex), 2019 Congress of the Swiss Society of Economics and Statistics (Geneva), 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 assistance 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 those affiliated 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—together with 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. 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.

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.¹ 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 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 relies on the identifying assumption that the program roll-out is uncorrelated with local unobserved factors at the municipality level, including credit demand. Thus, our

¹Rwanda 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 relatively 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 uncorrelated with a wide range of *ex-ante* municipality-level economic characteristics, including commercial bank presence, economic development (poverty rate and night-time luminosity), and distance to the capital—a measure of government agencies’ ability to reach U-SACCOs 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 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 as their relationship with U-SACCOs mature i.e., subsequent loans are larger, cheaper, and longer-term than the first loan. This finding is consistent with dynamic repayment incentives—that is, the promise of repeated and larger loans to elicit repayment (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 start expanding in under-banked low-risk areas and even granting loans to first-time borrowers from U-SACCOs. In fact, a sizable share of U-SACCO borrowers who need additional loans—over 9%—obtain these loans 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.² The microdata allow us to distinguish between U-SACCO borrowers who become clients of commercial banks (“switchers”) and U-SACCO bor-

²According to the World Bank’s 2013 Global Financial Development Report, 77% of countries in sub-Saharan Africa have a public credit register or private credit bureau, with almost two-thirds of these collecting both positive and negative borrower information.

rowers who continue borrowing from U-SACCOs (“non-switchers”). We show that switchers obtain larger, cheaper, 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 capacity constraints at microlenders (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-skin” low-risk borrowers from the pool of newly-banked individuals. In addition, switchers are as risky as similar borrowers already at banks. Overall, our results suggest MFIs play a key, and thus far under-documented, role in alleviating information frictions in thin credit markets where commercial banks find it difficult to serve the unbanked population through 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 the expansion increased the likelihood of households having bank accounts and obtaining loans.³

³Problems of financial inclusion are not exclusive to developing countries. According to recent estimates, 6.5% of U.S. households—or 14.1 million adults—do not have access to basic banking services such as a checking or savings account. In addition, 19.7% of households do not have any credit product, although one in every five such households would like such access (FDIC, 2018). Furthermore, 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

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, the data are often aggregated at the district or state level, inviting questions on whether the outcomes are being driven by a particular financial institution or by its competitors.⁴ In our context, the expansion of MFIs can have indirect effects on financial inclusion through increased competition with existing microlenders and other credit institutions that are attracted by profitable lending opportunities. To our knowledge, this paper is the first to employ administrative (supervisory) microdata from a credit register to examine the impact of a financial inclusion program. These data, by covering the lending activities of *all* microfinance institutions and commercial banks in a country, help overcome challenges related to aggregation and potential reporting biases. In addition, it 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 lender-borrower relationships, determine borrowers' risk profile based on loan performance, and analyze lending terms. Finally, the data extend several years into the program so we can examine not only short-term, but also medium-term effects of the program on financial access.⁵

Our paper also relates more broadly to a long-standing literature on banks and financial development as key drivers of economic growth (e.g., [King and Levine, 1993](#); [Jayaratne and Strahan, 1996](#); [Beck, Levine and Loayza, 2000](#)). Previous studies argue that financial inclusion—access to basic banking services and loans—is a necessary condition for economic development, as credit provision smooths consumption and sustains entrepreneurship. The evidence on the impact of microfinance presents an interesting contrast with studies of one-time randomized evaluations or aggregate data.

that the U.S. interstate bank branching deregulation increased financial inclusion and improved economic conditions for low-income households through asset accumulation and financial security.

⁴In addition, surveys may not be representative and survey questions about finance may suffer from reporting biases.

⁵It 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 in 2016 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. In addition, comparing the aggregate data on formal and informal access to credit between 2012 and 2016 (access to formal credit increased from 10 to 17%, while access to informal credit passed from 48 to 61%) does not show any clear pattern that access to formal finance crowds out informal lenders. A key aggregate results, instead, is the significant decline in the share of population who never borrowed, which declined from 42 to 28% between 2012 and 2016 ([FinScope, 2016](#)).

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 of 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 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 microdata on *all* 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. Contrary to that paper, our analysis assesses the effects of a *positive* shock—an expansion of the microfinance sector branch network—on access to credit both from microlenders 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 which grant them larger, cheaper, and longer-term loans.

Our analysis of switchers—first-time U-SACCO borrowers who become clients of commercial banks—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.⁶ Our analysis thus sheds light on the

⁶By examining lending terms for repeated U-SACCO borrowers, our work also adds to the literature on dynamic repayment incentives in microfinance (Armendáriz and Morduch, 2010; Shapiro, 2015).

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 later years of the program, posing potential risks for the long-term sustainability of the microlender 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.⁷ [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 problems—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.

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-

⁷Cross-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](#)).

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.⁸ 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). Taken together, MFIs account for about 10% of total banking sector assets.

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 developing countries, primarily in Africa, 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.⁹ These developments are partly the result of policies and regulations aimed at expanding financial access for the unbanked population, such as the nationwide microcredit expansion program we analyze in this paper.

⁸There are 17 banks in total: 11 commercial banks (one of which only obtained regulatory approval in December 2016), 1 development bank, 1 cooperative bank, and 4 microfinance banks. As we have data until December 2016, we observe the lending activities of 16 active banks. In this paper we refer to all banks as “commercial banks.” We include microfinance banks in this list because, in contrast to microfinance institutions, microfinance banks have similar legal status to commercial banks and are also supervised by the National Bank of Rwanda.

⁹In 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.

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.¹⁰ 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 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.¹¹ These credit cooperatives operate according to the Finance and Cooperative laws and are supervised by the 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

¹⁰Municipalities (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.

¹¹Both 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).

FinScope surveys: between 2012 and 2016 the share of individuals (in total adult population) who were granted loans doubled from 4.6% in 2012 to 8.1% in 2016 (Table A11). Data from the credit register (covering 336 municipalities that are part of our sample) depict a similar picture, as the share of adults with an outstanding loan 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). However, the market share of U-SACCOs in terms of loan volumes is smaller due the lower average loan size, reaching 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 effects beyond 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 and in the terms of those loans. We also examine borrowers’ ability to build credit history and reveal their creditworthiness through the credit reference bureau, with possible beneficial effects on access to commercial bank loans and business lending.

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.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 microloans. Our period

¹²The 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.

of analysis is January 2008 to December 2016. The credit register is highly representative of total banking sector loans, as shown in Figure A2.¹³

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).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.¹⁵ Borrowers are identified with a unique numerical code which allows us to track their lending activity over time and across lenders.¹⁶

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 average loan balance amounts to 2.8 million Rwandan francs (RWF) (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. 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: commercial bank presence, poverty rate, night-time luminosity—all measured before the program—and distance to the capital. For commercial bank presence, we use the number of bank branches per 1,000 adults measured in 2011, before the microcredit expansion

¹³The 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.

¹⁴The non-government employee category contains all individuals who do not work in the public sector.

¹⁵To identify borrower location as accurately as possible, we drop observations for which the borrower’s location is uncertain, i.e., (i) municipalities that have the same name as districts (e.g., Nyarugenge); (ii) municipalities that have the same name as provinces (e.g., Kigali); and (iii) municipalities that are not uniquely assigned to a district (e.g., Murambi). We also drop foreign currency loans, which account for less than 1% of total loans.

¹⁶Borrowers’ credit history is available to formal lenders upon query and against a fee. According to a microfinance report, by mid-2014, almost 3,000 searches were conducted in the credit register by U-SACCOs and 8,000 searches were conducted by other MFIs (MFR, 2015). The credit register does not have data on lender searches.

program. On average, there are 5 branches per 100,000 adults, with significant spatial variation. There are no data on regional output or consumption, therefore we measure local economic activity with the share of population living under the national poverty line—the poverty headcount ratio—and with night-time luminosity, a measure of economic activity at the national and sub-national levels (Henderson, Storeygard and Weil, 2012; Pinkovskiy and Sala-i Martin, 2016). The poverty headcount ratio across municipalities is 42% on average, 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 gave out loans in 297 out of 336 municipalities during our sample period (January 2008–December 2016), with the first two U-SACCOs granting their first loans 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 higher credit demand. In that case, endogeneity bias would generate a spurious positive correlation between the opening of a U-SACCO and access to credit. To check this identifying assumption, we examine the correlation between the

timing of U-SACCO openings and key observable local economic characteristics (namely, commercial bank presence, night-time luminosity, and poverty) measured *before* the roll-out of the program. Specifically, 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 (proxied by our measure of distance from Kigali). Once again, the results show no association between the timing of U-SACCO openings and distance to the capital (column 4).¹⁷ 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 staggered implementation of the microcredit expansion program is indeed “as good as random.”

Next we turn to the program’s effects on access to credit. As discussed in Section 2.2, the Fin-Scope 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. We organize the data as a balanced panel dataset at the borrower-municipality-month level and estimate the following specification:

$$P(\text{Loan}_{imt}) = v + \beta \text{Post } U\text{-SACCO}_{mt} + \delta' \mathbf{X}_i + \alpha_m + \phi_t + \varepsilon_{imt} \quad (1)$$

where i denotes the individual, m the municipality, and t the year:month.¹⁸ 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. \mathbf{X}_i are time-invariant individual characteristics, including gender, marital status,

¹⁷The 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.

¹⁸We also examine the robustness of our results to setting up the data as a balanced panel at yearly or quarterly frequency, see Table A2 and related discussion in Section 4.4.

age, and sector of employment (government or non-government).

Our main variable of interest is the dummy variable $Post\ U\text{-}SACCO_{mt}$, 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 α_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 ϕ_t absorb common time-varying shocks, such as changes in economic conditions affecting all municipalities at the same time. The coefficient of interest β 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 such as credit demand and urbanization. We estimate Equation 1 as a linear probability model with standard errors clustered at the municipality level.

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 β 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.¹⁹ The estimates indicate that the U-SACCO program raised the probability of an individual having an outstanding loan

¹⁹The 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.

by 3.7 percentage points and this effect is statistically significant at the 1% level. This effect is economically sizable given that on average the share of individuals with an outstanding loan before the program is 9.6%.²⁰ Figure 2 illustrates these results 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. Specifically, we split the β 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 shown in Figure 3. The estimates indicate that the likelihood of having a loan is higher after the program was implemented 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. Figure 3 also shows that the parallel trends assumption likely holds given that the point estimates before the program are close to zero and statistically insignificant.²¹

During the roll-out of the program, the U-SACCOs likely competed for new clients with other local lenders (such as commercial banks and other MFIs). Therefore, the overall effect of the program may not be exclusively driven by U-SACCOs but also by other financial intermediaries through local competition effects. To explore this issue, we analyze loans from U-SACCOs, commercial banks, and other MFIs separately in our preferred specification (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 given month. The results in columns 4–6 suggest that the rise in access to credit is, on average, mostly driven by the U-SACCOs themselves.

We plot the dynamics of this average effect by lender type in Figure 4.²² The figure reveals two key results. First, the overall 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 before the program.²³ Second, there are

²⁰The coefficients on control variables indicate that male, single, older individuals, and government employees, are more likely to obtain loans.

²¹Column 1 of Table A4 shows the estimated coefficients illustrated in Figure 3.

²²Columns 2 to 4 of Table A4 shows the estimated coefficients illustrated in Figure 4.

²³This is consistent with the descriptive evidence that most of the increase in the share of individuals with a loan—especially at U-SACCOs—occurs in the first 18 months of the program (Figure A3).

“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 compared to the-program period.

The lagged effect of the program on commercial bank lending suggests that banks reached out to a new customer base, consistent with some recent evidence showing that banks and MFIs do not necessarily operate in two segmented credit markets (Baraton and Leon, 2019). The spillover effect to commercial banks was made possible not only by U-SACCOs screening and lending to previously-unbanked individuals, but also by the credit register tracking these individuals’ borrowing activities and allowing them to build credit history. In fact, in the context of multiple competing borrowers, the very act of receiving a U-SACCO loan could send a positive signal to other lenders, such as commercial banks (Kovrijnykh, Livshits and Zetlin-Jones, 2019). In addition, the lag with which commercial banks start lending to U-SACCO borrowers exceeds the maturity of the standard U-SACCO loan (the median maturity is 12 months and banks start lending in the second year of the program), which suggests that banks actually take time to observe the repayment capacity of borrowers in order to assess their creditworthiness.

Consistent with this story, we observe that commercial banks expand their branch network in the years following the roll-out of the microcredit expansion program, increasing their presence relatively more in municipalities with lower bank presence before the program (see Figure 5, panel A). This expansion is concentrated in low-risk municipalities, where risk is proxied by the share of non-performing loans (Figure 5, panel B).²⁴ The expansion of commercial banks’ branch network is also reflected in a reduced distance between borrowers and bank branches. According to the FinScope surveys, the share of adults for whom it takes less than 30 minutes to reach the nearest commercial bank increased from 21% in 2012 to 25% in 2016 (FinScope, 2012, 2016).

The spillover effects of the program to commercial banks could be the result of capacity constraints at U-SACCOs, owing to their relatively smaller size and tighter regulation compared to banks. As a result, U-SACCOs may be less able than banks to improve loan terms as their relationships with

²⁴Using detailed data on the location of each bank branch for the 16 active commercial banks in Rwanda from 2011 to 2016, we find that 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 bank presence municipalities are defined as those below the 75th percentile of the distribution of the number of bank branches per 1,000 adults before the program.

borrowers mature (Cull, Demirgüç-Kunt and Morduch, 2014). We return to this issue in Section 6, where we document in detail the transition of borrowers from U-SACCOs to commercial banks.

4.3 Spatial Heterogeneity

Our baseline analysis reveals 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 economic and financial development prior to the introduction of U-SACCOs. In line with the literature documenting the importance of financial sector outreach for growth and economic development (e.g., Beck, Demirguc-Kunt and Martinez Peria, 2007; Bruhn and Love, 2014; Agarwal, Alok, Ghosh, Ghosh, Piskorski and Seru, 2017), we expect the increase in access to credit to be relatively larger in less developed areas.

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 measure the level of economic development in municipalities using pre-program night-time luminosity and poverty rates. Finally, we identify municipalities that are geographically remote. In all cases, we follow Bruhn and Love (2014) and split each continuous variable around the 75th percentile of its distribution to create a dummy variable for less developed and more remote areas that takes value 1 for the areas 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 stronger in municipalities with lower *ex-ante* levels of financial and economic development and in more remote areas (panel A). The coefficients on the interaction terms 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 effects of the program are at least twice as large in less developed and remote areas than elsewhere. 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% in high bank presence municipalities, a sizable increase given that the average share of individuals with a loan in low bank presence municipalities was 7% before the program. These differences are larger for other measures of spatial heterogeneity. By contrast, there is no systematic evidence of spatial heterogeneity for

loans from other MFIs or commercial banks (panel B).

4.4 Robustness and Falsification Tests

We conduct a series of robustness tests of our main results, which we report in the Internet 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 in Table A2 indicate that the baseline effect of the U-SACCO program is 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 an active (loan-granting) U-SACCO during the sample period. As mentioned in Section 4.1, in the credit register we observe loans granted to individuals in 336 municipalities. Among these municipalities, there is no loan-granting U-SACCO during our sample period in 39 municipalities. As seen in Table A5, dropping these municipalities from the sample leaves our results 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. Here 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.²⁵ The main differences from the baseline analysis is that (i) we only

²⁵FinScope surveys are conducted across 26 developing countries, primarily in Africa, and focus on the factors driving financial behavior. Results based on these surveys should be interpreted keeping in mind that surveys may suffer from limitations related to representativeness and reporting bias.

have two time periods: 2012 and 2016; and (ii) borrower location is only available at the district (rather than municipality) level. We define as dependent variables a dummy equal to 1 for survey respondents with a loan from a U-SACCO or a commercial bank (or both). 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.²⁶ The results in Table A12 indicate that the probability of being granted a loan increased between 2012 and 2016, and that U-SACCOs (not commercial banks) account for these results. This out-of-sample test confirms our previous micro-evidence that the loan expansion program increased access to finance.

4.5 Effects on Business and Mortgage Lending

To further document the economic impact of the microcredit expansion program, here we examine the link between the program and business lending (lending to formal firms and entrepreneurs) as well as mortgage lending. First, we use information on borrower type (individual vs. firm) in the credit register to test whether the increase in access to finance translates into a higher number of borrowing firms. Second, we identify entrepreneurs as individuals who take out loans for business purposes (trade, business, and commerce).²⁷ Third, we examine longer-term mortgage loans (the average maturity for mortgages is 55 months, more than double the average maturity of other loans, see 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:

$$Y_{mt} = v + \beta Post\ U-SACCO_{mt} + \delta' X_{mt} + \alpha_m + \phi_t + \varepsilon_{mt} \quad (2)$$

The dependent variable Y_{mt} is either: (i) the number of borrowing firms at time t per 1,000 adults in municipality m ; (ii) the number of individuals (scaled by 1,000 adults) with loans for business purposes in municipality m at time t ; or (iii) the number of individuals (scaled by 1,000 adults) with a mortgage. As in the borrower-level regressions, the variable of interest is $Post\ U-SACCO_{mt}$,

²⁶See Annex A-IV for a detailed description of the survey and research design.

²⁷Results are invariant to including loans for agriculture and fishing-related activities.

a dummy equal to 1 after U-SACCOs begin their lending activities in a given municipality, and 0 beforehand. The vector \mathbf{X}_{mt} includes control variables constructed by averaging the individual characteristics (such as gender, marital status, age, and sector of employment) at the municipality-month level. Time fixed effects (ϕ_t) absorb common shocks, while municipality fixed effects α_m control for unobserved factors that may be correlated with the timing of U-SACCO openings and affect business and mortgage lending. Potentially differential linear trends in financial access across municipalities are accounted for with municipality-specific time trends.

Coefficient estimates for Equation 2, with standard errors clustered at the municipality level, are reported in Table 5. For each dependent variable, we report the overall program effect (odd numbered columns) and the dynamic effect (other columns). The results show that the number of borrowing firms increases over time and becomes significantly higher (than prior to the program) two years after the program’s roll-out. The effect on business lending and long-term mortgage lending materializes earlier—one year into the program. These results suggest that the microcredit expansion program not only fostered access to credit by previously-unbanked individuals, but also positively impacted other types of lending, potentially boosting entrepreneurship and real activity.²⁸

5 Capacity Constraints at U-SACCOs

Dynamic repayment 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). Before zooming in on switching loans, we examine patterns of repeating borrowing at U-SACCOs to test whether loan terms (loan size, interest rate, and maturity) improve with the length of the lender-borrower relationship and how these terms compare to loan terms at commercial banks. In other words, so far our analysis has focused on the effects of the microcredit expansion program on loan provision to new borrowers, that is, on the extensive margin. In this section, we focus instead on the intensive margin and examine how access to credit progressively changes after individuals

²⁸We attempted to bring further evidence on the program’s effects on real economic activity, but we were hampered by the lack of reliable economic data at the municipality level before and after the program. Night-time luminosity, a good measure of economic activity at the local level, is available on a monthly basis. However, these data come from different satellites before and after April 2012, limiting their comparability before and after the program. In addition, local poverty rates from the National Institute of Statistics of Rwanda are only available for the year 2011.

obtain their first loan from a U-SACCO. A continuous sequence of loans for a given lender-borrower pair can substitute for lack of collateral and limited information sharing, potentially resulting in better term loans.

Among first-time U-SACCO borrowers in our sample, we observe that 34% borrow more than once from the same U-SACCO. Specifically, 21% of borrowers have 2 loans, 8% have 3 loans, and 5% have 4 or more loans. Among first-time U-SACCO borrowers, 9.4% switch to commercial banks. A little less than half of switching borrowers maintain their relationship with U-SACCOs and a little more than half of switching borrowers start borrowing exclusively from banks. For purposes of our subsequent analysis, we treat all these individuals as switchers.²⁹ In what follows, we analyze the link between the length of the banking relationship and loan terms, both at U-SACCOs and commercial banks. Given that the majority of individuals in our sample have zero or limited credit history, and hence are informationally opaque, we expect loan terms to improve with the length of the banking relationship, in the absence of hold-up problems (Bharath, Dahiya, Saunders and Srinivasan, 2011; Bos, de Haas and Millone, 2015).

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 (about USD 150) 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 (close to USD 900) larger and 8 months longer than the initial loan. Given that the average outstanding U-SACCO loan is RWF 0.85 million (close to USD 950) 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 in the interest rate spread (interest rate minus the repo rate) of 2.3 percentage points, which corresponds to about 10% of the average interest rate spread charged by U-SACCOs.

The increase in loan size and maturity and the reduction in loan rates as the banking relationship matures are suggestive of dynamic repayment incentives in microfinance (Tedeschi, 2006; Shapiro, 2015). They are also consistent with a large literature emphasizing the benefits of relationship

²⁹A negligible number of borrowers transition the other way around, from commercial banks to U-SACCOs.

lending and credit registers, especially for informationally opaque borrowers (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* obtains from a commercial bank, we can infer that regulatory and balance sheet constraints limit U-SACCOs' capacity to set loan terms close to those at commercial banks.³⁰ For the full sample of switchers, this comparison shows that the premium offered by commercial banks in terms of loan size, interest rate, and maturity is only comparable to 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 improvement in loan terms at commercial banks is larger for the latter group, which suggests that repeated U-SACCO borrowers benefit from longer credit histories.

6 Switching to Commercial Banks

The first part of our analysis documents the impact of the microcredit expansion program on financial inclusion. We showed that the program increased access to loans, particularly in less developed municipalities, and largely through the newly set-up U-SACCOs. Importantly, we also found suggestive evidence of lending constraints at U-SACCOs and showed 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 the transition of first-time borrowers—that is, borrowers who obtained their first loan from a U-SACCO—from the microfinance to the commercial

³⁰All MFIs have to meet specific requirements as set up by the National Bank of Rwanda in its regulation of the microfinance sector. 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). U-SACCOs are additionally subject to tight capital and liquidity regulation. At set-up, they were required to maintain a liquidity ratio of 80%, which was reduced to 30% after December 2013; and they generally hold capital buffers in excess of 30% of total assets (MFR, 2015).

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. 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. This corresponds to 9.4% of first-time borrowers at U-SACCOs who were granted a subsequent loan—an average of 2.2% per year during the implementation of the program. To put this figure into perspective, note that (i) our analysis focuses on a particular type of switching, namely from a subset of MFIs to commercial banks, and that (ii) in general, switching across financial institutions is rare in both developing and developed economies. For instance, only 4% and 8% of U.K. and U.S. customers, respectively, switch banks in any given year ([The Economist, 2019](#)). These figures are comparable with previous studies of lender switching among non-financial firms, which document switching rates of 4.5% per year in Bolivia ([Ioannidou and Ongena, 2010](#)) and 5.9% per year in Portugal ([Bonfim, Nogueira and Ongena, 2017](#)).

A visual inspection of the data shows that switching from MFIs (U-SACCOs and other MFIs combined) to commercial banks increased substantially after the microcredit expansion program (Figure 6). This result is confirmed in a formal regression analysis, similar to the baseline but on data organized at the municipality-month level as in Table 5. Taking the number of switching loans (either unscaled or scaled by the total number of borrowers or population) as dependent variables, the results in Table A7 show that the program was accompanied by an increase in the number of individuals who moved 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 the second year after the start of the program.

6.1 Switching Analysis: Empirical Strategy

To pin down the effect of switching on loan terms, ideally we would compare the terms of two loans—one extended by a U-SACCO and one extended by a commercial bank—to the same borrower in the same time period. However, the vast majority of borrowers do not have outstanding loans with

both U-SACCOs and banks at the same time, therefore we follow [Ioannidou and Ongena \(2010\)](#) and 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 terms may vary across switchers (treated group) and other borrowers (control groups) 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. Specifically, we match loans that are granted in the same month to borrowers in the same age group, and with the same 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 banking relationship, the number of lenders in a relationship with the borrower, as well as the (pre-program) characteristics of the municipality where the borrower resides (bank presence, night-time luminosity, poverty rate, and distance from Kigali).³¹

Table 7 reports summary statistics for the treatment group and the two alternative control groups. Consistent with 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 U-SACCOs to non-switchers. By contrast, switching loans are on average notably 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 compare the terms of switching loans (i.e., new loans to borrowers who switch from a first-time loan at U-SACCOs to a commercial bank) to those of non-switching borrowers who obtain similar loans from any U-SACCOs in the same month. As shown in columns 1–3 of Table 8,

³¹The results are robust to the use of propensity score matching techniques. Specifically, in the first step we match loans “exactly” across treated and control groups of loans 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.

switching loans are relatively larger, cheaper, and longer-term, consistent with the notion of capacity constraints at microlenders. These effects are economically sizable: switching loans are on average larger by RWF 0.453 million (USD 500), cheaper by 249 basis points, and their average 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 discount on interest rates from switching is significantly larger, at 564 basis points.

Next, we compare switching loans with new loans granted by the same commercial bank in the same month to borrowers who are already clients of that bank. As seen in Table 9, switching loans have similar interest rates to loans granted to the control group, but are smaller and have longer tenor. The coefficients in columns 1 and 3 show that switching loans are on average smaller by RWF 1 million (USD 1,100) and their maturity is longer by 2.1 months compared to loans granted by commercial banks to existing borrowers.

Given that loan terms tend to improve as the banking 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 by defining a narrower control group comprised of new loans granted by the same bank in the same month to borrowers already at 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 preserve sign, but lose statistical significance, suggesting that the reduction in loan size at the beginning of the relationship is not specific to borrowers who switch from U-SACCOs to banks, but instead is common to all switchers to a new commercial bank.

Non-Performing Loans. Recent studies emphasize the risks associated with rapid expansions of microfinance and credit provision (e.g., Banerjee, 2013; Zinman, 2014). Therefore, a key question pertaining to the transition of borrowers from the microfinance sector to commercial banks concerns borrower riskiness.³² On the one hand, if borrowers who switch from MFIs to commercial banks

³²Chen, 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 the rapid expansion of microcredit. 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

are riskier than existing bank borrowers, rapid growth in access to microcredit could affect the asset quality of commercial banks, with implications for financial stability. On the other hand, banks could take advantage of the screening role played by microlenders and “cream-skim” the most creditworthy individuals from the pool of microfinance borrowers. This would leave microlenders with riskier borrowers and pose risks to the long-term viability of their business model.

We examine the issue of borrower riskiness using information on loan performance. 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, we find that switching loans are *less* likely to become non-performing compared to similar loans extended by U-SACCOs (Table 10, columns 1-3). In addition, switching loans are not riskier than similar loans granted by commercial banks (Table 10, columns 4-6). However, one could argue that switching loans are less likely to become non-performing than similar loans granted to similar individuals who do not switch because switchers use U-SACCO loans to repay new bank loans. To examine this possibility, we run the analysis by dividing switchers into two groups: those who start borrowing from a bank while maintaining their relationship with the U-SACCO; and those who sever that relationship, substituting U-SACCO loans with bank loans. We find that the overall effect shown in Table 10 holds up whether or not switchers maintain their relationship with U-SACCOs (see Table A9).³³ Furthermore, we confirm that switchers are not riskier than existing bank borrowers, even across the two groups considered.

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, cheaper, 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 NPL ratio for U-SACCOs between December 2014 (7.1%) and June

to excessive borrowing and indebtedness among low-income clients (Beck, 2015).

³³However, loans extended to borrowers who preserve their relationship with U-SACCOs are less likely to become non-performing than loans granted to individuals who sever their U-SACCO relationship and borrow exclusively from banks. This result suggests that the effect is partly due to U-SACCO loans being used to repay new bank loans.

2016 (12.5%), while NPLs in the banking system remained flat ([National Bank of Rwanda, 2016](#)).

Post-Switching Loans. Finally, we exploit the time dimension of the credit register and analyze the terms of *subsequent* loans obtained by switching borrowers 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.³⁴ Overall, the length of the relationship has no significant effect 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 enjoyed by switchers for their first loan at a commercial bank persists during the lending relationship and there is no increase in interest rates over time, as documented by [Ioannidou and Ongena \(2010\)](#) for firms in Bolivia.

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 less developed municipalities. The overall program effect is driven by newly set-up savings and credit cooperatives and has positive effects on business and long-term mortgage lending. Importantly, we also find positive spillover effects of the program on commercial banks, which increase lending at the extensive margin and expand their branch network in under-served low-risk municipalities starting about one year after the roll-out of the program.

We also document that despite the dynamic repayment incentives in microfinance, U-SACCOs

³⁴Formally, 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).

are subject to capacity constraints while commercial banks are able to offer a significant premium in terms of loan size, interest rate, and maturity. Consistent with this evidence, a significant share of first-time borrowers at U-SACCOs who need additional loans switch to commercial banks, which grant them larger, cheaper, and longer-term loans than the loans they might have received from U-SACCOs. The borrowers graduating from U-SACCOs to commercial banks are less risky than non-switchers but have comparable risk profile to other commercial bank borrowers.

Our analysis supports the notion that microfinance institutions play an important screening role for the unbanked population in markets where scarce collateral and weak institutions impede commercial bank activities. Together with a credit reference bureau that supplies information on borrower credit history, the microfinance sector can support the expansion of commercial banks in traditionally under-served markets, boosting access to banking services and supporting financial development. However, in light of less risky borrowers transitioning to commercial banks, microlenders may be left with a pool of riskier borrowers, which may pose risks for financial stability.

References

- ABADIE, A. and IMBENS, G. W. (2011). Bias-corrected matching estimators for average treatment effects. *Journal of Business & Economic Statistics*, **29** (1), 1–11.
- AFI (2014). Rwanda’s financial inclusion success story: Umurenge SACCOs. *Alliance for Financial Inclusion Case Study*.
- AGARWAL, S., ALOK, S., GHOSH, P., GHOSH, S., PISKORSKI, T. and SERU, A. (2017). Banking the Unbanked: What Do 255 Million New Bank Accounts Reveal about Financial Access? *Working Paper*.
- ALLEN, F., CARLETTI, E., CULL, R., QIAN, J., SENBET, L. W. and VALENZUELA, P. (2017). Improving Access to Banking: Evidence from Kenya. *CEPR Discussion Paper No. 9840*.
- ARMENDÁRIZ, B. and MORDUCH, J. (2010). *The Economics of Microfinance*. Cambridge MA: MIT Press, 2nd edn.

- BANERJEE, A., KARLAN, D. and ZINMAN, J. (2015). Six randomized evaluations of microcredit: Introduction and further steps. *American Economic Journal: Applied Economics*, **7** (1), 1–21.
- BANERJEE, A. V. (2013). Microcredit Under the Microscope: What Have We Learned in the Past Two Decades, and What Do We Need to Know? *Annual Review of Economics*, **5** (1), 487–519.
- BARATON, P. and LEON, F. (2019). Do banks and microfinance institutions compete? Microevidence from Madagascar. *Economic Development and Cultural Change*, **forthcoming**.
- BECK, T. (2015). *Microfinance - A Critical Literature Survey*. IEG Working Paper 4, The World Bank.
- , DEMIRGUC-KUNT, A. and MARTINEZ PERIA, M. S. (2007). Reaching out: Access to and use of banking services across countries. *Journal of Financial Economics*, **85** (1), 234–266.
- , LEVINE, R. and LOAYZA, N. (2000). Finance and the sources of growth. *Journal of Financial Economics*, **58** (1), 261–300.
- BHARATH, S. T., DAHIYA, S., SAUNDERS, A. and SRINIVASAN, A. (2011). Lending Relationships and Loan Contract Terms. *The Review of Financial Studies*, **24** (4), 1141–1203.
- BONFIM, D., NOGUEIRA, G. and ONGENA, S. (2017). Sorry, We’re Closed: Loan Conditions When Bank Branches Close and Firms Transfer to Another Bank. *Bank of Portugal*.
- BOOT, A. W. A. and THAKOR, A. V. (1994). Moral Hazard and Secured Lending in an Infinite Repeated Credit Market Game. *International Economic Review*, **35** (4), 899–920.
- BOS, J. W., DE HAAS, R. and MILLONE, M. (2015). *Show me Yours and I’ll Show you Mine: Sharing Borrower Information in a Competitive Credit Market*. CentER Discussion Paper 27, Tilburg University - CentER.
- BREZA, E. and KINNAN, C. (2018). *Measuring the equilibrium impacts of credit: Evidence from the Indian microfinance crisis*. Tech. rep., National Bureau of Economic Research.
- BROWN, A., MACKIE, P. and SMITH, A. (2015). Microfinance and economic growth: Rwanda. *Inclusive Growth: Rwanda Country Report, Cardiff School of Geography and Planning*.

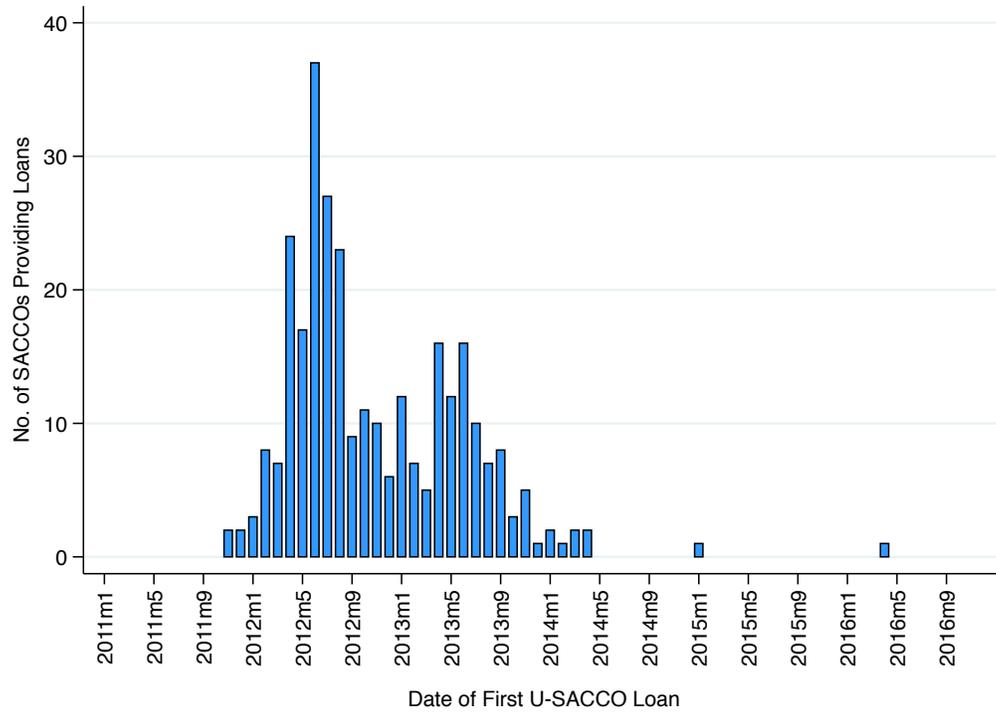
- BROWN, J., COOKSON, J. A. and HEIMER, R. (2019). Growing Up Without Finance. *Journal of Financial Economics*, **forthcoming**.
- BROWN, M., GUIN, B. and KIRSCHENMANN, K. (2016). Microfinance Banks and Financial Inclusion. *Review of Finance*, **20** (3), 907–946.
- , JAPPELLI, T. and PAGANO, M. (2009). Information sharing and credit: Firm-level evidence from transition countries. *Journal of Financial Intermediation*, **18** (2), 151–172.
- BRUHN, M. and LOVE, I. (2014). The Real Impact of Improved Access to Finance: Evidence from Mexico. *The Journal of Finance*, **69** (3), 1347–1376.
- BURGESS, R. and PANDE, R. (2005). Do Rural Banks Matter? Evidence from the Indian Social Banking Experiment. *American Economic Review*, **95** (3), 780–795.
- , — and WONG, G. (2005). Banking for the poor: Evidence from India. *Journal of the European Economic Association*, **3** (2-3), 268–278.
- CASTELLANOS, S. G., JIMENEZ-HERNANDEZ, D., MAHAJAN, A. and SEIRA, E. (2019). The Difficulties of Financial Inclusion via Large Banks: Evidence from Mexico, manuscript.
- CELERIER, C. and MATRAY, A. (2019). Bank Branch Supply, Financial Inclusion and Wealth Accumulation. *Review of Financial Studies*, **forthcoming**.
- CHEN, G., RASMUSSEN, S. and REILLE, X. (2010). Growth and vulnerabilities in microfinance. *Focus Note*, **61** (1), 1–21.
- COX, D. R. (1972). Regression models and life-tables. *Journal of the Royal Statistical Society, Series B*, **34** (2), 187–220.
- CULL, R., DEMIRGÜÇ-KUNT, A. and MORDUCH, J. (2014). Banks and Microbanks. *Journal of Financial Services Research*, **46** (1), 1–53.
- DJANKOV, S., MCLIESH, C. and SHLEIFER, A. (2007). Private credit in 129 countries. *Journal of Financial Economics*, **84** (2), 299–329.
- FDIC (2018). *2017 FDIC National Survey of Unbanked and Underbanked Households*. Tech. rep., Federal Deposit Insurance Corporation.

- FINSCOPE (2012). Financial Inclusion in Rwanda 2008-2012.
- FINSCOPE (2016). Financial Inclusion in Rwanda 2016.
- GILJE, E. P., LOUTSKINA, E. and STRAHAN, P. E. (2016). Exporting liquidity: Branch banking and financial integration. *The Journal of Finance*, **71** (3), 1159–1184.
- GINÉ, X. (2011). Access to capital in rural Thailand: An estimated model of formal vs. informal credit. *Journal of Development Economics*, **96** (1), 16–29.
- GINÉ, X., GOLDBERG, J. and YANG, D. (2012). Credit Market Consequences of Improved Personal Identification: Field Experimental Evidence from Malawi. *American Economic Review*, **102** (6), 2923–2954.
- HENDERSON, J. V., STOREYGARD, A. and WEIL, D. N. (2012). Measuring economic growth from outer space. *American Economic Review*, **102** (2), 994–1028.
- HOUSTON, J. F., LIN, C., LIN, P. and MA, Y. (2010). Creditor rights, information sharing, and bank risk taking. *Journal of Financial Economics*, **96** (3), 485–512.
- IMF (2017a). Rwanda: Selected issues. *IMF Country Report No. 17/214*.
- IMF (2017b). Staff Report for the 2017 Article IV Consultation, Seventh Review under the Policy Support Instrument, and Second Review under the Standby Credit Facility. *IMF Country Report No. 17/214*.
- IOANNIDOU, V. and ONGENA, S. (2010). “Time for a Change”: Loan Conditions and Bank Behavior when Firms Switch Banks. *The Journal of Finance*, **65** (5), 1847–1877.
- JAPPELLI, T. and PAGANO, M. (2002). Information sharing, lending and defaults: Cross-country evidence. *Journal of Banking & Finance*, **26** (10), 2017–2045.
- JAYARATNE, J. and STRAHAN, P. E. (1996). The finance-growth nexus: Evidence from bank branch deregulation. *The Quarterly Journal of Economics*, **111** (3), 639–670.
- KABOSKI, J. P. and TOWNSEND, R. M. (2012). The Impact of Credit on Village Economies. *American Economic Journal: Applied Economics*, **4** (2), 98–133.

- KING, R. G. and LEVINE, R. (1993). Finance and growth: Schumpeter might be right. *The Quarterly Journal of Economics*, **108** (3), 717–737.
- KOVRIJNYKH, N., LIVSHITS, I. and ZETLIN-JONES, A. (2019). Building Credit History with Heterogeneously Informed Lenders, unpublished.
- LIBERTI, J. M., SERU, A. and VIG, V. (2016). *Information, credit, and organization*. Working Paper, London Business School.
- MEAGER, R. (2019). Understanding the Average Impact of Microcredit Expansions: A Bayesian Hierarchical Analysis of Seven Randomized Experiments. *American Economic Journal: Applied Economics*, **11** (1), 57–91.
- MFR (2015). Assessment of the Rwandan Microfinance Sector Performance. *Access to Finance Rwanda, Association of Microfinance Institutions in Rwanda, MicroFinanza Rating*.
- MORDUCH, J. (1999). The Microfinance Promise. *Journal of Economic Literature*, **37** (4), 1569–1614.
- NATIONAL BANK OF RWANDA (2016). *Annual Financial Stability Report*. Tech. rep., National Bank of Rwanda, Kigali.
- NGUYEN, H.-L. Q. (2019). Are Credit Markets Still Local? Evidence from Bank Branch Closings. *American Economic Journal: Applied Economics*, **11** (1), 1–32.
- PADILLA, A. J. and PAGANO, M. (1997). Endogenous communication among lenders and entrepreneurial incentives. *The Review of Financial Studies*, **10** (1), 205–236.
- PAGANO, M. and JAPPELLI, T. (1993). Information sharing in credit markets. *The Journal of Finance*, **48** (5), 1693–1718.
- PINKOVSKIY, M. and SALA-I MARTIN, X. (2016). Lights, Camera... Income! Illuminating the National Accounts-Household Surveys Debate. *The Quarterly Journal of Economics*, **131** (2), 579–631.
- RAJAN, R. G. (1992). Insiders and outsiders: The choice between informed and arm’s-length debt. *Journal of Finance*, **47** (4), 1367–400.

- RANDALL, D. (2014). Financial Inclusion Up Close in Rwanda, World Bank Private Sector Development Blog, available at: <http://blogs.worldbank.org/psd/financial-inclusion-close-rwanda>.
- SHAPIRO, D. (2015). Microfinance and dynamic incentives. *Journal of Development Economics*, **115** (C), 73–84.
- SHARPE, S. A. (1990). Asymmetric information, bank lending, and implicit contracts: A stylized model of customer relationships. *Journal of Finance*, **45** (4), 1069–87.
- TEDESCHI, G. A. (2006). Here today, gone tomorrow: Can dynamic incentives make microfinance more flexible? *Journal of Development Economics*, **80** (1), 84 – 105.
- THE ECONOMIST (2019). Special report: Banking. The banking revolution is great for customers. May 2019.
- VON THADDEN, E.-L. (2004). Asymmetric information, bank lending and implicit contracts: the winner’s curse. *Finance Research Letters*, **1** (1), 11–23.
- 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 the U-SACCO Program

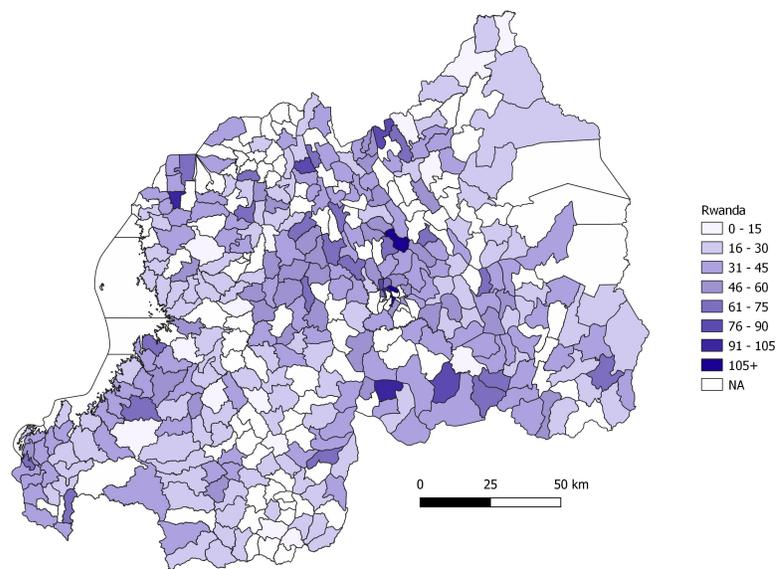


Notes: The figure plots the number of U-SACCOs that granted their first loan each month. Data source: Rwandan Credit Reference Bureau.

Figure 2: Share of Individuals with a Loan Before and After the U-SACCO Program



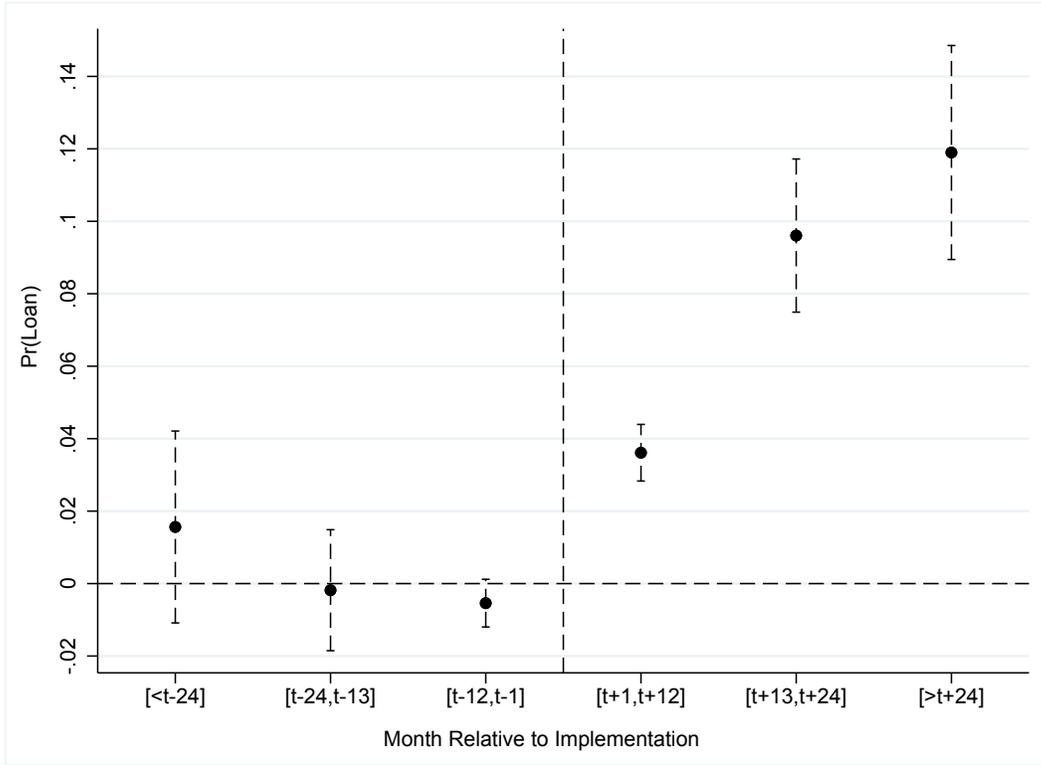
(a) Pre-program



(b) Post-program

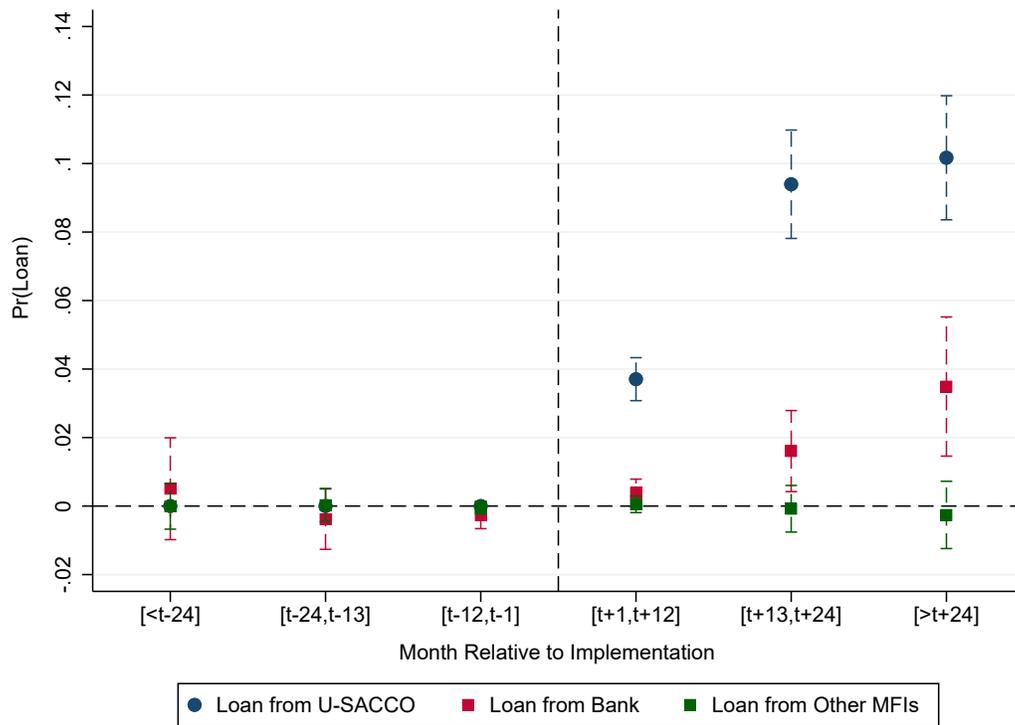
Notes: The figure shows the number of individuals with an outstanding loan per 1,000 adult inhabitants, by municipality, before and after the U-SACCO program. The pre- and post-program period are defined using as a threshold the month in which the U-SACCO grants its first loan in a given municipality.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

Figure 3: Probability of Getting a Loan, Before and After the U-SACCO Program



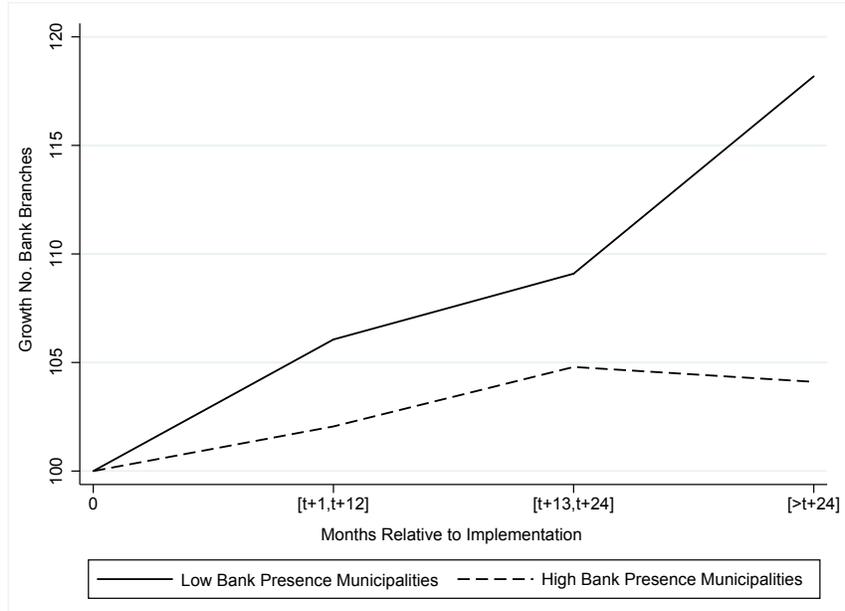
Notes: The figure shows the effect of the U-SACCO program on the probability of individual having a loan in any institution (U-SACCOs, other MFIs, or commercial banks). The chart plots the estimated coefficients and the associated 90% confidence intervals of the interaction terms between the U-SACCO 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 U-SACCO Program

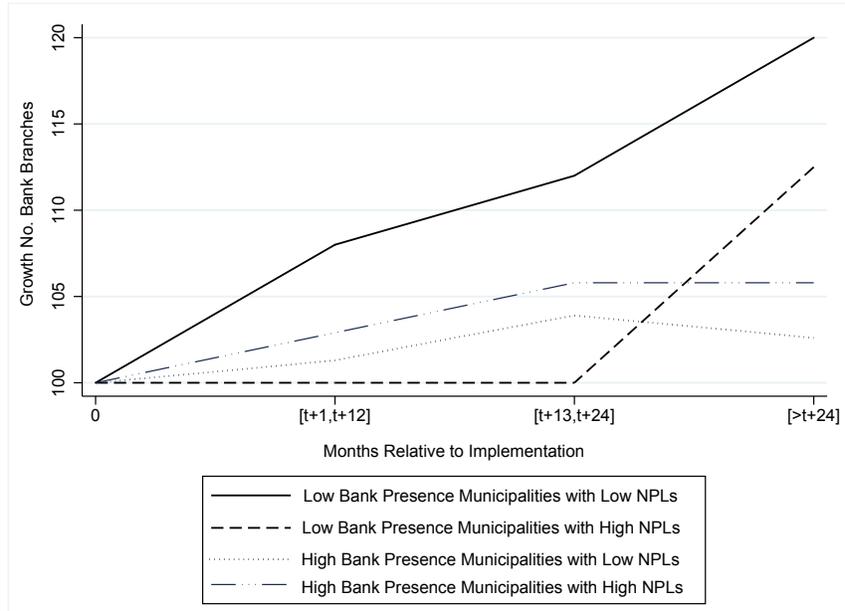


Notes: The figure shows the effect of the U-SACCO program on the probability of individual having a loan, separately, in U-SACCOs, other MFIs, and commercial banks. The chart plots the estimated coefficients and the associated 90% confidence intervals of the interaction terms between the U-SACCO variable 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 U-SACCO Program



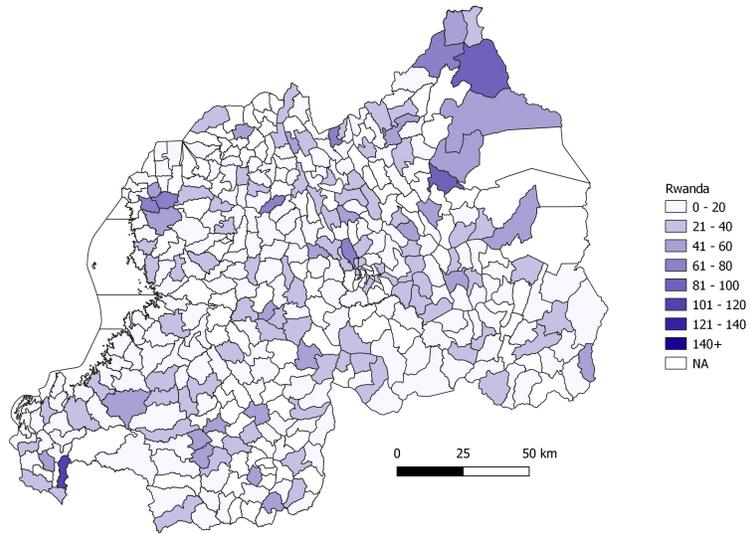
(a) Low vs high bank presence municipalities



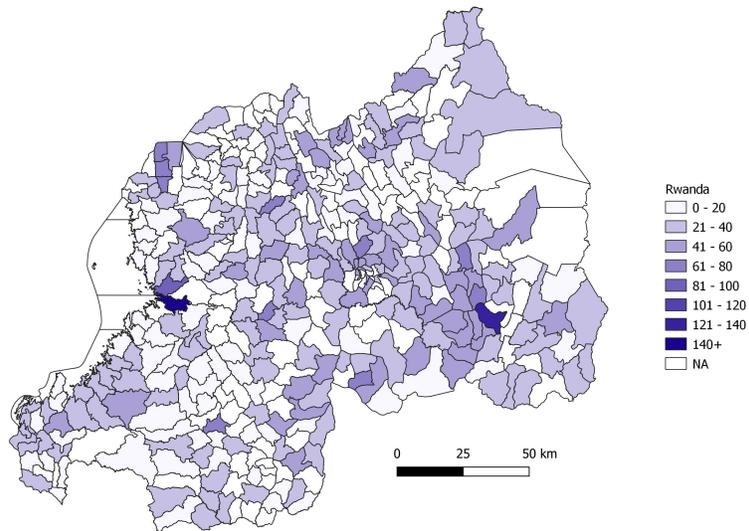
(b) Role of NPLs

Notes: The figure in Panel (a) shows the growth of commercial bank branches in municipalities with low (solid line) vs. high (dotted line) pre-program bank presence. The number of branches is 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 bank presence municipalities have bank presence that is equal to or below the 75th percentile of the distribution of bank branches per 1,000 adults before the program (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 NPL municipalities have an NPL ratio that is equal to or below the 75th percentile of the sample distribution. Data source: Rwandan Credit Reference Bureau.

Figure 6: Switching Activity Before and After the U-SACCO Program



(a) Pre-program



(b) Post-program

Notes: The figure shows the number of individuals who switch from an MFI (U-SACCO or other MFIs) to a commercial bank per 1,000 borrowers, by municipality, before and after the U-SACCO 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 1,000 adult population before the program (2011). Nightlights are calculated before the program (2011). 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.

	All Financial Institutions (n=420)				U-SACCOs (n=297)			
	N	Mean	p50	SD	N	Mean	p50	SD
A. Loan Characteristics								
Loan Exposure (RWF mn)	4,059,627	2.838	0.601	17.80	1,001,800	0.574	0.316	1.025
Loan Principal Amount (RWA mn)	4,059,627	4.058	1	23.75	1,001,800	0.854	0.500	1.068
Interest Rate (%)	3,190,739	18.43	17.50	12.71	393,794	24.33	20	21.81
Maturity (months)	4,059,627	27.37	24	24.73	1,001,800	15.31	12	7.229
Non-Performing Loan (0/1)	4,059,627	0.101	0	0.302	1,001,800	0.0666	0	0.249
Loan for Business Purposes (0/1)	4,059,627	0.0916	0	0.289	1,001,800	0.0347	0	0.183
Mortgage (0/1)	4,059,627	0.137	0	0.344	1,001,800	0.154	0	0.361
Loan from Bank (0/1)	4,059,627	0.501	1	0.500	1,001,800	0	0	0
Loan from other MFI (0/1)	4,059,627	0.252	0	0.434	1,001,800	0	0	0
Loan from SACCO (0/1)	4,059,627	0.247	0	0.431	1,001,800	1	1	0
B. Borrower characteristics								
Female (0/1)	177,829	0.377	0	0.485	74,924	0.262	0	0.440
Single (0/1)	177,829	0.0991	0	0.299	74,924	0.0982	0	0.298
Young (0/1)	177,829	0.231	0	0.421	74,924	0.209	0	0.407
Government Employee (0/1)	177,829	0.0985	0	0.298	74,924	0.0671	0	0.250
C. Municipality characteristics								
Bank Presence	336	0.0457	0	0.0743	297	0.0419	0	0.0681
Nightlights	336	2.644	0	9.754	297	2.270	0	9.277
Poverty Headcount Ratio	336	0.419	0.444	0.126	297	0.424	0.447	0.124
Distance to the capital	336	1.637	1.580	0.919	297	1.682	1.627	0.927
	Commercial Banks (n=16)				Other MFIs (n=107)			
	N	Mean	p50	SD	N	Mean	p50	SD
A. Loan Characteristics								
Loan Exposure (RWF mn)	2,032,848	4.658	0.943	24.91	1,024,979	1.442	0.534	3.235
Loan Principal Amount (RWA mn)	2,032,848	6.600	1.600	33.24	1,024,979	2.149	0.999	3.980
Interest Rate (%)	1,899,430	18.08	18	9.363	897,515	16.59	12.30	12.70
Maturity (months)	2,032,848	34.96	35	28.85	1,024,979	24.14	22.87	21.32
Non-Performing Loan (0/1)	2,032,848	0.128	0	0.334	1,024,979	0.0833	0	0.276
Loan for Business Purposes (0/1)	2,032,848	0.0704	0	0.256	1,024,979	0.189	0	0.392
Mortgage (0/1)	2,032,848	0.104	0	0.306	1,024,979	0.184	0	0.388
Loan from Bank (0/1)	2,032,848	1	1	0	1,024,979	0	0	0
Loan from other MFI (0/1)	2,032,848	0	0	0	1,024,979	1	1	0
Loan from SACCO (0/1)	2,032,848	0	0	0	1,024,979	0	0	0
B. Borrower characteristics								
Female (0/1)	87,012	0.452	0	0.498	43,685	0.391	0	0.488
Single (0/1)	87,012	0.108	0	0.310	43,685	0.110	0	0.313
Young (0/1)	87,012	0.248	0	0.432	43,685	0.226	0	0.418
Government Employee (0/1)	87,012	0.0759	0	0.265	43,685	0.310	0	0.462
C. Municipality characteristics								
Bank Presence	336	0.0457	0	0.0743	336	0.0457	0	0.0743
Nightlights	336	2.644	0	9.754	336	2.644	0	9.754
Poverty Headcount Ratio	336	0.419	0.444	0.126	336	0.419	0.444	0.126
Distance to the capital	336	1.637	1.580	0.919	336	1.637	1.580	0.919

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 1,000 adult inhabitants in 2011; (ii) Nightlights measure night-time luminosity in 2011; (iii) Poverty Headcount Ratio is the ratio of population under the poverty line; 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.

	(1)	(2)	(3)	(4)	(5)
Bank Presence	-1.2360 (1.112)				-0.9867 (1.085)
Nighlights		-0.0135 (0.014)			-0.0128 (0.022)
Poverty Headcount Ratio			0.0068 (0.009)		-0.0010 (0.015)
Distance to the Capital				-0.2468 (0.194)	-0.2819 (0.243)
District FE	No	No	No	No	No
Bank Presence	-1.1717 (1.010)				-1.2524 (1.061)
Nighlights		-0.0046 (0.008)			-0.0076 (0.010)
Poverty Headcount Ratio			-0.0018 (0.005)		-0.0070 (0.006)
Distance to the Capital				0.0105 (0.061)	0.0001 (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 1 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 employment (equal to 1 for government employees and 0 otherwise). 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.

	Dummy =1 if individual has a loan with:					
	Any Financial Institution			U-SACCO	Bank	Other MFI
	(1)	(2)	(3)	(4)	(5)	(6)
Post U-SACCO	0.0283*** (0.00547)	0.0283*** (0.00547)	0.0374*** (0.00629)	0.0370*** (0.00457)	0.00476 (0.00348)	0.00103 (0.00188)
Female		-0.0345*** (0.00159)	-0.0345*** (0.00159)	-0.0214*** (0.00151)	-0.0179*** (0.00250)	0.00149 (0.000962)
Single		0.0219*** (0.00255)	0.0219*** (0.00255)	0.00495*** (0.00114)	0.0222*** (0.00249)	0.000351 (0.00117)
Young		-0.0365*** (0.00298)	-0.0365*** (0.00298)	-0.00447*** (0.000663)	-0.0183*** (0.00312)	-0.0166*** (0.000753)
Government Employee		0.221*** (0.00469)	0.221*** (0.00469)	-0.0176*** (0.00157)	0.0274*** (0.00360)	0.244*** (0.00692)
Municipality FE	Y	Y	Y	Y	Y	Y
Time (Year:month) FE	Y	Y	Y	Y	Y	Y
Borrower Controls	N	Y	Y	Y	Y	Y
Municipality Time Trends	N	N	Y	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 1 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 night-time luminosity; (iii) with high poverty rate; and (iv) remote from the capital Kigali. To define the low bank presence and low nightlight municipalities, we split the continuous variables around the 75th 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 75th percentile, and 0 otherwise; Low Nightlights is equal to 1 if night-time luminosity before the program is below the 75th 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 75th percentile, and 0 otherwise; Remote 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 75th 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 employment (equal to 1 for government employees and 0 otherwise). 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).

	(1)	(2)	(3)	(4)
Panel A: U-SACCOs	Dummy =1 if individual has a Loan in a U-SACCO			
Post U-SACCO	0.0201** (0.00956)	0.0160* (0.00866)	0.0157* (0.00837)	0.0160* (0.00875)
Post U-SACCO x Low Bank Presence	0.0214** (0.00922)			
Post U-SACCO x Low Nightlights		0.0271*** (0.00858)		
Post U-SACCO x High Poverty			0.0276*** (0.00818)	
Post U-SACCO x Remote				0.0274*** (0.00867)
Panel B: Banks and Other MFIs	Dummy =1 if individual has a Loan in a Bank or Other MFI			
Post U-SACCO	0.0117* (0.00644)	0.00516 (0.00614)	0.00802 (0.00616)	0.00134 (0.00643)
Post U-SACCO x Low Bank Presence	-0.00725 (0.00611)			
Post U-SACCO x Low Nightlights		0.00107 (0.00576)		
Post U-SACCO x High Poverty			-0.00265 (0.00588)	
Post U-SACCO x Remote				0.00607 (0.00608)
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.

	(1)	(2)	(3)	(4)	(5)	(6)
	Borrowing Firms		Individual Business Loans		Mortgages	
	# firms/	# firms/population	# business loans/	# business loans/population	# mortgages/	# mortgages/population
Post U-SACCO	0.0792 (1.720)		0.0680 (0.0609)		0.0280 (0.0217)	
Post U-SACCO [t+0,t+12]		0.683 (1.729)		0.0847 (0.0609)		0.0288 (0.0223)
Post U-SACCO [t+13,t+24]		3.898 (3.302)		0.404*** (0.103)		0.0957** (0.0388)
Post U-SACCO [$>$ t+24]		7.724* (4.435)		0.506*** (0.122)		0.0999* (0.0537)
Municipality FE	Y	Y	Y	Y	Y	Y
Time (Year:month) FE	Y	Y	Y	Y	Y	Y
Borrower Controls	Y	Y	Y	Y	Y	Y
Municipality Time Trends	Y	Y	Y	Y	Y	Y
No. Observations	32,866	32,866	32,866	32,866	32,866	32,866
No. Municipalities	336	336	336	336	336	336
Adjusted R^2	0.956	0.956	0.725	0.728	0.856	0.857

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			
	2nd – 1st loan	3rd – 1st loan	4th (& more) – 1st loan
Loan Amount	0.139*** (0.027)	0.318*** (0.055)	0.772*** (0.079)
No. Subsequent Loans	725	273	2,373
No. First Loans	2,186	2,186	2,186
Interest Rate Spread	1.299 (0.917)	-0.397 (2.063)	-2.362*** (0.580)
No. Subsequent Loans	244	87	1,136
No. First Loans	1,056	1,056	1,056
Loan Maturity	0.699*** (0.243)	1.220** (0.499)	8.289*** (0.399)
No. Subsequent Loans	725	273	2,373
No. First Loans	2,186	2,186	2,186
Panel B: Switching Loan at Commercial Bank vs. Last Loan at U-SACCO			
	All Switchers	Switchers with multiple loans	Switchers with one loan
Loan Amount	0.718*** (0.078)	0.625*** (0.067)	0.906*** (0.194)
No. Switching Loans	2,186	1,461	725
No. Previous Loans	2,186	1,461	725
Interest Rate Spread	-2.602*** (0.606)	-2.165*** (0.691)	-2.819*** (1.066)
No. Switching Loans	981	685	296
No. Previous Loans	981	685	296
Loan Maturity	8.309*** (0.413)	7.996*** (0.474)	8.879*** (0.731)
No. Switching Loans	2,186	1,461	725
No. Previous Loans	2,186	1,461	725

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 is 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.

	Switching Loans (U-SACCO → Banks) (n=2,186)	New Loans from U-SACCOs to Non-Switchers (n=46,143)	New Loans from Banks to Non-Switchers (n=175,097)
	(1)	(2)	(3)
Young Borrower	0.194	0.224***	0.226***
Female Borrower	0.268	0.263	0.4***
Single Borrower	0.096	0.099	0.113***
Government Employee	0.090	0.075**	0.125***
# Months the Borrower is Banked	19.402	10.87***	13.438***
Multiple Banking Relationships	0.471	0.132***	0.096***
Bank Presence in Municipality	0.052	0.053	0.101***
Nightlights in Municipality	3.410	3.473	14.114***
Poverty Headcount Ratio in Municipality	40.038	40.893***	30.454***
Distance to Capital from Municipality	88.257	88.855	71.066***
Loan Amount	1.563	0.672***	3.852***
Loan Interest Rate	20.343	24.976***	19.804**
Loan Maturity	20.956	12.406***	20.039**

Table 8: Analysis of Switching Borrowers – Comparison with U-SACCOs

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 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.

	Control Group: New loans by all U-SACCOs to non-switcher borrowers in the same month			Control Group: New loans by inside U-SACCO to non-switcher borrowers in the same month		
	Loan Amount (1)	Interest Rate (2)	Loan Maturity (3)	Loan Amount (4)	Interest Rate (5)	Loan Maturity (6)
Switching Loan – Other Loans	0.373*** (0.094)	-2.488*** (0.681)	4.897*** (0.480)	0.443** (0.174)	-5.641*** (1.442)	4.261*** (1.012)
<i>Matching Variables:</i>						
Year:Month of Loan Initiation	Y	Y	Y	Y	Y	Y
U-SACCOs	Y	Y	Y	Y	Y	Y
Inside U-SACCO	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	433	433	433
No. Untreated Borrowers	46,143	46,143	46,143	46,143	46,143	46,143

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.

	Control Group:			Control Group:		
	New loans by the same commercial bank the U-SACCO borrower switched to			New loans to bank-to-bank switchers by the same commercial bank the U-SACCO borrower switched to		
	Loan Amount (1)	Interest Rate (2)	Loan Maturity (3)	Loan Amount (4)	Interest Rate (5)	Loan Maturity (6)
Switching Loan – Other Loans	-1.089*** (0.331)	-0.002 (0.285)	2.100*** (0.516)	-0.502 (0.527)	-0.199 (0.396)	0.812 (0.841)
<i>Matching Variables:</i>						
Year:Month of Loan Initiation	Y	Y	Y	Y	Y	Y
Outside Commercial Bank	Y	Y	Y	Y	Y	Y
Switchers						
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	1,743	1,743	1,743
No. Untreated Borrowers	175,097	175,097	175,097	9,194	9,194	9,194

Table 10: Analysis of Switching Borrowers – Non-Performing Loans

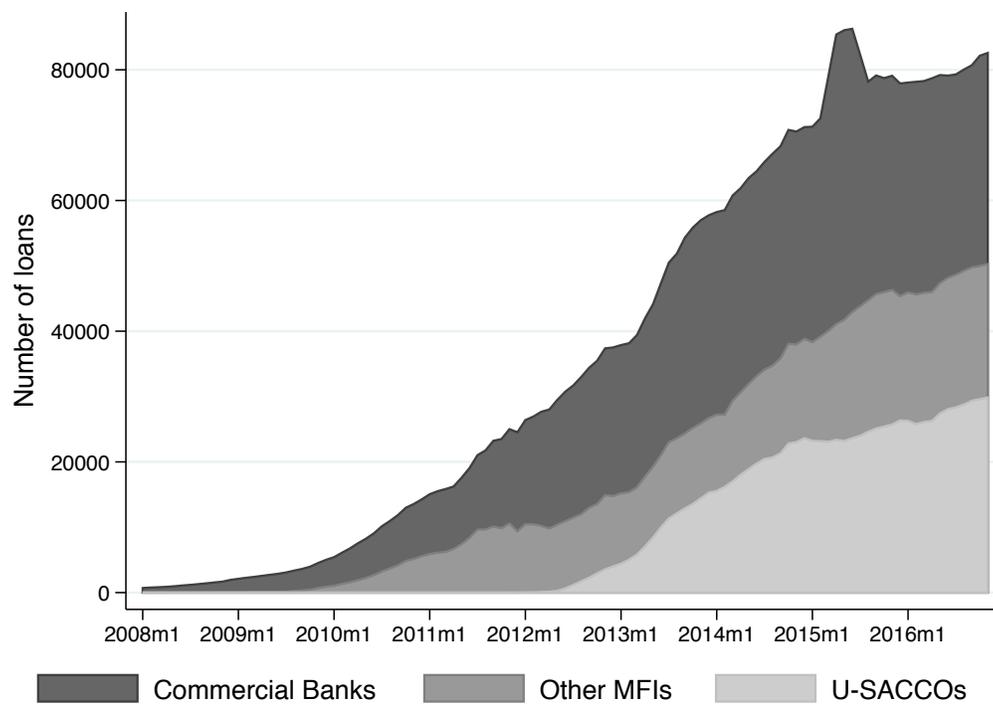
Notes: The table reports coefficients estimates of the [Abadie and Imbens \(2011\)](#) bias-corrected nearest-neighbor matching estimator where the dependent variable is a dummy equal to one if a loan becomes non-performing within 1 year, within 2 years, or until maturity, and 0 otherwise. The treatment 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.

NPL definition:	Control Group: New loans by all U-SACCOs to non-switcher borrowers in the same month			Control Group: New loans by the same commercial bank the U-SACCO borrower switched to		
	within 1 year (1)	within 2 years (2)	until maturity (3)	within 1 year (4)	within 2 years (5)	until maturity (6)
Switching Loan – Other Loans	-0.021*** (0.008)	-0.033*** (0.009)	-0.036*** (0.009)	-0.013* (0.007)	-0.010 (0.008)	-0.013 (0.008)
<i>Matching Variables:</i>						
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

Internet Appendix

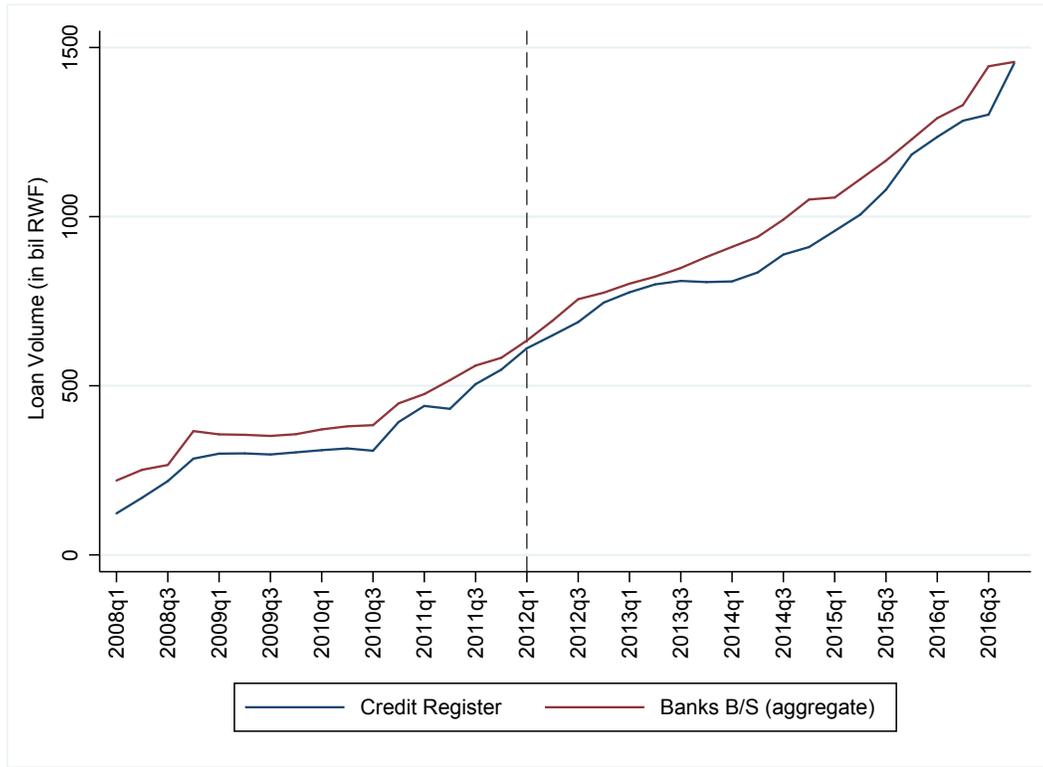
A-I Additional Figures

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



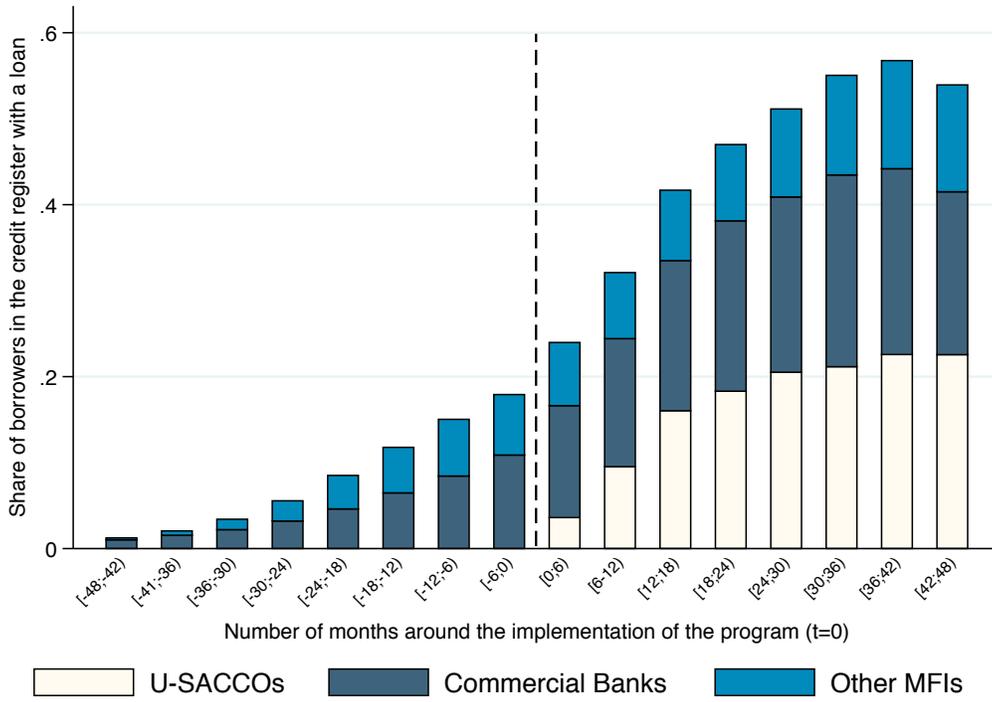
Notes: The figure shows the evolution over time of the number of loans by U-SACCOs, other MFIs, and commercial banks, at monthly frequency. Data source: Rwandan Credit Reference Bureau.

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 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

Here we exploit the richness of our microdata to explore heterogeneous effects of the program based on borrower characteristics. The credit register does not collect information on borrower income, consumption, or assets, but it has information on 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 number of borrower characteristics the fact that most individuals borrow from a single lender, 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](#), the program mainly increased credit access through U-SACCOs to non-government employees (panel A). By contrast, the program increased credit access through commercial banks and other MFIs to government employees (panel B). Assuming government employees are more creditworthy due to the stability of their labor contracts, these results suggest the program targeted riskier borrowers who were otherwise unable to obtain loans. The specifications in the remaining columns show that the expansion of U-SACCOs improved access to credit relatively more for older borrowers, single individuals, and men. Banks and other MFIs raised access to credit after the program relatively more for younger borrowers, single individuals, and women.

Table A1: Impact of the U-SACCO Program on Access to Credit – Borrower Heterogeneity

Notes: The table presents coefficient estimates of Equation 1. 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 employment (with a dummy equal to 1 for government employees and 0 otherwise); (ii) age (with a dummy equal to 1 for individuals younger than 30-year old); (iii) marital status (with a dummy equal to 1 for single individuals and 0 for any other status); and (iv) gender (with a dummy equal to 1 for women). 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.

	(1)	(2)	(3)	(4)
Panel A: U-SACCOs	Dummy =1 if individual has a Loan in a U-SACCO			
Post U-SACCO	0.00101 (0.00541)	0.0399*** (0.00459)	0.0356*** (0.00458)	0.0564*** (0.00466)
Post U-SACCO x Non-Government Employee	0.0399*** (0.00381)			
Post U-SACCO x Young		-0.00670*** (0.00160)		
Post U-SACCO x Single			0.0137*** (0.00290)	
Post U-SACCO x Female				-0.0525*** (0.00336)
Panel B: Banks and Other MFIs	Dummy =1 if individual has a Loan in a Bank or Other MFI			
Post U-SACCO	0.228*** (0.00850)	-0.0109*** (0.00402)	0.00214 (0.00392)	0.00295 (0.00438)
Post U-SACCO x Non-Government Employee	-0.246*** (0.00908)			
Post U-SACCO x Young		0.0382*** (0.00365)		
Post U-SACCO x Single			0.0390*** (0.00632)	
Post U-SACCO x Female				0.00821** (0.00375)
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

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 Equation 1 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 younger than 30-year old, and 0 otherwise), and sector of employment (equal to 1 for government employees and 0 otherwise). 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.

	Quarterly				Yearly			
	Any Inst. (1)	U-SACCO (2)	Bank (3)	Other MFI (4)	Any Inst. (5)	U-SACCO (6)	Bank (7)	Other MFI (8)
Post U-SACCO	0.0366*** (0.00613)	0.0374*** (0.00463)	0.00357 (0.00341)	0.000985 (0.00189)	0.0336*** (0.00753)	0.0414*** (0.00524)	-0.000848 (0.00424)	-0.000587 (0.00215)
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. Municipalities	336	336	336	336	336	336	336	336
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

Data frequency:

Dummy = 1 if individual has a loan in:

Table A3: Impact of the U-SACCO Program on Access to Credit – Quadratic Time Trends

Notes: The table presents coefficient estimates of Equation 1. 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 younger than 30-year old, and 0 otherwise), and sector of employment (equal to 1 for government employees and 0 otherwise). 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.

	Dummy =1 if individual has a loan with:			
	Any Institution	U-SACCO	Bank	Other MFI
	(1)	(2)	(3)	(4)
Post U-SACCO	0.0359*** (0.00620)	0.0360*** (0.00439)	0.00411 (0.00346)	0.00110 (0.00187)
Female	-0.0345*** (0.00159)	-0.0214*** (0.00151)	-0.0179*** (0.00250)	0.00149 (0.000962)
Single	0.0220*** (0.00254)	0.00496*** (0.00114)	0.0222*** (0.00249)	0.000355 (0.00117)
Young	-0.0365*** (0.00298)	-0.00447*** (0.000663)	-0.0183*** (0.00312)	-0.0166*** (0.000753)
Government Employee	0.221*** (0.00469)	-0.0176*** (0.00157)	0.0274*** (0.00360)	0.244*** (0.00692)
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 Equation 1. 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. The coefficient on the *Post U-SACCO* dummy is split by time elapsed before and after program implementation, using 6 dummies equal to 1 for: (i) more than 2 years before the program, (ii) 2 years before the program; (iii) one year before the program; (iv) one year after the program; (v) 2 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 younger than 30-year old, and 0 otherwise), and sector of employment (equal to 1 for government employees and 0 otherwise). 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.

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

Notes: The table presents coefficient estimates of Equation 1. The sample exclude the 39 municipalities where U-SACCOs did not grant loans 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 younger than 30-year old, and 0 otherwise), and sector of employment (equal to 1 for government employees and 0 otherwise). 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.

	Dummy = 1 if individual has a loan in							
	Any Institution (1)	U-SACCO (2)	U-SACCO (3)	Bank (4)	Bank (5)	Other MFI (6)	Other MFI (7)	Other MFI (8)
Post U-SACCO	0.0305*** (0.00695)		0.0326*** (0.00508)		0.00228 (0.00357)		0.000304 (0.00167)	
Post U-SACCO [$< t-24$]		-0.00513 (0.0185)		0.00130 (0.0139)		-0.00815 (0.00772)		0.00234 (0.00344)
Post U-SACCO [$t-13, t-24$]		-0.00613 (0.0125)		-0.00191 (0.00941)		-0.00628 (0.00544)		0.00186 (0.00255)
Post U-SACCO [$t-1, t-12$]		-0.00477 (0.00462)		-0.00324 (0.00352)		-0.00216 (0.00234)		-5.23e-05 (0.000909)
Post U-SACCO [$t+1, t+12$]		0.0324*** (0.00449)		0.0349*** (0.00365)		0.00181 (0.00198)		0.000884 (0.00117)
Post U-SACCO [$t+13, t+24$]		0.0816*** (0.0107)		0.0834*** (0.00871)		0.00832* (0.00493)		0.00271 (0.00305)
Post U-SACCO [$> t+24$]		0.0867*** (0.0125)		0.0790*** (0.00999)		0.0163** (0.00719)		0.00552 (0.00435)
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	16,906,428
No. Municipalities	297	297	297	297	297	297	297	297
No. Individuals	156,541	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 Equation 1 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 employment (equal to 1 for government employees and 0 otherwise). 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.

	Dummy =1 if individual has a Loan in:			
	Any Institution (1)	U-SACCO (2)	Bank (3)	Other MFI (4)
Post U-SACCO	-0.00028 (0.00636)	-0.00005 (0.00389)	-0.00008 (0.0037)	-0.00038 (0.00177)
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	19,208,124	19,208,124	19,208,124	19,208,124
No. Municipalities	336	336	336	336
No. Individuals	177,853	177,853	177,853	177,853
Adjusted R^2	0.205	0.142	0.112	0.155

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 numbered 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) 2 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 employment (equal to 1 for government employees and 0 otherwise). 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.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	# switches	# switches/MFI borrowers	# switches/borrowers	# switches/population				
Post U-SACCO	0.0105 (0.0176)		0.00006 (0.00000)		0.00002 (0.00000)		0.00020 (0.000680)	
Post U-SACCO [t+0,t+12]		0.0317 (0.0195)		0.000115 (0.0000)		0.00004 (0.0000)		0.000851 (0.000745)
Post U-SACCO [t+13,t+24]		0.108*** (0.0415)		0.0004** (0.000173)		0.00017** (0.0000)		0.00348** (0.00156)
Post U-SACCO [$>$ t+24]		0.243*** (0.0758)		0.00077*** (0.000270)		0.00031*** (0.000111)		0.0076*** (0.00271)
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	32,866	32,866	32,866	32,866	32,866	32,866	32,866	32,866
No. Municipalities	336	336	336	336	336	336	336	336
Adjusted R^2	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.

	Control Group: New loans by all U-SACCOs to non-switcher borrowers in the same month			Control Group: New loans by the same commercial bank the U-SACCO borrower switched to		
	Loan Amount (1)	Interest Rate (2)	Loan Maturity (3)	Loan Amount (4)	Interest Rate (5)	Loan Maturity (6)
Switching Loan – Other Loans (propensity score matching)	0.759*** (0.085)	-4.620*** (0.669)	7.454*** (0.434)	-1.276*** (0.368)	0.033 (0.332)	0.558 (0.642)
Switching Loan – Other Loans (without matching)	0.891*** (0.025)	-4.633*** (0.462)	8.550*** (0.181)	-2.289*** (0.56)	0.539** (0.223)	0.917* (0.505)
<i>Matching Variables:</i>						
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	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. Untreated Borrowers	46,136	46,136	46,136	174,119	174,119	174,119
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 Severing 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, night-time luminosity, poverty rate, 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.

Control Group:	New loans by all U-SACCOs to non-switcher borrowers in the same month			New loans by the same commercial bank the U-SACCO borrower switched to		
	within 1 year	within 2 years	until maturity	within 1 year	within 2 years	until maturity
Panel A: Only switchers who maintained their lending relationships with the U-SACCO after switching to banks						
Switching Loan – Other Loans	-0.036*** (0.013)	-0.051*** (0.015)	-0.052*** (0.015)	-0.021* (0.011)	-0.017 (0.013)	-0.021 (0.013)
No. Switchers	1,072	1,072	1,072	1,072	1,072	1,072
Panel B: Only switchers who severed their lending relationships with the U-SACCO after switching to banks						
Switching Loan – Other Loans	-0.010 (0.009)	-0.020** (0.010)	-0.025** (0.010)	-0.004 (0.008)	-0.003 (0.010)	-0.006 (0.010)
No. Switchers	1,114	1,114	1,114	1,114	1,114	1,114
<i>Matching Variables:</i>						
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.

Time since the switching loan:	1 to 6 months	7 to 12 months	12 to 24 months	24+ months
Panel A: Loan Amount				
New Loan – Original Switching Loan	0.169 (0.176)	0.274 (0.176)	-0.496 (0.455)	0.112 (0.147)
No. Future Loans of Switchers	527	290	127	944
No. Switching Loans	2,186	2,186	2,186	2,186
Panel B: Interest Rate Spread				
New Loan – Original Switching Loan	-1.284 (0.824)	1.183* (0.681)	-2.683** (1.301)	-0.726 (0.614)
No. Future Loans of Switchers	510	275	123	908
No. Switching Loans	2,186	2,186	2,186	2,186
Panel C: Loan Maturity				
New Loan – Original Switching Loan	0.909 (0.787)	0.410 (1.175)	-4.409*** (1.929)	0.040 (0.724)
No. Future Loans of Switchers	527	290	127	944
No. Switching Loans	2,186	2,186	2,186	2,186

A-IV The Microcredit Expansion Program and Financial Access: Additional Evidence from Survey Data

Here we test whether the 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 for two reasons: (i) we only have two cross-sections of data; and (ii) borrower location is available at the district (not municipality) level. Since we cannot exploit the staggered roll-out of the program across municipalities as we did in the baseline analysis, we take the 2012 survey data as the pre-program period and the 2016 survey data as the post-program period, and compare changes in access to credit before and after the program across districts.³⁵ We estimate the following specification, which controls for observable borrower characteristics, as in the loan-level analysis, and absorbs unobserved local heterogeneity with district fixed effects:

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

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

The results in Table [A12](#) show that the U-SACCO program raised the likelihood of individuals having a loan. The effects are both statistically and economically significant. Notably, the point estimate for the impact of the microcredit expansion program on the likelihood of having a loan at a U-SACCO is similar to that in the loan-level analysis.

³⁵Ideally, we would have liked to use the 2008 survey as baseline, but the microdata are unavailable. 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 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.

	Finscope 2012 (n=6,150)		Finscope 2016 (n=12,480)		Finscope 2012 and 2016 (n=18,630)	
	Mean	SD	Mean	SD	Mean	SD
<i>Loan in a:</i>						
Bank or U-SACCO	0.040	0.195	0.067	0.249	0.055	0.228
Bank	0.022	0.145	0.025	0.156	0.022	0.146
U-SACCO	0.019	0.138	0.044	0.205	0.035	0.183

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 loan 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.

Dependent variable:	Dummy =1 if Individual has a Loan in:		
	Bank or SACCO	SACCO	Bank
Post U-SACCO	0.0285*** (0.00648)	0.0214*** (0.00417)	0.00130 (0.00276)
District FE	Y	Y	Y
Individual-level controls	Y	Y	Y
Observations	18,630	18,630	18,630
Adjusted R^2	0.034	0.018	0.025