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## Financial Inclusion Under the Microscope

by Sumit Agarwal, Thomas Kigabo, Camelia Minoiu, Andrea Presbitero and Andre Silva

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I N T E R N A T I O N A L M O N E T A R Y F U N D

**IMF Working Paper**

Research Department

**Financial Inclusion Under the Microscope<sup>1</sup>**

**Prepared by Sumit Agarwal, Thomas Kigabo, Camelia Minoiu, Andrea F. Presbitero and  
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**Abstract**

We examine the impact of a large-scale microcredit expansion program on financial access and the transition of previously unbanked borrowers to commercial banks. Using administrative micro-data covering the universe of loans to individuals from a developing country, we show that the program significantly increased access to credit, particularly in less developed areas. This effect is driven by the newly set-up credit cooperatives (U-SACCOs), which grant loans to previously unbanked individuals. A sizable share of first-time borrowers who need a second loan switch to commercial banks, which cream-skim low-risk borrowers and grant them larger, cheaper, and longer-term loans. These borrowers are not riskier than similar individuals already at commercial banks and only initially receive smaller loans. Our results suggest that the microfinance sector, together with a well-functioning credit reference bureau, help mitigate information frictions in credit markets..

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# 1 Introduction<sup>1</sup>

The microfinance sector is responsible for much of the progress towards financial inclusion in developing and emerging market countries, where weak institutions limit access to financial services for a large share of the population and information frictions in credit markets are particularly costly due to the lack of collateralizable wealth (Morduch, 1999; Kaboski and Townsend, 2012; Brown, Guin and Kirschenmann, 2016). A key but unanswered question is to what extent a healthy microfinance sector can improve access to commercial banks. In this paper, we examine the effects of a large-scale microcredit expansion program conducted through microfinance institutions (MFIs) on access to finance and the transition of previously unbanked borrowers to commercial banks. We show that MFIs, by targeting the underprivileged population, allow first-time borrowers to build credit history and signal their creditworthiness, especially in the presence of a comprehensive credit reference bureau that monitors individual lending activities—both at banks and MFIs—and attenuates moral hazard and adverse selection (Pagano and Jappelli, 1993; Padilla and Pagano, 1997). By alleviating information frictions, the expansion of microcredit promotes the transition of previously unbanked individuals to the banking sector, where borrowers can tap into larger, cheaper, and longer-term loans owing to banks’ greater balance-sheet capacity compared to microlenders.

Specifically, 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.<sup>2</sup> The program resulted in more than 90% of Rwandans residing within 3

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<sup>2</sup>Rwanda is representative of other developing countries. In 2015 Rwanda had a credit-to-GDP ratio of 21.3%, which compares to an average of 24% for sub-Saharan African economies and 19% for low-income countries.

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 and cross-municipality variation from the staggered program roll-out coupled with high-frequency microdata on the lending activities of all financial institutions. The data come from a comprehensive credit register with detailed information on the universe of loans extended by commercial banks, U-SACCOs, and other MFIs to individual borrowers for a total of 9 years around the implementation of the program. The credit register, held at the credit reference bureau, is fully functioning during our period of analysis between 2008 and 2016. The clean dataset includes more than 4 million observations on bank-borrower loan exposures on a monthly basis for 177,853 individual borrowers.

We first show that the program significantly increased the probability of obtaining a loan for the previously unbanked population, particularly in rural and less developed areas with lower *ex-ante* bank presence, and among non-government employees. This effect is largely driven by the U-SACCOs that were set up during the program. Consistent with capacity constraints at microlenders (Cull, Demirgüç-Kunt and Morduch, 2014), we show that borrowers obtain better loan terms (i.e., larger, cheaper, and longer-term loans) as their relationship with lenders mature, though this effect is weaker for U-SACCOs compared to commercial banks. One year after the introduction of the program, commercial banks expand their presence in under-served areas and start granting loans to new (previously U-SACCO only) borrowers, thus expanding their loan supply on the extensive margin. Some of the new borrowers are chosen from the pool of first-time borrowers at U-SACCOs, about 10% of which leave U-SACCOs after their first loan and obtain subsequent loans from commercial banks.

We then zoom in on the borrowing activities of previously unbanked individuals. Once they start borrowing from MFIs, these individuals enter the credit register, which tracks all their borrowing activities, and start building a credit history. The credit register is maintained by a credit reference bureau which provides borrower information regarding payment history and defaults to financial institutions (that is, both positive and negative information) upon query and against a fee.<sup>3</sup> We track these individuals' borrowing activities, distinguishing between individuals who continue borrowing from U-SACCOs and who become clients of commercial banks ("switchers"). When individuals

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<sup>3</sup>According to the World Bank's 2013 Global Financial Development Report, 77% of countries in sub-Saharan Africa have functioning public credit registries or private credit bureaus, with almost two-thirds collecting both positive and negative borrower information.

switch from a U-SACCO to a bank, they obtain larger, cheaper, and longer-term loans from the bank compared to similar borrowers at U-SACCOs, consistent with the notion that borrowers who switch to commercial banks exhibit credit demand that is not fully met by U-SACCOs. Switchers to commercial banks initially receive smaller loans compared to similar borrowers already at banks, but loan size increases over time. Using *ex-post* defaults as a measure of borrower risk, we show that switchers are as risky as similar borrowers already in commercial banks, but less risky than similar borrowers that keep borrowing from U-SACCOs and do not switch to commercial banks.

Our results suggest that the microcredit expansion program had positive spillover effects on commercial banks, which “cream-skin” relatively low-risk borrowers from the pool of newly-banked individuals. At the same time, the program may have the unintended consequence of increasing the riskiness of the pool of MFIs borrowers, leading to financial stability risks and potential negative effects on the long-term sustainability of the microlender business model. Our findings also emphasize an important role for the microfinance sector which, coupled with a credit reference bureau, can reduce information frictions in credit markets and facilitate the transition of individual borrowers from microfinance to commercial banks.

Our paper builds on an influential literature documenting the positive effects of bank 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.<sup>4</sup> A recent analysis of the largest financial inclusion program in India (Jan Dhan Yojana) by [Agarwal, Alok, Ghosh, Ghosh, Piskorski and Seru \(2017\)](#), which led to 255 million new bank account openings, shows that regions more exposed to the program experienced an increase in lending. Banks met the demand for formal credit by previously unbanked households, which substituted informal lending for less expensive bank credit. In a case study of the branch network expansion by Banco Azteca in Mexico, [Bruhn and Love \(2014\)](#) find that expanded 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 regions increased the share of banked households. Focusing on Africa, [Allen, Carletti, Cull, Qian, Senbet and Valenzuela \(2017\)](#) examine the case of the branch expansion of Equity Bank in Kenya. The bank’s expansion into low-income and under-served regions led to

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<sup>4</sup>See also [Kochar \(2011\)](#), and [Fulford \(2013\)](#) for follow-up studies. [Young \(2017\)](#) documents positive impacts on agricultural and manufacturing output of a banking expansion program implemented in India in 2005.

an increase in the likelihood of households having bank accounts and obtaining loans.<sup>5</sup>

A common feature of previous studies is that they rely on survey data to measure access to and usage of financial services, as well as economic outcomes. However, surveys may not be representative and suffer from reporting biases, particularly in relation to questions about finance (Greer, Parker and Souleles, 2006). Furthermore, the data is often aggregated at the district or state level, inviting questions on whether the outcomes are being driven by a particular financial intermediary or its competitors. In other words, analyses based on aggregate data cannot establish if the increase in bank accounts, credit and the real effects following microcredit expansion programs are due to the targeted institutions or other banks.<sup>6</sup> Unlike previous studies, this is to our knowledge the first paper that employs extensive microdata from a supervisory credit register to assess the dynamics of financial inclusion programs. We use comprehensive information on the lending activities of all microfinance institutions and commercial banks in a country, which allows us to overcome challenges related to aggregation and reporting biases. In addition, the data enables us to gauge not only which banks are driving gains in access to bank credit, but also to track individuals' borrowing activities over time and across lenders, measure the length of their credit history, determine their risk profile based on loan performance, and analyze the terms on which they borrow from, and switch among, different lenders. Finally, the data extends several years into the program, allowing us to examine not only the short-term, but also the medium-term effects of the program on financial access.

Our paper also relates more broadly to a long-standing literature arguing that banks and financial development are key drivers of economic growth.<sup>7</sup> Earlier studies argue that financial inclusion—access to basic banking services and micro loans to previously unbanked individuals—is a necessary condition for economic development, as credit provision enables consumption smoothing and sustains entrepreneurship. The evidence on the impact of microfinance presents an interesting contrast with studies of one-time randomized evaluations or aggregate data. While randomized control trials generally reveal “a consistent pattern of modestly positive, but not transformative effects” (Banerjee,

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<sup>5</sup>The positive effects of increased bank branch density on financial inclusion and economic outcomes are also extensively documented in advanced economies (e.g., Gilje, Loutskina and Strahan, 2016; Brown, Cookson and Heimer, 2017; Nguyen, 2018). In particular, Celerier and Matray (2017) show that the U.S. interstate bank branching deregulation increased financial inclusion, leading to improved economic conditions for low-income households through asset accumulation and enhanced financial security.

<sup>6</sup>Although banks tend to impose barriers to entry through minimum account balances or large overdraft fees (Barr and Blank, 2008; Ho and Ishii, 2011), the expansion of banks to poorer (rural) areas can have indirect effects on financial inclusion through increased competition with existing microcredit providers and other institutions that are attracted by the profitable opportunities in those areas.

<sup>7</sup>See, e.g., King and Levine (1993), Jayaratne and Strahan (1996), and Beck, Levine and Loayza (2000).

Karlan and Zinman, 2015), studies based on aggregated household survey data show considerably more promising results (Bruhn and Love, 2014; Brown, Guin and Kirschenmann, 2016; Allen, Carletti, Cull, Qian, Senbet and Valenzuela, 2017). Our analysis, based on micro-level data covering the universe of loans to individuals from a developing country, helps to reconcile this “micro-macro paradox” by taking into account the positive spillovers that the microcredit expansion program can generate on the local economy. In fact, our results suggest that the expansion of U-SACCOs can foster local development not only directly by providing financial services to the underprivileged population, but also indirectly by allowing previously unbanked individuals to build credit history and graduate to commercial banks where they can get larger, cheaper, and longer-term loans, which in turn may boost entrepreneurship and small business growth.

Our analysis of individuals who become clients of commercial banks is also closely related to an influential paper by Ioannidou and Ongena (2010). The authors use data from the Bolivian credit register to show that firms which switch across commercial banks obtain lower loan rates that subsequently increase, consistent with the presence of adverse selection that leads to 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 microlenders (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, the nature of our unique microdata allows us to comprehensively analyze the terms of consumer (as opposed to business) loans—including size, interest rates, and maturity—and to compare the default risk of switching and non-switching loans. Our analysis thus provides new insights into the risks associated with the transition of newly-banked individuals from microfinance institutions to commercial banks.

Finally, this paper contributes to the literature documenting the positive effects of mandatory sharing of borrower information among financial institutions.<sup>8</sup> Liberti, Seru and Vig (2016) find that an expansion of the Argentinean credit registry improved the efficiency of bank credit allocation, improving lending terms for previously-excluded borrowers of high quality. Bos, De Haas and Millone (2015) show that the introduction of a credit registry in Bosnia and Herzegovina improved loan quality and reduced defaults, particularly among first-time borrowers. They also document that repeated borrowers receive progressively larger, cheaper, and longer-term loans due to their

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<sup>8</sup>Cross-country evidence indicates that information sharing is associated with improved availability and lower cost of credit (Djankov, McLiesh and Shleifer, 2007; Jappelli and Pagano, 2002; Brown, Jappelli and Pagano, 2009), as well as lower bank risk-taking (Houston, Lin, Lin and Ma, 2010).



ability to signal creditworthiness to competing lenders. Our results support the view that the availability of centralized credit registry data can mitigate moral hazard and adverse selection—bringing safe borrowers into the market—with potential positive effects on financial inclusion and credit availability (Pagano and Jappelli, 1993; Padilla and Pagano, 1997).

The remainder of the paper is organized as follows. In Section 2 we describe the financial sector in Rwanda and the credit expansion program. Section 3 describes our data sources and Section 4 reports our baseline results on the impact of the program on financial access. In Section 5 we analyze the transition of borrowers to commercial banks. Section 6 concludes.

## 2 Institutional Background

### 2.1 Rwandan Economy and Financial Sector

Rwanda is a landlocked country in East Africa with a population of 11.5 million. The country has a large rural population and few natural resources. Following a range of business-friendly reforms in the early 2000s, Rwanda experienced gains in competitiveness and strong economic growth. Annual GDP growth averaged 7.8% between 2008 and 2016 and per capita income doubled during the same period (IMF, 2017a). 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. Based on the ease of getting credit, a ranking which reflects the strength of credit reporting systems and the effectiveness of collateral and bankruptcy laws in facilitating lending, Rwanda is ranked 3rd in Africa and 11th in the world. The 2016-2017 World Economic Forum’s Global Competitiveness Index ranks Rwanda 52nd among 138 countries, outperforming the Sub-Saharan Africa (SSA) average on all dimensions other than market size. The reforms associated with the “Vision 2020” economic strategy, which strives to make Rwanda a middle-income country by 2020, have been accompanied by a reduction in poverty and income inequality (IMF, 2017b).

In recent years Rwanda also experienced rapid growth in its banking sector. 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.<sup>9</sup> 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 416 municipal credit cooperatives (U-SACCOs) that were set up as part of the microcredit expansion program examined in this paper, i.e., one U-SACCO in each of the 416 municipalities, with some only providing savings accounts, and others also granting loans. MFIs account for almost 6% of total bank assets.<sup>10</sup>

Over the past decade, Rwanda also made notable improvements on financial inclusion. Access to formal financial services increased from 21% to 68% of the adult population between 2008 and 2016, and access to formal credit from 5% to 17% over the same period (FinScope, 2012, 2016). According to statistics across 26 countries where FinScope surveys are conducted to measure financial access and use of financial products, Rwanda is ranked second in terms of the share of adult population with access to formal financial services.<sup>11</sup> These developments are the result of policies and regulations aimed at expanding financial access for the unbanked population. One such policy is the nationwide microcredit expansion program we analyze in this paper.

## 2.2 Microcredit Expansion (U-SACCO) Program

This paper examines 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.<sup>12</sup> The goal of the program was 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

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<sup>9</sup>There 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 the 16 active banks. For purposes of this paper, we refer to all these 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.

<sup>10</sup>While not captured in our supervisory dataset, the financial sector also includes informal or semi-formal institutions such as village savings and loans associations, as well as mobile money providers that carry out financial transactions for various institutions (MFR, 2015).

<sup>11</sup>Rwanda also fares well compared to its regional peers in terms raising financial inclusion. 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, also puts Rwanda in the 8th position among 55 countries in 2016.

<sup>12</sup>Municipalities (translated in Kinyarwanda as “Umurenge”) are administrative subdivisions of the 30 counties 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. Throughout the paper, non-Umurenge SACCOs are part of the “other MFIs” sample.

access to savings accounts, with different U-SACCOs only extending their first loans in late 2011. The program significantly improved the availability of financial services across the country, with 1.6 million new customers and 91% 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%).<sup>13</sup> Almost half of U-SACCO loans are extended for trade and tourism services and about one-fifth for agricultural activities, including livestock and fishing (MFR, 2015).

Municipality-specific U-SACCOs are financial intermediaries owned by their members. From a legal perspective, they are formed as microfinance institutions with the main objective of providing credit and savings facilities exclusively to members, and financed mainly from their own resources.<sup>14</sup> 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).<sup>15</sup>

It has been widely argued that the U-SACCO program substantially increased the share of the population with access to bank accounts, boosting financial inclusion especially in economically underprivileged areas. We document the rise in the share of banked population using data from the 2012 and 2016 FinScope surveys. As shown in Table A7, between 2012 and 2016 the share of individuals with a savings account rose from 31.9% to 36.4%, while the share of individuals who were granted loans doubled from 4.6% in 2012 to 8.1% in 2016. Administrative data from the credit register show a similar picture, as the share of individuals with an outstanding loan (in total adult population) increased substantially across the country, with variation across municipalities (Figure 1). These results suggest that the program coincided with gains in financial inclusion and are consistent with government and news reports (e.g., Randall, 2014).

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<sup>13</sup>Statistics from <http://fspmaps.com/> (last accessed May 8, 2018).

<sup>14</sup>Both 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).

<sup>15</sup>At set-up, U-SACCOs were required to maintain a liquidity ratio of 80%, which was reduced to 30% after December 2013. The minimum capital requirement is about USD 8,000. U-SACCOs generally hold high levels of capital, in excess of 30% of total assets (MFR, 2015).

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

### 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.<sup>16</sup> 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. Our period of analysis is January 2008 to December 2016. The credit register is highly representative of total banking sector loans, as shown in Figure 2.<sup>17</sup>

In our analysis we consider all loans to individuals. We have 4.1 million observations on bank-borrower loan exposures on a monthly basis. 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).<sup>18</sup> After cleaning the data, we have information on the local currency lending activities of banks, U-SACCOs and other MFIs in relation to 177,583 unique individuals residing in 336 municipalities.<sup>19</sup> The borrowers are identified with a unique numerical code which allows us to track their loans over time and across lenders.

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<sup>16</sup>The original provider was a subsidiary of CRB Africa and was taken over in 2015 by TransUnion Africa Holdings, an international credit and information management provider.

<sup>17</sup>The figure compares total bank credit in billions of Rwandan francs (RWF) from the credit register with aggregate statistics from bank balance sheets. Aggregate bank balance sheet figures, representing total credit to individuals and firms, are only available for the 16 active commercial banks operating in Rwanda 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.

<sup>18</sup>The non-government employee category contains all individuals who do not work in the public sector.

<sup>19</sup>To ensure that we identify the borrower’s location correctly, we exclude from our analysis all borrowers in the 80 (out of 416) municipalities that (i) have the same name as districts (e.g., Nyarugenge); or (ii) have the same name as provinces (e.g., Kigali); or (iii) are not uniquely assigned to one district (e.g., Murambi). We also exclude loans extended in foreign currency, which account for less than 1% of total loans.

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 (RFW) (approximately USD 3,250) and the average interest rate on outstanding loans is 18%. U-SACCOs provide smaller, shorter-term, and more expensive loans than other credit institutions. Commercial banks have the highest market share, accounting for half of all granted loans. U-SACCOs account for 24.7% of loans, and other MFIs for the remaining 25.2%. More than one third of borrowers are female, 23% are younger than 30 years old, and 10% are government employees.

Turning to municipality-level descriptive statistics, the average share of working-age individuals (older than 16 years) with an outstanding bank loan before the microcredit expansion program is 1%. We use this measure to compare the differential impact of the program on financial access in regions with varying degrees of *ex-ante* (pre-program) bank presence. Given that U-SACCOs started their lending activities in different months, initial bank presence varies both across municipalities and over time. The median and average share of urban population in a municipality are 0% and 11.8%, respectively, while the median and average share of population living in poverty, as measured by the poverty headcount ratio, are 44% and 42%, respectively. Night-time luminosity, a standard measure of economic activity at the national and sub-national levels ([Henderson, Storeygard and Weil, 2012](#); [Pinkovskiy and Sala-i Martin, 2016](#)), is on average 2.6 before the program (in 2011), with a great degree of spatial variation. These data come from satellite images and were obtained from the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce. Finally, for the 297 municipalities with at least one U-SACCO, all measures of financial and economic development before the microcredit expansion program are lower than sample averages, suggesting that the program targeted rural and less-developed areas.

## 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 as different U-SACCOs granted their first loans in different months starting in late 2011. The time-series variation in exposure to the program is illustrated in Figure 3, which shows the number of institutions that granted their first loan each month.

U-SACCOs started granting loans in 297 out of 336 municipalities during our sample period (i.e., January 2008–December 2016), with the first two U-SACCOs extending credit as early as November 2011 and the last one in April 2016.

As discussed in Section 2.2, data from the FinScope surveys offer suggestive evidence that the microcredit expansion program coincided with an increase in financial inclusion for the overall population (Table A7). Here we ask if the program had deeper effects on financial access by raising the probability of loan granting for previously unbanked individuals. Using a (balanced) panel dataset at the borrower-municipality-month level, we estimate the following specification:

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

where  $i$  denotes the individual,  $m$  the municipality and  $t$  the year-month.<sup>20</sup>  $\text{Loan}_{imt}$  is equal to 1 if individual  $i$  in municipality  $m$  has an outstanding loan with any financial institution at time  $t$ , and 0 otherwise.  $\mathbf{X}_i$  is a matrix of time-invariant individual characteristics, including gender, marital status, age, and sector of employment (government or non-government). Our main variable of interest is the dummy variable  $\text{Post } U\text{-SACCO}_{mt}$ , 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  $\alpha_m$  control for unobserved spatial factors—such as credit demand, urbanization, or economic development—that might correlate with the timing of U-SACCO openings and with financial access. Time (year:month) fixed effects  $\phi_t$  absorb common time-varying shocks, such as changes in economic conditions. The coefficient of interest  $\beta$  is identified by comparing the probability of borrowers in municipality  $m$  having a loan before or after the U-SACCO in that municipality starts operating, relative to individuals in other municipalities that do not yet have an active U-SACCO. In other words, the control group comprises all the individuals in municipalities that do not have U-SACCOs which give out loans at time  $t$ , even if they start doing so later on. In more demanding specifications, we add municipality-specific time trends to make sure our estimates are not confounded by differential trends in financial access or credit demand across municipalities, or other unobserved time-varying municipality attributes. We estimate Equation 1 as a linear probability model (Ordinary Least Squares) with standard errors that are clustered at the municipality level.

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<sup>20</sup>We also examine the robustness of our results to setting up the balanced panel at yearly or quarterly frequency, see Table A2 and related discussion in Section 4.4.

## 4.2 Baseline Results

The baseline results reported in Table 2 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 time trends (column 3). The coefficient  $\beta$  is precisely estimated across specifications and the point estimate becomes larger when the specifications include municipality-specific time trends such that the effect is identified by a deviation from trend in financial access that differs by municipality. The estimates indicate that the U-SACCO program raised the probability of an individual having an outstanding loan by 3.7 percentage points and this effect is statistically significant at the 1% level. This effect is economically sizeable given that on average the share of individuals with an outstanding loan in the pre-program period is 9.6%. The coefficients on control variables indicate that male, single, older individuals, as well as government employees, are more likely to have access to credit.

To rule out potential anticipation effects which could undermine our identification strategy, we explore the dynamic effects of the U-SACCO program during the sample period. Specifically, we split the  $\beta$  coefficient by time elapsed before and after the implementation of the program, considering intervals of one, two, and more than two years before and after program implementation. The estimated coefficients and associated confidence intervals are depicted in Figure 4. The estimates show that the likelihood of having a loan is higher after the program and rises over time. The increasing magnitude of the effect over time suggests that the program had sustained effects on financial access as opposed to a one-off (transitory) effect. The chart also shows that the parallel trends assumption is likely to hold in our setting given that the point estimates before the program are close to zero and statistically insignificant.<sup>21</sup>

Given that U-SACCOs were likely competing for clients with existing banks and MFIs, a natural question that emerges from this baseline result is whether the overall effect of the program is driven by U-SACCOs themselves or by other financial intermediaries due to increased competition in the local financial sector. To investigate this issue, we use our preferred specification with municipality-specific time trends in column 3 of Table 2, but examine loans from U-SACCOs, commercial banks, and other MFIs separately. That is, the dependent variable is a dummy equal to 1 for individuals

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<sup>21</sup>Column 1 of Table A1 shows the estimated coefficients illustrated in Figure 4.

who have a loan at each type of financial institution in a given month. The results suggest that the rise in credit availability is driven by U-SACCOs (columns 4-6).

We examine the dynamics of the average effect for each type of lender in Figure 5.<sup>22</sup> In addition to a lack of differential trends before the program for either type of financial institution, two further results emerge. First, the main program effect is driven by U-SACCOs, with the likelihood of an individual having an outstanding loan rising in the first two years of the program and subsequently stabilizing at about 10 percentage points higher than in the pre-program period. Second, there are “spillover” effects of the program to commercial banks, which catch up with a lag. In fact, starting in the second year of the program, the probability of obtaining a loan from a commercial bank increases up to 3.5 percentage points more than in the pre-program period. This result is consistent with the idea that commercial banks reached out to a new customer base taking advantage of the fact the U-SACCO program and the presence of the credit register reduced information asymmetries and allowed previously unbanked individuals to obtain credit, build credit history, and signal their creditworthiness. Consistent with this notion, we observe that, in the years following the roll-out of the microcredit expansion program, commercial banks expand their branch network, increasing their presence relatively more in municipalities with lower pre-program share of banked individuals (Figure 6).<sup>23</sup> The expansion of the branch network is reflected in a reduction of the distance between borrowers and commercial bank branches. According to the FinScope surveys, the share of individuals for whom it takes less than 30 minutes to reach the nearest bank increased from 21% in 2012 to 25% in 2016 (FinScope, 2012, 2016). In contrast, the same FinScope surveys document no such effect for other MFIs (i.e., non U-SACCOs).

### 4.3 Spatial and Borrower Heterogeneity

Our baseline results point to a significant positive average effect of the loan expansion program on access to credit. However, this effect likely varies with municipality attributes such as the level of financial inclusion, urbanization, and economic development prior to the introduction of U-SACCOs. Bruhn and Love (2014) show that the positive impact of Banco Azteca’s opening

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<sup>22</sup>Columns 2 to 4 of Table A1 shows the estimated coefficients illustrated in Figure 5.

<sup>23</sup>Using detailed bank-level data on the location of bank branches at the municipality level for the 16 active commercial banks in Rwanda from 2011 to 2016, we find that commercial banks increased the number of branches by 5.8% in high bank presence municipalities and by 11.0% in low bank presence municipalities—where low (high) bank presence municipalities are defined as those below (above) the 75<sup>th</sup> percentile of the distribution of the pre-program share of individuals with an outstanding loan over adult population.



of 800 bank branches on employment and income is concentrated in Mexican municipalities that were relatively underserved by banks, as measured by branch penetration. [Agarwal, Alok, Ghosh, Ghosh, Piskorski and Seru \(2017\)](#) show that the government-led Jan Dhan Yojana financial inclusion program in India increased account openings and bank lending relatively more in regions with lower bank branch presence and a higher share of unbanked households. Similarly, we expect the increase in access to credit to be relatively larger in areas with lower financial access prior to the U-SACCO program.

To examine spatial heterogeneity in the average program effect, we first exploit variation across municipalities according to the pre-program share of individuals with an outstanding bank loan relative to the municipality-specific working-age population. In particular, we follow [Bruhn and Love \(2014\)](#) and split the continuous variable around the 75<sup>th</sup> percentile of its distribution to create a low (below the 75<sup>th</sup> percentile) and high (above the 75<sup>th</sup> percentile) bank presence dummy variable. We also separate rural from urban municipalities, with the former defined as municipalities where the entire population resides in rural areas before the program, and the latter as municipalities where a nonzero fraction of the population resides in urban areas. Then, we identify high- and low-income municipalities based on two additional measures: the poverty headcount ratio and the average night-time luminosity for the year 2011 (i.e., before the program). In the first case we split the municipalities around a poverty headcount threshold of 20% (which roughly corresponds to the first quartile of the sample distribution), while for night-time lights we split the continuous variable around the 75<sup>th</sup> percentile of its sample distribution.

The results are reported in Table 3. Across all measures of spatial heterogeneity, we observe that the program's average effect is concentrated in municipalities with lower *ex-ante* levels of financial and economic development. This finding suggests that the impact of the loan expansion program was driven by increased access to credit to previously under-served individuals. The coefficient on the interaction term between the *Post U-SACCO* and the low bank presence dummy variables is positive and significant in the overall sample as well as separately for loans from U-SACCOs (columns 1-2), but insignificant for loans from MFIs or commercial banks (columns 3-4). The point estimate is larger than that on the stand-alone *Post U-SACCO* dummy (compare Table 3, columns 1-2, with Table 2, columns 3-4). Specifically, the probability of having a loan increased by 4.3 percentage points in low bank presence municipalities after the program, a sizeable increase given that the average share of individuals with a loan in the pre-program period in low bank presence

municipalities was 4.6%. The same result holds in sample splits of rural versus urban municipalities, low-income versus high-income, and low-poverty versus high-poverty municipalities.

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

As shown in column 1 of Table 4, our results suggest that the program mainly increased credit provision (through U-SACCOs) to non-government employees. Assuming government employees are more creditworthy due to the stability of their labor contracts, this result suggests the program was able to reach out to riskier borrowers who were otherwise unable to obtain loans. The specifications in the remaining columns show that the U-SACCOs improved access to credit to both young and old borrowers, single and married individuals, as well as males and single females. We find no significant program impact for married female borrowers, possibly because credit tends to be contracted by males on behalf of the household.

#### 4.4 Robustness and Falsification Tests

We present a series of robustness tests. 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 borrower-municipality-time dataset, but on a quarterly or yearly (rather than monthly) frequency. The results are shown in Table A2 and indicate that the baseline effect of the program as well as the role of U-SACCOs are robust to these alternative data frequencies.

Second, we make sure our results are not driven by the (small number of) municipalities for which we never observe an active U-SACCO during the sample period. As mentioned in Section 4.1, in the credit register we observe the lending activities of individuals residing in 336 municipalities. Among these municipalities, there is no loan-granting U-SACCO in 39 municipalities. To ensure our results are not driven by municipalities with loan-granting but non-reporting U-SACCOs, we drop these 39 municipalities from the sample. As shown in Table A3, our results are unchanged.

Third, we test 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.<sup>24</sup> The main differences from the baseline analysis is that (i) we only have two time periods 2012 and 2016, and (ii) borrower location is available at the district (rather than municipality) level. The dependent variable is either a dummy equal to 1 for survey respondents with a savings account, or for respondents with a savings account *and* a loan from a U-SACCO or a commercial bank. Although we cannot exploit the staggered implementation of the program due to the low frequency of the data, we instead compare changes in access to savings and credit before and after program implementation in districts with higher *ex-ante* bank presence (as a measure of program exposure) relative to districts with lower bank presence.<sup>25</sup> The results, shown in Table A8, suggest that the probability of having a savings account and that of being granted a loan (conditional on having an account) increased between 2012 and 2016 relatively more for individuals in districts with *ex-ante* lower program exposure. As in our baseline analysis, both of these results are driven by U-SACCOs, not commercial banks. These findings confirm our previous micro-evidence that the loan expansion program increased access to finance.

Fourth, we conduct a falsification test to rule out the potential concern that our results are driven by coincident events other than the implementation of the U-SACCO program. In this test we randomly assign the treatment across municipalities and over time. That is, for each municipality we randomly assign the program implementation date in the interval January 2008–December 2016 and we repeat this exercise 100 times. Table A4 reports the average coefficients across simulations corresponding to the 100 randomized 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.

## 4.5 U-SACCOs and Relationship Lending

So far our analysis has focused on the effects of the microcredit expansion program on loan provision on the extensive margin, that is, to new borrowers. In this section, we focus on the intensive margin and examine how access to credit changes after individuals obtain their first loan from a

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<sup>24</sup>FinScope surveys are conducted across 26 developing countries and focus on the factors driving financial behavior. Results based on these surveys should be interpreted with the caveat that surveys may suffer from limitations related to representativeness and reporting bias.

<sup>25</sup>Bank presence is measured as district-specific share of working age population without a bank loan in the pre-period, see Annex A-II for a detailed description of the survey and research design.

U-SACCO. Specifically, we analyze how loan terms including size, interest rate, and maturity, vary with the length of the lender-borrower relationship, and compare U-SACCOs with other financial institutions. Given that informational opaqueness likely affects the majority of individuals in our sample, who have zero or limited credit history, we expect loan terms to improve with the length of the lender-borrower relationship in the absence of hold-up problems (Bharath, Dahiya, Saunders and Srinivasan, 2011; Bos, De Haas and Millone, 2015). At the same time, it is possible that U-SACCOs face balance sheet capacity constraints compared to commercial banks, owing to their relatively smaller size, insufficient funding, and borrowing limits. As a result, U-SACCOs may be less able than commercial banks to improve loan terms as the relationship with a specific borrower matures (Cull, Demirgüç-Kunt and Morduch, 2014).<sup>26</sup>

We test this capacity-constraints conjecture by estimating a set of models that are similar to our baseline specification in Equation 1 but conditional on individuals having an outstanding loan. The dependent variables identify large loans and those with low interest rates and long maturity. They are defined as follows: (i) a dummy variable equal to 1 if loan size is larger than the 75<sup>th</sup> percentile of the sample distribution, and 0 otherwise; (ii) a dummy variable equal to 1 if the interest rate on the loan is lower than the 25<sup>th</sup> percentile of the sample distribution, and 0 otherwise; and (iii) a dummy variable equal to 1 if loan maturity is larger than the 75<sup>th</sup> percentile of the sample distribution, and 0 otherwise. The right-hand side variables include the standard set of fixed effects, municipality-specific time trends, and borrower characteristics, as well as a measure of relationship length, representing the number of months since the first loan was granted to a given borrower in a given financial institution. This relationship-length variable is then interacted with the Post-U-SACCO dummy to test whether returns to a longer lender-borrower relationship are similar in U-SACCOs compared to other financial institutions. The control group includes either loans from commercial banks and other MFIs or solely loans from commercial banks.

Table 5 shows that the likelihood of obtaining large, cheap, and long-term loans increases with the length of the relationship between borrowers and financial intermediaries. This result is in line with a large literature emphasizing the benefits of relationship lending, especially for informationally

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<sup>26</sup>All MFIs have to meet specific requirements as set up by the National Bank of Rwanda in the regulation of microfinance activity. In particular, “a microfinance institution, union or federation may not grant guarantees or loans, including overdrafts or credit facilities to the same natural person or legal entity or group for an amount exceeding 5% of its total net worth as established in its most recent financial statements. The ceiling is set at a maximum of 10% for savings and credit cooperatives whose non-performing overdue loans are under 5%. In no case may a single loan exceed 2.5% of the total deposits of the microfinance institution.” Moreover, U-SACCOs are generally not able to offer long-term loans as their funding consists almost entirely by callable deposits (the average maturity is about 5 months and the maximum maturity does not exceed 4 years).

opaque borrowers and in a presence of a credit reference bureau (Boot and Thakor, 1994; Bharath, Dahiya, Saunders and Srinivasan, 2011; Bos, De Haas and Millone, 2015). However, U-SACCOs are *less* likely to grant large, cheap, and long-term loans relative to either control group. In fact, the negative and significant coefficient on the interaction terms indicates that the beneficial effect of relationship length on loan terms is weaker, if not completely nil, for U-SACCOs. Looking at coefficient magnitudes, one additional year of relationship with a commercial bank or other MFIs raises the likelihood of obtaining a loan in the top quartile of the distribution of loan size by 4%, but this effect is only 2.2% for U-SACCOs.<sup>27</sup> Similarly, the effect on loan maturity of one additional year of relationship is 10.9% for banks and other MFIs, and only 3.3% for U-SACCOs. Finally, while a longer lender- borrower relationship is associated with a greater likelihood to obtain a loan in the bottom quartile of the interest rate distribution at banks, there is no such effect for U-SACCOs.

Overall, these findings indicate relatively lower returns to lending relationships with U-SACCOs compared to other financial intermediaries, supporting the notion that institutional and balance sheet constraints limit U-SACCOs' capacity to improve loan terms as lending relationships matures and informational asymmetries become less binding. The presence of such constraints at microlenders may be especially relevant for entrepreneurs and small-business owners who would need to look for alternative lenders for larger or longer-term loans. In fact, this is what we observe in our data, with 4% of borrowers who receive their first loan at U-SACCOs switching to commercial banks. This figure is larger if we isolate first-time borrowers at U-SACCOs who needed and were granted a subsequent loan, with 10% of such individuals switching to commercial banks.<sup>28</sup> In the next section we zoom in on these switching borrowers and compare loan terms between U-SACCOs and commercial banks when borrowers graduate from microfinance institutions to commercial banks.

## 5 Transition to Commercial Banks

The first part of our analysis documented the impact of the microcredit expansion program on financial inclusion. We showed that the program increased the probability of borrower access to loans, particularly in less developed municipalities, and largely through the newly set-up U-SACCOs. We also argued that U-SACCOs face balance sheet constraints in meeting increased loan demand and showed that commercial banks expanded their branch network and credit after the first year of the

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<sup>27</sup>Using the estimates in column 1 of Table 5,  $0.00333 \times 12 = 0.039$ , while  $(0.00333 - 0.00145) \times 12 = 0.022$ .

<sup>28</sup>These figures are comparable with previous studies examining loan conditions when firms switch across banks (Ioannidou and Ongena, 2010; Bonfim, Nogueira and Ongena, 2017).

program. Together, these results point towards the presence of spillover effects from U-SACCOs to commercial banks. In this section we examine in detail the transition of first-time borrowers—that is, borrowers who obtained their first loan from a U-SACCO set up through the microcredit expansion program—from the microfinance to the commercial banking sector. Specifically, we examine the characteristics of loans to borrowers who switch from U-SACCOs to commercial banks—loan size, interest rate, and maturity—relative to loans granted to similar borrowers who did not switch and kept borrowing from U-SACCOs, or similar borrowers who were already in commercial banks.

## 5.1 Empirical Strategy

Following [Ioannidou and Ongena \(2010\)](#), we define *switching loans* as new loans granted to individuals who (i) had a borrowing relationship with a financial institution (e.g., U-SACCO) in the previous year; and (ii) established a new borrowing relationship with another lender (e.g., non-U-SACCO). All loans not satisfying these two conditions are classified as non-switching loans. Using this definition, we identify 2,180 switching loans from first-time borrowers at U-SACCOs to commercial banks, corresponding to 10% of first-time U-SACCO borrowers that were granted more than one loan throughout the sample period.

Ideally, we would like to compare the terms of switching loans (loans to a borrower in a relationship with lender A that switches and takes up a new loan from lender B) with those of loans offered by the previous bank in the same period (lender A). Given that we are unable to observe the loan conditions offered by lender A to such borrowers, we compare switching loans with two alternative control groups: (i) new loans granted by U-SACCOs to similar borrowers who do not switch (non-switching borrowers); and (ii) new loans extended by banks to similar existing bank borrowers.

Loan conditions across switchers (treated group) and other borrowers (control groups) may vary for multiple reasons, including borrower characteristics and economic conditions. To alleviate potential concerns that such factors may bias our results, we carry out a matching procedure by which we match loans that are granted in the same month to borrowers of the same age group, gender, marital status, and employment status. We also match according to the type of loan, that is, mortgage or another type of loan. Within the set of borrowers who are matched “exactly” on these characteristics, we select the nearest-neighbour of each switching loan based on the loan amount, interest rate and/or maturity, as well as the degree of bank presence prior to the U-SACCO program

in the municipality where the borrower resides.<sup>29</sup>

Table 6 reports summary statistics for the treatment group and the two alternative control groups. Switching loans given by commercial banks to borrowers who switched from U-SACCOs are larger, have lower interest rates and longer maturities compared to new loans given by SACCOs to non-switchers. By contrast, switching loans are on average considerably smaller than new loans to individuals already at banks, namely, RWF 1.678 million (around USD 2,000) compared to RWF 3.324 million (for all new loans from commercial banks) or RWF 6.813 million (for loans to switchers across banks).

## 5.2 Results for Switching Loans

We first examine the loan terms of switching loans (new loans to borrowers who switch from a first-time loan at U-SACCOs to a commercial bank) compared to similar borrowers who do not switch and obtain similar loans from any U-SACCOs in the same month (non-switchers). As shown in columns 1-3 of Table 7, switchers obtain larger, cheaper, and longer-term loans relative to non-switchers, consistent with the presence of capacity constraints at microlenders. These effects are economically sizable: the coefficient magnitudes suggest that switching loans are on average larger by RWF 0.396 million, cheaper by 422 basis points, and their maturity is longer by almost 6.6 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 7.

Next, we compare switching borrowers from a U-SACCO to a commercial bank with new loans granted by the same bank in the same month to borrowers who were already in commercial banks. Table 8 reports the results. Switching loans have similar interest rates and maturities to loans granted to the control group, but considerably smaller principal amounts. The coefficient in column 1 indicates that switching loans are on average smaller by RWF 0.470 million. Given that loan conditions tend to improve as the bank-borrower relationship matures, this result could be driven by differences in relationship length between switchers and individuals already in a relationship with the switchers' destination banks. To rule out this potential explanation, we define a narrower control group comprising new loans granted by the same bank in the same month to borrowers who

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<sup>29</sup>The results are robust to an alternative matching approach combining exact matching with propensity score matching. In the first step, we “exactly” match loans across treated and control groups granted in the same month. Within this sample of loans, we carry out a one-to-one propensity score matching procedure that incorporates the same set of borrower, loan, and municipality-level characteristics as in our baseline specification—see Tables A5 and A6.

were already in commercial banks, but who switched from another commercial bank that month (i.e., U-SACCO-to-bank A switchers vs. bank B-to-bank A switchers). As shown in columns 4-6 of Table 8, our results are qualitatively the same and, if anything, quantitatively stronger.

A key question when analyzing the transition of borrowers from the microfinance sector to commercial banks is borrower riskiness.<sup>30</sup> On the one hand, if borrowers who switch from MFIs to commercial banks are riskier than existing bank borrowers, a rapid expansion in access to microcredit could affect the asset quality of commercial banks, possibly threatening financial stability. On the other hand, commercial banks could take advantage of the screening role played by microlenders and select the most creditworthy individuals from the pool of microfinance borrowers. We examine the issue of borrower riskiness using loan outcomes. Following the literature, we treat a loan as non-performing (NPL) if it goes into arrears for more than 90 days. We consider three different windows: arrears emerging within 1 year from loan origination, within 2 years, or any time until maturity. Comparing the performance of switching and non-switching loans as reported in Table 9, we find that switching loans are less likely to become non-performing compared to similar loans extended by U-SACCOs (columns 1-3). In addition, switching loans are not riskier than similar loans granted by commercial banks (columns 4-6).

Overall, these results suggest that borrowers who switch from U-SACCOs to commercial banks have credit demand that cannot be met by U-SACCOs. When they switch to commercial banks, these borrowers obtain larger and longer-term loans than the loans they might have obtained from U-SACCOs. Furthermore, commercial banks seem to engage in “cream-skimming” behavior when they select new clients from the U-SACCO borrower pool, focusing on low-risk borrowers as measured by *ex-post* loan performance.

### 5.3 Results for Post-Switching Loans

To further analyze the transition of SACCO borrowers to commercial banks, we also exploit the time dimension of the credit register and analyze *subsequent* loans that switching borrowers obtain from their new commercial bank. Using a similar approach to the previous section, we compare

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<sup>30</sup>The literature discusses the risks associated with rapid expansions of microfinance and credit provision (e.g., Banerjee, 2013; Zinman, 2014). Chen, Rasmussen and Reille (2010) document that NPLs reached 7% in Bosnia-Herzegovina, 10% in Morocco, 12% in Nicaragua and 13% in Pakistan in 2009. Most prominently, the state of Andhra Pradesh in India saw a major crisis in the MFI sector in 2010 following a rapid expansion of the microcredit sector. The characteristics of the crisis resemble those of a classical credit boom and bust cycle, where the high growth and profitability of Indian MFIs led to excessive borrowing and indebtedness among low-income clients (Beck, 2015).



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. Formally, we take an exact matching approach of the loans within borrower and bank. Subsequent loans are grouped into buckets depending on the date the loan was granted (less than 6 months, 7 to 12 months, 13 to 24 months, and more than 24 months after the first loan). In this way, we are able to tease out the effect of credit history on subsequent loan conditions.

The results reported in Table 10 show that repeat borrowers receive progressively larger and longer loans, consistent with the findings of [Bos, De Haas and Millone \(2015\)](#) for Bosnia and Herzegovina. Loan size gradually increases with the length of the relationship between the switcher and the bank (Panel A). The coefficient estimates indicate that loans granted more than two years after switching are larger by RWA 0.452 million than the original switching loan. We also find that the maturity of loans increases over time, although this positive effect disappears after two years (Panel C). Finally, there is no difference between the interest rate spread (interest rate minus the repo rate) charged on initial and subsequent loans (Panel B). This result is particularly interesting given that the discount switchers enjoy for their first loan at a commercial bank persists during the lending relationship, which is inconsistent with a hold-up problem (as documented by [Ioannidou and Ongena \(2010\)](#) for Bolivia). This result is also consistent with [Gietzen \(2016\)](#) who shows that information sharing mitigates hold-up problems in the African context.

## 6 Conclusions

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 rural and less financially developed municipalities. The overall program effect is driven by the newly set-up savings and credit cooperatives (U-SACCOs). We also document a spillover effect of the program on commercial banks, which increase their lending about one year after the roll-out of the program. A significant share of first-time borrowers at U-SACCOs who need a second loan switch to commercial banks, which grant them larger and cheaper loans than the loans they

might have received from U-SACCOs. Our evidence also suggests that the returns to relationship lending at U-SACCOs are lower than at commercial banks, leading U-SACCO borrowers with unmet credit demand to switch to commercial banks. Banks grant loans to borrowers who are least risky among U-SACCO borrowers and no riskier than existing bank borrowers.

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

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

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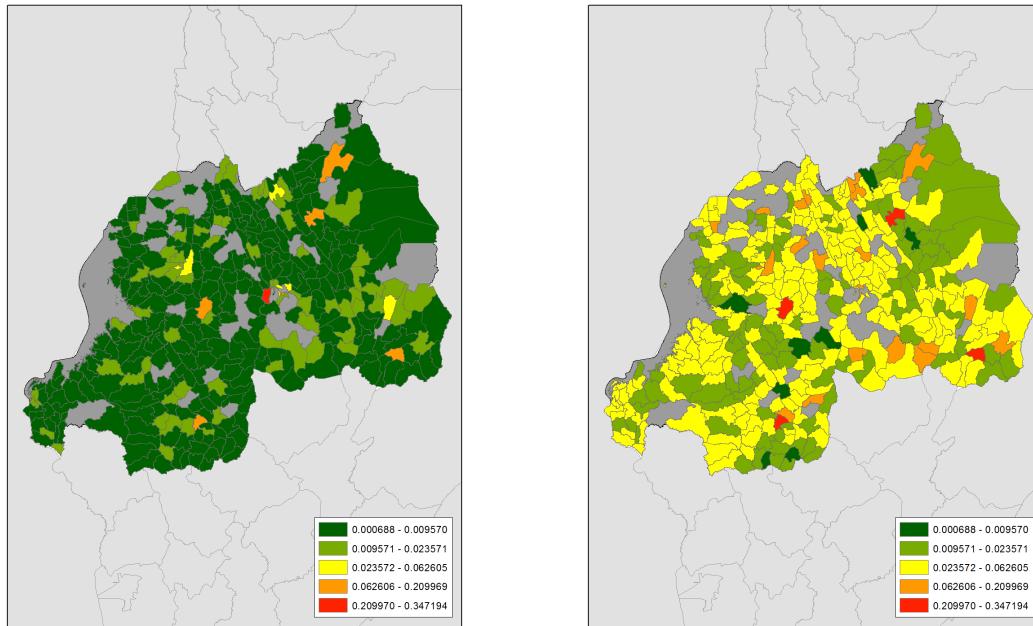
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Figure 1: Share of individuals with a loan before and after the Umerenge SACCO program

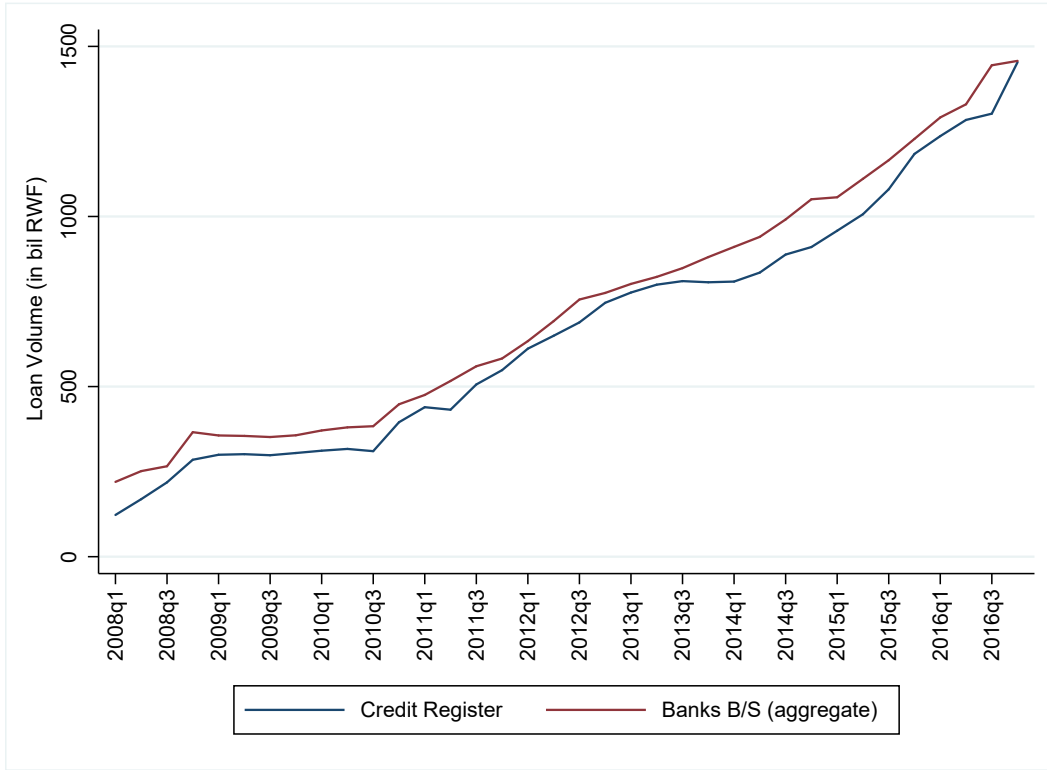


(a) Pre-program

(b) Post-program

Notes: The figure depicts the share of individuals with an outstanding loan over total adult population, by municipality, before and after the microcredit expansion program. Data sources: Rwandan Credit Reference Bureau, National Bank of Rwanda.

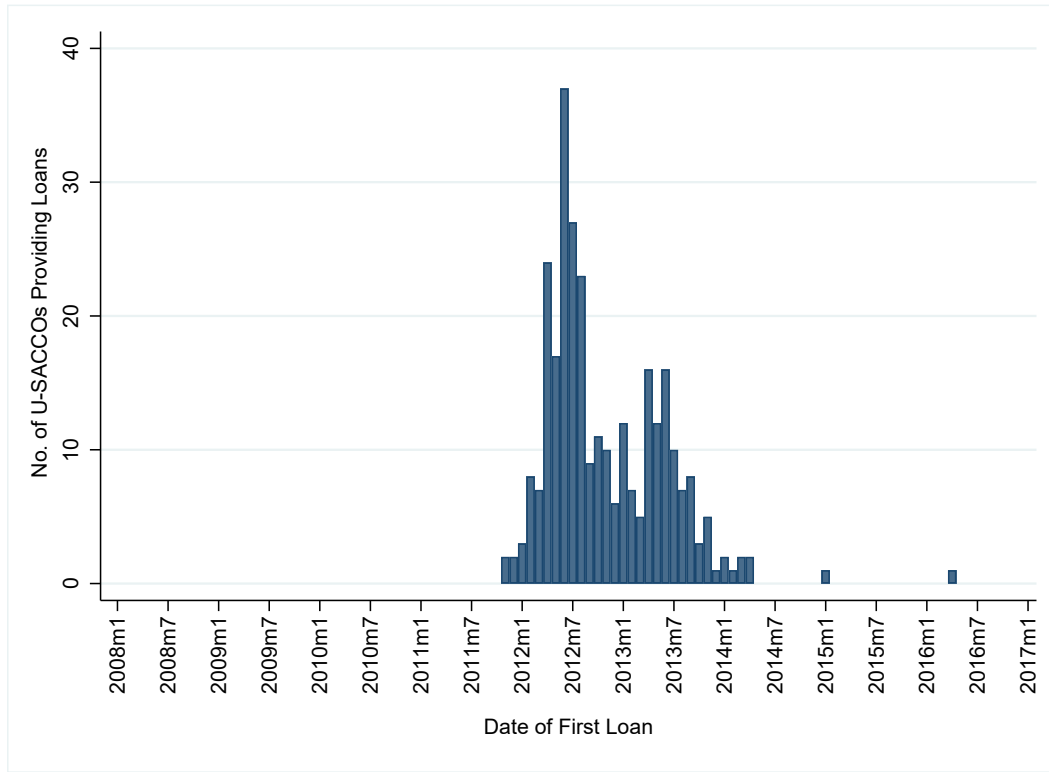
Figure 2: Credit Register Representativeness



Notes: The figure shows total bank credit in billions of Rwandan francs (RWF) from the credit register as compared to aggregate statistics from bank balance sheets. Data sources: Rwandan Credit Reference Bureau, National Bank of Rwanda.

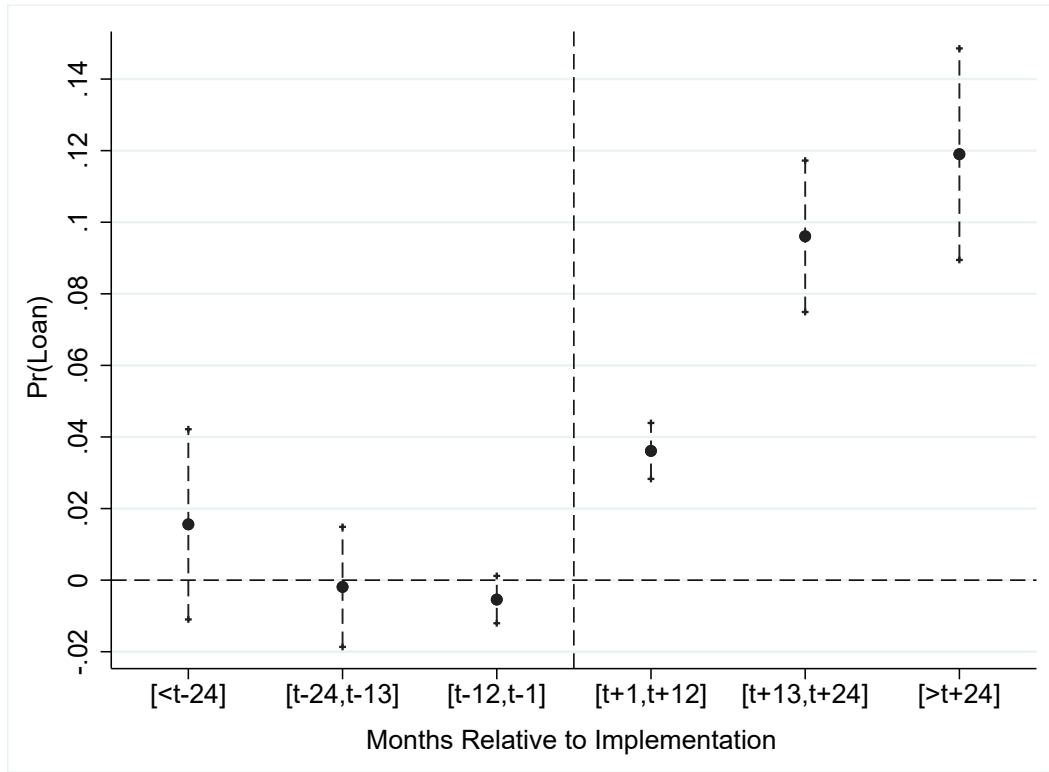


Figure 3: Staggered Implementation of SACCO Program



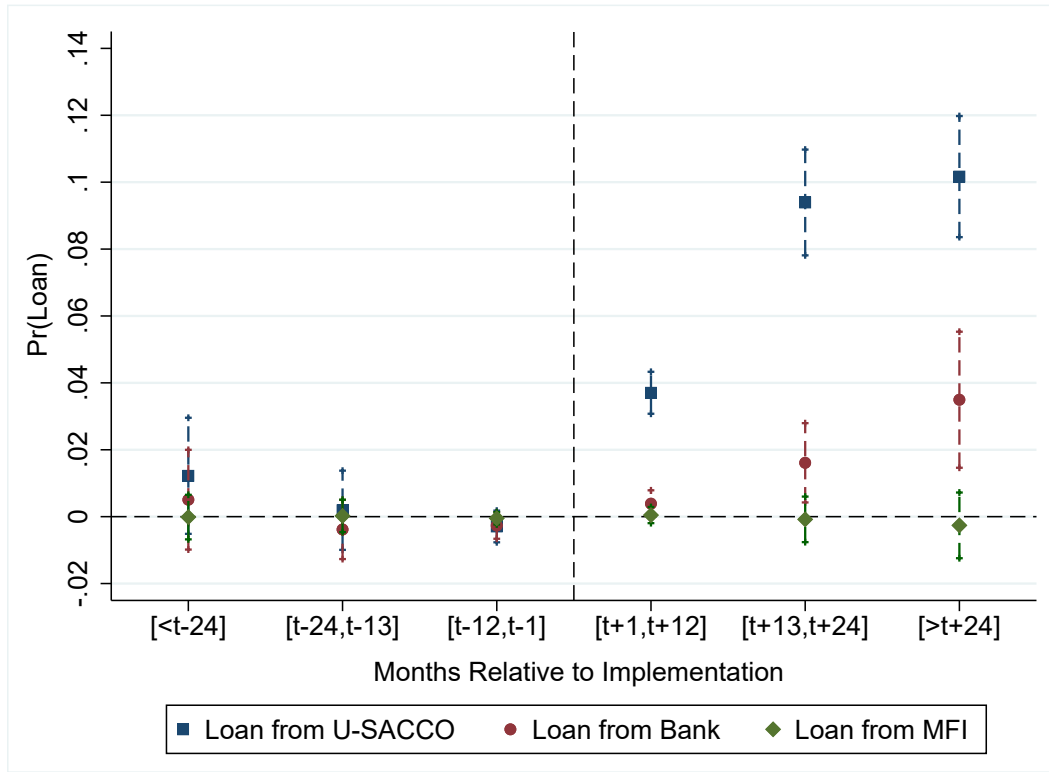
Notes: The figure depicts the number of U-SACCOs that granted their first loan during the microcredit expansion program. Data sources: Rwandan Credit Reference Bureau, National Bank of Rwanda.

Figure 4: Probability of getting a loan, before and after the program



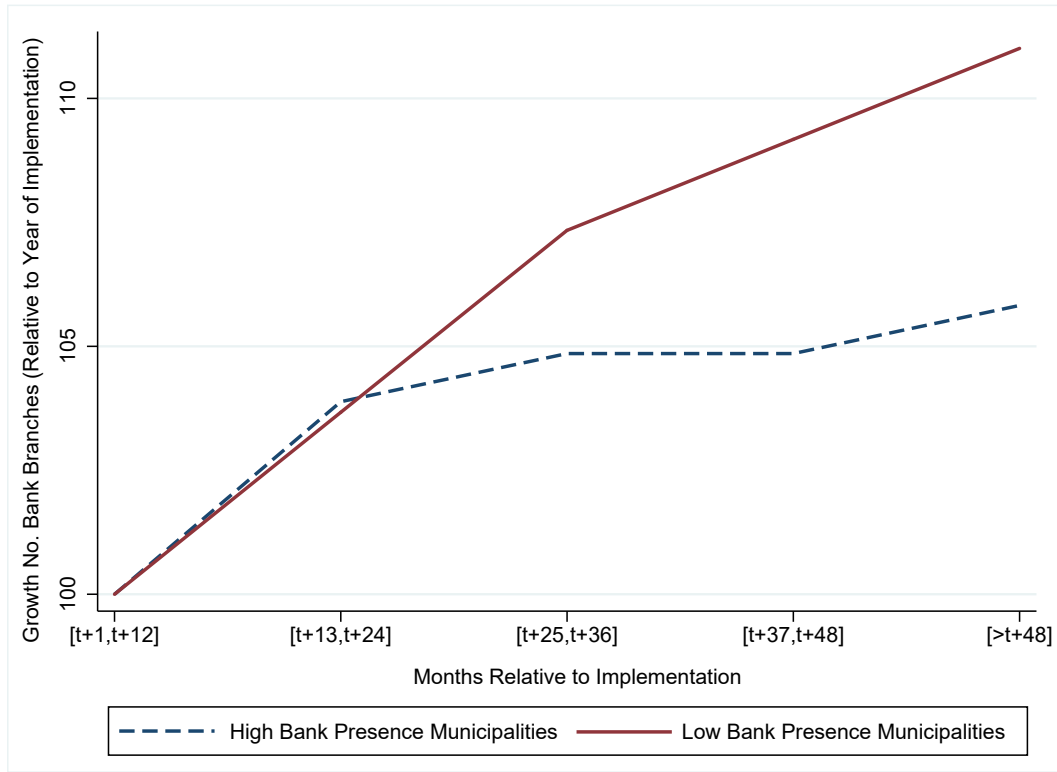
Notes: The figure shows the effect of the Umerenge SACCO program on the probability of individual having a loan in any institution (U-SACCO, other MFI or commercial bank) before and after the U-SACCO becomes operative in that municipality by extending its first loan. The chart plots the estimated coefficients and the associated 90 percent confident intervals of the interaction terms between the U-SACCO variable and a set of time dummies, as reported in Table A1, column 1. 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: Probability of getting a loan, by institution, before and after the program



Notes: The figure shows the effect of the Umerenge SACCO program on the probability of individual having a loan, separately, in U-SACCO, other MFI and commercial bank, before and after the U-SACCO becomes operative in that municipality by extending its first loan. The chart plots the estimated coefficients and the associated 90 percent confident intervals of the interaction terms between the U-SACCO variable and a set of time dummies, as reported in Table A1, columns 2-4. 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 6: Commercial banks' branch expansion after the program



Notes: The figure shows the growth of branches owned by commercial banks in municipalities with low (solid line) and high (dotted line) bank presence in the pre-program period. The number of branches are calculated relative to the value of 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 are defined as those below the 75<sup>th</sup> percentile of the distribution of the pre-program share of individuals with an outstanding loan over adult population. Data source: National Bank of Rwanda.

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. The 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 the share of the working-age population (aged 16 and above) with a loan before the program. The municipality-specific share of urban population and nightlights are also calculated before the program. The poverty headcount ratio refers to 2013. Data sources: Rwandan Credit Reference Bureau, National Institute of Statistics of Rwanda, and National Oceanic and Atmospheric Administration (NOAA).

	All financial institutions (n=420)				U-SACCOs (n=297)			
	N	Mean	p50	SD	N	Mean	p50	SD
<b>A. Loan Characteristics</b>								
Loan Exposure (RWF mn)	4,060,497	2.839	0.602	17.80	1,001,895	0.574	0.316	1.025
Loan Principal (RWA mn)	4,060,497	4.060	1	23.76	1,001,895	0.854	0.500	1.068
Interest Rate (%)	3,207,401	18.46	17.64	12.69	394,460	24.32	20	21.79
Maturity (months)	4,060,497	28.19	24	25.46	1,001,895	15.86	12	7.134
Relationship Length (months)	4,060,497	17.66	12	17.03	1,001,895	10.82	8	10.23
Loan from Bank	4,060,497	0.501	1	0.500	1,001,895	0	0	0
Loan from other MFI	4,060,497	0.252	0	0.434	1,001,895	0	0	0
Loan from U-SACCO	4,060,497	0.247	0	0.431	1,001,895	1	1	0
<b>B. Borrower characteristics</b>								
Female	177,853	0.377	0	0.485	74,935	0.262	0	0.440
Single	177,853	0.0991	0	0.299	74,935	0.0982	0	0.298
Young	177,853	0.231	0	0.421	74,935	0.209	0	0.407
Government Employee	177,853	0.0985	0	0.298	74,935	0.0671	0	0.250
<b>C. Municipality characteristics</b>								
Bank Presence	336	0.0101	0.00636	0.0127	297	0.00730	0.00563	0.00695
Share of Urban Population	336	0.118	0	0.261	297	0.0948	0	0.234
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
	Commercial Banks (n=16)				Other MFIs (n=107)			
	N	Mean	p50	SD	N	Mean	p50	SD
<b>A. Loan Characteristics</b>								
Loan Exposure (RWF mn)	2,033,512	4.658	0.943	24.90	1,025,090	1.442	0.534	3.235
Loan Principal (RWA mn)	2,033,512	6.602	1.600	33.24	1,025,090	2.149	0.999	3.980
Interest Rate (%)	1,904,814	18.07	18	9.350	908,127	16.74	12.70	12.70
Maturity (months)	2,033,512	36.20	36	29.87	1,025,090	24.35	23.34	21.38
Relationship Length (months)	2,033,512	19.31	15	17.63	1,025,090	21.09	15	19.14
Loan from Bank	2,033,512	1	1	0	1,025,090	0	0	0
Loan from other MFI	2,033,512	0	0	0	1,025,090	1	1	0
Loan from U-SACCO	2,033,512	0	0	0	1,025,090	0	0	0
<b>B. Borrower characteristics</b>								
Female	87,021	0.452	0	0.498	43,693	0.391	0	0.488
Single	87,021	0.108	0	0.310	43,693	0.110	0	0.312
Young	87,021	0.248	0	0.432	43,693	0.226	0	0.418
Government Employee	87,021	0.0759	0	0.265	43,693	0.310	0	0.462
<b>C. Municipality characteristics</b>								
Bank Presence	336	0.0101	0.00636	0.0127	336	0.0101	0.00636	0.0127
Share of Urban Population	336	0.118	0	0.261	336	0.118	0	0.261
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

Table 2: Impact of the U-SACCO Program on Access to Credit

Notes: The table presents OLS estimates of model 1. The dependent variable is a dummy equal to 1 for individuals who, at time  $t$ , have an outstanding loan with: any institutions (columns 1-3) or specifically in 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), young (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). As indicated in the bottom rows, different specifications include a different set of municipality and time fixed effects, and municipality-specific 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 sources: Rwandan Credit Reference Bureau.

	Dummy =1 if individual has a loan with:					
	Any 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*** (0.00630)	0.0370*** (0.00457)	0.00479 (0.00349)	0.00102 (0.00188)
Female		-0.0345*** (0.00159)	-0.0345*** (0.00159)	-0.0214*** (0.00151)	-0.0179*** (0.00250)	0.00149 (0.000962)
Single		0.0220*** (0.00255)	0.0220*** (0.00255)	0.00495*** (0.00114)	0.0223*** (0.00249)	0.000342 (0.00117)
Young		-0.0365*** (0.00299)	-0.0365*** (0.00299)	-0.00447*** (0.000663)	-0.0183*** (0.00312)	-0.0166*** (0.000753)
Government Employee		0.221*** (0.00468)	0.221*** (0.00468)	-0.0176*** (0.00157)	0.0275*** (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	19,208,124	19,208,124	19,208,124	19,208,124	19,208,124	19,208,124
No. Municipalities	336	336	336	336	336	336
No. Individuals	177,853	177,853	177,853	177,853	177,853	177,853
Adjusted $R^2$	0.169	0.201	0.206	0.143	0.112	0.155

Table 3: Impact of the U-SACCO Program on Access to Credit – Cross Sectional Heterogeneity

Notes: The table presents OLS estimates of model 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 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. The coefficient on the *Post U-SACCO* dummy is split across municipalities: i) with low versus high bank presence (defined as the share of individuals with a bank loan before the program, Panel A); ii) rural versus urban (Panel B); iii) with low versus high development (defined on the basis on night-time luminosity before the program, Panel C); and iv) with low vs high poverty (defined by the headcount ratio, Panel D). To define low vs. high bank presence and luminosity we split the continuous variables around the 75<sup>th</sup> percentile of the sample distribution. For poverty, we consider a municipality as a low (high) poverty one is the headcount ration in the pre-period was above (below) 20%. 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), young (equal to 1 for individuals less then 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level 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).

	Dummy =1 if individual has a Loan in			
	Any Institution (1)	U-SACCO (2)	Bank (3)	Other MFI (4)
<b>Panel A: Low vs. High Bank Presence Municipalities</b>				
Post U-SACCO x Low Bank Presence	0.0432*** (0.00544)	0.0432*** (0.00367)	0.00471 (0.00362)	0.00154 (0.00186)
Post U-SACCO x High Bank Presence	0.0100 (0.0142)	0.00762 (0.00993)	0.00515 (0.00504)	-0.00142 (0.00468)
<b>Panel B: Rural vs. Urban Municipalities</b>				
Post U-SACCO x Rural	0.0417*** (0.00550)	0.0421*** (0.00364)	0.00437 (0.00365)	0.00125 (0.00188)
Post U-SACCO x Urban	0.0123 (0.0158)	0.00723 (0.0113)	0.00723 (0.00508)	-0.000300 (0.00506)
<b>Panel C: Low vs. High Development Municipalities</b>				
Post U-SACCO x Low Development	0.0427*** (0.00587)	0.0431*** (0.00396)	0.00460 (0.00371)	0.00128 (0.00194)
Post U-SACCO x High Development	0.0193* (0.0113)	0.0160* (0.00866)	0.00542 (0.00450)	0.000142 (0.00359)
<b>Panel D: Low vs. High Poverty Levels</b>				
Post U-SACCO x High Poverty	0.0418*** (0.00568)	0.0425*** (0.00381)	0.00443 (0.00365)	0.000936 (0.00191)
Post U-SACCO x Low Poverty	0.0179 (0.0133)	0.0126 (0.00967)	0.00635 (0.00481)	0.00139 (0.00414)
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

Table 4: Impact of the U-SACCO Program on Access to Credit – Borrower Heterogeneity

Notes: The table presents OLS estimates of model 1. The dependent variable is a dummy equal to 1 for individuals who, at time  $t$ , have an outstanding loan with a U-SACCOs. *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 across: i) sector of occupation (using a dummy equal to one for government employees and zero for any other occupation and unemployed); ii) young versus old individuals (using a dummy equal to one for individuals less than 30-year old); iii) marital status (using a dummy equal to one for single individuals and zero for any other status); and iv) gender. 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 in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Data sources: Rwandan Credit Reference Bureau.

	Dummy =1 if individual has a Loan in a U-SACCO				
	(1)	(2)	(3)	(4)	(5)
Post U-SACCO x Government Employee	0.00102 (0.00541)				
Post U-SACCO x Non-Government Employee	0.0409*** (0.00465)				
Post U-SACCO x Young		0.0332*** (0.00468)			
Post U-SACCO x Old		0.0399*** (0.00459)			
Post U-SACCO x Single			0.0493*** (0.00545)		
Post U-SACCO x Married			0.0356*** (0.00457)		
Post U-SACCO x Female				0.00388 (0.00475)	
Post U-SACCO x Male				0.0564*** (0.00466)	
Post U-SACCO x Single Female					0.0199*** (0.00526)
Post U-SACCO x Married Female					0.00264 (0.00480)
Post U-SACCO x Single Male					0.0598*** (0.00574)
Post U-SACCO x Married Male					0.0559*** (0.00464)
Municipality FE	Y	Y	Y	Y	Y
Time (Year:month) FE	Y	Y	Y	Y	Y
Borrower Controls	Y	Y	Y	Y	Y
Municipality Time Trends	Y	Y	Y	Y	Y
No. Observations	19,208,124	19,208,124	19,208,124	19,208,124	19,208,124
No. Municipalities	336	336	336	336	336
No. Individuals	177,853	177,853	177,853	177,853	177,853
Adjusted $R^2$	0.144	0.143	0.143	0.146	0.146



Table 5: Impact of the U-SACCO Program on Access to Credit – Loan Terms

Notes: The table presents OLS estimates of model 1. The dependent variable is (i) a dummy equal to 1 if loan size is larger than the 75<sup>th</sup> percentile of the sample distribution, and 0 otherwise (columns 1-2); (ii) a dummy equal to 1 if the interest rate on the loan is lower than the 25<sup>th</sup> percentile of the sample distribution, and 0 otherwise (columns 3-4); and (iii) a dummy equal to 1 if the maturity is larger than the 75<sup>th</sup> percentile of the sample distribution, and 0 otherwise (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. Relationship length measured the length of the bank-borrower relationship, in months. 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), young (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The data are at the borrower-municipality-month level, conditional on individuals having an outstanding loan. 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 sources: Rwandan Credit Reference Bureau.

	loan amount > 75 <sup>th</sup> percentile (1)	interest rate < 25 <sup>th</sup> percentile (3)	Dummy =1 if maturity > 75 <sup>th</sup> percentile (5)	maturity > 75 <sup>th</sup> percentile (6)
Post U-SACCO x Relationship length	-0.00145*** (0.000196)	-0.00558*** (0.000302)	-0.00456*** (0.000294)	-0.00634*** (0.000246)
Post U-SACCO	-0.144*** (0.00584)	-0.101*** (0.00881)	-0.112*** (0.00860)	-0.233*** (0.00669)
Relationship length	0.00333*** (0.000117)	0.00448*** (0.000192)	0.00279*** (0.000178)	0.00907*** (0.000134)
Control Group	Banks & MFIs	Banks & MFIs	Banks	Banks & Other
Municipality x Time (Year:month) FE	Y	Y	Y	Y
Borrower Controls	Y	Y	Y	Y
No. Observations	4,058,854	3,205,693	2,296,987	4,058,854
No. Municipalities	336	336	336	336
No. Individuals	177,853	149,919	122411	177,853
Adjusted R-squared	0.154	0.333	0.167	0.273

Table 6: Switching Analysis – Treatment vs. Control Groups

Notes: The table presents average loan and borrower characteristics for the treatment (column 1) and control groups (columns 2-4) in the analysis of switching loans described in Section 5. 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, column 3 to all commercial bank borrowers, and column 4 to commercial bank borrowers who switch from another commercial bank. 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.

	Switching Loans (U-SACCO → Banks) (n=2,154)	New Loans from U-SACCOs to Non-Switchers (n=57,196)	New Loans from Banks to Non-Switchers (n=155,971)	New Loans from Banks to Bank → Bank Switchers (n=8,125)
	(1)	(2)	(3)	(4)
Loan Amount	1.678	0.667***	3.324***	6.813***
Loan Interest Rate	19.63	25.18***	20.41***	19.45
Loan Maturity	23.16	14.11***	23.74	34.76***
Female Borrower	0.264	0.260	0.424***	0.310***
Single Borrower	0.108	0.098	0.112	0.155***
Young Borrower	0.211	0.224	0.234***	0.205
Government Employee	0.095	0.075***	0.101	0.184***
Mortgage	0.033	0.017***	0.057***	0.087***
NPL - within 1 year	0.045	0.049	0.047	0.083***
NPL - within 2 years	0.071	0.060*	0.078	0.147***
NPL - until maturity	0.073	0.064	0.090***	0.166***

Table 7: Analysis of Switching Borrowers – Comparison with U-SACCOs

Notes: The table presents the OLS estimates of a regression in which the dependent variable is, alternatively, loan size, interest rate, and maturity (as indicated in column headings) and the explanatory variable is an indicator for switching loans. The comparison between switching and other loans is done with “exact matching” on lender, year:month, and borrower and loan characteristics, as listed at the bottom of the table. The dataset captures new loans. Standard errors are in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Data sources: Rwandan Credit Reference Bureau.

	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 Maturity (3)	Loan Amount (4)	Interest Rate (5)	Loan Maturity (6)	Loan Maturity (6)
	Switching Loan – Other Loans (with matching)	0.396*** (0.111)	-4.224*** (0.679)	6.596*** (0.446)	6.596*** (0.446)	0.484*** (0.177)	-3.283** (1.514)	3.481*** (0.795)
Switching Loan – Other Loans (without matching)	1.010*** (0.023)	-5.548*** (0.456)	9.052*** (0.170)	9.052*** (0.170)	1.038*** (0.034)	-5.158*** (0.782)	7.375*** (0.270)	7.375*** (0.270)
<i>Matching Variables:</i>								
Year:Month of Loan Initiation	Y	Y	Y	Y	Y	Y	Y	Y
U-SACCOs	Y	Y	Y	Y	Y	Y	Y	Y
Inside U-SACCO								
Young Borrower	Y	Y	Y	Y	Y	Y	Y	Y
Female Borrower	Y	Y	Y	Y	Y	Y	Y	Y
Single Borrower	Y	Y	Y	Y	Y	Y	Y	Y
Government Employee	Y	Y	Y	Y	Y	Y	Y	Y
Mortgage	Y	Y	Y	Y	Y	Y	Y	Y
Bank Presence	Y	Y	Y	Y	Y	Y	Y	Y
Loan Amount	Y	Y	Y	Y	Y	Y	Y	Y
Loan Interest Rate	Y	Y	Y	Y	Y	Y	Y	Y
Loan Maturity	Y	Y	Y	Y	Y	Y	Y	Y
No. Switchers (Treated)	2,154	2,154	2,154	2,154	729	729	729	729
No. Untreated Borrowers	57,196	57,196	57,196	57,196	57,196	57,196	57,196	57,196

Table 8: Analysis of Switching Borrowers – Comparison with Commercial Banks

Notes: The table presents the OLS estimates of a regression in which the dependent variable is, alternatively, loan size, interest rate, and maturity (as indicated in column headings) and the explanatory variable is an indicator for switching loans. The comparison between switching and other loans is done with “exact matching” on lender, year:month, and borrower and loan characteristics, as listed at the bottom of the table. The dataset captures new loans. Standard errors are in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Data sources: Rwandan Credit Reference Bureau.

	Control Group: New loans by the same commercial bank the U-SACCO borrower switched to			Control Group: 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 (with matching)	-0.470*** (0.152)	-0.072 (0.250)	-0.268 (0.387)	-1.505*** (0.362)	0.133 (0.407)
Switching Loan – Other Loans (without matching)	-1.647** (0.543)	-0.779*** (0.228)	-0.578 (0.533)	-5.268*** (0.561)	0.681*** (0.264)	-13.664*** (0.864)
<i>Matching Variables:</i>						
Year:Month of Loan Initiation	Y	Y	Y	Y	Y	Y
Outside Bank	Y	Y	Y	Y	Y	Y
Switcher				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
Mortgage	Y	Y	Y	Y	Y	Y
Bank Presence	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)	2,154	2,154	2,154	1,751	1,751	1,751
No. Untreated Borrowers	155,971	155,971	155,971	8,125	8,125	8,125

Table 9: Analysis of Switching Borrowers – Non-Performing Loans

Notes: The table presents the OLS estimates of a regression in which the dependent variable is the probability that the a loan becomes an NPL (according to three alternative windows as indicated in column headings) and the explanatory variable is an indicator for switching loans. The comparison between switching and other loans is done with ‘exact matching’ on lender, year:month, and borrower and loan characteristics, as listed at the bottom of the table. The dataset captures new loans. Standard errors are in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Data sources: Rwandan Credit Reference Bureau.

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 (with matching)	-0.005 (0.009)	-0.029*** (0.011)	-0.036*** (0.011)	-0.005 (0.006)	-0.006 (0.008)	-0.009 (0.008)
Switching Loan – Other Loans (without matching)	-0.004 (0.005)	0.010** (0.005)	0.009* (0.005)	-0.002 (0.005)	-0.007 (0.006)	-0.017*** (0.006)
<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
Mortgage	Y	Y	Y	Y	Y	Y
Degree of Bank Presence	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)	2,154	2,154	2,154	2,154	2,154	2,154
No. Untreated Borrowers	57,196	57,196	57,196	155,971	155,971	155,971

Table 10: Switching Analysis – Subsequent Loans

Notes: The table presents the OLS estimates of a regression of loan characteristics—Amount (Panel A); Interest rate (Panel B); and Maturity (Panel C)—on an indicator for on subsequent loans that the borrower switching from a U-SACCO obtain from a commercial bank, grouped in buckets depending on the time elapsed since the first loan, as indicated in column headings. 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 sources: Rwandan Credit Reference Bureau.

Time since the switching loan:	1 to 6 months	7 to 12 months	12 to 24 months	24+ months
<b>Panel A: Loan Amount</b>				
New Loan – Original Switching Loan	0.015 (0.016)	0.011 (0.028)	0.098*** (0.034)	0.452*** (0.133)
No. Switching Loans	2,154	2,154	2,154	2,154
No. Future Loans of Switchers	10,980	7,519	9,843	4,519
<b>Panel B: Interest Rate Spread</b>				
New Loan – Original Switching Loan	-0.155 (0.160)	-0.349 (0.260)	-0.375 (0.356)	-0.616 (0.654)
No. Switching Loans	2,154	2,154	2,154	2,154
No. Future Loans of Switchers	10,980	7,519	9,843	4,519
<b>Panel C: Loan Maturity</b>				
New Loan – Original Switching Loan	0.060 (0.078)	0.336* (0.181)	0.891*** (0.280)	0.390 (0.715)
No. Switching Loans	2,154	2,154	2,154	2,154
No. Future Loans of Switchers	10,980	7,519	9,843	4,519

# Appendix—Intended for Online Publication

## A-I Additional Results

Table A1: Impact of the U-SACCO Program on Access to Credit – Effects over time

Notes: The table presents OLS estimates of model 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 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. 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), young (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Data sources: 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)	0.00507 (0.00758)	-0.000118 (0.00339)
Post U-SACCO [ $t-13,t-24$ ]	-0.00189 (0.00853)	0.00191 (0.00602)	-0.00383 (0.00450)	0.000230 (0.00246)
Post U-SACCO [ $t-1,t-12$ ]	-0.00542 (0.00336)	-0.00292 (0.00241)	-0.00265 (0.00201)	-0.000490 (0.000933)
Post U-SACCO [ $t+1,t+12$ ]	0.0361*** (0.00398)	0.0370*** (0.00319)	0.00389* (0.00203)	0.000474 (0.00123)
Post U-SACCO [ $t+13,t+24$ ]	0.0961*** (0.0108)	0.0939*** (0.00804)	0.0161*** (0.00602)	-0.000806 (0.00346)
Post U-SACCO [ $> t+24$ ]	0.119*** (0.0150)	0.102*** (0.00920)	0.0350*** (0.0103)	-0.00260 (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	19,208,124	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 $R^2$	0.207	0.146	0.112	0.155

Table A2: Impact of the U-SACCO Program on Access to Credit – Alternative Data Structure

Notes: The table presents OLS estimates of model 1 collapsing the original dataset at the borrower-municipality-month level at 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), young (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level in parentheses. \*\*\*,  $p < 0.01$ , \*\*,  $p < 0.05$ , \*  $p < 0.1$ . Data sources: 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*** (0.00614)	0.0374*** (0.00463)	0.00359 (0.00341)	0.000976 (0.00189)	0.0337*** (0.00754)	0.0414*** (0.00524)	-0.000769 (0.00424)	-0.000592 (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	6,402,708	6,402,708	6,402,708	6,402,708	1,600,677	1,600,677	1,600,677	1,600,677
No. Municipalities	336	336	336	336	336	336	336	336
No. Individuals	177,853	177,853	177,853	177,853	177,853	177,853	177,853	177,853
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 – Excluding municipalities where U-SACCOs never operated

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

	Dummy = 1 if individual has a loan in							
	Any Institution (1)	(2)	U-SACCO (3)	(4)	Bank (5)	(6)	Other MFI (7)	(8)
Post U-SACCO	0.0305*** (0.00696)		0.0326*** (0.00508)	0.00130 (0.0139)	0.00229 (0.00359)	-0.00810 (0.00776)	0.000285 (0.00167)	0.00231 (0.00344)
Post U-SACCO [ $< t-24$ ]		-0.00511 (0.0186)		(0.0139)		(0.00776)		(0.00344)
Post U-SACCO [ $t-13, t-24$ ]		-0.00616 (0.0125)		-0.00191 (0.00941)		-0.00627 (0.00547)		0.00182 (0.00255)
Post U-SACCO [ $t-1, t-12$ ]		-0.00478 (0.00463)		-0.00324 (0.00352)		-0.00215 (0.00235)		-6.09e-05 (0.000909)
Post U-SACCO [ $t+1, t+12$ ]		0.0324*** (0.00449)		0.0349*** (0.00365)		0.00184 (0.00199)		0.000852 (0.00117)
Post U-SACCO [ $t+13, t+24$ ]		0.0817*** (0.0107)		0.0834*** (0.00871)		0.00837* (0.00493)		0.00269 (0.00305)
Post U-SACCO [ $> t+24$ ]		0.0867*** (0.0125)		0.0790*** (0.00999)		0.0164** (0.00719)		0.00551 (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	16,909,020	16,909,020	16,909,020	16,909,020	16,909,020	16,909,020	16,909,020	16,909,020
No. Municipalities	297	297	297	297	297	297	297	297
No. Individuals	156,565	156,565	156,565	156,565	156,565	156,565	156,565	156,565
Adjusted $R^2$	0.213	0.213	0.139	0.140	0.101	0.101	0.164	0.164

Table A4: Impact of the U-SACCO Program on Access to Credit – Falsification Tests

Notes: The table presents OLS estimates of model 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 4), commercial banks (column 5) or other MFIs (column 6). *Post U-SACCO* is a dummy constructed 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), young (equal to 1 for individuals less than 30-year old, and 0 otherwise), and sector of occupation (equal to 1 for government employees and 0 for any other occupation as well as for those unemployed). The data are at the borrower-municipality-month level. The sample period is 2008:M1 to 2016:M12. Standard errors clustered at the municipality level in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Data sources: 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	0.0004 (0.00636)	-0.0005 (0.00391)	-0.00004 (0.00367)	0.00034 (0.00177)
Female	-0.0345*** (0.00159)	-0.0214*** (0.00151)	-0.0179*** (0.00250)	0.00149 (0.000962)
Single	0.0220*** (0.00255)	0.00495*** (0.00114)	0.0223*** (0.00249)	0.000342 (0.00117)
Young	-0.0365*** (0.00299)	-0.00447*** (0.000663)	-0.0183*** (0.00312)	-0.0166*** (0.000753)
Government Employee	0.2214*** (0.00468)	-0.0176*** (0.00157)	0.0275*** (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 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 A5: Analysis of Switching Borrowers – Comparison with U-SACCOs, Propensity Score Matching

Notes: The table presents the OLS estimates of a regression in which the dependent variable is, alternatively, loan size, interest rate, and maturity (as indicated in column headings) and the explanatory variable is an indicator for switching loans. The comparison between switching and other loans is done with “exact matching” on lender and year:month and propensity score matching on the borrower and loan characteristics listed at the bottom of the table. The dataset captures new loans. Standard errors are in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Data sources: Rwandan Credit Reference Bureau.

	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 (propensity score matching)	0.822*** (0.087)	-6.266*** (0.669)	8.643*** (0.443)	0.941*** (0.171)	-9.063*** (1.322)
Switching Loan – Other Loans (without matching)	1.010*** (0.023)	-5.548*** (0.456)	9.052*** (0.170)	1.038*** (0.034)	-5.158*** (0.782)	7.375*** (0.270)
<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						
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
Mortgage	Y	Y	Y	Y	Y	Y
Degree of Bank Presence	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)	2,154	2,154	2,154	729	729	729
No. Untreated Borrowers	57,196	57,196	57,196	57,196	57,196	57,196

Table A6: Analysis of Switching Borrowers – Comparison with Commercial Banks, Propensity Score Matching

Notes: The table presents the OLS estimates of a regression in which the dependent variable is, alternatively, loan size, interest rate, and maturity (as indicated in column headings) and the explanatory variable is an indicator for switching loans. The comparison between switching and other loans is done with “exact matching” on lender and year:month and propensity score matching on the borrower and loan characteristics listed at the bottom of the table. The dataset captures new loans. Standard errors are in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Data sources: Rwandan Credit Reference Bureau.

	Control Group: New loans by the same commercial bank the U-SACCO borrower switched to			Control Group: 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 (propensity score matching)	-0.758*** (0.250)	-0.083 (0.345)	-0.266 (0.629)	-1.290*** (0.454)	-0.387 (0.562)
Switching Loan – Other Loans (without matching)	-1.647** (0.543)	-0.779*** (0.228)	-0.578 (0.533)	-5.268*** (0.561)	0.681*** (0.264)	-13.664*** (0.864)
<i>Matching Variables:</i>						
Year:Month of Loan Initiation	Y	Y	Y	Y	Y	Y
Outside Bank	Y	Y	Y	Y	Y	Y
Switcher						
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
Mortgage	Y	Y	Y	Y	Y	Y
Degree of Bank Presence	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)	2,154	2,154	2,154	1,751	1,751	1,751
No. Untreated Borrowers	155,971	155,971	155,971	8,125	8,125	8,125

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

We test whether the microcredit expansion program increased financial access using survey data from the 2012 and the 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 financial sector. Summary statistics on financial inclusion are shown in Table A7.

We employ a different identification strategy than in the baseline analysis as we only have two cross sections of data and borrower location is available at the district rather than municipality level. Given that 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 outcome, and compare changes in access to finance before and after the program across districts with a different *ex-ante* exposure to the program.<sup>31</sup> Similar to our main analysis looking at spatial heterogeneity, the variable that captures exposure to the program is *Low Bank Presence* and is defined as the share of working-age individuals without an outstanding bank loan before the program (in the month before each SACCO started its lending operations) and is constructed from the credit register. In all specifications we control for borrower characteristics. We estimate the following specification:

$$Pr(Access)_{idt} = \beta(Low\ Bank\ Presence_d \times Post_t) + \delta' X_i + \alpha_d + \phi_t + \varepsilon_{idt} \quad (A-I)$$

where the dependent variable is alternately the probability that individual  $i$  in a district  $d$  has a savings account or a bank loan (conditional on a savings account) in year  $t$  (where  $t = 2012$  or  $t = 2016$ );  $\alpha_d$  are district fixed effects; and  $\phi_t$  are survey fixed effects.

The results, shown in Table A8, show that the likelihood of individuals having savings and loan accounts is relatively higher in districts with pre-program lower bank presence than in other districts, an effect that is driven by U-SACCOs. The point estimates are close to those in our primary analysis.

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<sup>31</sup>Ideally, we would have used the 2008 survey as baseline, but the microdata is not available. It is important to note, however, that using 2012 as the benchmark will likely underestimate the effects of the program given that its implementation started in 2011.

Table A7: Descriptives on SACCO Program and Financial Inclusion—Survey Evidence

Notes: The table presents descriptive statistics for two key variables on financial inclusion: an indicator variable for individuals with savings accounts and an indicator variable for individuals with savings and loan accounts. The dataset is repeated cross-sections of borrowers in the 2012 and 2016 FinScope surveys. Source: FinScope Surveys, 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>Savings Account in a:</i>						
Bank, SACCO or MFI	0.319	0.466	0.364	0.481	0.344	0.475
Bank or SACCO	0.305	0.460	0.343	0.475	0.326	0.469
Bank	0.153	0.360	0.120	0.325	0.121	0.326
SACCO	0.192	0.394	0.258	0.438	0.239	0.427
MFI	0.032	0.175	0.044	0.204	0.038	0.192
<i>Loan in a:</i>						
Bank, SACCO or MFI	0.046	0.210	0.081	0.273	0.067	0.250
Bank or 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
SACCO	0.019	0.138	0.044	0.205	0.035	0.183
MFI	0.008	0.088	0.018	0.131	0.014	0.116

Table A8: Impact of SACCO Program on Financial Access—Survey Evidence

Notes: The table presents coefficient estimates from a regression of an indicator variable for individuals who have savings accounts (top panel) or loan accounts (bottom panel) on an interaction term between Bank Presence and Post dummy (equal to 1 for the 2016 survey), and borrower characteristics. The dataset is repeated cross-sections of borrowers in the 2012 and 2016 FinScope surveys. Standard errors clustered at the district level in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: FinScope Surveys, 2012 and 2016 rounds.

Dep. Var.:	Dummy =1 if individual has a savings account in:		
	Bank or SACCO (1)	SACCO (2)	Bank (3)
Low Bank Presence x Post	1.305 (0.897)	0.902** (0.372)	0.879 (0.929)
Post	-1.237 (0.885)	-0.816** (0.359)	-0.893 (0.921)
Female	-0.113*** (0.00900)	-0.0836*** (0.0104)	-0.0474*** (0.00580)
Young	-0.0914*** (0.00838)	-0.0681*** (0.00873)	-0.0538*** (0.00849)
Single	-0.158*** (0.0168)	-0.120*** (0.0102)	-0.0602*** (0.0136)
No Formal Education	-0.196*** (0.0111)	-0.124*** (0.00939)	-0.113*** (0.0124)
District FE	Y	Y	Y
Observations	18,630	18,630	18,630
Adjusted R-squared	0.097	0.064	0.116
Mean Dependent Variable	0.326	0.239	0.121
Dep. Var.:	Conditional on having a savings account, dummy =1 if individual has a loan in:		
	Bank or SACCO	SACCO	Bank
Low Bank Presence x Post	1.296*** (0.420)	1.098*** (0.362)	0.475 (0.358)
Post	-1.191*** (0.397)	-1.008*** (0.347)	-0.450 (0.346)
Female	-0.00115 (0.0184)	0.00132 (0.00833)	-0.00270 (0.0162)
Young	-0.0648*** (0.0186)	-0.0375*** (0.0110)	-0.0271 (0.0189)
Single	-0.0683*** (0.0197)	-0.00973 (0.0151)	-0.0679*** (0.0173)
No Formal Education	-0.0469 (0.0295)	-0.00445 (0.0188)	-0.0530** (0.0257)
District FE	Y	Y	Y
Observations	2,949	2,949	2,949
Adjusted R-squared	0.037	0.047	0.020
Mean Dependent Variable	0.055	0.035	0.022