The Role of Technical Assistance in Expanding Access to Finance*

Miriam Bruhn[a], Rekha Reddy[b], Claudia Ruiz Ortega[c]

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Abstract

This paper links the literatures on technical assistance and access to finance by examining a Mexican program that provided capacity-building grants to nonbank financial institutions (NBFIs) serving micro, small, and medium enterprises (MSMEs). Using ten years of data from 81 credit unions and a staggered difference-in-differences approach, the analysis shows that the program improved NBFIs' efficiency, enabling them to obtain more funding from private sources and leading to a 79 percent increase in lending. The findings suggest that technical assistance initiatives can strengthen NBFIs' ability to expand credit access for underserved MSMEs.

JEL Classification: G23, O12, O16, R51

Keywords: technical assistance; access to finance; rural finance; credit unions

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[a] Corresponding author: World Bank and IZA. The World Bank, 1818 H Street N.W., Washington, DC 20433, United States. mbruhn@worldbank.org

[b] World Bank. The World Bank, 1818 H Street N.W., Washington, DC 20433, United States. rreddy5@worldbank.org

[c] World Bank. The World Bank, 1818 H Street N.W., Washington, DC 20433, United States. cruizortega@worldbank.org

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1. Introduction

Despite recent progress in expanding access to finance, a large segment of borrowers—micro, small, and medium enterprises (MSMEs)—remains underserved by traditional financial institutions in many countries. Informational opacity, stemming from a lack of credit history, collateral, or income documentation, keeps these borrowers at the margins of formal finance. This challenge is massive: the International Finance Corporation estimates that the global credit gap for MSMEs in developing countries amounts to $5.2 trillion, or 19% of their collective GDP (Khanna et al., 2017).

Nonbank financial institutions (NBFIs) often fill gaps left by traditional banks, focusing on relationship-based lending rather than relying solely on hard data (Beck, Demirgüç-Kunt, and Singer (2013), Berger and Udell (2002), Berger and Udell (2006), Delgado, Salas, and Saurina (2007), McKillop et al. (2020), Nitani and Legendre (2021)). However, NBFIs themselves face significant constraints, from poor governance to low technical capacity and limited funding sources (Brown and Davis (2009), de la Torre, Martinez Peria, and Schmukler (2010), Garmaise and Natividad (2010 and 2013), McKillop and Wilson (2010)), which prevent them from scaling their lending operations.

There is growing evidence that technical assistance can significantly improve firm performance across various non-financial sectors (Anderson, Chandy, and Zia (2018), Bianchi and Giorcelli (2022), Bloom et al. (2013), Bruhn, Karlan, and Schoar (2018)). [1] However, little is

[1] Related research finds that technical assistance for public schools can lead to improved student outcomes (de Hoyos, Ganimian, and Holland (2020)).

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known about whether similar interventions can enhance the performance of financial institutions themselves. This paper bridges that gap by connecting the research on technical assistance to the literature on access to finance. That is, we explore whether technical assistance can strengthen NBFIs, thereby increasing access to credit for underserved MSMEs.

This paper specifically examines this effect within the context of a training program run by the Mexican development finance institution *Financiera Nacional de Desarrollo Agropecuario, Rural, Forestal y Pesquero* (FND), which aimed to expand access to credit for small producers in rural areas. FND's training program began in 2004 and gave matching grants to NBFIs for technical assistance, provided through a network of accredited specialists.[2] The program intended to strengthen NBFIs' business plans, IT systems, operating procedures, accounting, and credit risk management, with the ultimate goal of helping NBFIs secure more funding and increase their lending.

We measure the impact of FND's training program using quarterly financial data from 81 credit unions for the years 2002 through 2012. Credit unions started to receive grants in 2004, with more credit unions joining the program until 2012. Among NBFIs in Mexico, credit unions play a key role in financing small producers. They exclusively provide business loans to their members, who are typically small firms within specific economic sectors, such as tannery, poultry farming, coffee production, or embroidery. By law, credit unions cannot accept deposits, but they can receive loans from members, which serve as their primary funding source. Additional financing

[2] Matching grants refer to grants that require recipients to match a fraction of the amount contributed by the funder. In the context we study, FND covered 70 percent of the cost of the technical assistance, with the remaining 30 percent paid by the recipient NBFI.

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comes from subsidized loans provided by development banks and, to a lesser extent, from loans by private sector financial institutions.

There are several ways in which the technical assistance financed through FND's training program may help credit unions secure additional funding to expand their lending. First, the program taught credit unions how to maintain accurate financial records, improving transparency. Second, the technical assistance aimed to enhance operational efficiency, which can lead to better financial performance and enable credit unions to pay higher interest rates on their funding. Third, the training helped credit unions develop business plans, often a requirement when applying for external loans, from other lenders. Business plans can also help credit unions develop a strategy for expanding their member base, such as by reaching new economic sectors. Fourth, the training may improve credit unions' ability to screen and monitor loans, reducing credit risk.[3] Finally, some credit unions obtained grants that were directly used for help with preparing credit applications and for obtaining certified credit ratings.

However, there are also reasons to question the effectiveness of the training program. First, the quality or relevance of the technical assistance may have been insufficient. Second, limited technical capacity may not have been a significant barrier to increasing credit union funding and lending in the first place.

Our identification strategy relies on Callaway and Sant'Anna's (2021) staggered difference-in-difference approach, comparing observations after participating in the program with

[3] At the same time, greater lending may reach riskier borrowers, increasing credit risk and leading to an ambiguous overall effect on credit risk.

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not-yet-treated observations. We find no evidence of differential trends in outcomes prior to program participation. We also show that credit unions closer to FND were more likely to join the program earlier, consistent with the fact that the program was not widely advertised. Importantly, for identifying causal effects, pre-program credit union performance and municipality characteristics do not systematically predict program take-up.

The results show that the program increased credit unions' funding, raising the funding rate by 1.8 percentage points, compared to an average of 8.5 percent. This suggests that the technical assistance enabled credit unions to tap into private sector lending rather than relying solely on subsidized funding from development finance institutions. The program also improved operating efficiency, although it did not affect profitability. Lending increased by 83 percent without any rise in the lending interest rate. However, the non-performing loan ratio rose by 3 percentage points, from an average of 12 percent, suggesting that the additional lending went to riskier borrowers on average.

Overall, we find that the program successfully expanded lending without affecting credit unions' profitability, indicating that the expansion was achieved sustainably. The higher funding interest rate and higher non-performing loan ratio were offset by gains in operating efficiency. We conclude that a lack of technical expertise is a significant constraint to sustainably expanding NBFI lending to underserved borrowers.

Our paper contributes to the literature on expanding access to finance for underserved groups by studying the effects of matching grants for technical assistance. Previous papers have focused on other interventions aimed at increasing access to credit, including state-owned banks,

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subsidized funding, and interest rate subsidies. While state-owned banks can channel funding to underserved areas (da Mata and Resende (2020)), they can also generate high costs and inefficiencies, making them difficult to sustain in the longer run (Burgess and Pande (2005)). Subsidized funding and interest rate subsidies for private lenders often fail to reach the intended target groups, as lenders tend to allocate these resources in alignment with their own incentives (Garmaise and Natividad (2013) and Ornelas et al. (2024)). In contrast, the matching grants program we study effectively increased lending to existing and new borrowers in a way that is sustainable from both the lenders and the government's perspective. The program kept lenders' profitability constant while the cost to the government per additional dollar lent was remarkably low at just US$0.01, as it facilitated lenders in mobilizing additional capital from the private sector.

Our findings also relate to the literature on matching grants, which evaluates interventions in which funds are provided to institutions or firms for technical assistance. This literature has faced many difficulties in studying the effectiveness of such grants (Campos et al. (2014)). Bruhn, Karlan, and Schoar (2018) may be the only paper so far to illustrate that matching grants for consulting services can have a positive effect on productivity and firm growth, suggesting that these grants do not simply subsidize services that firms would have hired in any case. Our paper further expands this evidence by showing that matching grants for technical assistance can promote the growth of NBFIs.

The rest of this paper is organized as follows. Section 2 provides background information on FND and its training program, Section 3 describes the data, Section 4 discusses the

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identification strategy, Section 5 presents the results, Section 6 examines the mechanisms explaining our results, and Section 7 concludes.

2. Background Information: FND, Its Training Program, and Credit Unions

FND was a Mexican development finance institution that aimed to increase access to credit for small producers located in rural areas. It was established in 2002 and operated under the name "Financiera Rural" until 2014. The Mexican government decommissioned FND in 2023.

FND offered credit via two mechanisms. First, it lent directly to producers. Second, FND provided financing to NBFIs for on-lending to rural producers. FND focused on NBFIs since they tend to serve smaller borrowers, while banks lend to large agribusiness clients. To be eligible for FND programs, NBFIs needed to have clients in rural areas, but they did not need to be in rural areas themselves.

FND also had two non-lending programs for NBFIs. First, FND provided credit guarantees to lower NBFIs' credit risk, making it easier for them to obtain external financing. Second, FND gave matching grants for capacity building to strengthen NBFI's operations and procedures, which can make these institutions more efficient, transparent, and creditworthy, ultimately allowing them to lend more.[4] We focus on this second program. That is, we measure the effect of matching grants for capacity building on NBFI funding, performance, and lending.

[4] Development finance institutions in other countries follow a similar approach, allocating about 4 percent of their funding to capacity building (Tolzmann (2021)).

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FND offered matching grants for capacity building through their training program (*Programa Integral de Formación, Capacitación y Consultoría*), which started in 2004 and continued until 2023. We have data for the period up to 2012. Although the training program targeted different NBFIs (e.g., credit unions, cooperatives, and SOFOMES), we focus on credit unions, which are supervised by the National Banking and Securities Commission (CNBV) and are required to submit quarterly financial statements. Between 2004 and 2012, FND's support program provided 680 grants with a combined value of about US$3.5 million[5] to 81 credit unions.[6] Of the 81 credit unions, only six were in rural municipalities.[7]

Credit unions in Mexico are non-profit privately-owned companies that intermediate credit to their members. Many credit unions focus on one economic sector, either broadly defined (e.g., agriculture, livestock, commerce, construction, tourism, or industry), or more specific (e.g., tannery, poultry farming, coffee production, or embroidery). Members must be producers in these sectors, including both small firms and self-employed individuals. When joining a credit union, members contribute capital. By law, credit unions cannot accept deposits, but they can receive loans from members, which represent the most important funding source for credit unions. Additionally, credit unions fund their operations through loans from development banks and, to a lesser extent, from private sector financial institutions (i.e., commercial banks, credit unions, and

[5] Using an exchange rate of 12 MXP per USD.
[6] During this period, there were 127 credit unions in Mexico.
[7] Following the definition used by the Mexican Statistical Institute, INEGI, where a rural municipality has fewer than 2,500 inhabitants.

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private investment funds). By law, credit unions can only lend to their members for business purposes and are prohibited from making consumption or mortgage loans.

Table 1 displays the number of credit unions that obtained a grant through the program in each year broken down by the year when the credit union first received a grant through the program. The largest cohort is in 2006, when 32 credit unions received their first grant, followed by 2005, when 24 received their first grant. Many credit unions received additional grants in subsequent years. Figure 1 shows that the cumulative amount received by a cohort of credit unions increased for about six years after first receiving a grant. The cumulative grant value per credit union was US$43,277 on average.

Most of the grants disbursed to credit unions were for technical assistance (89 percent). The remaining 11 percent of grants were for purchasing office equipment (e.g., software, computers, and desks) needed to strengthen operations. FND covered up to 70 percent of the cost of technical assistance or equipment purchases.

The technical assistance was provided through a network of accredited specialists with extensive experience working with financial institutions. FND screened and interviewed specialists who could provide technical assistance through the program, generating a list of providers from which credit unions could choose. This list included a range of providers, from local experts to international business advisory firms, such as KPMG.

Technical assistance grants fall into four categories: consulting, business planning, preparing credit applications, and credit rating. Appendix Table A1 lists the descriptions of these categories. Most grants were for consulting, which focused on areas such as improving operating

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procedures, accounting, credit risk management, information technology (IT) systems, and marketing. The number of credit unions with consulting grants is 64, with each credit union obtaining six of these grants on average, with an average value of US$3,526. Consulting grants may have helped credit unions obtain funding by making them more transparent, efficient, and profitable. Becoming more efficient can also allow credit unions to pay higher funding interest rates to attract more loans from members or other institutions.

The second most frequent type of grant was business planning, which included developing business plans, operating manuals, and new products. Almost all credit unions obtained a grant for business planning, with an average of 2.6 grants per credit union and an average value of US$2,156. Business planning can make it easier for credit unions to obtain funding since lenders often require that a loan application include a business plan. Also, credit unions in Mexico commonly grow by expanding to new sectors. Formulating a business plan along these lines could have allowed credit unions to obtain more capital and loans from new members.

Grants for assistance with preparing a credit application were focused on FND loans but could in principle have also helped credit unions prepare other credit applications since the required information and documentation is similar. Only 13 credit unions obtained such grants, with an average value of US$4,001. A minority of grants were for credit rating, which allowed credit unions to obtain a certified evaluation of their credit quality.[8] The average value of credit rating grants was US$8,873.

[8] This type of grant is similar to the credit rating program for microfinance institutions studied by Garmaise and Natividad (2010).

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All 81 credit unions obtained at least one grant for technical assistance. In addition, 47 credit unions received a grant for equipment. Our analysis cannot estimate the effects of technical assistance and equipment grants separately since many credit unions received both types in the same year. However, we argue that the effect primarily operates through technical assistance, as most grants were for this purpose. We conduct a robustness check to show that the measured effects of the program are similar if we exclude credit unions that obtained equipment grants.

Funds from FND's training program were allocated on a first-come, first-served basis. The program was advertised through events at FND branches and nearby business associations. Thus, credit unions located near FND offices likely found out about the program sooner than others. We explore the predictors of participating in the training program in more detail in Section 4.

3. Data Sources and Outcome Variables

We combine two main datasets on credit unions. [9] The first dataset comes from FND. It contains the list of 81 credit unions that obtained a grant through the training program between 2004 and 2012, along with the quarter when the grant was disbursed, type, and amount. If the credit union had a credit line with FND, it also provides the date when this credit line was opened, without providing amounts or subsequent activity, for confidentiality reasons. Further, the FND data contains information on which credit unions received credit guarantees from FND. We use this information on FND credit lines and guarantees in robustness checks.

[9] Table A2 lists the definitions and sources of all variables used in the paper.

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Panel A in Table 2 shows that 58 percent of credit unions in the sample received grants for equipment, in addition to technical assistance grants, which all credit unions received. The percentage of credit unions with an FND credit line and guarantee are 51 and 56, respectively.

The second main dataset contains quarterly financial statements of all credit unions, as reported to the CNBV, for the third quarter of 2002 through the fourth quarter of December 2012.[10] We keep only the 81 credit unions that received a grant through FND's training program between 2004 and 2012 since our identification strategy exploits the staggered timing of FND grants (see Section 4).

We extract eight variables from the financial statements and group them into two categories. We start by defining four operational outcome variables. First, to measure if the training program increased access to funding, we look at loans from members, banks, and other institutions, which are the three possible funding sources for credit unions in Mexico. The statements do not disaggregate these loans into the different sources, so we can only look at the program's impact on total funding from all sources. However, we later use supplemental data to examine funding sources in more detail. Second, we calculate the funding interest rate as the ratio of interest expenses to average annual liabilities. Third, to examine whether the program increased operating efficiency, we generate an operating cost ratio by dividing annualized operating expenses by average annual total assets. Fourth, as another measure of efficiency, we use return-on-assets (ROA), defined as annualized net income divided by average annual total assets.

[10] We do not use data after 2012 since a change in the reporting format makes this data not comparable with pre-2012 financial statements.

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The second group of outcome variables captures credit unions' lending and outreach. If the program allowed credit unions to obtain more funding and improved operating efficiency, these changes may have led to increased lending. From the financial statements, we obtain the value of the total loan portfolio by adding up outstanding performing and non-performing loans. Since credit unions lend exclusively to their members, an increase in lending can be driven by more loans to existing members or an increase in the number of members. We do not have data on the number of members but use paid-in-capital as a proxy. An increase in paid-in-capital likely reflects equity contributions from new members. We also ask whether the program led to changes in the lending interest rate, calculated by dividing annualized interest income by the average annual loan portfolio, and in the non-performing loans (NPL) ratio, defined as the value of non-performing loans divided by the total loan portfolio.

To reduce noise, we winsorize the following four variables at the top and bottom 1 percent: funding interest rate, operating cost ratio, ROA, and the lending interest rate. We conduct a robustness check where we trim these variables instead.

Panel B in Table 2 contains summary statistics for the pre-program period, 2002 through 2004. On average, credit unions obtained US$5.6 million in total funding, at an average interest rate of 8.5 percent. The average operating expenses were 7.7 percent of assets. The average ROA was negative at -0.3, but the median was positive at 0.55. The average value of the loan portfolio was US$5.8 million, while average paid-in-capital was US$2.8 million. Credit unions charged an average interest rate of 17.6 percent and had an average NPL of 12 percent, with a substantially lower median of 3.6 percent.

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For comparison, Appendix Table A3 reports operational and lending data for commercial banks in Mexico between 2002 and 2004. Credit unions were much smaller than commercial banks, in terms of their funding, loan portfolio, and capital. Three variables suggest that the average credit union had lower technical capacity than the average commercial bank: (i) the average and median operating costs of credit unions were higher than for commercial banks, (ii) the average and median ROA were lower for credit unions than for commercial banks, and (iii) credit unions had higher average and median NPL ratios than commercial banks. These three variables also have larger standard deviations, indicating more heterogeneity in technical capacity among credit unions than commercial banks.

4. Identification Strategy

We use a staggered difference-in-difference approach to estimate the effects of the training program. Relying on the estimator proposed by Callaway and Sant'Anna (2021), we compare observations after participating in the program with not-yet-treated observations. This method circumvents the recently documented limitations of two-way fixed effect (TWFE) models when treatment effects are heterogeneous and time to treatment varies (Callaway and Sant'Anna (2021), De Chaisemartin and d'Haultfoeuille (2020), Goodman-Bacon (2021), Jakiela (2021), Sun and Abraham (2021)).

When units are treated at different points in time, Equation (1) represents the canonical TWFE regression:

$$y_{it} = \alpha_i + \beta_t + \gamma Treat_{it} + \varepsilon_{it} \qquad (1),$$

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where, for each credit union i and quarter t, y_{it} corresponds to the outcome of interest, α_i is a vector of credit union fixed effects, and β_t is a vector of quarter fixed effects. The variable $Treat_{it}$ is equal to one if credit union i received the first FND grant in or after quarter t and is equal to zero otherwise. ε_{it} corresponds to the error term.

Equation (1) makes "clean" comparisons between treated and not-yet treated units as well as "forbidden" comparisons that can receive negative weights, which are differences-in-differences that use early-treated units as a control group. In the presence of heterogenous treatment effects, such "forbidden" comparisons can lead to biases and erroneous conclusions about the impact of an intervention (Baker et al. (2022), Goodman-Bacon (2021), Roth et al. (2023)). In our context, diagnostics indicate that such limitations are likely to be present (Jakiela (2021)). First, the TWFE approach assigns negative weights to a significant fraction of treated observations, particularly among early adopters in later years (Panels A and B of Appendix Figure A1). Second, we expect the effects of the training to change over time, as the cumulative value of grants continued to grow after the initial grant (Figure 1).

To overcome these limitations, the main building block of Callaway and Sant'Anna's (CS) estimator involves calculating the $ATT(g,t)$, which is the average effect of the program in period t for the cohort of credit unions starting the program in each period g. This estimator uses only "clean" comparisons in Equation (1), but not "forbidden" comparisons. It compares the expected change in outcomes between periods g-1 and t of two groups: credit unions in cohort g and a control group of not-yet-treated credit unions. The estimated $ATT(g,t)$ cohort-time parameters can be aggregated using specified weights to obtain the overall average effect of the program, as

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well as its impact over time. We use the *csdid* command in Stata, as described in Callaway and Sant'Anna (2021).[11]

As with the canonical difference-in-difference methodology, there are two key identifying assumptions for credit unions in the control group (i.e., not-yet treated credit unions) to provide a valid counterfactual for the evolution of outcomes that treated credit unions would have followed in the absence of the program. The first assumption requires that the average outcomes of credit unions entering the program at different points in time follow parallel trends in the years prior to participating in the program. The second identifying assumption is that of no anticipation, which implies that the FND program has no causal effect prior to its implementation.

Panels A and B of Figure 2 plot the quarterly average treatment effects for our outcomes of interest, before and after credit unions began to participate in the program. Suggesting that both identifying assumptions hold, the impact estimates of outcomes prior to the program are close to zero and do not display a discernable trend.

To further corroborate the validity of our empirical strategy, Table 3 reports the results of chi-squared tests that show that the quarterly pre-training effects are statistically equal to zero. Only one of our outcomes of interest, the NPL ratio, shows a small, but statistically significant pre-program difference. A closer examination of Figure 2 suggests that this difference is driven by

[11] Our preferred specification relies on repeated cross-section estimators as the panel of credit unions is unbalanced. This is because five credit unions closed during the sample period. However, we run a series of robustness checks and find that the results remain similar when we use the panel option of the *csdid* command as well as when we drop from the sample the credit unions that closed.

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outliers more than two years prior to the program. The estimates for all quarters in the two years before the program are close to zero.

We also explore the drivers behind the timing of participation in the training program. Table 4 displays regression estimates from Ordinary Least Squares (Columns 1–3) and Cox Proportional Hazard models (Columns 4–6). In all specifications, observations are at the credit union level and the dependent variable is the date when credit unions obtained their first training grant. The first set of covariates contains information about the municipalities where credit unions operate: if there is an FND branch, the number of commercial bank branches, and the level and growth of the municipality's value added and population size.[12] The next set of covariates are characteristics of credit unions prior to the training program, averaged over 2002Q1 to 2004Q3. These include whether the credit union had a loan from FND, total funding, funding interest rate, operating cost ratio, ROA, values of the loan portfolio and paid-in-capital, as well as the lending interest rate, and NPL ratio.

All specifications in Table 4 show that credit unions that are closer to FND—either proxied by having an FND branch in their municipality or by having obtained a loan from FND before–participated in the program earlier. This result is consistent with the training being advertised through FND branches and nearby business associations. We find no evidence that the timing of credit union participation in the training program was systematically driven by municipality or

[12] The location of FND branches is from the 2012 National Statistical Directory of Economic Units (DENUE). The location of commercial bank branches is based on data from June 2004, obtained from the CNBV. The value added of municipalities is from INEGI's 2004 Economic Census, and the growth rate was calculated using the 1999 and 2004 Economic Census. The population size of municipalities is from INEGI's 2005 Population Census, and the growth rate was calculated using the 2000 and 2005 Population Census.

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credit union characteristics. This finding suggests that not-yet-treated observations are a valid counterfactual for treated observations.

5. Effects of the Training Program on Credit Union Operations and Lending

Table 5 displays the overall average treatment effects of the training program on our outcomes of interest. The estimates in the first two columns indicate that the program increased credit unions' funding, although at a higher funding rate. That is, credit unions experienced an 85-percent increase in their total funding (Column 1). At the same time, credit unions paid a 1.8 percentage points higher interest rate to obtain funding (Column 2). As reported in Column 3, the program reduced the operating cost ratio by 1.9 percentage points (i.e., a decline of 25 percent), suggesting that the technical assistance made credit unions' operations more efficient. The magnitude of the effect on operating costs implies that the program improved the operating efficiency of credit unions to a level that is like that of commercial banks (Appendix Table A3). Taken together, the increase in funding costs and drop in operating costs offset each other, leaving profitability unchanged (Column 4).

The next four columns of Table 5 report the average impact estimates of the program on lending and outreach. Estimates in Column 5 indicate that the training program increased lending volume by 83 percent for the average credit union. This increase corresponds to US$4,833,000, using as a base the pre-program value of the loan portfolio reported in Table 2 (US$5,838,000). The increase in lending generated by the program is much larger than the cumulative grant value

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received by the average credit union (US$43,277), implying a cost of about US$0.01 per additional dollar in lending volume.[13]

The results in Table 5 further show that the increase in lending went both to existing members and new members, as indicated by the 21-percent increase in equity contributions from new members (Column 6). The program did not alter the interest rate charged to borrowers (Column 7). However, it increased the NPL ratio by 3 percentage points (i.e., a 25 percent increase), suggesting that the additional lending went to riskier borrowers on average (Column 8).

Panels A and B of Figure 2 show that the program's impact on funding, funding interest rate, operating cost ratio, lending, and paid-in capital increased over time. One reason may be that many credit unions continued receiving grants in subsequent years.

We run several tests to confirm that our results are robust to different modeling approaches, variable definitions, and sample selection options. We report the results of these tests in Appendix Table A4. First, we confirm that the findings remain similar when using panel estimators instead of repeated cross-section estimators (Panel A). Second, we examine the validity of our results using alternative variable definitions. For operating cost ratio, return-on-assets, and interest rates for both funding and lending, we trim observations at the 1st and 99th percentiles. For paid-in capital, funding, and lending volumes, we take the natural logarithm of the variable plus one, to keep the relatively few zeroes in the sample. As Panel B shows, most impact estimates remain similar, and all statistically significant effects go in the same direction as in Table 5. Third, we

[13] This calculation does not consider administrative costs of the program, on which we do not have information.

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drop from the sample five credit unions that closed before the end of the sample period and, again, confirm that our results remain robust (Panel C). Fourth, we estimate the causal effects of the FND program using an alternative econometric approach proposed by Borusyak et al. (2021). Like the CS approach, this method helps circumvent the limitations of the canonical TWFE regressions when the timing of treatment varies, and treatment effects are heterogeneous. As estimates in Panel D show, our findings remain mostly unchanged when using this alternative estimation strategy.

6. Mechanisms

One concern with the baseline results is that our estimates may not exclusively capture the effect of training grants, as several credit unions received other benefits from FND during the same period. To mitigate this concern, we replicate our analysis in various samples where we exclude credit unions with other FND benefits. The results of these tests are in Table 6. In Panel A, we restrict the sample to the 34 credit unions that did not obtain grants for equipment via the training program—that is, they only obtained technical assistance grants through this program. The estimates in Panel B are for the sample that excludes the 41 credit unions with FND credit lines. In Panel C, we drop credit unions with credit guarantees from FND, a non-lending program intended to help NBFIs obtain external financing. In Panel D, we restrict the sample to the 27 credit unions that did not have equipment grants, FND loans, or credit guarantees. The effects of the training program on our outcomes of interest are consistent throughout the robustness checks. We thus argue that our estimated effects on credit unions' outcomes are primarily driven by technical assistance.

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Finally, we examine which source is driving the increase in credit union funding due to the program. The increase in the funding interest rate shown in Table 5 suggests that the program increased funding from the private sector (members or other financial institutions), instead of development banks that tend to lend at subsidized rates. While we do not have funding broken down by source for the complete period we study, this data is available since 2009 thanks to changes in CNBV reporting requirements.

Appendix Figure A2 figure plots the shares of funding obtained by each credit union from its members, development banks, and other private sector financial institutions, averaged over all quarters from 2009 to 2012. Private sector financial institutions account for a small share of funding for most credit unions, suggesting that they are not the source of the 85-percent increase in funding caused by the program. While loans from members are the largest source of funding for most credit unions, development banks also play a significant funding role for some.

To verify whether the increase in funding caused by the program was due to increased loans from members instead of development banks, as suggested by the increased interest rate, we estimate the effects of the program in the sample of credit unions that received little funding from development banks. Panel E of Table 6 shows the results in this sample of 39 credit unions that received less than the median share of funding from development banks (less than 7.7 percent of funding). The effect on funding is similar to the one in the full sample in Table 5, confirming the conclusion that the increase in funding due to the training was largely driven by the private sector. In particular, the additional funding likely came from members (new members joining and existing

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members providing more loans) since private sector financial institutions account for a small share of credit union funding.

7. Conclusion

This paper studies the impact of a program providing grants for technical assistance on the lending and outreach of credit unions financing small producers in rural Mexico. We find that the program increased credit unions' lending volumes by 79 percent. Using paid-in capital as a proxy for the number of members, our results indicate that the program increased credit unions' outreach. That is, credit unions channeled more lending to both existing borrowers as well as to new members. Notably, the lending interest rate remained unchanged. However, the program led to a 3-percentage-point increase in the non-performing loan ratio (relative to a baseline mean of 12 percent), suggesting that the additional lending was directed to riskier borrowers on average.

Digging into the mechanisms behind the increased lending, we find that the program enabled credit unions to secure additional financing beyond subsidized government funds, likely sourced from new and existing credit union members. The technical assistance improved operational efficiency, allowing credit unions to pay higher funding interest rates to attract more private sector financing. Overall, the program had no effect on credit union profitability.

All in all, our findings indicate that limited technical capacity constrains credit unions from financing more borrowers and that technical assistance can effectively address this constraint. In the case of FND, providing grants for technical assistance seems to have successfully supported their goal of expanding access to credit in rural areas.

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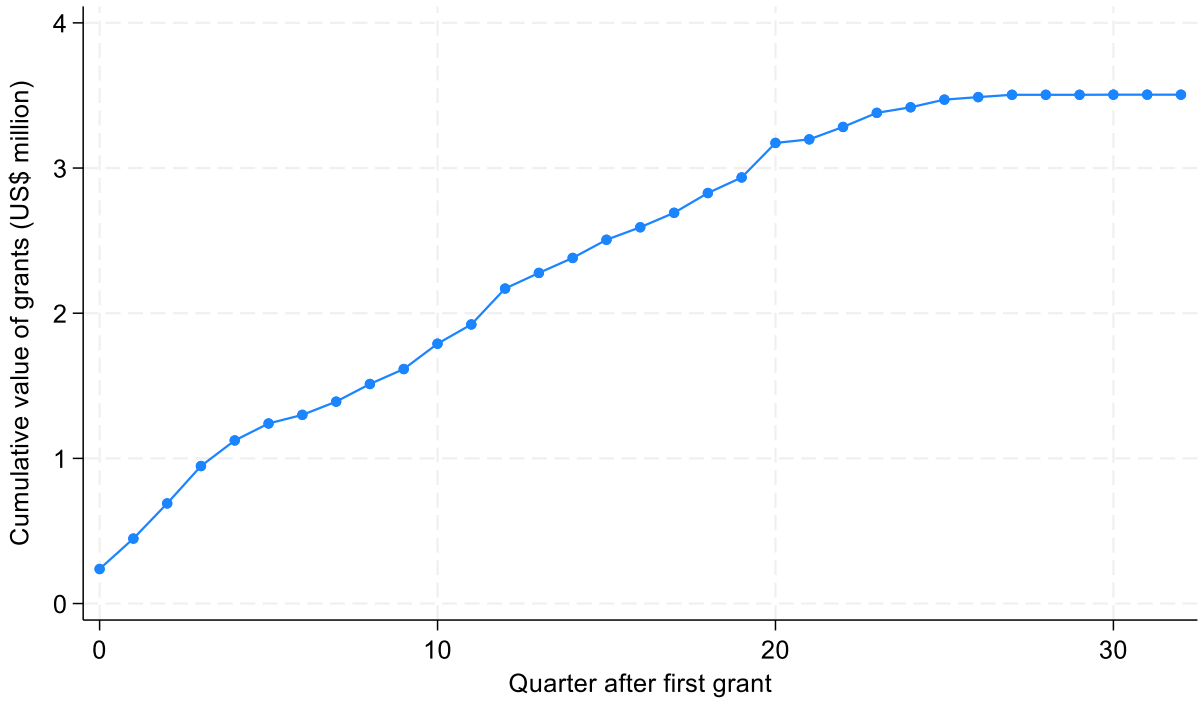
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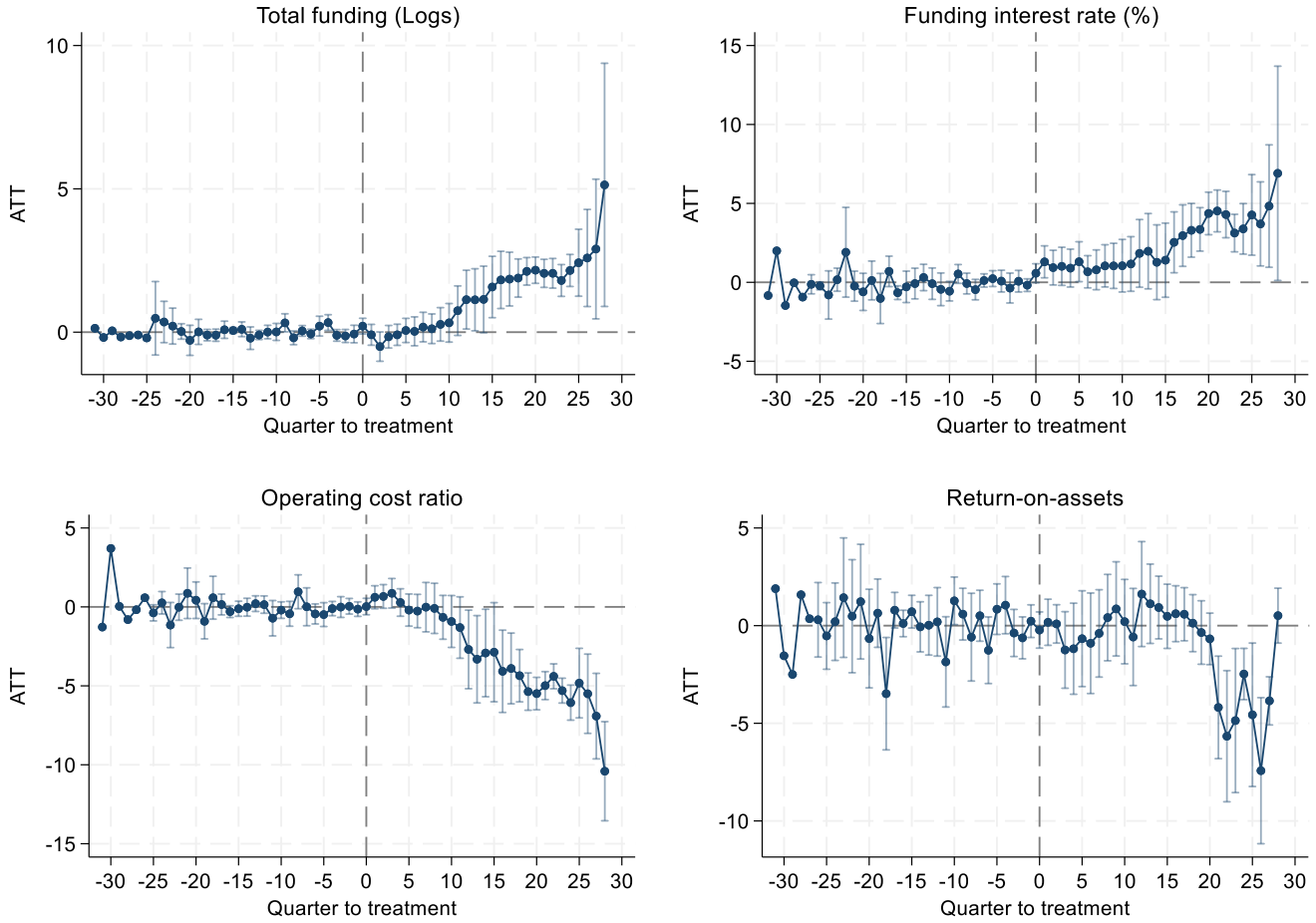
Figure 1. Cumulative value of grants



Note: The figure plots the cumulative value of grants (US $ million) over time since the quarter when the first grant was received. Each point shows the cumulative grant amounts summed across all cohorts.

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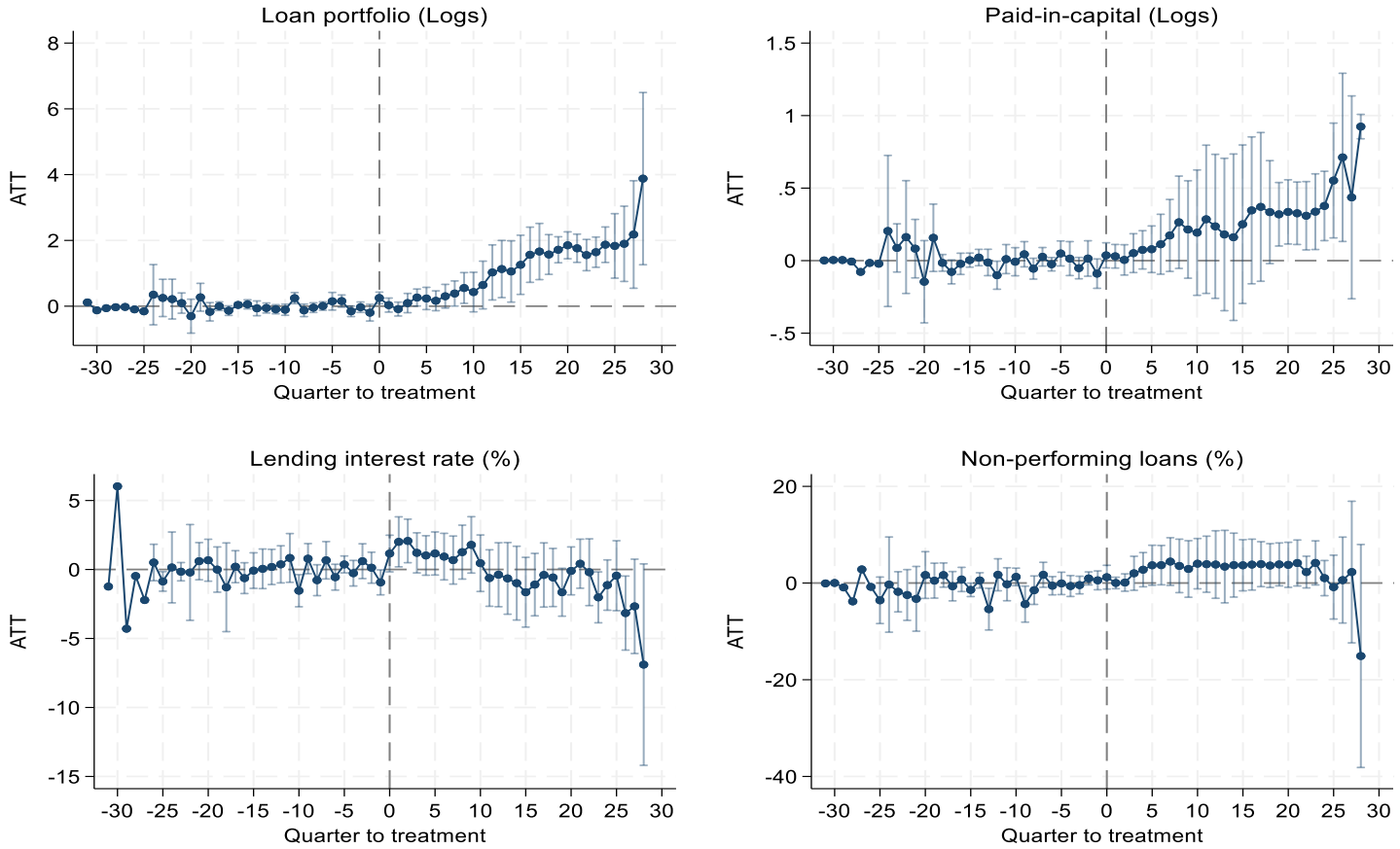
Figure 2. Panel A. Impact of training program on operational outcomes



Note: The figure plots the Callaway and Sant'Anna estimates of the quarterly pre- and post-training program effects on four outcomes of interest: 1) total funding (logs); 2) funding interest rate (%); 3) operating cost ratio; and 4) return-on-assets. The plots are generated using the *event_plot* command in Stata, clustering the standard errors at the credit union level. The shaded bars correspond to the 95% confidence intervals.

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Figure 2. Panel B. Impact of FND training program on lending and outreach



Note: The figure plots the Callaway and Sant'Anna estimates of the quarterly pre and post-training program effects on four outcomes of interest: 1) loan portfolio (logs); 2) paid-in-capital (logs); 3) lending interest rate (%); and 4) non-performing loans (%). The plots are generated using the *event_plot* command in Stata, clustering the standard errors at the credit union level. The shaded bars correspond to the 95% confidence intervals.

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Table 1. Number of credit unions receiving grants over time (by year of first grant)

	2004 Cohort	2005 Cohort	2006 Cohort	2007 Cohort	2008 Cohort	2009 Cohort	2010 Cohort	2012 Cohort	Total
2004	2	0	0	0	0	0	0	0	2
2005	2	24	0	0	0	0	0	0	26
2006	2	24	32	0	0	0	0	0	58
2007	1	19	27	10	0	0	0	0	57
2008	2	18	17	5	7	0	0	0	49
2009	2	14	10	5	7	3	0	0	41
2010	2	13	11	5	3	2	2	0	38
2011	1	9	5	4	0	0	0	0	19
2012	0	4	5	2	0	0	0	1	12

Note: Each cell displays the number of training program grants received per year by credit unions of a given cohort. Cohorts group credit unions that receive their first grant in the same year. In the analysis below, we use the quarter when a credit union first received a grant. We group quarters into years here for ease of exposition.

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Table 2. Summary statistics

	Mean	Median	St. Dev.	Obs.
Panel A. FND administrative information				
Received technical assistance	1.00	1.00	0.00	729
Received equipment grant	0.58	1.00	0.49	729
Received loan from FND	0.51	1.00	0.50	729
Received guarantee from FND	0.56	1.00	0.50	729
Panel B. Financial statements of credit unions				
Total funding (1,000 dollars)	5,642	2,023	9,679	595
Funding interest rate (%)	8.54	8.38	4.70	595
Operating cost ratio	7.72	6.05	14.41	595
Return-on-assets	-0.30	0.55	16.17	595
Loan portfolio (1,000 dollars)	5,838	2,397	8,625	595
Paid-in-capital (1,000 dollars)	2,799	1,739	2,586	595
Lending interest rate (%)	17.64	16.73	8.39	590
Non-performing loans (%)	12.02	3.56	19.46	594

Note: The table presents summary statistics for the period 2002Q1–2004Q3, prior to the start of the training program. Each column displays the mean, median, and standard deviation for the sample of 81 credit unions that participated in the training program at any point during the sample period.

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Table 3. Pre-program differences in outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Operational outcomes				Lending/Outreach			
	Total funding (Logs)	Funding interest rate (%)	Operating cost ratio	Return-on-assets	Loan portfolio (Logs)	Paid-in-capital (Logs)	Lending interest rate (%)	Non-performing loans (%)
Pre-training program	0.010	-0.106	0.009	0.030	-0.001	0.005	-0.109	-0.584
P-value	0.734	0.152	0.806	0.641	0.958	0.674	0.239	0.000
N	2618	2711	2711	2711	2704	2711	2696	2704

Note: The table reports the chi-squared statistics and p-values of tests evaluating if the pre training program effects are equal to zero for the outcomes listed in columns 1 to 8. All estimates are calculated using the *csdid* command in Stata (Callaway and Sant'Anna (2021)), clustering the standard errors at the credit union level.

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Table 4. Timing of participation of credit unions in the training program

	(1)	(2)	(3)	(4)	(5)	(6)
	Ordinary Least Squares			Cox Proportional Hazard		
FND branch in municipality	-3.477***		-2.565**	0.615**		0.462
	(1.060)		(1.166)	(0.271)		(0.303)
IHS # of bank branches in mun. June 2004	-0.318		0.481	0.034		-0.105
	(0.511)		(0.601)	(0.118)		(0.134)
Log(municipality value added in 2004)	1.978***		1.236	-0.241		-0.131
	(0.697)		(0.798)	(0.212)		(0.235)
Growth in mun. value added 1999-2004	-0.632		-0.133	0.070		-0.019
	(0.563)		(0.748)	(0.206)		(0.233)
Log(municipality population in 2004)	-2.730*		-2.941	0.344		0.384
	(1.428)		(1.793)	(0.423)		(0.444)
Growth in mun. population 1999-2004	20.560**		12.108	-2.969*		-1.876
	(9.719)		(11.387)	(1.786)		(2.265)
Received loan from FND pre-program		-5.615***	-5.677***		1.390***	1.365***
		(1.205)	(1.562)		(0.374)	(0.410)
Log(total funding) pre-program		0.034	-0.028		0.073	0.079
		(0.748)	(0.692)		(0.212)	(0.213)
Funding interest rate pre-program		0.089	0.074		-0.017	-0.038
		(0.179)	(0.206)		(0.044)	(0.047)
Operating cost ratio pre-program		-0.014	-0.034		0.047	0.036
		(0.209)	(0.186)		(0.053)	(0.055)
Return-on-assets pre-program		0.176**	0.142*		-0.021	-0.019
		(0.081)	(0.084)		(0.031)	(0.031)
Log(loan portfolio) pre-program		-0.223	-0.410		-0.007	-0.061
		(1.452)	(1.434)		(0.344)	(0.356)
Log(paid-in-capital) pre-program		1.423	2.028		-0.279	-0.290
		(1.095)	(1.474)		(0.258)	(0.306)
Lending interest rate pre-program		-0.080	-0.059		0.013	0.012
		(0.112)	(0.121)		(0.025)	(0.026)
Non-performing loans pre-program		-0.047	-0.046		0.006	0.005
		(0.038)	(0.047)		(0.012)	(0.013)
Constant	191.8***	179.8***	194.2***			
	(11.514)	(9.581)	(17.198)			
Observations	81	70	70	81	70	70
R-squared	0.223	0.227	0.331			

Note: The table presents regression estimates predicting the timing of participation of credit unions in the training program. Estimates are obtained through Ordinary Least Squares (Columns 1–3) and Cox Proportional Hazard models (Columns 4–6). Observations are at the credit union level. The dependent variable is the date when a credit union starts participating in the training program. Credit union pre-program characteristics are averaged over 2002Q1 to 2004Q3. IHS stands for inverse hyperbolic sine. We use the IHS instead of log for the number of bank branches since a few municipalities have a value of zero. Robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

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Table 5. Impact of training program

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Operational outcomes				Lending/Outreach			
	Total funding (Logs)	Funding interest rate (%)	Operating cost ratio	Return-on-assets	Loan portfolio (Logs)	Paid-in-capital (Logs)	Lending interest rate (%)	Non-performing loans (%)
Training program	0.847	1.837	-1.942	-0.463	0.828	0.205	0.216	3.037
P-value	0.001	0.001	0.001	0.438	0.000	0.101	0.753	0.090
N	2618	2711	2711	2711	2704	2711	2696	2704

Note: The table reports impact estimates of the training program for the outcomes listed in columns 1 to 8. Impact estimates and p-values are calculated using the *csdid* command in Stata (Callaway and Sant'Anna (2021)), clustering the standard errors at the credit union level.

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Table 6. Impact heterogeneity of training program

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Operational outcomes				Lending/Outreach			
	Total funding (Logs)	Funding interest rate (%)	Operating cost ratio	Return-on-assets	Loan portfolio (Logs)	Paid-in-capital (Logs)	Lending interest rate (%)	Non-performing loans (%)
Panel A. Sample restricted to 34 credit unions without equipment grants								
Training program	0.678	2.067	-1.905	-2.172	0.600	0.284	0.793	11.219
P-value	0.026	0.006	0.008	0.068	0.006	0.024	0.346	0.001
N	1088	1119	1119	1119	1117	1119	1113	1117
Panel B. Sample restricted to 40 credit unions without FND loans								
Training program	0.565	2.831	-1.662	-1.659	0.723	0.237	1.611	8.202
P-value	0.073	0.000	0.037	0.130	0.006	0.093	0.092	0.010
N	1213	1281	1281	1281	1276	1281	1271	1276
Panel C. Sample restricted to 36 credit unions without loan guarantees from FND								
Training program	0.622	2.324	-2.038	-1.351	0.850	0.309	0.890	10.257
P-value	0.048	0.003	0.004	0.224	0.001	0.016	0.359	0.003
N	1137	1189	1189	1189	1184	1189	1180	1184
Panel D. Sample restricted to 27 credit unions without equipment grants, loans from FND and loan guarantees from FND								
Training program	0.748	2.049	-1.953	-1.960	0.680	0.289	0.607	12.092
P-value	0.049	0.015	0.019	0.152	0.007	0.040	0.554	0.008
N	877	907	907	907	905	907	902	905
Panel E. Sample restricted to 39 credit unions with below median funding share from development banks (0.077)								
Training program	0.744	2.396	-2.092	-1.937	0.723	0.255	0.645	8.546
P-value	0.010	0.001	0.003	0.062	0.000	0.050	0.426	0.005
N	1297	1347	1347	1347	1344	1347	1337	1344

Note: The table reports impact estimates of the training program for the outcomes listed in columns 1 to 8, varying the sample of credit unions. The impact estimates and associated p-values are calculated using the *csdid* command in Stata (Callaway and Sant'Anna (2021)), clustering the standard errors at the credit union level. In Panel E, funding share is measured as the ratio of funds from development banks over total funding averaged over all quarters in 2009 to 2012.

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Appendix Table A1. Description of technical assistance grants

Type of technical assistance grants	Description of grants	Number of grants	Number of credit unions	Avg grant amount (USD)
Consulting	Consulting grants cover three stages: technical advice, implementation, and staff training. They focus on one or more of the following topics: • Strategic planning • Finance and accounting • Credit policies and management • Risk management • Corporate governance • Internal audits and controls • Technological solutions & IT systems • Marketing • Money laundering prevention	379	64	3,526
Business planning	Help with developing business plans, operating manuals, and new products.	192	74	2,156
Preparing credit application	Assistance with compiling the necessary documentation for a credit application with FND. Includes analyzing the viability of the credit application, ensuring that all documents are included in the application, verifying the validity of the documents and consistency of the information, as well as checking that the business plan follows FND guidelines.	23	13	4,001
Credit rating	Pays for the services of an authorized securities rating agency that evaluates and certifies the credit quality of the credit union.	11	5	8,873

Note: The average grant amount corresponds to the amount paid by FND. FND covered 70 percent of the technical assistance cost.

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Table A2: Variable definitions and sources

Variable	Definition	Source
Received equipment grant	Dummy variable equal to one if the credit union received an equipment grant, and zero otherwise.	FND
Received loan from FND	Dummy variable equal to one if the credit union is observed with a credit line from FND, and zero otherwise.	FND
Received guarantee from FND	Dummy variable equal to one if the credit union received a loan guarantee from FND, and zero otherwise.	FND
Total funding	Loans from members, banks, and other financial institutions (1,000 USD).	CNBV
Funding interest rate	Ratio of interest expenses to average annual liabilities (%), winsorized at top and bottom 1%.	CNBV
Operating cost ratio	Ratio of annualized operating expenses to average annual total assets (%), winsorized at top and bottom 1%.	CNBV
Return-on-assets	Ratio of annualized net income to average annual total assets (%),winsorized at top and bottom 1%.	CNBV
Loan portfolio	Total outstanding performing and non-performing loans (1,000 USD).	CNBV
Paid-in-capital	Capital amount contributed by credit union members (1,000 USD).	CNBV
Lending interest rate	Ratio of annualized interest income to average annual loan portfolio (%),winsorized at top and bottom 1%.	CNBV
Non-performing loans	Ratio of non-performing loans to total loan portfolio (%).	CNBV
FND branch in mun	Dummy variable equal to one if an FND branch operated in the credit union's municipality in 2012, and zero otherwise.	DENUE
# of bank branches in mun	Number of commercial bank branches operating in the credit union's municipality in June 2004, and zero otherwise.	CNBV
Municipality value added in 2004	Value added of the credit union's municipality in 2004.	2004 Economic Census (INEGI)
Growth in mun value added 1999–2004	Growth in value added of the credit union's municipality from 1999 to 2004.	1999 and 2004 Economic Census (INEGI)
Municipality population in 2004	Population of the credit union's municipality in 2005.	2005 Population Census (INEGI)
Growth in mun population 1999–2004	Population growth of the credit union's municipality from 2000 to 2005.	2000 and 2005 Population Census (INEGI)

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Appendix Table A3. Summary statistics for commercial banks

	Mean	Median	St. Dev.	Obs.
Total funding (1,000 dollars)	5,822,258	598,830	9,366,500	235
Funding interest rate (%)	9.46	7.43	6.30	235
Operating cost ratio	5.72	4.88	4.21	235
Return-on-assets	0.59	0.80	5.07	235
Loan portfolio (1,000 dollars)	3,712,539	329,984	5,777,395	235
Paid-in-capital (1,000 dollars)	456,001	80,257	733,478	235
Lending interest rate (%)	23.20	20.19	11.31	223
Non-performing loans (%)	4.36	1.84	12.90	227

Note: The table presents summary statistics for commercial banks based on their financial statements for the period 2002Q1–2004Q3, prior to the start of the training program. Each column displays the mean, median, and standard deviation for the commercial banks operating in Mexico at any point during the sample period.

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Appendix Table A4. Robustness checks

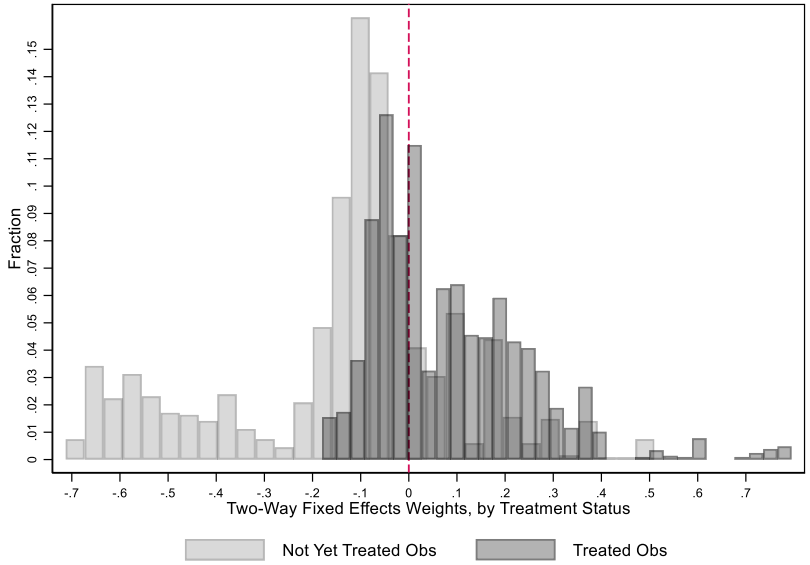
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Operational outcomes				Lending/Outreach			
	Total funding (Logs)	Funding interest rate (%)	Operating cost ratio	Return-on-assets	Loan portfolio (Logs)	Paid-in-capital (Logs)	Lending interest rate (%)	Non-performing loans (%)
Panel A. Panel estimators [ivar]								
Training program	0.530	1.379	-1.141	-0.795	0.485	0.025	0.226	3.213
P-value	0.008	0.004	0.005	0.158	0.000	0.762	0.715	0.112
N	2446	2633	2633	2633	2627	2633	2617	2627
Panel B. Other transformations of the outcome variables								
Training program	1.310	1.873	-2.042	-0.195	0.799	0.204	0.185	3.037
P-value	0.000	0.000	0.001	0.689	0.000	0.101	0.787	0.090
N	2711	2693	2694	2680	2711	2711	2683	2704
Panel C. Dropping credit unions that closed								
Training program	0.805	1.882	-1.983	-0.420	0.839	0.182	0.358	3.205
P-value	0.002	0.001	0.003	0.519	0.000	0.195	0.627	0.077
N	2512	2597	2597	2597	2590	2597	2583	2590
Panel D. Estimation approach by Borusyak et al. (2021)								
Training program	0.455	1.002	-1.965	-0.308	0.342	-0.001	-0.253	1.377
P-value	0.088	0.061	0.000	0.686	0.067	0.996	0.720	0.611
N	2569	2698	2698	2698	2692	2698	2683	2692

Note: The table reports impact estimates of the training program for the outcomes listed in columns 1 to 8 under four robustness checks. Panel A reports panel estimators, using the *ivar* option of the *csdid* command. In Panel B, the outcomes of interest in Columns 1, 5 and 6 are measured using the log(x+1) function; and the 1 and 99 percentiles of the outcomes in Columns 2 to 4, and 7 are trimmed. In Panel C, credit unions that closed during the sample period are dropped from the sample. In Panels A to C, the impact estimates and p-values are calculated using the *csdid* command in Stata (Callaway and Sant'Anna (2021)), clustering the standard errors at the credit union level. In Panel D, impact estimates and p-values are calculated by an alternative estimation approach proposed by Boursyak et al. (2021) using the *did_imputation* command in Stata.

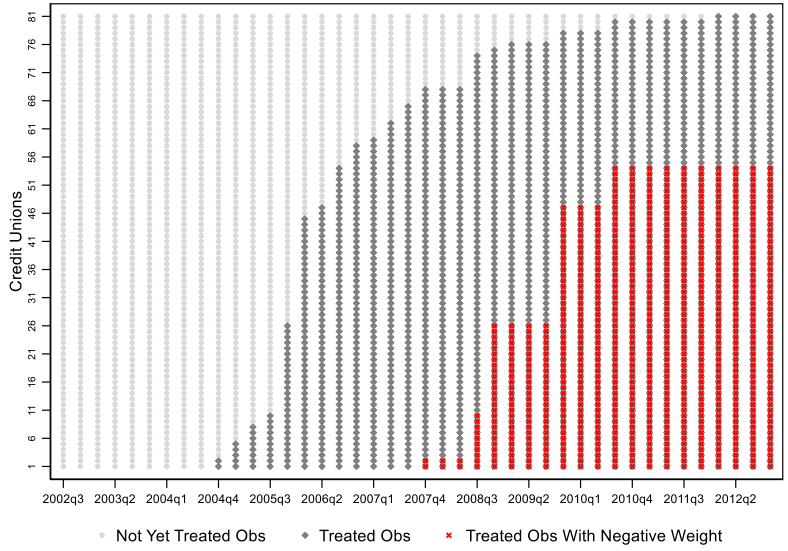
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Appendix Figure A1. TWFE weights

Panel A. Distribution of TWFE Weights



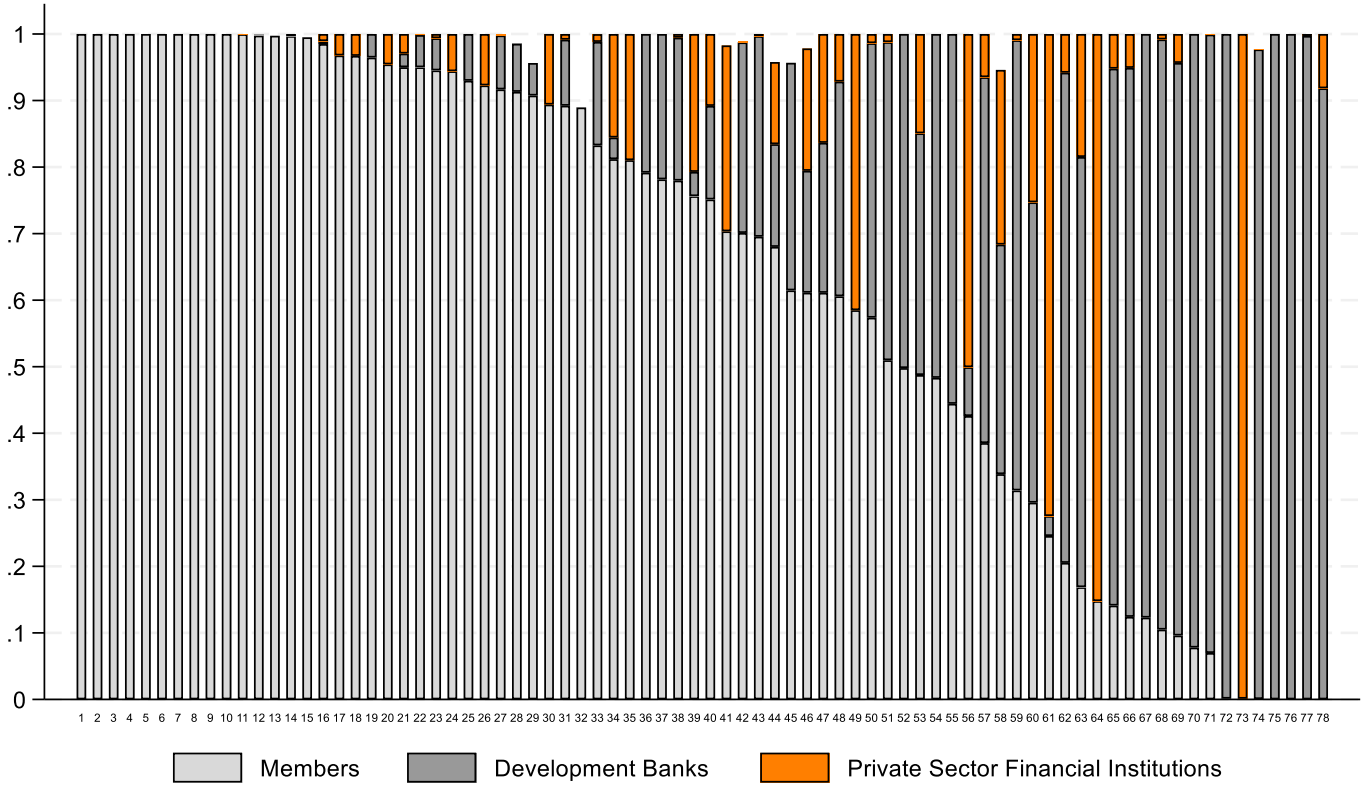
Panel B. Distribution of Negative TWFE Weights



Note: Panel A plots the distribution of TWFE weights for not-yet-treated and treated credit unions. Panel B plots the distribution of negative TWFE weights by credit union and quarter. Weights are calculated as the inverse of the residuals from a regression of the treatment variable on credit union and time fixed effects.

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Appendix Figure A2. Average funding shares



Notes: The figure plots the shares of funding obtained by each credit union from its members, development banks, and private sector financial institutions. Funding from private sector financial institutions includes loans from commercial banks as well as from private investment funds, credit unions and other financial institutions. Shares are measured as the ratio of funds from each source over the total funding, averaged over all quarters from 2009 to 2012.

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