Summary

Poverty in Brazil is disproportionately concentrated in rural areas. Although rural households account for only 15% of the population, 45% of them fall within the nation’s poorest quartile. A large proportion of the rural population relies on small scale agriculture for their livelihoods, highlighting the importance of inclusive growth in the sector. Accessing markets is one of the major development challenges faced by small producers. As a result of limited commercial activities and viable business plans, opportunities to access financial services to invest are limited. Aiming to foster rural development by linking smallholder producers to markets, the state of São Paulo and the World Bank developed the São Paulo Sustainable Rural Development and Access to Markets Project. The project followed a Productive Alliances (PA) approach to address the potential market failures and inefficiencies that prevent smallholders to engage in more profitable activities. The approach does so through the provision of technical and financial support to smallholder’s organizations for the development and implementation of business initiatives. The support is focused on initiatives that seek to improve smallholder competitiveness and improve linkages between smallholder producers, buyers, and the public sector.

Although the PA approach has been widely used both in Brazil and in São Paulo, there is limited rigorous evidence on the impact and success of matching grants programs in rural areas. For the evaluation of the São Paulo Development and Access to Markets Project, we use a combination of a propensity score matching and difference-in-differences approach. We collect information among a large representative sample of 284 participant and control organizations and a sample of their members at baseline and endline. The evaluation finds that rural organizations supported by the project increased their sales by 87% compared to a control group. This result is explained by the fact that organizations that were not supported by the project fared poorly during the recent economic crisis in Brazil, losing almost half of their average sales value between 2012 and 2017, whereas the organizations supported by the project increased their sales by 62%. These results far exceed the project’s target of an 8% increase in real sales value. Comparing sales of organizations’ members suggests that this impact translates in improved sales outcomes at the household level. We find that households linked to treated organizations sell more production overall and a larger share of their sales is done through the organization at better prices. As a result, we observe 31% higher revenues among treated members. Due to the lack of a baseline, we cannot claim that all the difference is caused by the project. However, the results are very much in line with what we observe at the organization level.
1 Project Description

1.1 Context

Poverty in Brazil is disproportionately concentrated in rural areas. Although rural households account for only 15% of the population, 45% of them fall within the nation’s poorest quartile. A large proportion of the rural population relies on small scale agriculture for their livelihoods, highlighting the importance of inclusive growth in the sector to contribute to poverty reduction. The agricultural sector in Brazil has a large divide between multinational large-scale agribusinesses and small-scale family farmers. While 84% of the roughly 5.2 million farms are officially labeled as family farms, they possess only 24% of all farm land. Most of the value generation in the agriculture sector comes from the large scale and agribusiness production. However, small farms produce around 70% of the domestic food supply (Helfand et al., 2013) and employed 74% of the agriculture workforce in 2006.

While São Paulo is the richest state in the country \(^1\), the rural sector of the state is characterized by large inequalities like the rest of the country. Around 35% of the poorest in the state live in rural areas. While 66% of the properties are owned by family farmers, they only use 15% of the total agriculture area, with the remainder being owned by commercial farms. Accessing markets is one of the major development challenges faced by small producers. As a result of limited commercial activities and viable business plans, opportunities to access financial services to invest are limited. When rural organizations are asked what their main limitation is to the development of new projects or to diversification of the services offered, 56% of the organizations reported the lack of resources – financial, physical, and human. Aiming to foster rural development by linking smallholder producers to markets, the state of São Paulo and the World Bank developed the São Paulo Sustainable Rural Development and Access to Markets Project. By strengthening smallholder organizations, the project seeks to improve market access, which is challenging to achieve by individual farmers due to their small size of production.

1.2 São Paulo Development and access to Markets project

1.2.1 Objectives

The project was launched in 2010 with the objective to support the State of São Paulo in improving access to markets for rural producers’ organizations in its territory and in improving its instruments and policies that contribute to environmental sustainability of family agriculture. The project was structured in three components. The first component provided technical and financial support to smallholders’ business initiatives. The second component sought to strengthen institutional and physical infrastructure, such as roads, critical elements to ensure access to market and competitiveness gains. The third component was related with the project management. The Impact Evaluation (IE) results presented in this report focuses on the first component.

The project followed a Productive Alliances (PA) approach (see Box 1 for more details on the approach). The approach seeks to address the potential market failures and inefficiencies that prevent smallholders to engage in more profitable activities. Market failures include limited access to finance, the lack of information on profitable business opportunities, limited business planning capacity, among others.

\(^1\)Not considering Distrito Federal
Box 1: The Productive Alliances (PA) approach

"The PA approach seeks to strengthen the linkages between producers, buyers and the public sector within agriculture value chains. A Productive Alliance involves three core agents: a group of smallholder producers, one or more buyers, and the public sector. These three agents are connected through a business proposition, or “business plan”, which describes the capital and services needs of the producers and proposes improvements that would allow them to upgrade their production capacities and skills to strengthen their linkage with the market, i.e., the buyer(s). The implementation of such a business plan through a subproject is typically supported through three core inputs and/or activities directed towards the producers’ needs: productive investments, technical assistance, and business development. These core inputs are financed through public grants provided by the project, which are matched by the beneficiary producers and in some cases also by the buyer(s). iv. The financial support provided to Productive Alliance sub-projects usually comes in the form of matching grants, which are justified by the positive externalities that are generated by the subproject and the fact that commercial finance is often not available to rural smallholders. The Productive Alliance approach was introduced during the early 2000s in Latin America and the Caribbean (LAC). Since then, the World Bank has provided more than US$1 billion in financing to support 21 projects with over 3,500 subprojects in ten countries across the LAC region."


The project tackled these barriers through the provision of technical and financial support to smallholder’s organizations for the development and implementation of business initiatives aimed at improving smallholder competitiveness and improve linkages between smallholder producers, buyers, and the public sector. The financial support was provided through a matching grant, which financed up to 70% of the business proposals.

1.2.2 Implementation

Selection process The beneficiaries of the project were selected through public calls for expressions of interest (EoI). The EoI include basic information of the applying organization and the proposed initiative. An initial eligibility filter is applied to verify if the EoI includes the target populations, has focus on competitiveness and environmental sustainability and demonstrates market viability. Eligible organizations are then invited to elaborate a full business proposal. This proposal specifies project costs, market information and how the investments will increase market share or strengthen market position among other aspects. Projects are evaluated and ranked on their market viability and social and environmental aspects. Those who passed a pre-established minimum score are selected to receive a matching grant and technical support to implement the proposal. The grant financed 50% of the proposed investment. Examples of activities that were financed include construction of processing structures, packinghouses, structures for agroindustry, investments for improvement of transport and logistics, such as the trucks’ acquisition. The project specifically tried incentivize small producers’ organizations by

\[\text{\textsuperscript{2}}\text{The business proposals are usually prepared by an external consultant hired by the organization. Successful applicants can use the received funding to recover these costs ex-post. This means that organizations that do not receive funding incur the costs of the consultancy.}\]
increasing the funding provided per organization. Up to 70% of the proposed investment was reimbursed in cases where more than 70% of the members were family farmers. ³

**Selected proposals** From 2011 to 2017, 287 projects were selected through 6 calls, which covered 231 organizations ⁴ and around 8,000 smallholder farmers. Figure 1 summarizes the timeline of all calls, including the number of organizations selected in each call. In addition, 76 projects of indigenous and quilombola organizations and 37 complementary projects were selected. Selection of these projects was done outside the public calls. In total, 399 proposals from 265 organizations were selected. The first call for EoIs was launched in August of 2011 and selected 33 organizations. In the last call 114 projects were selected.

Each proposal specified the productive chain(s) in which the organization planned to invest. The large majority of proposals included the vegetable and fruticulture chains (Figure 2). Common investments in these value chains included construction of structures and purchase of machines for simple processing like product cleaning, sorting, and packing, as well as acquisition of trucks.

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³Proposals from indigenous and quilombola organizations could receive up to 99% of the investment.
⁴55 organizations had multiple proposals accepted
The project financed up to R$800,000 per organization and up to R$10,000 per member that is part of the proposal. The average project value across all calls is R$623,506\(^5\). Considering all calls, 75% of proposals were less than R$900,000 (Figure 3). Across calls there is slight variation in average proposal size, ranging from R$537,636 in call 5 to R$677,666 in call 6. Indigenous, quilombola and complementary proposals are substantially smaller (Figure 4).

Figure 3: Distribution of Project Value, all calls

Figure 4: Average Value of project, by call

\(^5\)Not considering indigenous, quilombolas and complementary projects. Considering all types of projects, the average value is R$499,618
Reimbursement  The first reimbursement for approved proposals in call 1 initiated in January of 2013, one year and half after the selection. The disbursements for organizations approved in the second call started in August of 2013, one year after the call for expressions of interest had being launched. For the remaining calls, the time lag between approval and first reimbursement was around 12 months.

Figure 5: Program implementation

1.2.3 Characteristics of participants

Table 1 shows some basic characteristics of participating organizations.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of operation</td>
<td>141</td>
<td>17.0</td>
<td>11.8</td>
</tr>
<tr>
<td>Number of members</td>
<td>144</td>
<td>95.1</td>
<td>145.8</td>
</tr>
<tr>
<td>% of women</td>
<td>131</td>
<td>24.9%</td>
<td>0.24</td>
</tr>
<tr>
<td>% of young (less 30 years)</td>
<td>131</td>
<td>6.3%</td>
<td>0.11</td>
</tr>
<tr>
<td>% of small producers</td>
<td>136</td>
<td>86.3%</td>
<td>0.24</td>
</tr>
<tr>
<td>President is female</td>
<td>143</td>
<td>14.0%</td>
<td>0.35</td>
</tr>
<tr>
<td>Education of president</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary or less</td>
<td>284</td>
<td>29.2%</td>
<td>0.45</td>
</tr>
<tr>
<td>Complete high school</td>
<td>284</td>
<td>39.3%</td>
<td>0.49</td>
</tr>
<tr>
<td>Higher education</td>
<td>284</td>
<td>23.5%</td>
<td>0.42</td>
</tr>
</tbody>
</table>
2 Impact evaluation

Although the Productive Alliance approaches has been widely used both in Brazil and in São Paulo, there is limited rigorous evidence on the impact and success of matching grants programs in rural areas. When designing and implementing public policies, it is important to measure whether the program has reached its desired results to inform future policy design. A typical project evaluation often aims to assess the project’s success by observing the final results among a small handpicked sample. This is problematic for many different reasons including the fact that 1) the sample is often highly selective and not representative of the average participant and 2) no conclusion can be drawn as to whether these final outcomes can be attributed to the project’s interventions.

A rigorous IE aims to isolate the effects that can be attributed to the program instead of other factors, such as economic growth, climate change, change in regulation, or any other program targeting these organizations. Simply comparing outcomes among participants before and after the program implementation would measure the combined impact of the policy AND of other factors affecting the outcomes. In order to isolate the impact of the policy one needs to understand what would have happened with the participants in the absence of the program. An IE therefore seeks to answer what would have happened with the participants of the program in the absence of the program by comparing participants with a valid control group. The control group is composed by non-participants that are similar to the participants of the program considering several characteristics that can affect the outcomes of interest.

For the evaluation of the São Paulo Development and Access to Markets, we use a combination of propensity score matching and differences-in-differences approach. The project’s baseline was collected in 2012, prior to roll-out of any interventions, and covered almost all rural organizations. The extensive baseline allowed us to select a group of control associations that were most similar to the participating organizations in 2012, prior to the roll-out of the project. Using the baseline data, 144 participant organizations were matched to similar 140 non-participants, who composed the control group. A follow-up data collection was conducted in 2017, after the closure of all calls, to assess what happened with both participating and control organizations compared to their baseline situation. This section explains the IE strategy in more detail.

2.1 Sample selection

The first step of the evaluation is to identify the treatment and control groups. For this, the IE leverages the project’s extensive baseline that was collected in the beginning of 2012. The survey covered 773 rural organizations, which represented almost all active rural organizations in the state at that time.

**Treatment group** The treatment group is defined as all participants organizations – from any of the six calls and indigenous and quilombolas projects – that are included in the baseline. Participants organizations may not be part of the baseline either because the organization was created after the baseline data collection, or because the organization was not able to answer the interview. Out of the 265 participating organizations, 144 are included in our evaluation sample.
Control group  To select the control group from the non-participating organizations, we attempted to identify those organizations that were most similar to participants at baseline. To do so we try to understand what characteristics increased the likelihood of being a participant by estimating the probability of being selected to the program according to following equation:

\[ y_i = \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \epsilon_i \]  

(1)

where \( y_i \) is a variable equal to 1 if the organization participated to the program and equal to 0 otherwise. The vector of covariates \( X_1 \) contains: a variable indicating if the organization is a cooperative or an association, the organization age and coverage. The vector \( X_2 \) encompasses organizations’ management characteristics: variables indicating if the organization has internal regiment, code of conduct, manual of procedures, cashbook, balance sheet, fiscal counsel, control of members, administrative counsel, elections for director board, and manager hired. The vector \( X_3 \) refers to the characteristics of organization’s president, such as gender and schooling. The vector \( X_4 \) includes the services offered by the organization: buys machinery, or inputs, does commercialization, makes loans, marketing of products, political representation, does processing, product storage, and training. The distance of the organization from an urban center, is in vector \( X_5 \), whereas vector \( X_6 \) contains information on the members and organization expectation: number of members, whether they expect the number of members to increase, proportion of females, proportion of young people (less than 30 years old) and of smallholders and members’ participation in meetings.

Non-participant organizations with a high estimated probability of participating in the program, depicted by their so-called propensity score, were selected as the control group. To further improve the comparability of treatment and control groups, the control observations are weighted by their propensity score. The intuition behind this is that we put more weight on those control organizations that are more like treated organizations. To see how this strategy performed we compare mean observed characteristics of the treatment and control groups. Table 2 shows the mean of key variables for the treatment organizations, all non-participants included in the baseline, the control group and the weighted control group. The stars indicate whether the differences in the average of the treatment group (column 1) and the control group (column 2) is statistically significant. Comparing column 1 and 2, one can see that the treatment group is, on average, different from non-participants. When restricting the non-participants to those organizations selected to the control group, the groups become more comparable and the differences are reduced. Weighting the control group increases the comparability, making both groups as similar as possible.

Final IE sample  The final sample for the evaluation includes 140 control and 144 treatment organizations, resulting in a total sample of 284 organizations. The follow-up data collection took place from July to October of 2017 covering these organizations and an average of 10 members for each organization. The selected sample covers both a large portion of all organization in the state and is geographically spread across its territory (see Figure 6).
Table 2: Balance Test Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Treated (1)</th>
<th>All non treated</th>
<th>Matched controls not weighted (3)</th>
<th>Matched controls weighted (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperative</td>
<td>28%</td>
<td>9%</td>
<td>16%</td>
<td>24%</td>
</tr>
<tr>
<td>Age</td>
<td>11.3</td>
<td>13.5</td>
<td>12.2</td>
<td>12.9</td>
</tr>
<tr>
<td>Number of members</td>
<td>79.4</td>
<td>161.4</td>
<td>235.7</td>
<td>408</td>
</tr>
<tr>
<td>Sales value</td>
<td>$815,992.90$</td>
<td>$343,301.70$</td>
<td>$515,678.50$</td>
<td>$668,400.20$</td>
</tr>
<tr>
<td>Offer commercialization</td>
<td>72%</td>
<td>45%</td>
<td>64%</td>
<td>68%</td>
</tr>
<tr>
<td>Number of the clients</td>
<td>1.3</td>
<td>0.62</td>
<td>0.9</td>
<td>1.1</td>
</tr>
<tr>
<td>Government is not the unique client</td>
<td>19%</td>
<td>9%</td>
<td>15%</td>
<td>13%</td>
</tr>
<tr>
<td>Offer processing</td>
<td>31%</td>
<td>25%</td>
<td>22%</td>
<td>30%</td>
</tr>
<tr>
<td>Access to credit</td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Figure 6: Geographical distribution of sample: control and treatment group
2.2 Estimation

The evaluation uses difference-in-difference techniques to estimate the impact. The approach compares the treatment group and control group before and after the implementation. The impact is then measured by comparing the difference between the two groups at baseline and follow-up. This empirical strategy assumes that the outcome(s) of treatment and control groups would have the same time trend in the absence of the intervention. This assumption is more credible when treatment and control groups are similar, which is what we achieve with the ‘matching’ (propensity score weighting) described in the previous section (Abadie, 2005). Thus, any change in the difference between the two groups regarding a given outcome relative to the baseline difference is attributed to the program.

The difference-in-difference regression model with fixed effects is specified as follows:

\[ y_{it} = \beta_0 + \theta_{time} T_i + \beta_1 time + \alpha_i + \epsilon_{it}, \]

where \( y_{it} \) is the outcome of interest of organization \( i \) in time \( t \). The coefficient of interest \( \theta \) refers to the average treatment effect on the treated (ATT), that is, the average causal effect of the program on participant organizations. The binary variable \( time \) takes the value of 1 in the follow up period and 0 in the baseline, and the binary variable \( T_i \) takes the value of 1 for participant organizations and 0 otherwise. Unobserved characteristics of the organizations that are fixed in time such as president and members engagement, which could affect the outcome of interest but are unobserved by the researcher, are captured by \( \alpha_i \).

3 Results

3.1 Commercialization

The main objective of the component was to increase sales values of participating organizations. The final target, as defined in the results framework, was to increase sales value by 8%, compared to baseline. This section describes the impact of the component on both extensive and intensive margins, meaning both on whether organizations commercialize at all and whether they sell more. Even though the project indicator is sales at the organization level, the expectation is that this would also reflect an improvement at the household level. However, it is possible that an increase in sales at the organization level is actually substituting sales that households otherwise would have done themselves. Therefore we also investigate sales outcomes at the household level.

3.1.1 Sales by the organization

The evolution of the sales value of participating organizations between 2012 and 2017 indicates a significant increase, as shown in Figure 7. In contrast, the control group experienced a severe reduction in the sales value. This is not surprising since during this period Brazil experienced an economic crisis with real GDP shrinking by 0.7% in real terms between 2012 and 2017, with a particularly strong contraction between 2015 and 2016. The economic crisis precipitated in rapid rise in unemployment, reaching 12.7% in 2017, and a rising poverty rate. The sharp decline in the sales value among control organizations illustrates this negative shock. The project helped buffer organizations against the shock and foster their growth. The dashed line shows what the likely trajectory
of the treatment group would have been in the absence of the project, if the treated followed the same negative trend as the control group (the counterfactual). Taking into account the expected outcome in absence of the project, the overall estimated impact of the project is an increase of 87% in sales value, much larger than the initial project’s target of an 8% increase.

Figure 7: Sales Value (R$)

The project not only prevented this retraction, but also managed to increase sales value among the treated. This total increase in the sales value is driven by three factors: (i) an increase in the sales value of the organizations already commercializing at the baseline; (ii) a greater number of treated organizations that started the commercialization activity and (iii) preventing organizations from seizing their commercial activities. Figure 8 helps to understanding the effects of (ii) and (iii). The left side of each figure shows the commercialization status of the organization at baseline and the right side the status at endline. The lighter area shows how the status shifts for organizations that commercialize at baseline and the darker area does this for organizations that did not commercialize at baseline. The top figure (Panel a) shows that in the control group 40% of organizations that commercialized at baseline ceased their commercialization activities between 2012 and 2017, while only 16% started commercializing. For the treatment group (Panel b), the proportion that stopped and started was much more balanced. Comparing this with the control group, this results in a net increase of 29% in the likelihood of an organization offering commercialization services among treated organizations.
Figure 8: Commercialization transition status

(a) Control Group

(b) Treatment Group
3.1.2 Clients

Institutional markets are an important buyer for small producers and their organizations. There are at least two programs from federal government in Brazil PAA (Programa de Aquisição de Alimentos/Food Acquisition Program) and PNAE (Programa Nacional de Alimentação Escolar/National School Food Purchase Program) encouraging government and public institutions to purchase food from family farmers. Both these federal programs existed before the creation of the São Paulo Development and Access to Markets project, resulting in an average of one quarter of organizations selling exclusively to governmental programs at the baseline. Among treated organizations that did commercialize at the baseline, 27.6% of them relied fully on institutional markets (Figure 9).

In the end of 2011, coincidentally with the launch of the project, the government of the state of São Paulo, approved a state level law ensuring that at least 30% of the public expenses with food should be on products from the family agriculture.\(^6\) As a result of this new legislation and the economic recession, organizations in both control and treatment group increased their market concentration in governmental programs. For the treatment group, the proportion of organizations selling exclusively to institutional market rose to 46.4%. A similar development can be observed in the control group. Moreover, the percentage of sales going to institutional market increased in both groups, reaching 54% for the treatment group in comparison to 47.5% for the control organizations (Figure 10). When running our impact estimation, we find no impact on the likelihood or share sold to government programs due to the program, meaning the tendencies were similar in both groups. However, it is interesting to note that the increase in the share of sales intended to institutional markets mainly occurs among organizations that started the commercialization activity after baseline. Figure 11 shows the variation in this share for organizations that commercialized at baseline. One can see that the percentage of sales going to governmental programs remained almost constant for those organizations and thus are not driving this trend.

Figure 9: Percentage of organizations only selling to government programs

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\(^6\)PPAIS- Programa Paulista da Agricultura de Interesse Social/ Paulista Program of Agriculture of Social Interest
Figure 10: Percentage of sales that goes to government programs

Figure 11: Percentage of sales that goes to government programs among organizations that commercialize at baseline
3.2 Processing

Most of the proposals supported by the project included construction of warehouses and purchase of machinery for processing products. Broadly speaking, this kind of proposal aims to add value to products through processes like sorting, sanitation, cutting and packaging.

At baseline, 30% of organizations in the control group and 31% in the treatment offered any processing service. Figure 12 shows the transition of these organizations to the follow-up status. Similar to the graph for the commercialization status, the left side of each panel shows the processing status of the organization at baseline and the right side the status at endline. The lighter area shows how the status shifts for organizations that process at baseline and the darker area does this for organizations that did not process at baseline. More organizations in the control group ceased their processing activity than organizations in the treatment group. At the follow-up, only 14% of control organizations offered processing activities, while 33% of treatment offered this kind of activity. Therefore, in addition to an increased likelihood of commercialization activity, the project also led to a 57% increase in the probability of an organization offering product processing.

![Figure 12: Processing transition status](image)

(a) Control Group  (b) Treatment Group

3.3 Other services offered by the organization

In addition to commercialization and processing, the organizations offer many other kinds of services to members like machine rental, product storage and training. Figure 13 shows the percentage of treated organizations offering each kind of service at baseline and follow-up. The percentage of organizations offering commercialization and processing are the same as shown before in this report. For the other services, for instance, one can see that more organizations are engaged in renting machines for members (increase from 22.5% at baseline to 38.9% at follow-up) while less organizations are offering any kind of training to members.
To test whether the program changed the share of organizations offering each kind of services, we compare the likelihood of the treatment organizations with the control group. Figure 14 shows the impact estimation of the increase in the probability of offering the services. Each bar shows the estimated impact as a percentage of the mean in the treatment group. The probabilities for commercialization and processing are the ones shown before. In addition to that, we find that the project increased the probability of the organization offer machine rental services by 91.8%, which is not surprising given that the machinery purchased may also be rented to members, increasing the offer of this kind of service. For all the other services, we find that the project did not affect the probability of them being offered.

Figure 14: Impact on probability of offering certain services
3.4 Credit

During the baseline, organizations listed lack of access to credit as a major constraint for developing new activities and investment. In fact only 4.2% of treatment organizations had taken out any credit line at that time. The project led the state of São Paulo to change the rules for accessing a governmental credit for agriculture, FEAP, favoring participant organizations. Under the new rule, the beneficiaries could use their participation in the project as collateral. As a result, the project increased the likelihood of an organization accessing credit by 31 percentage point. The majority of the increase was indeed through a large increase of FEAP credit. Among participating organizations that took credit, 87% used FEAP funding, compared to none from the control group (see Figure 15).

![Figure 15: Sources of credit taken](image)
3.5 Targeting

One should consider the targeting implications of working through rural organizations. Data from the 2017 AgroCensus in Brazil shows that in the State of São Paulo whether you are a member of a rural organization has a strong correlation with property size. This indicates that working through organizations may excludes a large portion of targeted farmers. The most vulnerable are less likely to present a viable business plan and require a different approach. Nevertheless, the project successfully targeted organizations with large proportions of smallholder farmers – we find that 77% of members among participants organizations are family farmers (Figure 16).

Figure 16: Share of proprieties where the producer is associated to an organization – by size of the property

3.6 Household analysis

There are several channels through which collective commercialization by rural organizations can help improve outcomes for their members, including access to more secure markets, higher prices by improving their bargaining power and payment security. However, some of the increased sales we observe at the organization level may reflect a substitution of sales households would have made anyway. This could still lead to a net income gain if prices are higher. Households’ perception of the benefits of commercializing through an organization confirm these main channels (Figure 17). To provide an indication whether increased sales of the organization indeed translate into improved outcomes at the household level, we compare sales patterns among members of treated and control organizations.
Estimation  The household survey was only conducted at endline, once the treatment and control organizations were known. As a result, we are not able to verify whether members in both groups were comparable prior to implementation of the project. Therefore, the results presented in this section should be interpreted as suggestive evidence and not causal. As a first step, we test whether characteristics that are likely to not be affected by the project are balanced. We find that almost all households are engaged in at least one productive activity. Even though there is a statistical significant difference in the proportion, the magnitude of the difference is not meaningful. However, we do find that households engage in slightly different types of productive activities (Table 3) and, therefore, control for these main categories in the subsequent analysis. Other characteristics such as household size, asset index, total property size and area dedicated to agriculture are balanced (Table 4).\(^7\) In the remainder of this section, the treatment effect is estimated through the following linear regression:

\[
y_{ij} = \beta_0 + \beta_1 T_j + \beta_2 X_{ij} + \epsilon_{ij},
\]

where \(y_{ij}\) is the outcome of interest for household \(i\) in organization \(j\). The binary variable \(T_j\) takes the value 1 for members of treatment organizations and 0 otherwise. \(X_{ij}\) is a vector of covariates that capture the different productive activities in which the

\(^7\)Even if this difference is not statistically significant, households in the treatment seem to have property sizes smaller – than those in the control arm – by 8 hectares on average. However, this occurs due to the different productive activities in which producers are engaged (in general, property size for livestock is larger and, as we have more livestock producers in the control group, this explains the magnitude of the difference). In line with this, after controlling for activity dummies, the difference shrinks to 1.8 hectares.
household $i$ in organization $j$ is engaged. Standard errors are clustered at the organization level. The coefficient of interest is $\beta_1$, which refers to the difference in the outcome between the treatment and control groups. The household level analysis presented in this section uses the same propensity score weighting assigned to the members’ organization (see Section 2.1).

Table 3: Balance table – Type of productive activity

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1) Treatment</th>
<th>(2) Control</th>
<th>T-test Difference (1)-(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/[Clusters]</td>
<td>Mean/SE</td>
<td>N/[Clusters]</td>
</tr>
<tr>
<td>Producer is engaged in a productive activity</td>
<td>1442</td>
<td>0.994</td>
<td>1345</td>
</tr>
<tr>
<td></td>
<td>[144]</td>
<td>(0.002)</td>
<td>[139]</td>
</tr>
<tr>
<td>Producer is engaged in agriculture production</td>
<td>1442</td>
<td>0.800</td>
<td>1345</td>
</tr>
<tr>
<td></td>
<td>[144]</td>
<td>(0.025)</td>
<td>[139]</td>
</tr>
<tr>
<td>Producer is engaged in livestock production</td>
<td>1442</td>
<td>0.382</td>
<td>1345</td>
</tr>
<tr>
<td></td>
<td>[144]</td>
<td>(0.031)</td>
<td>[139]</td>
</tr>
<tr>
<td>Producer is engaged in beekeeping</td>
<td>1442</td>
<td>0.025</td>
<td>1345</td>
</tr>
<tr>
<td></td>
<td>[144]</td>
<td>(0.012)</td>
<td>[139]</td>
</tr>
<tr>
<td>Producer is engaged in tourism</td>
<td>1442</td>
<td>0.005</td>
<td>1345</td>
</tr>
<tr>
<td></td>
<td>[144]</td>
<td>(0.002)</td>
<td>[139]</td>
</tr>
</tbody>
</table>

Notes: Data from endline producer household survey. The value displayed for t-tests are the differences in the means across the groups. Standard errors are clustered at the organization level. Observations are weighted using organization propensity score as analytical weights. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 4: Balance table – Other producer characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1) Treatment</th>
<th>(2) Control</th>
<th>T-test Difference (1)-(2)</th>
<th>T-test Difference with controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/[Clusters]</td>
<td>Mean/SE</td>
<td>N/[Clusters]</td>
<td>Mean/SE</td>
</tr>
<tr>
<td>Household size</td>
<td>1442</td>
<td>3.232</td>
<td>1345</td>
<td>3.153</td>
</tr>
<tr>
<td></td>
<td>[144]</td>
<td>(0.041)</td>
<td>[139]</td>
<td>(0.055)</td>
</tr>
<tr>
<td>Asset index</td>
<td>1442</td>
<td>7.477</td>
<td>1345</td>
<td>7.441</td>
</tr>
<tr>
<td></td>
<td>[144]</td>
<td>(0.088)</td>
<td>[139]</td>
<td>(0.079)</td>
</tr>
<tr>
<td>Total property area</td>
<td>1442</td>
<td>58.829</td>
<td>1345</td>
<td>67.433</td>
</tr>
<tr>
<td></td>
<td>[144]</td>
<td>(24.147)</td>
<td>[139]</td>
<td>(36.401)</td>
</tr>
<tr>
<td>Area dedicated to agriculture</td>
<td>1123</td>
<td>13.830</td>
<td>839</td>
<td>17.486</td>
</tr>
<tr>
<td></td>
<td>[138]</td>
<td>(1.456)</td>
<td>[124]</td>
<td>(2.778)</td>
</tr>
</tbody>
</table>

Notes: Data from endline producer household survey. Agriculture area was trimmed at 99% percent level. The value displayed for t-tests are the differences in the means across the groups before and after controlling for productive activity dummies. Standard errors are clustered at the organization level. Observations are weighted using organization propensity score as analytical weights. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.
Production  Total production is defined as the overall production across all the different activities such as crops, fruits, livestock and honey, produced by one household, either for own consumption or for sales. Part of this production may be lost before the harvest, but this is a minor occurrence in our sample. Production is aggregated across activities by multiplying the amount produced by the median unit price of direct sales of that product. We find that across all farmers almost three-quarter of production is from agriculture, which includes both crops and fruits (Figure 18). Total production is 14% higher among treated households, but the difference is not significant (Figure 19).

Figure 18: Production by type of activity

![Production by type of activity](image1)

Note: Production variables are all trimmed at 95%.

Figure 19: Total production

![Total production](image2)

Note: Production variables are trimmed at 95%. The coefficient was estimated in a regression with productive activity dummies, organization propensity score weights and clustered standard errors. The 90% confidence interval is attached to the treatment bar.
We find that almost around 85% of households sell some portion of their production and this percentage is roughly the same among members of both groups (Figure 20). This suggests that the project has not led to an increase in the likelihood of members selling any of their production. The same pattern holds for the share of production sold. Among members that sell any of their production, the share of production sold is quite high at 71.1 and 74.7% for members of treatment and control organizations, respectively (Figure 21).

However, the slightly higher total production and share of production sold, results in a positive and significant correlation between treatment and total amount sold. Members of treated organizations sell 26% more production (Figure 22).

**Channel of sales** We observe that members of treatment organizations are more likely to sell through the organization (Figure 23a) and as a result, a larger share of their sales

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8The share sold excludes sales of livestock and meat as this is calculated over a stock instead of production.
are done through the organization (Figure 23b). Since the proportion of overall sales is similar across groups, these findings suggest that the increased sales of the organizations indeed represent some substitution of sales that households would have done directly otherwise.

(a) Share of members selling through organization, among sellers
(b) Share of sales through organization, among sellers
**Prices**  One of the benefits of selling through the organization instead of individually to buyers directly, is that the organization may have more bargaining power and better information about prices. Indeed, we observe that sales prices are higher for some of the most commonly sold crops, including for pumpkin, oranges, okra and tomato, which may increase revenue at the household level even when quantity sold remains constant (Figure 24).

Figure 24: Median prices of main crops and milk, by channel
Revenue  We calculate total sales revenues by taking the amount sold across all types of products through each channel (directly or through the organization) and multiplying by the the actual price each producer reported received through that channel. Considering only households that sell some portion of their production, we find that sales value among treated households is 31% higher (Figure 25). The treated households have higher revenue across the distribution. Even though the absolute increase is modest at the bottom quintiles (Figure 26), the percentage increase is in fact higher among this group (Figure 27).

Figure 25: Sales revenues

![Bar chart showing sales revenues](image)

Note: Revenue variables are trimmed at 95%. The coefficient was estimated in a regression with productive activity dummies, organization propensity score weights and clustered standard errors. The 90% confidence interval is attached to the treatment bar.

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9We trim observations above the 95th percentile or higher than BRL570,000.
Figure 26: Treatment effects by quintile – Sales revenues

Note: Estimates of a quantile regression controlling for type of productive activity dummies and clustering standard errors at the organization level. Revenues are trimmed at 95%. Confidence intervals are 90%.

Figure 27: Treatment effects by quintile – Log of sales revenues

Note: Estimates of a quantile regression controlling for type of productive activity dummies and clustering standard errors at the organization level. Revenues are trimmed at 95%. Confidence intervals are 90%.
4 Summary and next steps

The evaluation finds that rural organizations supported by the project increased their sales by 87% compared to a control group. This result is explained by the fact that organizations that were not supported by the project fared poorly during the recent economic crisis in Brazil, losing almost half of their average sales value between 2012 and 2017 whereas the organizations supported by the project increased their sales by 62%. These results far exceed the project’s target of an 8% increase in real sales value. Comparing sales of organizations’ members suggests that this impact translates in improved sales outcomes at the household level. We find that households linked to treated organizations sell more production overall and a larger share of their sales is done through the organization at better prices. As a result, we observe 31% higher revenues among treated members. Due to the lack of a baseline, we cannot claim that all the difference is caused by the project. However, the results are very much in line with what we observe at the organization level. We cannot explore with our data what led to the higher prices, whether this is due to improved bargaining power or higher quality production, for example.

Further research is needed to shed light on the sustainability and efficiency of the approach. First, are recipient organizations capable of providing adequate maintenance of the investment, sustaining the growth, and does the initial boost enable a higher level of investment in the future? Does the increment in sales value and producer revenue translate into a sustainable increase in income level for producers? As part of the final evaluation, the project is carrying out a cost-benefit analysis, which will shed further light on the returns to the investment. Further long-term observation of the organizations and their members is needed to attest sustainability of the investment. In addition, the data shows that the share of sales done through organizations is relatively low in both treatment and control groups. Qualitative work could help clarify some of the reasons for this. Second, is the PA approach the best way to address the constraints faced by smallholders and their organizations or are other strategies more cost-effective, such as changes in the regulation of credit markets or provision of technical assistance alone? Further experimentation and evaluating alternative policy designs could shed light on some of these questions.