
# Rural Development Policies and Conditional Cash Transfers in Brazil: An Impact Evaluation of the IFAD-Supported Gavião Project and Potential Synergies with Bolsa Família

*L.V. Costa[1]; S. Helfand[2]; A.P. Souza[3]*

*1: Federal University of Viçosa, Applied Economics, Brazil, 2: UC Riverside, Economics, United States of America, 3: FGV, São Paulo School of Economics, Brazil*

*Corresponding author email: steven.helfand@ucr.edu*

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*Public policies frequently are implemented simultaneously rather than in isolation. We seek to estimate the impacts—and possible synergies—of a rural development project (Pro-Gavião) and the Brazilian conditional cash transfer program (Bolsa Família). In partnership with the State Government of Bahia, Pro-Gavião was an IFAD supported rural development project in 13 contiguous municipalities between 1997 and 2005. Census tract level data were extracted for the analysis from the 1995-96 and 2006 Agricultural Censuses. The evaluation uses Propensity Score Matching to construct a control group of untreated census tracts, and a difference-in-differences estimation to identify impacts. The outcomes analyzed include land productivity, agricultural income and child labor. Although Pro-Gavião involved significant investments in the region, the results suggest little if any program impact, or synergies between the two programs. Alternative explanations for the null results are discussed.*

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**JEL Codes:** Q01, Q12

#1499

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**Key words***:* Rural development projects, Conditional Cash Transfers, Synergies, Brazil.
**JEL Codes: O13, Q1.**

## 1. Introduction

Conditional cash transfer policies (CCTs) and rural development programs have different objectives. Cash transfers seek to alleviate current poverty and promote improvements in the well-being of future generations, while rural development programs aim to build capacity to generate agricultural income, increase productivity and guarantee food security. Although these policies have different target populations, designs, and actions, there are reasons to believe that policy synergies could exist between them. This is especially true in environments marked by significant market failures, such as those faced by a large share of small farmers in developing countries. There is no guarantee that policies will have enhanced impacts when executed simultaneously, rather than in isolation, especially if there is no coordination in the design and implementation of the policies. But if synergies exist, they could contribute to the impact and cost effectiveness of anti-poverty policies in rural areas of developing countries.

In this paper, we evaluate the impacts of an IFAD[1]-supported rural development program called the Community Development Project for the Rio Gavião Region (Pro-Gavião), and test for policy synergies with the Brazilian CCT Bolsa Família. The analysis focuses on land productivity, agricultural income, and child labor as outcomes, and credit, investment and access to electricity as potential channels. In addition to the variables related to agriculture, child labor is included because it can be an important impediment to the accumulation of human capital. Electricity is important because it can have direct effects on production, human capital accumulation and well-being, as well as indirect effects through a reduction of market failures.

As Maldonado et al. (2016) stress, despite growing recognition of the possibility of interactions between social and development programs, there is a dearth of empirical evidence in the

[1] The International Fund for Agricultural Development (IFAD) is a UN agency established in 1977 with the aim of assisting the poorest of the poor by financing agricultural development projects in developing countries (IFAD, 2017).

international literature. Although rural development programs have been widely used in Brazil, there is little rigorous empirical evidence on their impacts. There is also little, if any, evidence on the impacts of overlapping public policies. In this regard, we are not aware of any econometric studies of Pro-Gavião, nor of any research that has sought to identify potential synergies between IFAD sponsored projects in Brazil and other interventions. We seek to contribute to this debate about policy design and effectiveness by addressing some of these gaps in the literature.

The empirical approach utilized provides a method for evaluating rural development programs *ex-post*, even when baseline and follow-up data were not collected for this purpose at the time. The strategy to identify individual program impacts, and synergies, relies on a) field work conducted to gather GPS coordinates of the 210 treated communities so that they could be linked with census tracts, b) propensity score matching to create a control group of untreated census tracts, and c) a difference-in-differences estimation with census tract level fixed effects. The models are estimated with average census tract level data on farms under 50 hectares drawn from the 1995-96 and 2006 Agricultural Censuses in Brazil.

Taken as a whole, the results paint a picture of generally improving conditions in the decade under study, but with little evidence of program impacts or synergies. These unexpected findings are robust to alternative approaches to identifying the treated census tracts, matching techniques, attempts to control for possible program spillovers to non-treated communities, and heterogeneity of impacts by initial level of poverty. While the limitations of our data and approach lead us to view these results as suggestive, albeit important, they are by no means the final word on this subject. We discuss a number of considerations that could help to understand the null findings.

In addition to this introductory section, the paper is organized as follows: Section 2 provides a brief overview of Bolsa Família and Pro-Gavião. Section 3 discusses policies synergies and some empirical evidence concerning the topic. Section 4 describes the methodology, Section 5 presents the econometric results, and Section 6 concludes.

## 2. Bolsa Família and Pro-Gavião

Conditional cash transfer and rural development policies grew rapidly in Brazil since the mid-1990s. The first conditional cash transfer policy—Bolsa Escola—was introduced in the municipality of Campinas in 1995, and by 2002 had become a federal program operating in nearly all Brazilian municipalities. The program was modified, unified with other smaller policies, and expanded in 2004 with the creation of Bolsa Família. In its current form, poor families are eligible if there are children, or pregnant or nursing women in the household, while those families considered extremely poor receive a basic transfer regardless of the composition of their family. Bolsa Família currently reaches over 13 million families.[2]

At the same time as the Brazilian government was expanding Bolsa Família, IFAD was collaborating with the Federal and State governments on a number of rural development projects in the Northeast of the country. Between 1980 and 2017, IFAD supported 12 projects, (of which 7 are on-going), providing a total of US$ 279.4 million in finance and benefiting over 395,000 families (IFAD, 2017). The main goal of the projects is to increase family farmers' production and income mainly through promoting access to essential services such as training, credit and technical

[2] Many studies have provided evidence of the positive effects of the *Bolsa Familia* or *Bolsa Escola*, on several variables, such as poverty, income inequality, education and child labor (see Hoffmann (2007); Barros *et al.* (2009); Cardoso & Souza (2009); Glewwe & Kassouf (2012)).

support, giving special attention to the importance of local organizations, community development, and participation in markets (IFAD, 2017).

In this paper, we focus on just one of IFAD's projects in Brazil—Pro-Gavião (PG)—that took place between 1997 and 2005 in the state of Bahia.[3] The project spanned 13 municipalities in the southern part of the state (Figure 1), reaching 210 communities and over 17,000 beneficiaries. With a total cost of US$ 40.4 million, Pro-Gavião emphasized two lines of action: one that focused on production and another on community development. The first line comprised the creation of producers' associations, agricultural extension, diffusion of technologies appropriate for the semi-arid region, access to credit, and training related to agricultural management, microenterprises, and the elaboration of business plans. Community development involved investments in individual and community infrastructure, such as wells and cisterns, bathrooms, community laundries, dams, expansion of the electrical grid, and other items. Different communities received different components, so some may have had more complete intervention packages than others (BAHIA, 2006).

The Rio Gavião region was chosen for the project because of its extensive rural poverty and the adverse environmental conditions for agricultural production (BAHIA, 2006). The target population were small agricultural producers, most of whom had incomes under the poverty line. There were, however, no clear criteria for the selection of communities. Field work was conducted in the municipalities to identify the most deprived communities for inclusion, and their specific needs, but there appears to have been considerable discretion involved on the part of the program administrators in determining the final list of communities to include.[4]

According to the final reports, both IFAD and the state government of Bahia considered Pro-Gavião to be a relatively successful project. The IFAD reports list considerable achievements on numerous fronts, including community organization, infrastructure construction, the introduction of technology, and facilitating access to credit. There was, however, no rigorous evaluation of the program impacts on the beneficiaries based on a methodology that used treatment and control groups, and baseline and follow-up data.

## 3. Synergies Between Policies and Empirical Evidence

As Tirivayi et al. (2013) stress, most of the beneficiaries of social programs live in places where essential markets for credit, insurance, labor, final goods and inputs either do not exist, are difficult to access or do not work well. Consequently, social protection and rural development policies could play a central role in overcoming multiple constraints that limit the decisions of agricultural households. According to these authors, interventions promoted by rural development programs could benefit from social protection policies that help reduce liquidity constraints.

According to Sabates-Wheeler et al. (2009), it is essential that cash transfer interventions provide a predictable and stable stream of income in order to have sustainable impacts on agricultural activities. The poverty experienced by the beneficiaries also influences the synergies that may

[3] Among the IFAD projects in Brazil, our choice to evaluate Pro-Gavião was based on data availability and its period of operation. As will be described below, we used Agricultural Census data from 1996 and 2006 at the level of census tracts. In order to have baseline data prior to the existence of the IFAD project, we restrict the analysis to projects that began after 1996. We also require that the projects were in operation for a sufficient number of years in order to generate observable impacts by 2006. For these reasons, we exclude projects that had either concluded or had begun prior to 1996, and exclude those that were only starting around 2006.

[4] This view is supported by interviews conducted in 2013 with former program officials.

emerge. The possibility of poverty traps indicates that interventions that are capable of moving the beneficiaries beyond a possible threshold of assets can have greater effects on production and growth than interventions that do not. It follows that simple and linear relationships between transfers and their impacts on production cannot be expected.

Another important distinction relates to the time horizon of potential synergistic effects. According to Brooks et al. (2011), agricultural activities have relatively fixed structures that need time to develop and adjust. Thus, public policy aimed at farmers must emphasize the protection and strengthening of income in the short and medium run (creating a role for CCTs), while promoting the fundamentals of productivity growth and development in the long run (emphasizing policies that are capable of reducing transaction costs).

Few empirical studies have examined the existence of interactions between social and rural development policies. One exception is Winters and Davis (2007), who evaluated the impacts of two Mexican programs, Oportunidades (a CCT) and Procampo.[5] The authors found that the beneficiaries of both programs had a greater likelihood of spending on farming and a greater amount spent on production.

Macours et al. (2012) also verified the effects of three intervention packages designed to protect small farmers against weather shocks in Nicaragua. They found evidence that farmers who benefited from a CCT program along with either monetary aid for investment or training were better protected than those who only received the transfer.

Much of the recent evidence on the possible existence of synergies between CCTs and rural development policies comes from a project called "Conditional cash transfers and rural development in Latin America." The project resulted from a partnership between the Universidad de los Andes (Uniandes) in Colombia and IFAD. Researchers involved in the project evaluated these two kinds of policies in six Latin American countries (Chile, Mexico, Colombia, El Salvador, Peru and Brazil). Using mainly quasi-experimental methods complemented by qualitative analyses, a number of the evaluations suggest little if any synergistic effects. In Chile, Colombia and Mexico, all papers find a lack of evidence in favor of synergies between CCTs and rural development (RD) programs (see Fernandez et al. 2016; Moya 2016; and Naude et al. 2016). In El Salvador, Peru, and Brazil, in contrast, synergies may indeed have occurred.

In El Salvador, Sanfeliú et al. (2016) show that the CCT interacted differently with two alternative components of the rural development program—one that supports subsistence producers and one that provides help for small commercial producers. Beneficiaries of the CCT and the first component had better outcomes regarding access to credit, food security and the role of women in farming. On the other hand, the interaction between the CCT and the second component only had a significant impact on the introduction of new farming and/or livestock activities. In both cases, however, there weren't any synergistic effects on productivity and income. In Peru, Aldana et al. (2016) conclude that the RD program allowed for the adoption of new production practices and for investment in agricultural and livestock assets to be increased among those who also benefited from the CCT. In Brazil, Garcia et al. (2016) evaluated the Bolsa Família CCT and the agricultural credit program for family farmers, Pronaf. With an analysis at the municipal level, results for the whole country suggest the existence of synergistic effects between the two programs,

[5]Procampo was created in 1994 and comprised a cash transfer for farmers, although it was not associated with the situation of poverty. The aim was to compensate rural farmers for possible losses resulting from NAFTA.

which contributed to raising average land productivity and income per worker, although they did not significantly affect the incidence of child labor.

## 4. Empirical Strategy

Our empirical strategy seeks to address the fact that the selection of communities to be included in Pro-Gavião was not random. We first use a matching procedure to construct a control group based on observables. It creates a group of comparison communities with similar pre-intervention characteristics associated with the policy makers' decisions. Because there might be unobservable characteristics that are jointly associated with treatment choice and the outcomes of interest, we also use a difference-in-differences approach. This allows us to remove the influence of unobservable characteristics that do not vary over time. Although we also control for a set of time varying observables, it is still possible that there are some sources of selection bias related to factors that vary over time. For instance, our estimates would be biased upward if policy makers chose communities that were more likely to have faster growth in the outcomes of interest. While we think policy makers chose locations based on levels, not expected growth, this is nonetheless a possibility.

In summary, the empirical strategy involves the following steps:

i) We conducted field work to obtain the GPS coordinates of the 210 communities that participated in Pro-Gavião. This allowed us to identify the treated census tracts in the Agricultural Censuses.
ii) We formed the control group with Propensity Score Matching using the 1996 pre-intervention data.
iii) We constructed a panel of census tracts for 1995-96 and 2006. In cases where the census tract changed, we built consistent geographical units called minimum comparable areas (AMCs).[6] Thus, our final unit of analysis refers to AMCs.
iv) Once the panel was constructed, we used a difference-in-differences estimation to identify the impacts.

### 4.1. Construction of the Control Group

We used Propensity Score Matching to identify a control group that is similar to the treated census tracts, based on observable pre-treatment characteristics. We estimated a probit model, with the dependent variable equal to one if the census tract participated in Pro-Gavião, and zero otherwise.[7] The explanatory variables included those related to participation in the Project (such as the poverty gap, access to electricity, and agricultural practices) and for which the impacts were calculated. The choice was also based on variable inclusion and exclusion exercises ("hit or miss") to improve the prediction and quality of the model, and to ensure balance of the observables (Caliendo and Kopeinig, 2005).[8]

Different criteria can be used to match beneficiaries with non-participants. We present results based on the five nearest neighbors, but we obtained qualitatively similar results with Kernel-based matching. With the nearest neighbor approach, each treated unit is matched with the five units in

[6] AMCs were constructed based on digital maps using the ArcGis software.
[7] Census tracts and AMCs are described in more detail in Section 4.3 below. For simplicity, in this section we refer to census tracts.
[8] Balance guarantees that units with identical propensity scores have the same distribution of observable characteristics, regardless of whether they are treated or not (Becker and Ichino, 2002).

the non-treated group that have the closest propensity scores, with replacement. With Kernel-based matching, each treatment unit is matched with a weighted average of all control units, based on weights inversely proportional to the distance of their propensity scores (Becker and Ichino, 2002).

### 4.2. Estimating the Impact of Pro-Gavião and Bolsa Família

Once the control group is formed, we build a panel of census tracts for 1995-96 and 2006 and use a difference-in-differences (DD) estimation to identify the impacts of Pro-Gavião, Bolsa Familia, and their interaction. To control for additional confounders, we use a fixed effects estimator that addresses time invariant unobserved heterogeneity at the level of census tracts. Our main estimating equation is:

$$Y_{st} = \alpha_0 + \alpha_1 PG_{st} + \alpha_2 BF_{st} + \alpha_3 BF_{st} * PG_{st} + X_{st}{}'\varphi + \theta_s + \gamma_t + \varepsilon_{st}, \quad (1)$$

where $Y_{st}$ is the average result of interest in census tract $s$ and period $t$; $PG_{st}$ is a dummy variable that indicates the presence of Pro-Gavião; $BF_{st}$, refers to the percentage of farm establishments that are beneficiaries of Bolsa Família; the term $BF_{st} * PG_{st}$ represents the percentage of establishments that access Bolsa Família in each census tract treated by Pro-Gavião; and $X_{st}$ refers to a vector of controls that change over time, given in terms of their mean values in census tract $s$ and period $t$. $\theta_s$ is the census tract fixed effect, $\gamma_t$ is the year fixed effect and $\varepsilon_{st}$ is a random error. Coefficient $\alpha_3$ on the interaction term provides the impacts of the synergies between the two programs. If it does not exist, the marginal impacts of each program are reduced to $\alpha_1$ (Pro-Gavião) and $\alpha_2$ (Bolsa Família).

In order to allow for the fact that matched control units have different degrees of similarity with the treated census tracts, weights were used that reflect the frequency with which each untreated observation was used as a match. Treated census tracts are unweighted.

The model specified in (1) provides an estimate of average impacts at the level of each census tract. To examine the possibility of heterogeneous effects of Pro-Gavião, a second equation was specified:

$$Y_{st} = \alpha_0 + \alpha_1 BF_{st} + \alpha_2 BF_{st} * PG_{st} + \alpha_3 PG_{st} * D_s^{40-80\%} + \alpha_4 PG_{st} * D_s^{80-90\%} + \alpha_5 PG_{st} * D_s^{>90\%} + X_{st}{}'\varphi + \theta_s + \gamma_t + \varepsilon_{st} \quad (2)$$

where the dummies indicating the presence of Pro-Gavião ($PG_{st}$) in census tract $s$ are interacted with dummies that represent the incidence of extremely poor farm establishments in each census tract (between 40% and 80%, 80% and 90%, and over 90% extreme poverty). Everything else is as defined in equation (1). With this specification, it is possible to check whether the census tracts with a high share of extremely poor farms were impacted differently than those where the incidence was less than 40% (the excluded group).

### 4.3. Data, Variables and Definitions

The analysis is conducted with data from the 1995-96 and 2006 Agricultural Censuses in Brazil. Because the municipality is the lowest level of geographical aggregation at which the Census data are publicly available, we submitted a special request to the Brazilian Institute of Geography and Statistics (IBGE) to extract the data at the level of census tracts. Because census tracts are closer to the level of communities, we believe that this is a more appropriate level at which to study the potential impacts of Pro-Gavião.

Each community participating in Pro-Gavião was represented by a single geographical coordinate that we collected during our fieldwork. Whenever possible, this point represented the community center (such as a church, school, association or soccer field). Since residents of rural communities tend to be dispersed, census tracts within a 2.5km radius around each geographical coordinate were considered to be treated by Pro-Gavião.[9] However, as a robustness check, we also estimated the effects considering as treated only those census tracts where the exact coordinates were located. Figure 2 shows the 13 Pro-Gavião municipalities, their divisions into census tracts, and the 2.5 km radius around each point representing a treated community. The 210 communities were located in 156 census tracts that we transformed into 99 AMCs with the radius definition and into 75 AMCs using the point definition.

The 41 municipalities in Bahia located in the vicinity of the 13 Pro-Gavião municipalities provided census tracts that were candidates for matching and that could potentially be included in the control group (see Figure 1). Although we are not able to provide evidence concerning the parallel trends assumption, since we do not have data at the census tract level prior to 1995-96, it is important to consider a group of untreated units as similar as possible to those that were treated. Thus, the initial pool of 334 AMCs from which a control group could be selected was drawn from all the untreated census tracts that belong to the 13 municipalities where Pro-Gavião was located as well as the census tracts from the other 41 municipalities nearby. Due to the potential for spillovers to bias the estimated impacts of the program, we excluded all non-treated AMCs from within the 13 PG municipalities and also those AMCs that shared borders with the treated ones. In the end, our control group was drawn from a pool of 288 AMCs, none of which share a border with the treated AMCs.

The sample is restricted to farms under 50 hectares in order to be more consistent with the IFAD target population. This threshold was determined based on an analysis of project documents, information collected in the field, and discussions with government officials in Bahia.

The 2006 Agricultural Census does not specifically identify receipts from Bolsa Família. It asks informants if they received transfers from federal, state or municipal government social programs and it distinguishes these form social security and pension income. Because Bolsa Família is the largest social program in Brazil, it is reasonable to assume that most informants who receive transfers are referring to this program. However, there are other state and municipal programs that provide transfers. For this reason we talk about “social programs” rather than Bolsa Família in the sections below.

All the variables used in the analysis were drawn from the 1995-96 and 2006 Agricultural Censuses. Table 1 shows each variable and its definition.

## 5. Results

Appendix Tables A.1, A.2 and A.3 were removed due to space limitations. They show, respectively, descriptive statistics on the main variables, the Probit results, and the tests of means before and after matching. We discuss these tables briefly. Table A.1 shows that land productivity is well below the national average in this region, both for treated and non-treated AMCs. Productivity rose for both groups, but the gains were higher (86%) for the non-treated than for the treated (23%). Income per adult family member working on the farm fell considerably for the treated AMCs (-36%), while it rose by 57% for the non-treated. This decline appears to be due to

[9] This definition resulted from observations made during the fieldwork.

a 187% increase in spending on inputs, coupled with only a 6% increase in the value of output per farm. Child labor declined dramatically in both groups. In 1996, 27% of the establishments in treated AMCs had a child working on the farm, yet by 2006 this had fallen to 12%.

Table A.2 shows the probit results where the dependent variable is equal to one if the AMC participated in Pro-Gavião and zero otherwise. The model was estimated with 99 treated AMCs and 288 non-treated AMCs. The matched sample consists of 96 treated AMCs and 177 controls. Table A.3 shows the difference in means for the matched and unmatched samples. The Table also shows the standardized bias between the two, the percentage reduction in the absolute value of the bias, and t-tests of the difference in means. The principal takeaway from this table is that there is a significant reduction in the bias after the matching. While many variables show statistically significant differences prior to matching, all of these disappear in the matched sample that restrict observations to the region of common support and use the five nearest neighbors for matching.

### 5.1. Impacts of Pro-Gavião, Bolsa Família and their Synergies

In this section, we present results for the impacts of Pro-Gavião, Bolsa Família, and their interaction on three outcome variables: land productivity, income per adult family worker, and child labor. We also explore impacts on three potential channels: investment, access to credit and access to electricity. Tables 2 and 3 show these results based on the estimation of equation (1), with and without additional controls, and with all models using fixed effects. The specifications in columns (2) and (3) include controls that are potentially endogenous. We decided to present these results anyway so that we could verify the channels through which the main effects operate. All variables measured in values (productivity, income and investment) are in logarithms, while the others are in shares.

The first aspect to be highlighted is the absence of any statistically significant effect of Pro-Gavião on the mean value of any of the variables in Table 2. The inclusion of controls, as shown in the specifications (2) and (3), does not change the main results of interest. Neither of the programs—whether isolated or their interaction—significantly affected the average growth of land productivity, income per adult or the share of establishments using child labor.

Table 3 shows a similar absence of any significant impacts of Pro-Gavião on the amount invested, and on access to credit and electricity. Access to credit, in contrast, was significantly affected by the incidence of social programs, and the interaction between the programs had a significant effect on the share of establishments with electricity. The estimates for credit suggest that a one percentage point (p.p.) increase in the farms that receive social programs is associated with a 0.21 p.p. increase in access to credit, all else constant. This effect remains significant (albeit smaller) even when we include additional controls, such as average farm size, technical assistance, participation in cooperatives, and the use of animal traction and irrigation.

If social programs were concentrated precisely on those AMCs where growth in access to credit was higher, then the estimated effect would not reflect a causal impact. However, government programs, such as Bolsa Familia, are not based on criteria related to the growth in variables, and even less so on access to credit. Although access to credit is not an explicit objective of social programs, this effect may be due to the fact that being a beneficiary makes it easier to provide collateral. The mere fact that a household participates in a social program can lead to greater reliability, stability and the possibility of contact in the case of credit arrears. This is consistent with the theoretical discussion that associates regular and predictable transfers with the overcoming of liquidity constraints, and is an important result for these households. In addition to

facilitating investment in agriculture, credit can help to smooth consumption in the face of income shocks, which are so frequent in rural environments.

In terms of access to electricity, the results show that the interaction between Pro-Gavião and social programs had a positive and statistically significant effect, although only at the 10% level of significance in the first specification. The increase in access to electricity in the region was substantial between 1996 and 2006. The share of farms with electricity increased from under 15% to around 60% in both treated and control AMCs. This increase reflects the priority given to certain public policies—such as Light for Everybody—and the general expansion of electrical power networks in this period. In this case, we suspect that the estimated effect may indicate an association, but not necessarily a causal impact.

The results presented so far refer to the average impacts of the programs on the treated AMCs. However, an important question concerns the possibility that the impacts differ depending on the initial level of poverty of each location. The estimation of equation (2) allows us to test for the existence of heterogeneous impacts of Pro-Gavião. A slight modification of equation (2) allows for the possibility that there is heterogeneity in the impact of the interaction between policies. The results are shown in Table 4.[10] Similar to the average effects in Tables 2 and 3, these results provide no evidence of a policy impact on the Pro-Gavião AMCs, even when allowing for heterogeneous impacts by the level of extreme poverty. Similarly, we find no evidence of a heterogeneous impact of the interaction between programs.

The empirical findings presented thus far reject the hypotheses of this paper. We found no statistically significant evidence for the impact of Pro-Gavião, or of synergies between the two programs, on the main outcome variables studied. AMCs that benefited from Pro-Gavião, or both programs, do not seem to have had superior outcomes related to the growth of land productivity and income, or the reduction of child labor. The findings were unaltered when we allowed for the possibility of heterogeneous impacts that varied based on the AMC initial level of extreme poverty. The interaction between the programs may have had an effect on access to electricity, but this was statistically significant only at the 10% level. We found, in contrast, evidence of a positive effect of social programs on access to credit.

### 5.2. Robustness Checks

In order to evaluate the robustness of the findings, in this section we present estimates of the impacts of each program and their interaction, from a subset of tests that we conducted.[11] We explore possible program spillovers to non-treated AMCs. We also examine data that sheds light on the possibility that our control units might have benefited from other social programs, which could alter the interpretation of our results.

With the aim of checking for the existence of spillover effects that could also explain the lack of any significant PG impact, we estimate the main specification (eq. 1) considering as treated the 46 AMCs that are neighbors of the PG AMCs. As potential controls, we include the 288 non-

[10] No AMC treated by Pro-Gavião had an incidence of extreme poverty equal to or less than 40% in 2006. The dummies, therefore, compare to the situation in which the Project is absent. There were 25 AMCs in the 40-80% interval, 40 AMCs in the 80-90% interval, and 31 AMCs where the incidence of extreme poverty was over 90%.

[11] Robustness tests that use kernel matching rather than the 5 nearest neighbors, and that define treated AMCs based on the exact coordinate rather than the 2.5km radius are available from the authors. The qualitative results did not change.

neighboring AMCs. The results presented in Table 5 are qualitatively similar to those previously discussed. The lack of evidence of impacts is consistent with the absence of spillover effect.

One potential explanation for finding no impact of Pro-Gavião is that there were other rural development programs taking place in Bahia at the same time, and these might have differentially affected the control AMCs. The World Bank, for example, invested heavily in rural poverty alleviation programs throughout the Northeast of Brazil in this period. Because IFAD was investing in these 13 municipalities, other programs might have left these locations alone and targeted other—almost as needy—municipalities. This would imply that our control group based on non-neighbors would not have represented the counterfactual of zero program intervention, but rather the counterfactual of no Pro-Gavião intervention. To address this issue, we were able to gather administrative data from the state government of Bahia on spending in PG and other locations. Although it was not possible to verify this hypothesis in each of the 54 municipalities analyzed, we have information from about 25 municipalities in the River Gavião region (13 Pro-Gavião municipalities and 12 neighbors). This can help to provide evidence as to how important Pro-Gavião was in relation to the other programs.

There were five different social programs in the region: PRODUR, PRODUZIR, PRODUZIR II, PRODUZIR III and PRODECAR.[12] Figure 2 shows the amounts spent by each program in each municipality in the period between 1996 and 2012. All municipalities, including those targeted by Pro-Gavião, took part in at least one of the other programs. Moreover, it can be seen that the average amount spent in the Pro-Gavião municipalities was higher than the average amount in the others. However, six municipalities belonging to the group of potential controls appear to have received relatively high investments from other social programs in the period from 1996 to 2012.[13] In order to verify if this may have led to a downward bias on the estimated impacts of Pro-Gavião, Table 6 presents estimates when excluding these municipalities from the potential pool of census tracts for the comparison group. When they are excluded, the average spending in the PG municipalities is about double what was spent in the controls. The results found in the main analysis remain. There is a lack of significant impacts of Pro-Gavião alone, a positive and significant effect of social programs on access to credit, and the absence of significant effects of the interaction between programs except on access to electricity.

Taken as a whole, the robustness checks confirm the results found previously. We found no statistically significant evidence to support a positive impact of Pro-Gavião in relation to the control locations. We found no evidence of synergies between the two programs, with the possible exception of access to electricity. Social programs seem to have improved access to credit.

### 5.3. Discussion

The finding that Pro-Gavião and the interaction between the programs had no statistically significant impact on the main outcomes studied in this paper represents an unexpected null result

[12] PRODUR (1997 to 2004) refers to the World Bank project called the Bahia Municipal Infrastructure and Management Project, which emphasized actions for urban areas. Produzir, Produzir II and Produzir III were stages of an ample program for reducing rural poverty, which was the result of a partnership between the government of Bahia and the World Bank. It occurred between 1995 and 2014. Prodecar (2006 to 2012) refers to the Rural Community Most Needy Areas' Development Project, which is also known as Gente de Valor. It was the result of a partnership between IFAD and the Bahia State government.

[13] Brumado, Bom Jesus da Serra, Caetanos, Pindaí, Planalto and Poções.

that raises a number of questions. In this section, we address three possible explanations for these findings: the data, the setting, and the design and implementation of the policies.

One explanation relates to the data. It is possible that there were in fact impacts, but they were at the level of the household, not the census tract, or on outcomes that we were not able to measure. Given the data available, it was only possible to evaluate outcomes that appear in the Agricultural Censuses, and at the census tract level. Other dimensions of well-being of the beneficiary communities may have been affected that we were unable to measure. For example, the components of PG that encouraged social participation through training events, or the creation of associations and common processing centers, may have been responsible for significant changes in terms of the human and social capital of those involved. These are highly relevant outcomes, although we could not include them among our dependent variables. Similarly, even among the agricultural outcomes, PG may have helped farmers to cope better with the risks that they face by providing technical assistance and disseminating new technologies to the semi-arid region. These too are outcomes that may not have been captured by the data used. An analysis of risk reduction would require data from more than one follow-up period. Finally, in terms of data, it is important to emphasize that although PG occurred at the community level, not all of the residents participated. It would be more appropriate for the impacts to be measured at the household level, but this was not possible with the dataset that we created long after the program had ended.

A second possibility relates to the adverse environmental and economic setting of the Gavião region. Favareto and Seifer (2013) identify a number of structural factors that could limit the success of rural development programs in the region. These relate to i) environmental restrictions, ii) unequal economic structures, insecurity of the poor, and a lack of opportunities to participate in markets, and iii) cultural and political-institutional constraints. The soil and weather characteristics of the semi-arid region do, according to Bahia (2006), represent significant obstacles for agricultural production. Consequently, although PG may have built important infrastructure items and disseminated knowledge through extension activities, it may have been insufficient to improve the average situation of the beneficiaries. Market failures also create obstacles. De Janvry and Sadoulet (2005) point out that the existence of market failures may be responsible for the lack of response of households to public policies. They suggest that even if certain public policies relax constraints in particular markets, the ability of agricultural households to change their behavior is affected by the imperfections that remain in other markets.

A third possibility for the absence of significant interaction effects between the programs could be related to the way in which these policies were designed and implemented. Helfand and Souza (2014) conducted interviews with Brazilian officials involved in running Bolsa Família and Pro-Gavião to analyze their perceptions about the interaction between these programs. The authors conclude that although many respondents believe that synergistic effects are likely, there was little or no coordination in the design and implementation of the policies. For example, Directors of rural development programs did not have access to information from the Cadastro Único[14] that could be extremely valuable for targeting poor households and vulnerable locations, or to avoid duplication of efforts. There may be legal or administrative restrictions that impede the sharing of information. But there are also political obstacles to policy coordination, with their roots in the individual logic of politicians, the heterogeneous governing coalitions that are often formed, or in the archaic practices of traditional elites in the Northeast of Brazil.

[14] This is the database on poor families that have applied to or received benefits from the Bolsa Família Program.

In spite of all of the possible reasons why there might actually be an impact, even though we were unable to detect one, it is nonetheless a rather surprising result to find zero impact of the Pro-Gavião program on almost all outcomes that we were able to measure.

## 6. Conclusions

In this paper, we explored the impacts of an IFAD supported rural development project—Pro-Gavião—in 13 municipalities of Brazil, and possible synergies with the Bolsa Família conditional cash transfer program. The paper used a matching technique to create a control group of untreated census tracts, and a difference-in-differences estimation to identify policy impacts. The findings were unexpected. When examining the main outcomes of land productivity, agricultural income, and child labor—all available in the Agricultural Censuses—we found no statistically significant evidence to support a positive impact of Pro-Gavião or of synergies between the two programs. The presence of Bolsa Família seems to have improved access to credit, and there was some evidence showing a likely association between the interaction of the policies and improved access to electricity. These results are robust to different matching techniques, ways of defining the treated locations, the exclusion of control locations that may have benefited disproportionately from alternative interventions, and heterogeneity by initial level of poverty.

The paper discussed possible explanations for these null results. These fell into three broad categories. First, it is possible that policies did in fact have impacts, but we were unable to measure them with the data and methods employed. Second, it is possible that the soil, climate, and economic environments are so adverse in this region that it is extremely difficult for rural development interventions to succeed. Finally, in terms of policy synergies, one limitation of the study is that Bolsa Família and Pro-Gavião only operated jointly for a short period of time. More importantly, we suspect, is that these policies were not designed to complement each other, and were implemented independently of each other. Perhaps enhanced synergies require more coordination and collaboration.

This paper has raised nearly as many questions as it has answered. Two lessons are clear. First, many policy makers and administrators, as well as researchers, believe that conditional cash transfers and rural development interventions are likely to have enhanced impacts when implemented in tandem. Thus, policies should be designed with these complementarities in mind, and implemented in a more coordinated fashion in order to reduce duplication, increase efficiency and enhance impacts. Second, while we have devised a creative approach to estimating impacts *ex post*, rural development interventions should build in impact evaluations from the start so that outcomes can be measured at the household level and evaluated with a rigorous methodology.

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## Tables and Figures

**Figure 1: Brazil, State of Bahia, Pro-Gavião municipalities and municipalities for comparison group**

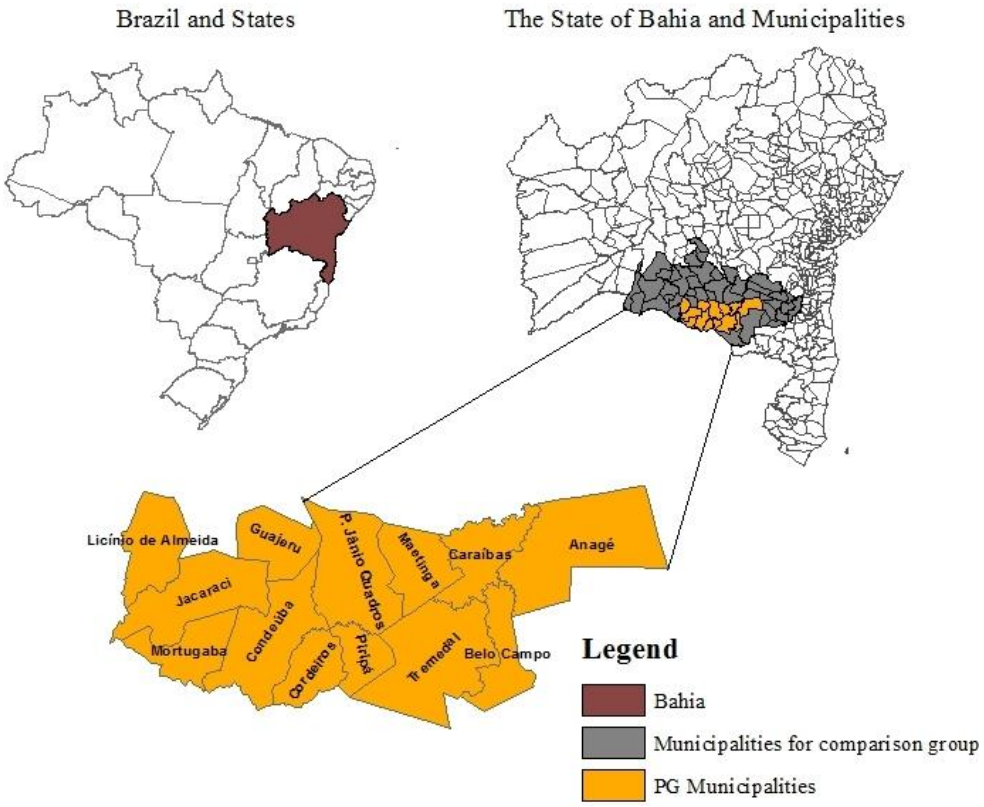


**Figure 2: Pro-Gavião Municipalities, Census Tracts and Treated Communities (with a 2.5km radius)**

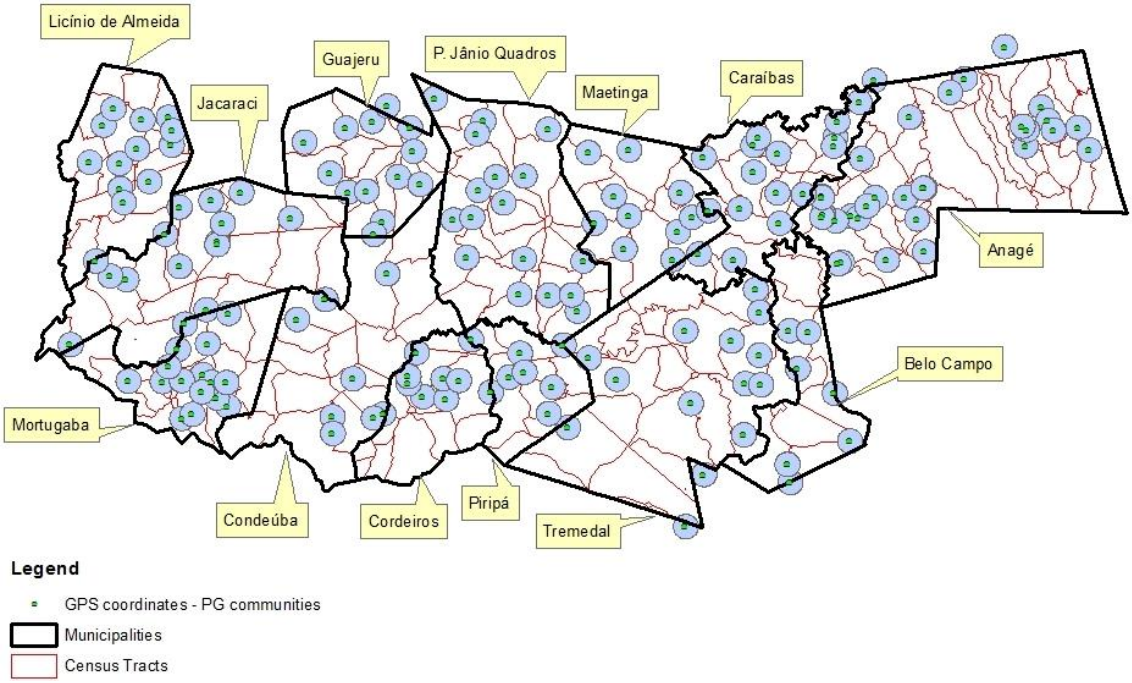
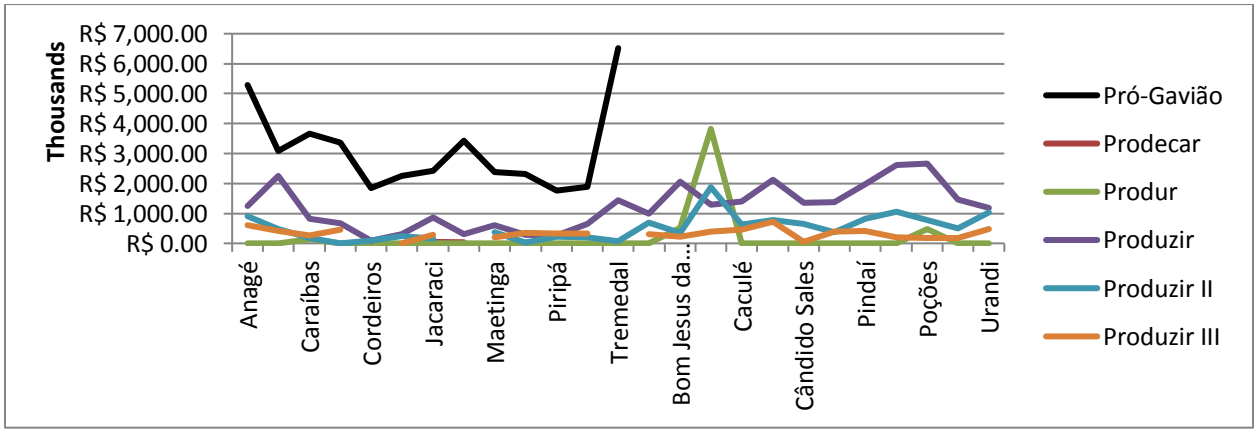



**Figure 3: Evolution of the Spending of Each Program by Municipality for the 1996-2012 Period**




Note: Monetary Values are in 2012 prices.

## Table 1: Description of Variables

| Variable | Definition |
|---|---|
| Farm size | Total area in hectares(ha) divided by the number of establishments of the AMC |
| Land productivity | Real value of agricultural output per ha in 2006 prices |
| Income per adult | Real value of agricultural output minus real value of expenditures per family worker (above 14 years old) in 2006 prices |
| Child labor (share) | Share of establishments that have children under 14 years old working on the farm |
| Access to credit (share) | Share of establishments that access financing |
| Investments | Total value of investments per establishment in 2006 prices |
| Electricity (share) | Share of establishments with electricity |
| Value of output per estab. | Real value of agricultural output per establishment in 2006 prices |
| Expenditure per estab. | Real value of expenditures per establishment in 2006 prices |
| Livestock production (share) | Share of the livestock value in total output |
| Crop production (share) | Share of the crop production value in total output |
| Crop extraction (share) | Share of the extrative products value in total output |
| Permanent crops (share) | Share of the permanent crops value in total output |
| Temporary crops (share) | Share of the temporary crops value in total output |
| Technical assistance (share) | Share of establishments that use technical assistance |
| Cooperatives (share) | Share of establishments in cooperatives |
| Animal traction (share) | Share of establishments that use animals for traction |
| Mechanical traction (share) | Share of establishments that use machines |
| Irrigation (share) | Share of establishments with irrigation |
| Social programs (share) | Share of establishments that access Social Programs (2006 only) |
| Poverty Incidence (share) | Share of establishments bellow the poverty line (1/2 minimum wage) |
| Extreme poverty incidence (share) | Share of establishments bellow the extreme poverty line (1/4 minimum wage) |
| Poverty gap | Average poverty gap in AMC |
| Extreme poverty gap | Average extreme poverty gap in AMC |

## Table 2: Effects of Pro-Gavião, Social Programs and their Interaction on Land Productivity, Income and Child Labor

| | Land Productivity | | | Income per adult | | | Child labor | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) | (1) | (2) | (3) |
| Pro-Gavião | 0.16 | 0.17 | 0.30 | 0.001 | 0.16 | 0.22 | 10.41 | 9.33 | 10.70 |
| | (0.28) | (0.28) | (0.28) | (0.38) | (0.40) | (0.38) | (9.73) | (9.48) | (9.19) |
| Social programs incidence | -0.001 | 0.003 | 0.01 | -0.01 | 0.00 | 0.00 | 0.13 | 0.08 | 0.10 |
| | (0.004) | (0.01) | (0.004) | (0.01) | (0.01) | (0.01) | 0.17 | (0.17) | (0.17) |
| Interaction between the programs | -0.01 | -0.01 | -0.01 | -0.003 | -0.01 | -0.01 | -0.22 | -0.17 | -0.19 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.24) | (0.24) | (0.24) |
| Farm size | - | -0.03** | -0.04*** | - | 0.03* | 0.04* | - | -0.06 | -0.12 |
| | | (0.01) | (0.01) | | (0.02) | (0.02) | | (0.40) | (0.39) |
| Technical assistance | - | -0.002 | -0.01 | - | -0.01** | -0.01** | - | 0.15 | 0.12 |
| | | (0.003) | (0.003) | | (0.004) | (0.004) | | (0.15) | (0.16) |
| Cooperatives | - | -0.004 | 0.00 | - | -0.01* | -0.01** | - | 0.05 | 0.06 |
| | | (0.002) | (0.003) | | (0.004) | (0.004) | | (0.08) | (0.08) |
| Animal traction | - | - | 0.00 | - | - | -0.01 | - | - | 0.06 |
| | | | (0.002) | | | (0.003) | | | (0.09) |
| Irrigation | - | - | 0.02* | - | - | 0.01 | - | - | 0.12 |
| | | | (0.01) | | | (0.01) | | | (0.27) |
| Year (2006) | 0.13 | 0.13 | -0.04 | -0.01463 | 0.23 | 0.21 | -25.80*** | -26.75*** | -28.79*** |
| | (0.21) | (0.19) | (0.23) | 0.241649 | (0.29) | (0.31) | (7.35) | (8.03) | (7.61) |
| Constant | 4.71*** | 5.31*** | 5.28*** | 6.12*** | 5.60*** | 5.77*** | 31.85*** | 32.37*** | 30.69*** |
| | (0.03) | (0.24) | (0.24) | (0.04) | (0.33) | (0.35) | (0.98) | (6.93) | (7.76) |
| R2 | 0.00 | 0.09 | 0.12 | 0.01 | 0.02 | 0.01 | 0.19 | 0.18 | 0.173 |
| Number of observations | 426 | 426 | 426 | 388 | 388 | 388 | 426 | 426 | 426 |
| Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Note: AMC level clustered standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01.

## Table 3: Effects of Pro-Gavião, Social Programs and their Interaction on Investment, Credit and Electricity

| | Investment | | | Access to credit | | | Access to electricity | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) | (1) | (2) | (3) |
| Pro-Gavião | -0.13 | -0.27 | 0.19 | 0.15 | -0.77 | 0.12 | -6.75 | -7.98 | -11.27 |
| | (0.84) | (0.84) | (0.80) | (2.69) | (2.54) | (2.51) | (9.67) | (9.64) | (8.37) |
| Social programs incidence | -0.01 | -0.01 | -0.01 | 0.21*** | 0.13** | 0.15*** | -0.09 | -0.21 | -0.29* |
| | (0.02) | (0.02) | (0.02) | (0.06) | (0.06) | (0.05) | (0.17) | (0.18) | (0.15) |
| Interaction between the programs | 0.00 | 0.00 | 0.00 | -0.06 | -0.01 | -0.03 | 0.43* | 0.50** | 0.55** |
| | (0.02) | (0.02) | (0.02) | (0.08) | (0.07) | (0.07) | (0.24) | (0.24) | (0.22) |
| Farm size | - | 0.07** | 0.05 | - | 0.03 | 0.01 | - | 0.44 | 0.37 |
| | | (0.03) | (0.03) | | (0.12) | (0.12) | | (0.44) | (0.42) |
| Technical assistance | - | 0.00 | 0.00 | - | -0.02 | -0.04 | - | 0.22 | 0.28 |
| | | (0.01) | (0.01) | | (0.05) | (0.05) | | (0.18) | (0.18) |
| Cooperatives | - | 0.00 | 0.00 | - | 0.10*** | 0.10*** | - | 0.12 | 0.14* |
| | | (0.01) | (0.01) | | (0.03) | (0.03) | | (0.08) | (0.08) |
| Animal traction | - | - | 0.01** | - | - | 0.02 | - | - | 0.06 |
| | | | (0.01) | | | (0.03) | | | (0.08) |
| Irrigation | - | - | 0.02* | - | - | 0.09 | - | - | -0.48* |
| | | | (0.01) | | | (0.07) | | | (0.26) |
| Year (2006) | 0.929 | 1.29** | 0.91 | 9.84*** | 7.71*** | 6.50*** | 42.63*** | 41.62*** | 45.35*** |
| | (0.64) | (0.64) | (0.66) | (2.12) | (1.85) | (1.95) | (7.22) | (7.12) | (5.89) |
| Constant | 5.31*** | 4.17*** | 3.63*** | 0.12 | -0.41 | -1.01 | 14.35*** | 6.27 | 5.27 |
| | (0.07) | (0.54) | (0.61) | (0.38) | (2.07) | (2.15) | (1.03) | (7.11) | (6.83) |
| R2 | 0.11 | 0.12 | 0.10 | 0.67 | 0.69 | 0.68 | 0.54 | 0.51 | 0.48 |
| Number of observations | 299 | 299 | 299 | 426 | 426 | 426 | 426 | 426 | 426 |
| Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Note: AMC level clustered standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01.

## Table 4: Heterogeneous Program Effects by Level of Extreme Poverty

| | Land productivity | | Income per adult | | Child labor | | Investment | | Credit | | Electricity | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (1) | (2) | (1) | (2) | (1) | (2) | (1) | (2) | (1) | (2) |
| Pro-Gavião | - | 0.25 | - | 0.23 | - | 11.81 | - | 0.18 | - | -2.00 | - | -4.43 |
| | | (0.32) | | (0.42) | | (13.26) | | (0.46) | | (3.33) | | (13.14) |
| Social programs incidence | 0.00 | 0.00 | -0.01 | -0.01 | 0.13 | 0.08 | -0.01 | -0.01 | 0.21*** | 0.18*** | -0.09 | 0.06 |
| | (0.004) | (0.003) | (0.01) | (0.01) | (0.18) | (0.13) | (0.02) | (0.01) | (0.06) | (0.04) | (0.17) | (0.12) |
| Pro-Gavião*2006 and extreme poverty between 40 and 80% | 0.39 | - | 0.45 | - | 2.20 | - | 0.21 | - | 1.47 | - | -14.94 | - |
| | (0.31) | | (0.41) | | (10.93) | | (0.91) | | (3.06) | | (10.80) | |
| Pro-Gavião*2006 and extreme poverty between 80 and 90% | 0.29 | - | -0.07 | - | 11.28 | - | -0.32 | - | -0.57 | - | -8.99 | - |
| | (0.30) | | (0.40) | | (9.50) | | (0.82) | | (2.91) | | (10.01) | |
| Pro-Gavião*2006 and extreme poverty over 90% | -0.10 | - | -0.27 | - | 14.72 | - | 0.23 | - | 0.03 | - | 0.70 | - |
| | (0.31) | | (0.45) | | (10.71) | | (0.90) | | (2.87) | | (10.14) | |
| Interaction between the programs | -0.01 | - | 0.00 | - | -0.21 | - | 0.00 | - | -0.06 | - | 0.45* | - |
| | (0.01) | | (0.01) | | (0.24) | | (0.02) | | (0.08) | | (0.24) | |
| Interaction * extreme poverty between 40 and 80% | - | -0.06 | - | -0.01 | - | -17.90 | - | -0.02 | - | 2.87 | - | 5.22 |
| | | (0.33) | | (0.47) | | (14.16) | | (0.51) | | (3.51) | | (13.62) |
| Interaction *extreme poverty between 80 and 90% | - | -0.23 | - | -0.54 | - | -6.31 | - | -0.55 | - | -1.06 | - | 13.71 |
| | | (0.33) | | (0.45) | | (13.03) | | (0.45) | | (3.35) | | (13.19) |
| Interaction *extreme poverty over 90% | - | -0.62* | - | -0.61 | - | -7.09 | - | | - | -0.16 | - | 19.02 |
| | | (0.36) | | (0.54) | | (13.26) | | | | (3.53) | | (13.64) |
| Year (2006) | 0.13 | 0.18 | -0.01 | -0.02 | -25.80*** | -23.89*** | 0.93 | 0.95** | 9.84*** | 10.93*** | 42.63*** | 37.32*** |
| | (0.21) | (0.18) | (0.24) | (0.24) | (7.37) | (5.95) | (0.64) | (0.46) | (2.12) | (1.79) | (7.24) | (5.38) |
| Constant | 4.71*** | 4.71*** | 6.12*** | 6.12*** | 31.86*** | 31.86*** | 5.30*** | 5.30*** | 0.12 | 0.12 | 14.35*** | 14.35*** |
| | (0.03) | (0.03) | (0.04) | (0.04) | (0.98) | (0.98) | (0.07) | (0.07) | (0.38) | (0.38) | (1.02) | (1.03) |
| R2 | 0.05 | 0.05 | 0.05 | 0.05 | 0.19 | 0.19 | 0.10 | 0.10 | 0.674 | 0.67 | 0.53 | 0.52 |
| Number of observations | 426 | 426 | 388 | 388 | 426 | 426 | 299 | 299 | 426 | 426 | 426 | 426 |
| Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Note: AMC level clustered standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01.

**Table 5: Spillover Effects of Pro-Gavião, Social Programs and their Interaction on Neighboring AMCs**

| | Land Productivity | Income per adult | Child labor | Investment | Credit | Electricity |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Pro-Gavião | -0.43 | 0.22 | -4.17 | -0.81 | 4.36 | -8.70 |
| | (0.34) | (0.54) | (6.75) | (0.74) | (2.98) | (6.56) |
| Social programs incidence | -0.01 | -0.01 | -0.03 | -0.01 | 0.15*** | -0.08 |
| | (0.004) | (0.01) | (0.11) | (0.02) | (0.04) | (0.12) |
| Interaction between the programs | 0.00 | -0.03* | 0.27 | 0.03 | -0.11 | 0.24 |
| | (0.01) | (0.02) | (0.22) | (0.02) | (0.09) | (0.23) |
| Year (2006) | 0.57*** | 0.48 | -18.28*** | 1.19** | 12.31*** | 47.35*** |
| | (0.16) | (0.41) | (4.74) | (0.53) | (1.61) | (4.15) |
| Constant | 4.74*** | 5.89*** | 27.68*** | 5.25*** | 0.16 | 17.83*** |
| | (0.05) | (0.07) | (0.99) | (0.06) | (0.45) | (1.12) |
| R2 | 0.05 | 0.06 | 0.25 | 0.14 | 0.64 | 0.48 |
| Number of observations | 332 | 301 | 332 | 218 | 332 | 332 |
| Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |

Note: AMC level clustered standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01.

**Table 6: Effects of *Pro-Gavião*, Social Programs and their Interaction, with the Exclusion of Control Municipalities with High Spending on Other Social Programs**

| | Land Productivity | Income per adult | Child labor | Investment | Credit | Electricity |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Pro-Gavião | -0.25 | -0.22 | 7.38 | -0.78 | -1.59 | -4.01 |
| | (0.31) | (0.44) | (7.73) | (0.82) | (2.38) | (9.18) |
| Social programs incidence | -0.01* | -0.01 | 0.08 | -0.02 | 0.20*** | -0.14 |
| | (0.01) | (0.01) | (0.13) | (0.02) | (0.04) | (0.16) |
| Interaction between the programs | 0.003 | 0.00 | -0.18 | 0.01 | -0.05 | 0.46** |
| | (0.01) | (0.01) | (0.22) | (0.02) | (0.06) | (0.23) |
| Year (2006) | 0.53** | 0.20 | -22.12*** | 1.57** | 11.54*** | 40.57*** |
| | (0.24) | (0.32) | (4.36) | (0.61) | (1.71) | (6.52) |
| Constant | 4.68*** | 6.09*** | 31.23*** | 5.29*** | 0.15 | 15.53*** |
| | (0.03) | (0.05) | (1.10) | (0.08) | (0.34) | (1.04) |
| R2 | 0.05 | 0.01 | 0.19 | 0.14 | 0.70 | 0.52 |
| Number of observations | 398 | 360 | 398 | 276 | 398 | 398 |
| Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |

Note: AMC level clustered standard errors in parentheses.*p<0.10, **p<0.05, ***p<0.01.