Does the Small Business Program Benefit Self-Employed Workers? Evidence from Nicaragua[*]

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Abstract:

Do social programs lead to higher incomes for self-employed workers? In many Latin American countries, governments have been implementing a diverse set of social programs to improve the living standards of the target groups. We study the policy shift of the Government of Nicaragua that started in 2012 toward self-employed workers with the implementation of the Small Business of the Family Economy (SBFE) program. This paper aims to quantify the impact of the SBFE program on self-employed workers' income using data from the Living Standards Measurement Survey. The results suggest that the program increases self-employed workers' income by 21 percent. In particular, those with low educational attainment and in manufacturing, hotels and restaurant sectors are more likely to benefit from the SBFE program.

JEL Codes: E24, J22, J48, O17.

Keywords: Nicaragua; self-employed worker; small business; social program

1. Introduction

Do social programs lead to higher incomes for individuals? Although there is still little consensus on this question, estimating the causal impact of social programs is important not only for the efficient allocation of public expenditure but also for the overall wellbeing of those with fewer employment opportunities.[1] In many Latin American countries, governments have been implementing a diverse set of social programs to improve the living standards of the targeted population. From conditional cash transfers, food stamps, price subsidies to labor empowerment and inclusive training programs, governments aim to develop policy design to tackle poverty (Karlan & Appel, 2011).

Notably, in developing countries, self-employment is vastly common and it accounts for a considerable portion of their labor force and informal economy (Fields, 2014; Gindling & Newhouse, 2014). In the case of Nicaragua, self-employed workers comprised up to 30 percent of the labor force in 2014 (Center for Distributive, Labor and Social Studies & World Bank, 2017). Generally, self-employed workers can be separated into three groups: (1) entrepreneurs who are innovative with further growth potential and with different set of ambitious goals (de Soto, 1989); (2) workers that earn little because they are rationed out of wage jobs in the formal labor market and with less likelihood to become employers (Castells & Portes, 1989; Tokman, 1978); and (3) volunteer workers that prefer to have more significant independence and flexibility (Maloney, 1998, 2004; Chen, 2012). The self-employed sector in the Latin American region is a particular case where these three categories are integrated (Funkhouser, 1997). In addition, Funkhouser (1996) found that in the Central American countries, there is an interesting pattern of higher returns to experience and education in the informal sector than the formal sector, indicating preferences for the informal sector.[2]

Given that self-employed workers comprise a large portion of Latin American labor force and they might have quite different characteristics from paid-employees, it is an important question to identify programs through which self-employed workers benefit the most and estimate the effect of social programs aiming to help them. Nevertheless, little is known about the impact of social programs on self-employed workers. The literature has been mainly focused on job satisfaction of self-employed workers in comparison to salaried workers (Cueto & Pruneda, 2016) or the returns to education of self-employed workers (Garcıa-Mainar &

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[1] For studies on the entrepreneurship in developing countries, see Cho & Honorati (2013).
[2] The higher returns to experience in the informal sector is not only presented by the study of Funkhouser (1996). Telles (1993) found higher return for males and females self-employed workers in Brazil and Mohan (1986) found a similar pattern for self-employed male workers in Colombia.

Montuenga-Gomez, 2005). In addition, as the relatively small number of programs has targeted only self-employed workers, the empirical evidence on their effectiveness is still scarce.

In this paper, we study the effect on the self-employed workers' income of the implementation of the Small Business of the Family Economy (SBFE) program which aims to improve the capabilities of self-employed workers through provision of training and information, and development of skills in the sectors of Agriculture, Forestry, Manufacturing, Commerce and Services, and Construction in Nicaragua. We use data from the Living Standards Measurement Survey (LSMS) conducted by the National Institute of Development Information of Nicaragua (INIDE, by its acronym in Spanish). We focus on intent-to-treat effects, which rely on a difference-in-differences method, exploiting variation in the timing of the introduction of the program and group exposure to it. We also perform various robustness checks as well as a placebo test to provide further justification for our identification strategy.

We find that the introduction of the SBFE program has a positive impact on the self-employed workers by increasing their income by 21 percent. The increase in income comes mainly from low educated workers and those in manufacturing, hotels and restaurant sectors. Our results are robust to other specifications and different samples. This paper contributes to the literature of social program for self-employed workers in developing countries, providing optimal policy design.

The remainder of this paper is organized as follows. In Section 2, we describe the SBFE program and policy background. Section 3 describes the data we use and its limitations. Section 4 presents the definition of the eligibility status, the empirical strategy and the estimated impact of the program on self-employed workers' income. Section 5 turns to a heterogeneity and sector decomposition analysis and the robustness checks. Finally, section 6 offers the concluding remarks.

2. The Program

In 2012, the Government of Nicaragua created the Ministry of Family Economy, Community, Cooperative, and Associative (Ministerio de Economía Familiar, Comunitaria, Cooperativa, y Asociativa, MEFCCA by its acronym in Spanish). The main objective of the MEFCCA is to promote and support small and medium-sized businesses and the commercialization of their products to improve the quality and productivity of those businesses. The creation of this ministry serves as a shift toward the inclusion of self-employed individuals into the social programs implemented by the Government. The MEFCCA is part of a new

model of integral attention to the small businesses, recognizing the diverse capacities of the Nicaraguan families and various forms of participation in the national economy.

The MEFCCA introduced the Small Businesses of the Family Economy program (hereinafter, SBFE), formerly known as the "Micro, Pequeña y Mediana Empresa" program,[3] with the National Institute of Technology (Instituto Nacional de Tecnología, INATEC by its acronym in Spanish) since 2012. The SBFE program was designed to target individuals who want to develop or start their own business; they are mostly self-employed workers of small and medium-sized enterprises (SMEs) in the sectors of Agriculture, Forestry, Manufacturing, Commerce and Services, and Construction.

The main goal of the SBFE program is to improve and strengthen the capabilities of self-employed workers through training and creation of sustainable businesses.[4] The SBFE program provides four types of training: (1) creation of business plans; (2) talks about business organization; (3) networking and establishment of virtual stores and access to new markets; and (4) administrative and productive techniques. There are two modalities in which the trainers carry out the program. First, 100 hours of training for three months, and, second, strengthening talks that are conducted in one day for four hours. In both types of modalities, the program is adjusted to the demand by the self-employed workers, and there is no limit for re-application for the training. The SBFE program ensures that all the participants create business development plans to marketize their small and medium business. The program also facilitates registration and update of small businesses through the information system established by the MEFCCA. This aims to improve the corporate image of small and medium businesses and to facilitate the access to local markets for the products of these businesses.

The SBFE program is coordinated by the Small Business Training Directorate of the MEFCCA which oversees the development of training programs for small and medium-sized businesses together with INATEC. The program implements capacity-building programs with gender practices that promote the quality, productivity and efficiency of small businesses and design booklets for the small business establishment. It also encourages different marketing mechanisms of small businesses through national, municipal and regional fairs. The program

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[3] This is translated to Micro, Small and Medium Enterprises in English.
[4] The program requires the following documentation and conditions; (1) copy of birth certificate or identification card; (2) copy of the last academic grades or certificates showing that the individual can read and write; (3) 14 years or older for the training in the commerce and service sector; (4) 16 years or older for the training in the manufacturing and construction sector, and finally; (5) the individual should desire to be trained. Self-employed workers who want to be a part of the program are requested to fill a form at the MEFCCA and, then, they are assigned to the INATEC to coordinate the day in which that training will be performed and the number of training hours to be held.

works together with the Promotion and Commercialization of the Small and Medium Directorate of the MEFCCA to promote the development of small businesses at a national level. In order to promote small and medium business at the local and municipal level, the program facilitates spaces for commercial exchanges of products and services (e.g., Fairs of the Family Economy).

3. Data

In order to examine the impact of the SBFE program on the self-employed workers' income, we use the data from the Living Standards Measurement Survey (LSMS) conducted by the National Institute of Development Information of Nicaragua (INIDE, by its acronym in Spanish). The LSMS is a nationally representative survey covering both urban and rural areas. For the data collection, the country was divided into census segments, each containing approximately 150 households in the urban area and 120 households in the rural area.[5]

Our dataset comprises the 2005, 2009 and 2014 waves. In a falsification test, we use the 2005 and 2009 waves as both are pre-intervention periods. For our main analysis, we use the 2009 wave as pre-intervention and the 2014 wave as post-intervention period of the program. The total sample size for the 2005, 2009 and 2014 waves is 7,871, 7,520 and 7,570 households, respectively.

We classify each individual in the sample into their employment status using the LSMS questionnaire. A self-employed individual is identified as an individual who recognized himself/herself as a self-employed, whose primary activity during the previous week of the survey interview is performed in a small or medium-sized business and does not include hiring any workers. We did not consider workers that have a second or third occupation as a self-employed worker, and we excluded unpaid family workers. For this paper, we restricted the sample to only self-employed individuals. In addition, we focus only on those people who are 14 years older and above which is the legal working age in Nicaragua and the minimum age required to be a subject of the SBFE program. Additionally, we construct a primary economic sector variable using a 3 digits code classification of the Uniform Classifier of the Economic Activities of Nicaragua (CUAEN, by its acronym in Spanish). We use this variable to create an *eligibility* measure that is discussed in the following section.

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[5] The observation units are all the households of the selected dwellings in the sample. The division of areas that have partitioned the country is based on the cartographic update carried out in 2004 by INIDE, which was used for the 2005 Nicaraguan Population and Housing Census.

The LSMS dataset also contains income information for each individual. Given that the surveyed income in the LSMS is in nominal terms, we use the Consumer Price Index (CPI) from the Central Bank of Nicaragua (BCN by its acronym in Spanish) to construct the real income for the self-employed workers. We report all monetary estimation in 2006 real Nicaraguan córdobas. Table 1 presents the summary statistics for several key variables in the analysis. On average, a half of the self-employed workers in the sample are males (50.4 percent), with 6.4 years of education. 76 percent of the sample lives in the urban area, their average age is 42.4 years old, and the average household size is around 5. Among the sample of self-employed workers, around 75 percent of them are eligible for the SBFE program.

[Table 1]

Additionally, we present in Table A.1 (See Appendix) the summary statistics for sex and education which divides the sample into five primary economic sectors.[6] Overall, females represent more than 90 percent in Hotels and Restaurants and 62 percent in Commerce. In contrast, males made up more than 90 percent in Agriculture, Livestock, Hunting and Forestry, and in Construction. Regarding education, the most-educated individuals are present in the Commerce sector.

The eligibility for the program depends on the sector where they work and each sector is composed of people with different characteristics such as age, gender, eduction and residence. In order to address differences between non-eligible and eligible individuals, we use a propensity score matching (PSM) methodology constructed using the single nearest neighbour imposing common support.[7] The PSM estimator contains two identifying assumptions. The first assumption is *unconfoundedness* which implies that the differences in outcomes between treatment and control group are attributed to the intervention as follows: $(Y_1, Y_0) \perp D|X$, where Y_1 and Y_0 are potential outcomes for each individual i, D is the assignment and X are the covariates. This implies that the selection into treatment is based only on observable factors (Caliendo & Kopeinig, 2008). The second assumption is *overlap*, or *common support* which can be expressed as $0 < P(D = 1 | X) < 1$. The overlap assumption ensures that all the individuals that have the same values of X can be participants of the program (Heckman,

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[6] The primary economic sectors are: (1) Agriculture, Livestock, Hunting and Forestry; (2) Manufacturing Industry; (3) Construction; (4) Commerce; and (5) Hotels and Restaurants.
[7] Using different matching algorithms, such as radius or kernel, does not significantly change the main results presented in this paper. Results using different matching methods are available on request.

LaLonde & Smith, 1999). Because eligible and non-eligible individuals differ in terms of covariates, we balance the distribution of their observable characteristics using the PSM. We plot the bias correction in Figure 1 using the standardized percent of bias across covariates (Caliendo & Kopeinig, 2008). After the PSM is applied, the standardized bias across covariates is within zero percent in contrast to the unmatched sample. All the following estimations presented in the next sections are based on the matched sample.[8]

[Figure 1]

4. Empirical Strategy and Main Results

In this Section, we explain the eligibility status for the self-employed workers, present the empirical strategy, and discuss the main results.

4.1. Eligibility Status

The eligibility variable is constructed using the information in the LSMS dataset. The LSMS questionnaire contains the following question: "What is the main economic activity of your occupation or the place you work at?" We code this question using the "Uniform Classifier of the Economic Activities of Nicaragua" (CUAEN) to obtain a total of 105 economic activities for self-employed workers. Out of these 105 economic activities, there are 51 economic activities that are eligible for the SBFE Program, the remaining activities comprise non-eligible individuals. We use this variable to create our eligible measure of the program. Likewise, we group the economic activities into 18 primary economic sectors.[9] Out of those 18 economic sector categories, there are 13 sectors that are not eligible for the SBFE program. In particular, we separate agriculture and forestry sector from livestock and hunting sector given that the former sector is eligible for the SBFE and the latter is not. Additionally, we separate manufacturing industries that are not eligible for the SBFE program such as the manufacture of chemicals. We classify each individual who reports to be self-employed into eligible sectors

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[8] In Table A.2, we present a test for equality of means for key variables which contains the summary statistics of eligible and non-eligible individuals and their differences before and after matching.
[9] The 18 primary economic sectors are the following: (a) agriculture, livestock, hunting, and forestry, (b) fishing, (c) mining and quarry exploitation, (d) manufacturing industries, (e) supply of electricity, gas and water, (f) construction, (g) wholesale and retail trade, (h) hotels and restaurants, (i) transportation, storage and communications, (j) financial intermediation, (k) real estate, business and rental activities, (l) public administration and defense, (m) teaching, (n) social and health services, (o) other activities of community, social and personal services, (p) private homes with domestic service, (q) extraterritorial organizations, (z) other activities.

if they belong to the following economic sectors: (1) Agriculture and Forestry; (2) Manufacturing; (3) Construction; (4) Commerce; and (5) Hotels and Restaurants. The remaining sectors serve as the comparison group, i.e., the non-eligible primary economic sectors. Given the definition of the eligibility status presented above, we cannot identify whether the individual was treated or not by the SBFE program. The analysis, therefore, can be interpreted as intent-to-treat (ITT) analysis which ignores non-compliance, withdrawal, and protocol deviation of the individuals (Gupta, 2011).

4.2. Empirical Strategy

The empirical strategy follows a standard Difference-in-Differences (DID) strategy, exploiting variation in the timing of the introduction of the program and group exposure to it. Our identification strategy is thus two-pronged. First, it is based on the difference between pre and post treatment exposure among eligible self-employed workers. Second, since there could be other changes happening country wide, we use the corresponding counterparts, who were not eligible for the SBFE program, to factor out any contemporaneous changes. The baseline estimating equation is as follows:

$$Y_{it} = \alpha + \beta Post_t + \gamma Eligibility_i + \delta(Post_t \times Eligibility_i)$$
$$+ \mathbf{X}'_{it}\omega + \tau_r + \pi_o + \sigma_p + \varepsilon_{it}, \tag{1}$$

where Y_{it} is the outcome variable for the individual i, which is the logarithm of the real income; $Eligibility_i$ is a dummy variable that takes the value of 1 if the individual i is in the eligible sector of the SBFE program and 0, otherwise; $Post_t$ is another dummy variable that takes the value of 1 if the period is 2014 and 0 if the period is 2009. Thus, δ represents the coefficient of interest given the interaction between *Post* and *Eligibility*. $\mathbf{X}'_{it}$ is a vector of individual characteristics that might affect income, including gender, area of residence, years of education, age, age squared, and household size. τ_r is a regional fixed effect that absorbs geographically restricted shocks affecting the real income of self-employed workers; π_o is an occupational fixed effect; and σ_p is a primary economic sector fixed effect that absorbs non-observable, time-invariant, sector characteristics. ε_{it} is the error term clustered at the year times eighteen primary economic sectors.

The DID approach used in this paper requires the identifying assumption that in absence of the SBFE program, the eligible group would have change in a similar way to the non-eligible

group (i.e., the parallel trend assumption). The DID can be interpreted as the casual effect of the program, under the assumption that in the absence of the program, the increase in real income would not have been systematically different between eligible and non-eligible individuals. The validity of this assumption is tested in section 4.3, where we perform a parallel trends assumption test using the 2005 and 2009 samples and a falsification test using only paid-employed workers instead of self-employed workers.

4.3. Parallel Trend Assumption Test and Falsification Test

In this section, we test the validity of the parallel trend assumption of the DID model. Using the 2005 and 2009 samples which are pre-treatment periods, we run equation (1) which takes the 2005 year as pre-period of the SBFE program and 2009 as the post-period. We expect the interaction between *Post* and Eligibility to be not significantly different from zero given that the SBFE was introduced in 2012. The estimates of the falsification test are presented in Table 2. Column (1) reports estimates with primary activity fixed effects only. In column (2), we include individual controls. Column (3) controls for regional fixed effects that capture the importance of geographical differences for the real income. Column (4) shows the estimate with controlling for occupation fixed effects. Overall, in all the specifications, the estimates are not statistically significant and including a different set of controls do not have a differential effect on the estimates.

[Table 2]

Now, we turn to a falsification test. We estimate equation (1) using only paid-employed workers who are not eligible for the SBFE program. We use the 2009 and 2014 LSMS surveys as a pre and post-intervention of the SBFE program, respectively. We expect the estimates to be not statistically significant as well. Table 3 shows that the employed workers are not affected by the program. We gradually include a different set of fixed effects and individual controls. In all specifications, the estimates are negative but not statistically significant. These results give confidence to the robustness of the parallel trend assumption of the DID model in this study.

[Table 3]

4.4. Estimating the Effect of SBFE on Income

We now turn to the estimates using equation (1) with sample of self-employed workers in the 2009 and 2014 LSMS datasets as pre and post-program periods. Table 4 presents our main results, where standard errors are clustered at the year-specific economic sector level. The first column shows the impact of the SBFE program on self-employed workers' real income including economic sector fixed effects without additional controls. The estimate suggests that the introduction of the SBFE has a positive impact on the self-employed workers increasing their income by 21 percent. The coefficients are robust to the addition of other controls such as individual controls, regional and occupation fixed effects. This estimate is similar to or a bit higher than those reported in similar social programs.[10]

[Table 4]

5. Heterogeneity and Sector Decomposition Analysis

In this section, we look at differential effects of the SBFE program by gender, educational attainment using subsamples.

5.1. Gender Heterogeneity

First, we present the program's impact for each gender in Table 5. The result for females in Panel A shows that the program had a significant impact on females. The SBFE program increased female income by on average 24 percent, which is slightly higher than the overall impact of the program. The result is also robust to a different set of controls. Taken all together, the finding suggests that females are likely to benefit from a training program that enables them to create their own business and improve their productive and administrative techniques. Other studies have found no significant effect on female's performance (de Mel, McKenzie and Woodruff, 2009; Berge, Bjorvatn and Tungodden, 2015; Fiala, 2018). But the discrepancy could be due to differences in settings and methodologies among those studies.

Turning to Panel B of Table 5, the SBFE program also affected males, but the point estimates are slightly lower than the estimates for females. The increase in males' income is about 18.9 percent. As in the case of females, the results for males are robust to a different set of controls. The heterogeneity in the impact of the SBFE program observed in this paper by gender is minimum in comparison to other studies that have found differential effects between

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[10] Cho & Honorati (2013) discussed a different set of entrepreneurship programs using a meta-analysis. They found that on average the impact of those programs is a 14.7 percent increase in the participant's income.

females and males. However, it is worth of notice that in the Nicaraguan context the introduction of productive and administrative techniques is likely to have a significant impact on the self-employed workers, especially for females.[11]

[Table 5]

5.2. Education Heterogeneity

Now, we turn to another heterogeneity analysis by education level. We divide the total sample into three groups of interest: (1) people with primary education or below; (2) people with more than primary but less than secondary education; and (3) people with more than secondary education. The three categories are mutually exclusive. Previous studies have explored the differences on the impact of social programs between high-educated and low-educated individuals, and the evidence is mixed (Bjorvatn and Tungodden, 2010; Bruhn and Zia, 2013; Cho & Honorati, 2012; de Mel, McKenzie and Woodruff, 2008; Duflo, 2006; Premand et al., 2011). This has called attention because dividing the sample into those three categories can give insights to the policy makers about which group is more affected by the social programs.

In Table 6, we present the estimates of equation (1) by educational attainments. In this section, we only report two specifications: (1) with individual controls, regional and primary economic sector fixed effects; and (2) with all controls. Other specifications without controls do not yield different results. First, in columns (1) and (2), we present the estimates for people with primary education or below. The result suggests a 40 percent increase in the self-employed worker's income if they are low-educated. The estimate is almost twice higher than the overall impact of the program (a 21 percent increase). This could be due to the target population of the program is disadvantaged self-employed workers with low levels of education. Second, in columns (3) and (4), we restrict the sample to self-employed workers with secondary education or below but not primary education. For this sub-sample, the overall impact of the program is similar to the impact on those with primary education or below. Finally, we look into the effect of the SBFE program on self-employed workers with above secondary education (columns 5

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[11] These results are related to the composition of the labor market in Nicaragua. Female labor force participation in the urban area is higher than in the rural, and the household composition plays a significant role in the opportunities for females. Interestingly, female self-employed workers have been increasing considerably in comparison to male self-employed workers (Monroy, 2008; Martínez, 2017). In addition, according to Government of Nicaragua the creation of Child Development Centers (CDI, by its acronym in Spanish) has allowed females to continue working and has increased their employment opportunities (La Voz del Sandinismo, 2017).

and 6 in Table 6). For high-educated self-employed workers, the SBFE did not have any significant impact on their income. This finding suggests that in the context of Nicaragua, the SBFE program targeted low-educated people which support the 'poor but rational' idea (Duflo, 2006).

[Table 6]

5.3. Sector Decomposition

We also look at the differential impact of the SBFE program across the targeted sectors estimating the following equation:

$$Y_{it} = \alpha + \beta Post_t + \sum_{s=1}^{5} \gamma(Sector)_s + \sum_{s=1}^{5} \delta(Post_t \times Sector_s)$$
$$+ \mathbf{X}'_{it}\omega + \tau_r + \pi_o + \sigma_{pa} + \varepsilon_{it}, \qquad (2)$$

where $Sector_s$ represents the five sectors that are targeted by the program (Agriculture and Forestry, Manufacture, Construction, Commerce, and Hotels and Restaurants). δ, a coefficient for an interaction of $Sector_s$ and $Post_t$, shows a differential effect of the program by targeted sector. Other variables are defined as before. The reference group is comprised of the non-eligible sectors.

Table 7 shows that the positive effect of the program seems to be concentrated in three sectors: manufacturing, commerce, and hotels and restaurants. In contrast, there was a negative impact in agriculture and no impact in the construction sector. Overall, in the hotels and restaurants sector, the self-employed workers increased the most their income by 44 percent (Column 4 in Table 7), followed by the manufacturing industry with 32 percent and Commerce with 16 percent. However, it is interesting to acknowledge the negative impact presented in the agriculture and forestry sector. The differences among sectors could be due to the overall labor market structure of self-employed workers in Nicaragua. There has been an increase in self-employed workers in the commerce, and hotels and restaurants sector from 23.8 and 2.8 percent in 2005 to 40.2 and 8.5 percent in 2014, respectively. In contrast, self-employed workers in the agriculture and forestry sector have decreased from 31.9 percent in 2005 to 9.02 percent in 2014. The switch in their activities toward those industries could be due to the labor force movement to more productive sectors. In addition, the contrasting significant impact between

agriculture and forestry sector, and the manufacturing sector could be due to the nature of the SBFE program; the main objective of the program is the creation of sustainable businesses. In interviews with the participants of the program, they pointed out that the seasonal fluctuations of the agriculture sector pushes them to look for opportunities in other sectors. This is also mentioned by the Food and Agriculture Organization (2011) in its State of Food and Agriculture.

[Table 7]

In Table 8, we present the estimation of equation (1) for two subsamples: (1) agriculture, livestock, hunting and forestry; and (2) manufacture sectors. When we estimate the program effect using only the agriculture, livestock, hunting and forestry subsample, the impact presented in Table 7 is no longer statistically significant, suggesting that within the agriculture, livestock, hunting and forestry sector, those activities that are eligible for the SBFE program are not statistically different from those that are not eligible. Moreover, the effect in the manufacturing industry is still persistent with estimates similar to those presented in Table 7 and statistically significant at the 5 percent level.

[Table 8]

5.4. Robustness Checks

In this subsection, we investigate the robustness of the main results. In order to minimize the influence of outliers in our estimations, we test the sensitivity to extreme values that could be driving our main results. We modify the log of real income variable using a winsorizing method which is the transformation of the extreme values by replacing them by specific percentiles. We estimate equation (1) using the winsorized log of real income as the dependent variable. Table 9 presents the results using the winsorizing method. The percentiles at which the data are minorized are 1st and 99th percentiles shown in columns (1) and (2), and 10th and 90th percentiles shown in columns (3) and (4). Overall, the results are slightly lower in magnitude than the main ones in Table 4, but they remain positive and significant at the 1 percent level. Additionally, the results are robust to the inclusion of other controls and fixed effects.

[Table 9]

6. Conclusion

This paper estimates the effects of the Small Business of the Family Economy program in Nicaragua on self-employed worker's income. Self-employed workers are often considered as the predominant form of economic activity in developing countries including Nicaragua and thus, it is an essential question for policy makers for designing efficient labor market policies. The results indicate that the program increased the real income of self-employed workers, especially for females and less-educated workers. Regarding sectoral differences, the program affected positively self-employed workers in the manufacturing, and hotels and restaurants sectors, and negatively those in agriculture. Although these findings are related to self-employed workers and, in particular, the case of Nicaragua, they might provide insights for policy design for other developing countries with high level of informality and self-employment.

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Figure 1: Bias Histogram between Unmatched and Matched Observations
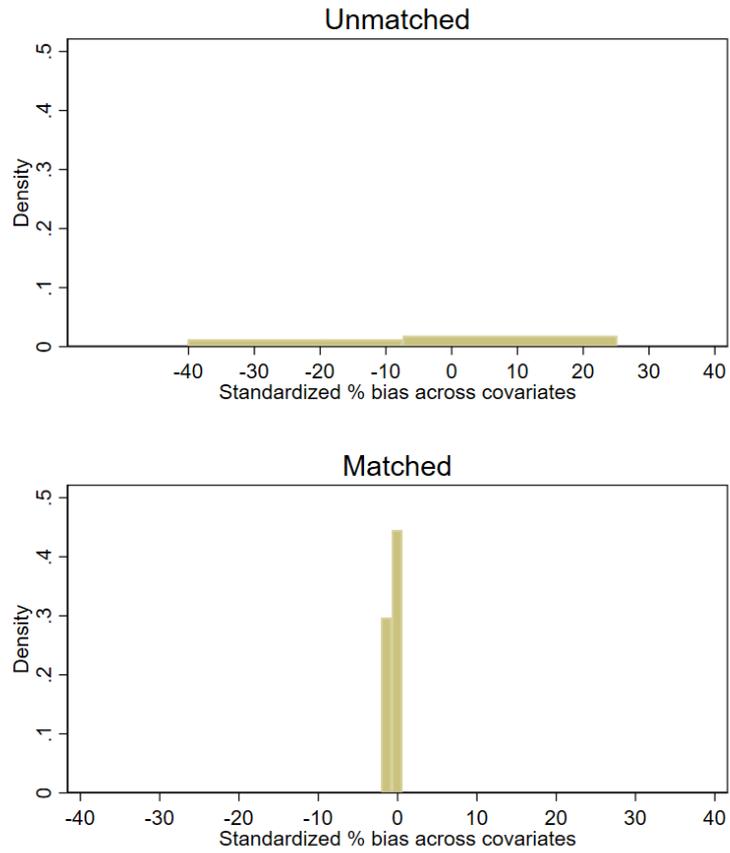
Notes: Histogram for the standardized percent bias across covariates for the treatment status. The matching estimator is the single nearest-neighbour within a caliper of 0.001 imposing common support.

Table 1: Summary Statistics

Variables	2005	2009	2014
Sex	0.636	0.552	0.452
	(0.481)	(0.497)	(0.498)
Years of Education	5.735	6.047	6.886
	(3.454)	(4.516)	(4.590)
Urban Area	0.438	0.718	0.808
	(0.496)	(0.450)	(0.394)
Age	43.184	42.05	42.81
	(15.07)	(14.30)	(14.60)
Household Size	5.877	5.322	4.865
	(2.831)	(2.646)	(2.328)
Real Income	1698.1	2826.1	3267.9
	(3139.5)	(12451.7)	(9420.6)
Log of Real Income	6.991	7.317	7.359
	(1.285)	(1.126)	(1.215)
Eligible individuals (percent)	84.8	76.7	74.7
Observations	4,760	4,307	3,834

Notes: This table presents summary statistics for the 2005, 2009 and 2014 samples. Standard deviations are shown in parentheses. Sex is a dummy variable that equals 1 if the individual is male and 0 if the individual is female. Area of residence is a dummy variable that equals 1 if the individual lives in urban area and 0 if the individuals lives in rural area. Household size measures the number of people in one household.

Table 2: Parallel Trends Assumption Test

Variables	Dependent variable: Log of Real Income			
	(1)	(2)	(3)	(4)
Post × Eligibility	**-0.226**	**-0.254**	**-0.213**	**-0.164**
	(0.256)	**(0.239)**	**(0.223)**	**(0.206)**
Post	0.343	0.352	0.250	0.253
	(0.315)	(0.266)	(0.265)	(0.263)
Eligibility	-0.295	-0.267	-0.316	-0.392
	(0.319)	(0.305)	(0.299)	(0.275)
Individual Controls	No	Yes	Yes	Yes
Regional Fixed Effects	No	No	Yes	Yes
Occupation Fixed Effects	No	No	No	Yes
Primary Economic Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.148	0.199	0.205	0.230
Observations	1,364	1,364	1,356	1,356

Notes: The table reports OLS estimates of a matched sample. The matching estimator is single nearest-neighbour within a caliper of 0.00001 imposing common support. Standard errors clustered at year times primary economic sector level are shown in parentheses. The pre-introduction period is 2005 and the post-introduction period is 2009. The unit of observation is an individual. The individual controls are sex, area of residence, years of education, age, household size, four regional fixed effects, eighteen primary activity fixed effects, and nine occupation fixed effects. Statistical significance at the 1, 5, 10% levels are indicated by ***,**, and *, respectively.

Table 3: Falsification Test

| Variables | Dependent variable: Log of Real Income | | | |
	(1)	(2)	(3)	(4)
Post × Eligibility	**-0.165**	**-0.096**	**-0.138**	**-0.077**
	(0.493)	**(0.381)**	**(0.497)**	**(0.503)**
Post	0.509	0.377	0.471	0.297
	(0.423)	(0.308)	(0.409)	(0.370)
Eligibility	0.491	0.376	0.306	0.308
	(0.305)	(0.252)	(0.263)	(0.211)
Individual Controls	No	Yes	Yes	Yes
Regional Fixed Effects	No	No	Yes	Yes
Occupation Fixed Effects	No	No	No	Yes
Primary Economic Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.202	0.326	0.365	0.501
Observations	154	154	154	154

Notes: The table reports OLS estimates of a matched sample. The matching estimator is single nearest-neighbour within a caliper of 0.00001 imposing common support. Standard errors clustered at year times primary economic sector level are shown in parentheses. The pre-introduction period is 2009 and the post-introduction period is 2014. The unit of observation is an individual. The individual controls are sex, area of residence, years of education, age, household size, four regional fixed effects, eighteen primary activity fixed effects, and nine occupation fixed effects. Statistical significance at the 1, 5, 10% levels are indicated by ***,**, and *, respectively.

Table 4: Impact of the Program on Real Income of the Self-Employed

	Dependent variable: Log of Real Income			
	(1)	(2)	(3)	(4)
Post × Eligibility	**0.213****	**0.218****	**0.231****	**0.213****
	(0.090)	**(0.089)**	**(0.092)**	**(0.078)**
Post	-0.134	-0.162*	-0.133*	-0.115*
	(0.079)	(0.079)	(0.076)	(0.065)
Eligibility	-0.611***	-0.436***	-0.409***	-0.481***
	(0.148)	(0.104)	(0.107)	(0.097)
Sex		0.437***	0.439***	0.516***
		(0.052)	(0.050)	(0.082)
Age		0.005***	0.005***	0.003
		(0.002)	(0.002)	(0.002)
Education		0.34***	0.034***	0.022***
		(0.007)	(0.007)	(0.005)
Individual Controls	No	Yes	Yes	Yes
Regional Fixed Effects	No	No	Yes	Yes
Occupation Fixed Effects	No	No	No	Yes
Primary Economic Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.222	0.272	0.280	0.313
Observations	3,082	3,082	3,082	3,082

Notes: The table reports OLS estimates of a matched sample. The matching estimator is single nearest-neighbor within a caliper of 0.00001 imposing common support. Standard errors clustered at year-specific primary economic sector level are shown in parentheses. The pre-intervention period is 2009 and the post-intervention period is 2014. The unit of observation is an individual. The individual controls are sex, area of residence, years of education, age, household size, four regional fixed effects, eighteen primary activity fixed effects, and nine occupation fixed effects. Statistical significance at the 1, 5, 10% levels are indicated by ***, **, and *, respectively.

Table 5: Heterogeneity by Gender - Subsamples

Variables	Dependent variable: Log of Real Income			
	(1)	(2)	(3)	(4)
Panel A: Females				
Post × Eligibility	**0.255****	**0.237****	**0.258****	**0.224****
	(0.104)	**(0.100)**	**(0.100)**	**(0.096)**
Post	-0.187**	-0.213**	-0.161*	-0.128
	(0.086)	(0.081)	(0.078)	(0.077)
Eligibility	-0.146	-0.207	-0.172	-0.342
	(0.816)	(0.830)	(0.851)	(0.791)
Individual Controls	No	Yes	Yes	Yes
Regional Fixed Effects	No	No	Yes	Yes
Occupation Fixed Effects	No	No	No	Yes
Primary Activity Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.143	0.175	0.188	0.229
Observations	1,775	1,775	1,775	1,775
Panel B: Males				
Post × Eligibility	**0.190****	**0.189****	**0.193****	**0.187*****
	(0.072)	**(0.072)**	**(0.072)**	**(0.065)**
Post	-0.067	-0.078	-0.082	-0.070
	(0.059)	(0.054)	(0.058)	(0.051)
Eligibility	-0.609***	-0.576***	-0.554***	-0.574***
	(0.110)	(0.111)	(0.105)	(0.110)
Individual Controls	No	Yes	Yes	Yes
Regional Fixed Effects	No	No	Yes	Yes
Occupation Fixed Effects	No	No	No	Yes
Primary Activity Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.201	0.225	0.231	0.265
Observations	1,307	1,307	1,307	1,307

Notes: The table reports OLS estimates of a matched sample. The matching estimator is single nearest-neighbor within a caliper of 0.00001 imposing common support. Standard errors clustered at year-specific primary economic sector level are shown in parentheses. Panel A presents estimates for a sub-sample of females. Panel B presents estimates for a sub-sample of males. The pre-intervention period is 2009 and the post-intervention period is 2014. The unit of observation is an individual. The individual controls are area of residence, years of education, age, household size, four regional fixed effects, eighteen primary activity fixed effects, and nine occupation fixed effects. Statistical significance at the 1, 5, 10% levels are indicated by ***, **, and *, respectively.

Table 6: Heterogeneity by Education - Subsamples

	Dependent variable: Log of Real Income					
	Primary or Below		Secondary or Below		Above Secondary	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Post × Eligibility	**0.455*****	**0.401*****	**0.421*****	**0.367*****	**0.164**	**0.117**
	(0.131)	**(0.137)**	**(0.096)**	**(0.088)**	**(0.100)**	**(0.090)**
Post	-0.269***	-0.238**	-0.252***	-0.205**	-0.112	-0.074
	(0.073)	(0.088)	(0.081)	(0.075)	(0.078)	(0.068)
Eligibility	-0.548**	-0.617***	-0.330*	-0.334*	-0.206	-0.210
	(0.215)	(0.199)	(0.178)	(0.186)	(0.247)	(0.251)
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Occupation Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Primary Economic Sector Fixed Effects	No	Yes	No	Yes	No	Yes
R-squared	0.251	0.293	0.269	0.299	0.335	0.365
Observations	1,165	1,165	1,192	1,192	942	942

Notes: The table reports OLS estimates of a matched sample. The matching estimator is single nearest-neighbor within a caliper of 0.00001 imposing common support. Standard errors clustered at year-specific primary economic sector level are shown in parentheses. The unit of observation is an individual. The individual controls are sex, area of residence, years of education, age, household size, four regional fixed effects, eighteen primary activity fixed effects, and nine occupation fixed effects. Statistical significance at the 1, 5, 10% levels are indicated by ***, **, and *, respectively.

Table 7: Sector Decomposition

	Dependent variable: Log of Real Income			
	(1)	(2)	(3)	(4)
Post × Agriculture and Forestry	**-0.311***	**-0.349***	**-0.372***	**-0.352***
	(0.090)	**(0.093)**	**(0.094)**	**(0.086)**
Post × Manufacturing Industry	**0.324***	**0.350***	**0.357***	**0.321***
	(0.090)	**(0.085)**	**(0.087)**	**(0.077)**
Post × Construction	**0.071**	**0.085**	**0.115**	**0.116**
	(0.090)	**(0.085)**	**(0.087)**	**(0.078)**
Post × Commerce	**0.137**	**0.173***	**0.195****	**0.160****
	(0.090)	**(0.086)**	**(0.088)**	**(0.077)**
Post × Hotels and Restaurants	**0.486***	**0.434***	**0.439***	**0.440***
	(0.090)	**(0.085)**	**(0.087)**	**(0.080)**
Post	-0.107	-0.146*	-0.116	-0.095
	(0.090)	(0.084)	(0.081)	(0.072)
Agriculture and Forestry	-0.614**	-0.723***	-0.664***	-0.696***
	(0.291)	(0.228)	(0.212)	(0.219)
Manufacturing Industry	-0.767***	-0.405***	-0.378***	-0.462***
	(0.034)	(0.050)	(0.051)	(0.051)
Construction	1.205***	0.713***	0.698***	0.716***
	(0.079)	(0.098)	(0.097)	(0.143)
Commerce	0.742***	0.520***	0.511***	0.395***
	(0.079)	(0.081)	(0.081)	(0.076)
Hotels and Restaurants	0.145*	0.134*	0.135*	-0.195**
	(0.079)	(0.072)	(0.069)	(0.086)
Individual Controls	No	Yes	Yes	Yes
Regional Fixed Effects	No	No	Yes	Yes
Occupation Fixed Effects	No	No	No	Yes
Primary Economic Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.231	0.283	0.290	0.322
Observations	3,082	3,082	3,082	3,082

Notes: The table reports OLS estimates of a matched sample. The matching estimator is single nearest-neighbor within a caliper of 0.00001 imposing common support. Standard errors clustered at year-specific primary economic sector level are shown in parentheses. The pre-intervention period is 2009 and the post-intervention period is 2014. The unit of observation is an individual. The individual controls are sex, area of residence, years of education, age, household size, four regional fixed effects, eighteen primary activity fixed effects, and nine occupation fixed effects. Statistical significance at the 1, 5, 10% levels are indicated by ***, **, and *, respectively.

Table 8: Impact of the program on real income – Sectors Subsamples

	Dependent variable: Log of Real Income			
	Agriculture, Livestock, Hunting and Forestry		Manufacturing Industry	
	(1)	(2)	(3)	(4)
Post × Eligibility	**-0.371**	**-0.289**	**0.457****	**0.510****
	(0.123)	**(0.161)**	**(0.013)**	**(0.011)**
Post	0.113	0.073	-0.111*	-0.180
	(0.085)	(0.131)	(0.015)	(0.083)
Eligibility	-0.406	-0.513	-0.491*	-0.533**
	(0.180)	(0.247)	(0.046)	(0.020)
Individual Controls	Yes	Yes	Yes	Yes
Regional Fixed Effects	Yes	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No	Yes
R-squared	0.112	0.129	0.202	0.256
Observations	179	179	310	310

Notes: The table reports OLS estimates of a matched sample. The matching estimator is single nearest-neighbor within a caliper of 0.00001 imposing common support. Standard errors clustered at year-specific primary economic sector level are shown in parentheses. The pre-intervention period is 2009 and the post-intervention period is 2014. The unit of observation is an individual. The individual controls are sex, area of residence, years of education, age, household size, four regional fixed effects, eighteen primary activity fixed effects, and nine occupation fixed effects. Statistical significance at the 1, 5, 10% levels are indicated by ***, **, and *, respectively.

Table 9: Impact of the SBFE Program using Winsorizing Method

	Dependent variable: Log of Real Income			
Winsorizing at:	1st and 99th		10th and 90th	
	(1)	(2)	(3)	(4)
Post × Eligibility	**0.236****	**0.218*****	**0.212*****	**0.194*****
	(0.088)	**(0.075)**	**(0.071)**	**(0.061)**
Post	-0.140*	-0.122*	-0.116*	-0.099*
	(0.073)	(0.062)	(0.062)	(0.054)
Eligibility	-0.415***	-0.485***	-0.304***	-0.359***
	(0.090)	(0.081)	(0.052)	(0.045)
Individual Controls	No	Yes	Yes	Yes
Regional Fixed Effects	No	No	Yes	Yes
Occupation Fixed Effects	No	No	No	Yes
Primary Economic Sector Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.285	0.317	0.302	0.334
Observations	3,082	3,082	3,082	3,082

Notes: The table reports OLS estimates of a matched sample. The matching estimator is single nearest-neighbor within a caliper of 0.001 imposing common support. Standard errors clustered at year-specific primary economic sector level are shown in parentheses. The pre-intervention period is 2009 and the post-intervention period is 2014. The unit of observation is an individual. The individual controls are sex, area of residence, years of education, age, household size, four regional fixed effects, eighteen primary activity fixed effects, and nine occupation fixed effects. Statistical significance at the 1, 5, 10% levels are indicated by ***, **, and *, respectively.

Appendix

Table A.1: Summary Statistics by Sector

	2009			2014			Pooled		
	Sex	Edu	Obs.	Sex	Edu	Obs.	Sex	Edu	Obs.
Not eligible sector	0.476	7.335	890	0.482	7.580	907	0.479	7.459	1797
	(0.500)	(4.882)		(0.500)	(4.833)		(0.500)	(4.857)	
Agriculture, Livestock, Hunting and Forestry	0.913	3.117	916	0.902	3.973	564	0.909	3.443	1480
	(0.282)	(3.291)		(0.297)	(3.750)		(0.288)	(3.497)	
Manufacturing Industry	0.449	6.011	463	0.370	6.449	381	0.414	6.209	844
	(0.498)	(3.953)		(0.483)	(4.510)		(0.493)	(4.217)	
Construction	0.996	7.283	226	0.992	6.701	127	0.994	7.074	353
	(0.067)	(4.280)		(0.089)	(3.555)		(0.075)	(4.039)	
Commerce	0.433	6.693	1560	0.326	7.629	1532	0.380	7.157	3092
	(0.496)	(4.391)		(0.469)	(4.473)		(0.486)	(4.455)	
Hotels and Restaurants	0.0714	6.591	252	0.0960	6.783	323	0.0852	6.699	575
	(0.258)	(4.385)		(0.295)	(4.248)		(0.279)	(4.306)	

Notes: This table presents summary statistics for the 2009 and 2014 samples. Standard deviations are shown in parentheses. Sex is a dummy variable that equals 1 if the individual is male and 0 if the individual is female. Edu refers to years of education.

Table A.2: Test for Equality of Means for Key Variables in Pre-Treatment, 2009

	Before Matching			After Matching		
	Eligible	Not Eligible	Diff	Eligible	Not Eligible	Diff
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Sex	0.574	0.476	0.0981	0.485	0.390	0.0944
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Years of Education	5.673	7.335	-1.661	7.105	7.347	-0.241
	(0.07)	(0.16)	(0.17)	(0.14)	(0.17)	(0.22)
Age	0.668	0.878	-0.210	0.874	0.912	-0.0381
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Area of Residence	42.75	39.37	3.374	40.65	41.14	-0.497
	(0.25)	(0.45)	(0.54)	(0.39)	(0.42)	(0.57)
Household Size	5.296	5.434	-0.138	4.921	4.827	0.0941
	(0.04)	(0.09)	(0.10)	(0.06)	(0.06)	(0.08)

Notes: This table reports descriptive statistics on the key variables. Standard errors are shown in parentheses. The estimations for column (1), (2), (4), and (5) come from a regression framework where the independent variable is the intercept of the variable. Column (3) and (6) present the differences between eligible and non-eligible individuals.