



**Does *Familias en Acción* Strengthen Coffee Growers Productive Inclusion?**

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# Does Familias en Acción strengthen coffee growers productive inclusion?

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## Abstract

*Conditional Cash Transfer programs not only help households to solve poverty deprivations in the short run, but they also can improve capabilities to break poverty traps through the strengthening of productive inclusion in the long run. This paper studies the long-term impact of a Conditional Cash Transfer program, Familias en Acción, among coffee-producing households in Colombia using administrative records from the National Federation of Coffee Growers and Household Social Register from the National Planning Department. With a difference-in-differences identification strategy, the study shows that Familias en Acción increase input use, investment in land, the purchase of high-value productive assets and improve living conditions. Results highlight that contrary to what is established in the routes for overcoming poverty, PI programs should not go after the conditional transfer, both programs should match in time and monitoring results to improve poverty reduction.*

## 1 Introduction

About 79 percent of the world's poor live in rural areas. The global extreme poverty rate in rural areas is 17,2%, three times higher than in urban areas. Strategies to close the poverty gap and eradicate extreme poverty by 2030 seem to be running out. **Poverty in rural areas is persistent and complex** and its eradication "often involves the interplay of social, political and economic factors" (United Nations, 2023 SDGS report). Colombia is not the exception, by 2021, the extreme poverty rate in the rural population is more than 1.8 higher than in urban areas (18,8% Vs 10,3%) and among the 6 million people in extreme poverty, 2 million lives in rurality (DANE, 2022 Extreme Poverty report).

Two families of programs have been developed to help households to overcome poverty: social inclusion programs and productive inclusion programs. Conditional Cash Transfer (CCT) programs belong to the first family and its core channel is based on supporting the consumption of the poorest households through transfers granted mainly to mothers, under conditionality schemes aimed to promote the accumulation of human capital among children, to break the intergenerational transmission of poverty (Ibarran, et al. 2018). CCT programs usually target households in extreme poverty and are led by social ministries.

Productive Inclusion (PI) is defined as "The process by which people overcome monetary poverty and have access to quality jobs or economic opportunities that guarantee sources of income sufficient and sustainable" (United Nations and Inclusion, 2023). PI programs seek to support income generation capacity, especially for the poor and vulnerable people through (i) the increased uses of existing

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inputs, closing the gap between current household production and its potential production; (ii) the incorporation of new productive assets to run for the border of household production boundary and (iii) the increase of human capital through the adoption of new skills by formal or informal training (World Bank, 2020). PI programs should go after conditional transfer programs and target partnerships in moderate poverty. Usually, PI programs are led by agricultural ministries.

Despite the common objective of social and productive inclusion programs to reduce poverty, the ministries in charge rarely work together; consequently, they do not take advantage of the possible synergies of matching programs in time, target population, and monitoring results (Farrington et al., 2014). In theory, When a rural household is a beneficiary of both of these types of families programs, at the same time, is expected that CCT optimizes the synergies to strengthen their productive inclusion, thanks to the **availability of permanent resources** that allows households **to change the use of their production factors** (Farrington et al., 2014; Slater, 2006; Devereux and Guenter, 2008) and **decrease risk aversion decisions** to invest in productive assets (Tiravayi, et al. 2013; Moreno-Sánchez, et al. 2019).

Empirical studies have been studying these possible synergies and have found, positive impacts on productive inclusion outcomes, but in the short-run, because of the lack of integrated and complete data for a long period. Likewise, other impact evaluations did not find any evidence of synergies because PI programs are weak or short-lived and their information is low-quality to make a robust impact evaluation.

With this context, the motivation of this study is to contribute to the literature on economic development with the estimation of a long-term impact of a CCT program, *Familias en Acción*, on coffee growers' productive inclusion, who are receiving, at the same time, life-long productive inclusion services by FNC, taking advantage of the high-quality administrative records of the National Federation of Coffee Growers (FNC) and the National Planning Department (DNP). The central question of this research is: Does Familias en Acción Strengthen coffee growers' productive inclusion?

The evaluation was made with panel data (2011–2022) using the Information System for Coffee Growing Households, an administrative record from the National Federation of Coffee Growers, and the Household Social Register from the National Planning Department, which, together, compile productive and social information to 74.034 coffee growers, of which 42.300 have received a transfer of FA by ten years and 31.734 never have received that transfer. Both groups receive at the same time all the FNC productive inclusions services grouped in (i) Technical assistance to improve agronomic practices, (ii) Purchase guarantee for the harvest through the cooperative system, and (iii) Internal marketing support and international promotion for exporting their coffee.

Results were estimated by a difference-in-differences empirical strategy (2011–2022), evaluating the impact of FA transfers over several coffee household outcomes, connected with an increase in their use of existing inputs, the incorporation of new productive assets, and an increase of their human capital. Results show that FA increases coffee household input by 8,3% of the area planted with coffee and 0,8% of the number of plants, relative to coffee producers which are not FA beneficiaries. Likewise, FA also increases the incorporation of new productive assets, because the number of coffee producers that have bought a new farm or high-value assets of production grew 10,5% and 34,9% more, compared to FA coffee households that do not have received the transfer. Furthermore, this study confirmed what the evidence on the effects of CCT on human capital says, insofar as FA Coffee families educational achievement increased by 56,6%, compared with the control group. As a total final result, living conditions as a indirect indicator of standar of living and income improves 8,2% more for FA families.

Additionally, the incorporation of heterogenous effects reveals worthwhile changes in FA impacts. For example, if the household is led by a woman, FA effect is stronger on the area planted with coffee, the investment in an additional farm, and the achievement of more formal education. Important multiplier effects were also found when the producer belongs to the Colombian government transfer program for elderly people, *Colombia Mayor*, or has been a beneficiary of money to support their coffee plants renovation by Ministry of Agriculture and Rural Development or National Coffee Found-FNC. The findings of this study offer a new angle to the usual lazy work incentives problem that some studies attribute to conditional cash transfers (see Banerjee, et al. 2017), for a critique of these studies). In general, the study concludes that in order to exploit synergies between CCT and PI programs to improve results to reduce poverty, both need a high-quality and long-life partnership, CCT needs to reach households with strong and long-term PI programs and PI programs need to be complemented with a long-term CCT intervention.

The rest of the paper is structured as follows: Section 2, presents a brief context of Coffee growing and *Familias en Acción program*; Section 3, describes the bibliography contributions; Section 4, describes the data sources and measurements; Section 5, presents the empirical strategy to estimate the causal effect of FA on productive inclusion of Coffee Growers; Section 6, reports the main results and a robustness test. Finally, Section 7 concludes.

## 2 Context of Coffee and Familias en Acción program

### *About Coffee*

"It would be impossible to describe the history of Colombia during the last half century without taking coffee into consideration. The production of coffee beans is indeed connected not only to economic life in its different aspects: market expansion, job creation, capital accumulation, industry emergence, domestic and foreign trade, communication routes, etc., but also to advance made in technology, demographic changes, territorial settlements, local developments, cultural expressions, and to the political arena at national and international level" (FNC, 2017)

According to figures from the National Federation of Coffee Growers (FNC), by 2023, Colombia leads the world in "suave" coffee production and is the world's #3 coffee producer with 7,32% of total global production, after Brazil and Vietnam. Coffee represents 17,2% of the agricultural GDP in Colombia and more than half (604 of 1.102) of municipalities in Colombia produce Coffee. There are 540 thousand coffee producers, close to 22% of the total agricultural producers in Colombia, according to National Agricultural Census.

By 2022, 0,5 million households are living from growing Coffee, with a population of 1,7 million (15% of the rural population). Historically, Colombian coffee farming has been carried out by small producers, 96,8% of coffee farmers have small crops, less than 5 ha, as a consequence, coffee growing is characterized as a "family farming crop", a type of farming in which **the financial budget of the economic activity is closely connected with the household budget.**

### *About Familias en Acción*

Conditional Cash Transfer (CCT) programs were born in Latin America and the Caribbean (LAC) during the mid-nineties as a result of reforms in poverty reduction programs. The core mechanism of CCT is to support the consumption of the poorest households through transfers granted mainly to mothers and by the use of conditionality schemes aimed to promote the accumulation of human

capital among children, in order to break the intergenerational transmission of poverty (Ibarran, et al. 2018).

Colombia was one of the pioneers in LAC with the implementation of FA in 2000. FA was designed to supplement the income of families in poverty with children and adolescents, through monetary payments conditional on school attendance and compliance with health check-ups. It is expected that this new generation with better human capital, skills, knowledge, and better health, will have more tools for generating their own income that will allow them to overcome the situation of poverty.

Initially, FA program was implemented in municipalities with a high proportion of the rural population. Over time, and in response to the favorable results of evidence, FA reached all the municipalities of the country<sup>1</sup>, and currently, 2.1 million households (12.0% of the total households in Colombia) belongs to FA (DNP & DAPRE, 2022). FA is directly operated by the Social Prosperity Department in Colombia (DPS).

The target population of the FA is every poverty and vulnerable family in Colombia with members under the age of 18. This condition is verified by the Identification System for Potential Beneficiaries of Social Programs (Sisben). Enrolments in the program are massive and occur when a national policy decision is made. The last two bulk records took place between October 2012 and February 2013, as a result of the implementation of Sisben III and from March 2018 to March 2021 with the implementation of Sisben IV.

The amount of the transfer varies according to the family profile: Families with children between 0 and 5 years old have a single payment conditioned by assistance to development and growth health controls. Families with children between 6 and 18 years old of age receive a transfer for each child conditioned to attending school. FA pays until 3 children per family with the exception when there is a child with a disability. The average monthly transfer for school attendance is COP 35.794 and for health check-ups COP 94.588. These values represent 10% and 26% of the 2021 national per capita poverty line (Acosta, et al. 2023).

The theory of change that support the effects of FA is based on the fulfillment of specific conditionalities with actions aimed at strengthening children's education and health indicators. In the short term, attendance of at least 80 percent of classes per month is expected to mitigate school dropout, child labor, and repetition. In the long term, it is expected increased secondary education achievement, avoid teenage pregnancy, and greater access to higher education, which jointly increase expected income generation and poverty reduction (DNP, 2019).

In parallel, with the conditionality of assistance to growth and development controls, it is expected to increase children's comprehensive vaccination schemes and further stabilize their nutritional status, which in the long term, should lead to better health indicators. In addition, as the transfer is made through banks, it is expected that the indicators of financial inclusion of the household improve (DNP, 2019).

#### *About Coffee and Familias en Acción*

According to the National Federation of Coffee Growers (FNC), 142.557 (26,2%) of coffee producers belong to a household that is FA beneficiary. Of them, 91.615 Coffee Producers have been in FA since 2012 and have received, simultaneously, all the FNC services to improve their productive inclusion.

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<sup>1</sup>The expansion of the program was made according to the findings of Attanasio et al., (2005), Attanasio and Mesnard (2005) and Econometría-SEI-FIP (2006)

Coffee producers outside the FNC are marginal because the FNC coffee growers' records (SICA) were made by a national coffee census 1993-1997 and since then, SICA has been updated continuously during the year, every year. Additionally, Coffee producers have the incentive to be registered in FNC records because the government's monetary transfers to support coffee households during the bad economic times, always have been used FNC channel. For this reason, with total certainty, the results of this study cover all the coffee producers in Colombia.

With respect to coffee producers in FA, their distribution is similar to the coffee country. The marginal differences are consistent with the pro-poor target of the program when women, the southern, the Caribbean, and the emerging region have more participation. Despite FA records were not constructed as a random sample the potential treatment group did not show high biases (Table 1).

Table 1: Distribution of coffee growers compared to coffee growers in Familias en Acción by structural characteristics

		Coffee growers in Colombia	Coffee growers in Colombia and in Familias en Acción (%)
<b>Gender</b>	Female	31,4%	33,2%
	<b>Southern region</b> (Cauca, Huila, Tolima y Nariño)	51,3%	57,7%
<b>Region</b>	<b>Traditional Coffee Axis</b> (Antioquia, Caldas,	28,5%	23,7%
	<b>Pioneers</b> (Santander, Cundinamarca, Norte de	16,2%	13,2%
	<b>Caribbean</b> (Cesar, La Guajira, Magdalena y	2,9%	4,1%
	<b>Emerging</b> (Caquetá, Casanare, Meta,	1,2%	1,4%
	< de 1ha	52,1%	49,9%
<b>Crop Size</b>	1ha and 3ha	37,9%	40,9%
	3ha and 5ha	6,7%	7,0%
	5ha and 10ha	2,4%	1,9%
	>10ha	0,80%	0,20%

### 3 Bibliography Contributions

Since 2004, the Food and Agriculture Organizations of The United Nations (2013) encourages research about the pertinence of combining Monetary Transfer Programmes with Agricultural Development Programmes. The research about this kind of combination, was especially motivated because the results in terms of poverty rates in rural Africa did not meet the international community's expectations.

In a context where public expenditure is limited and social protection is often perceived as a drain on resources or non-productive (Holmes et al., 2007 and Banerjee et al., 2017) emerged an

important question: what synergies or tensions exist between social protection programs as CCT and rural development programs, in order to maximize resources for reduce poverty? (Holmes et al., 2007; Devereux et al., 2008). This question is also important, in Latin America and Caribbean countries (LAC) where, despite good results on poverty reduction, policymakers were aware of the limitations in ensuring the sustainability of those gains (World Bank, 2020).

Several studies have estimated the impact of CCT programs when they clash with PI programs on the rural population and have found positives effects on outcomes like household income consumption, local economy, investment in productive assets (draft animals and small machinery), protection from climate shocks, cultivated land and adoption of new production lines (Sadoulet, et al. 2001; Barrientos and Wheeler, 2006; Rabbani, et al. 2006; Winters and Davis, 2009; Macours, et al. 2012; Asfaw, et al. 2014; Del Pozzo, 2014; De Sanfeliú, 2016). Those authors argue that the core mechanism of CCT is to help break financial inclusion barriers and reduce risk-averse to taking credit packages. However, those studies have found effects only in the short run because of a lack of information. As a consequence, there was no evidence of long-term outcomes like the incorporation of high-value assets, increases in the number of farms, or qualitative improvements in the intergenerational quality of life.

Additionally, García, et al. (2016); Naude, (2016); Fernández, (2016) and Moya, (2016) did not find any evidence, not only because of a lack of information but also because productive inclusion programs were weak or short-lived. Particularly, Moya, (2016) evaluated the effects of FA on the Colombian rural population who were receiving *Oportunidades Rurales program* (OR) simultaneously. The objective of OR was to increase the productive, social, human, and financial assets of small rural micro-entrepreneurs through resources for contracting technical assistance and access to financial products and information. Moya explains that the difficulty of his evaluation was due to the fact that OR was not implemented with a future impact evaluation in mind, as a consequence, it "was impossible to implement traditional econometric techniques, such as matching methods, the difference in differences, or selection based on observables".

Moreno-Sanchez, et al. (2019) also evaluated FA with another productive inclusion program in Colombia, *Familias en su tierra* (FEST) in the head of DPS, just like FA. FEST aims to contribute to the economic stabilization of victims of armed conflict who have returned to their land through the improvement of rural productive initiatives, nutrition security, living conditions, and the human capital of households (DPS, 2017). Due to the absence of quantitative information on characteristics before/after FEST, the authors made a qualitative study and found positive synergies between both programs. For example, they found that FA money had also been used to develop small productive enterprises such as animal fattening or to leverage the main productive activity of the household in cases of scarcity.<sup>2</sup>

This research contributes to the literature on economic development in multiple ways: On the one hand, it is the first long-term impact evaluation of Familias en Acción (the greatest CCT program in Colombia) on coffee growers' productive inclusion, who are receiving, at the same time, life-long productive inclusion services by FNC. In this sense, this is the first inquiry about the existence of

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<sup>2</sup>The effects of the FA program on the variables of social inclusion in rural areas in Colombia are widely verified. The official evaluations of FA; Econometría-SEI-FIP (2006); Econometría-SEI (2012) and DNP (2019) confirmed that FA has a significant impact on outcomes, such as attendance and enrollment in secondary education, reduction in child labor rates, increase in the probability of achieving high school, increase in the height of children as a result of better nutrition and reduction in growth retardation and chronic malnutrition. Regarding the effects of FA on PI, Econometry-SEI-FIP, (2006) and Attanasio, et al. (2012) found that FA in rural areas increases the consumption of food, children's clothing, items for education and produces marginal increases in the labor participation of adult men in the household.

possible complementarities between social and economic inclusion programs in this population. On the other hand, this is the first evaluation that uses administrative records from FNC about productive inclusion outcomes supplemented by sociodemographic characteristics from administrative records from DNP, before and after the last massive call of *Familias en Acción*. On this basis, this research is not exposed to problems of other research mentioned above, such as the lack of information or short-lived PI programs.

Additionally, this study is novel because, for the first time, is studying the interactions between government programs that had never been studied together, such as *Familias en Acción*, Colombia Mayor and the support for coffee plants renovation by Ministry of Agriculture and Rural Development or National Coffee Found-FNC.

And last but not least, the results of this impact evaluation have unprecedented implications for public policy, in terms of opportunities for improved program coordination and monitoring between public and private policies, conceived in order to generate benefits for the coffee growers population.

## 4 Data sources and measurement

### *Source of data*

This research uses administrative records from FNC and DNP, within the framework of the Information System for Coffee Growing Households (SIHC) in charge of FNC. This system collects data from Coffee Information System (SICA-FNC) about production techniques by each coffee producer and information from the Household Social Register (RSH-DNP), about their demographic situation, standard of living, and access to national government social programs.

The heart of the RSH-DNP is the Potential Beneficiaries of Social Programs in Colombia (*Sisben*). By, 2022, 74% of Coffee Growers have a *Sisben* record. When a new version of *Sisben* is updated, all the families have to refresh their information. The two latest releases of *Sisben* have been in 2011 (*Sisben* III) and 2019/2022 (*Sisben* IV), for that, this research used the SIHC compilation (2011 and 2022) for carrying out this impact evaluation to ensure that, all the information from coffee producer was updated between after and before the latest massive call of *Familias en Acción* in 2012.

Treatment and control groups were selected taking the information from the 2022 cohort. Of 542.043 coffee producers, 142.557 (26,2%) were in FA (potential treatment group) and 339.486 not belongs to FA-household (potential control group). To select the treatment group, 4 additional criteria were taken into account: (i) the producer had to be registered in SICA and in *Sisben* in 2011 and 2022; (ii) the producer had to be selected for the program based on his *Sisben* score, (iii) the producer should have all the information in *Sisben* about their children, and (iv) the producer should have joined *Familias en acción* 2012 or 2013. With those criteriums, 42.300 coffee producers were selected as the treatment group.

To select the control group, the same selection criteria of the treatment group were applied in order to have the most comparable groups. In this way, the households in the control group are those that in 2011 would have fulfilled all the criteria to have been chosen in the *Familias en Acción* program, but for any unknown reason were not selected (Table 2).

In general, treatment and control groups have a similar structural distribution on population (Table 3), therefore, the results to be estimated can be representative of coffee farming, despite of

Table 2: Selection criterion to choose treatment and control groups

Selection Criterion	Number of Coffee Growers 542.043		% of Coffee Growers 2022 on each group	
	Treatment group	Control group	Treatment group	Control group
Total Coffee Growers 2022	142.557	399.486		
Coffee Growers that remained between 2011 and 2022	91.615	245.818	64,3%	61,5%
Also were registered in Sisben Survey	79.236	160.758	55,6%	40,2%
Also have the score required to join FA	59.755	63.944	41,9%	16,0%
Household have children < 18 in 2011 and have all the information of their children	55.067	31.734	38,6%	7,9%
Join to FA in 2012 or 2013	42.300		29,7%	

Note 1: FA score target: <29,03 (rural) o <32,20 (urban)

the small differences between groups. To ensure statistical representativeness, differences will be corrected with the specification method that will be explained in the next section. For now, it is necessary to keep in mind that, by 2011, producers in the treatment group are on average 7 years younger, have households with an additional person on average, and have a greater representation in the southern region and less representation of micro-production (<1ha).

### Outcomes

To explain the **increase in input use (potential production)** were used 4 outcomes that according to the technical criteria of FNC, are related to higher production: (i) Number of hectares planted with coffee, (ii) Number of coffee plants (in log), (iii) the proportion of plantation with variety resistant to Roya disease, and (IV) the proportion of young coffee plantation (less of 6.5 years).

To measure **the incorporation of new productive assets**, two indicators were constructed : (i) the proportion of coffee producers that have invested in a new land and the proportion of coffee producers that have invested in high-value productive assets. The first was measured by a dummy variable that indicates if the coffee grower have more than 1 farm and the second was measured with a dummy that indicates if the household bought a car or moto between 2011-2022.

In order to explain the **increase of human capital** it was used education achievement of household and education achievement of young indicators. The first was measured with a dummy variable that tell if at least one person in their household has achieved secondary school (9 grade) and the second, was constructed as a dummy variable showing the mean years of young schooling (18-28 years old).

Finally, PI outcomes were supplemented with two standards of living variables: (i) households with not dirty floors and (ii) extreme poverty indicator. The first indicator is widely used in quality of life measurements and the second, was measured with the vulnerability official index of extreme poverty reported by DNP. Summary of descriptive statistics of outcomes is shown in Table 4.

Table 3: Structural characteristics of the control and treatment groups

	Coffee Grower Characteristics (2011)	Treatment group FA=1	Control group FA=0
<b>Gender</b>	Coffee Grower female	29,6%	28,0%
<b>Marital status</b>	Having spouse or partner In 2011	44,4%	45,1%
<b>Age of producer</b>	Age of Coffee Grower In 2011 (years)	42	49
<b>Household size</b>	Household size In 2011 (number of people)	5,5	5,1
	Number of Children In household In 2011 (number of people)	2,7	1,9
<b>Poverty</b>	Extreme Poverty In 2011	85,0%	81,0%
<b>Region</b>	Southern region	61,2%	60,9%
	Traditional Coffee Axis	21,7%	20,9%
	Pioneers	13,3%	14,4%
	Caribbean Culture	2,7%	2,5%
	Emerging	1,2%	1,4%
<b>Crop Size in 2011</b>	< 1ha	45,7%	52,1%
	1ha and 3ha	44,0%	37,9%
	3ha and 5ha	8,0%	6,7%
	3ha and 5ha	2,1%	2,4%
	>10ha	0,2%	0,8%

Table 4: Summary of descriptive statistics of outcomes

<b>Dimension of productive inclusion</b> <i>Capabilities for increase their incomes through:</i>	<b>Characteristic</b>	<b>Indicator</b>	<b>Years</b>	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>Treatment (FA=1) N=42.300</b>	<b>Control (FA=0) N=31.734</b>	<b>Diference treatment-Control (pp)</b>
<b>Increase in inputs use (potential production)</b>	Area planted with coffee	Mean area planted with coffee ( <i>ha</i> )	2022	1,47	0,01	69,42	1,50	1,44	0,05***
			2011	1,47	0	76,45	1,44	1,51	-0,06***
	Number of plants	Average of coffee plants ( <i>Log number of plants</i> )	2022	8,79	3,7	13,1	8,8	8,7	0,08***
			2011	8,40	2,7	13,7	8,4	8,4	0,01**
	Quality of plants	Coffee plants resistant to diseases ( <i>dummy</i> )	2022	0,84	0	1	0,84	0,83	0,02***
			2011	0,41	0	1	0,41	0,40	0,02***
Age of coffee plantation	Plantation with optimal age (<6,5 years) ( <i>dummy</i> )	2022	0,50	0	1	0,50	0,46	0,03***	
		2011	0,43	0	1	0,46	0,41	0,05***	
<b>Incorporation of new productive assets</b>	Investment in Land	Coffee producers with more than 1 farm ( <i>dummy</i> )	2022	0,27	0	1	0,28	0,26	0,01***
			2011	0,23	0	1	0,22	0,24	-0,01***
	High-value assets	Assets that contribute to production (other) ( <i>dummy</i> )	2022	0,11	0	1	0,12	0,09	0,03***
2011			0,03	0	1	0,03	0,03	0**	
<b>Increase of human capital of household</b>	Education achievement of household	At least one person in their household have achieved the secondary School (9 grade) ( <i>dummy</i> )	2022	0,37	0	1	0,43	0,30	0,12***
			2011	0,18	0	1	0,16	0,20	-0,05***
	Education achievement of young	Mean years of young schooling (18-28) ( <i>years</i> )	2022	8,58	0	18	8,65	8,45	0,19***
2011			5,98	0	17	5,82	6,17	-0,35***	
<b>Better standards of living</b>	Living conditions	Houses with not dirt floors ( <i>dummy</i> )	2022	0,64	0	1	0,64	0,64	0,00
			2011	0,56	0	1	0,54	0,59	-0,05***
	Government clasification	Official Index of extreme poverty ( <i>dummy</i> )	2022	0,39	0	1	0,43	0,34	0,09***
			2011	0,83	0	1	0,85	0,81	0,03***

Historically coffee has been grown by small producers. By 2022, the average size of a coffee crop was 1,47 hectares, quite similar to the average by 2011. Likewise, the coffee plantation has on average 6,568 plants per ha, with not several changes in a decade, by 2011 FA households have on average 6,204 trees per ha and the control group had 6,410. The proportion of plants resistant to diseases has had a huge growth between 2011 (41%) and 2022 (84%), thanks to the renovation of coffee plantations, one of the pillars of the coffee policy. In this way, the optimal age of the plantation has to be 6,5 years.

One out of 5 coffee producers have more than one farm, this share has increased 4pp during the period, from 23% from 2011 to 27% in 2022. By 2011, of the coffee producers in Sisben, only 3% had a car or a motorcycle, this indicator had a significant growth by 2022 when it reached a proportion of 11%. Having this kind of high-value assets is close connected with production because, in a Family-Farmer context, the household assets are, at the same time productive assets.

By 2022, in 37% of the coffee households, at least one person has achieved secondary school (9 grade), this educational achievement has grown from 11% in 2011 and reveals one of the most important differences between FA beneficiaries and not beneficiaries. With the same tendency, the mean years of young schooling (18–28) had increased from 5,98 years in 2011 to 8,58 years in 2022. Lastly, better coffee household's standard of living is shown by the increase in housing that doesn't have dirt floors, which has passed from 56% in 2011 to 64% in 2022; additionally, the official index of extreme poverty has decreased from 83% in 2011 to 39% in 2022.

Figures in Table 4 also show that in 2011, in addition to the difference on personal characteristics of the producer between treatment and control group (table 3), there are also significant differences on the outcome in 2011.

#### *Control variables*

To control the results of outcomes, I constructed variables that describe some structural characteristics of each group (treatment and control groups) both by 2011. The main criterion to select this variable was the political interest of FNC in finding possible differences in the impact of FA between coffee producers' characteristics, in order to have new elements to guide coffee policy. Control variables are related to the gender of the producer, marital status, age of the coffee grower, household size, number of children in the household, and region (showed in Table 3).

In addition, two variables of interest to FNC coffee policy were added to test possible multiplier effects of FA transfer: (i) an indicator variable of the group of producers that have been beneficiaries of support renovation for coffee plants by Ministry of Agriculture and Rural Development or National Coffee Found-FNC and the group of producers that belong to *Colombia Mayor* program. By 2022, 52,4% of coffee growers in the treatment group have received resources for renovation and 15,0% have received *Colombia Mayor*. For the control group, these proportions are 46,5% and 30,2%.

The renovation of coffee plants program has been supported by National Coffee Found in charge of FNC. Since 2011 about 183 Millard of pesos were transferred to coffee growers. Additionally, between 2018 and 2019 Ministry of Agriculture and Rural Development created the textitIncentivo Gubernamental para la Equidad Cafetera – IGEC, to protect coffee growers income from the fall in the price of coffee. The incentive was activated when the load of 125kg was below OP 700 thousand pesos. By IGEC, about 203 Millard of pesos were transferred to coffee growers. *Colombia Mayor* is a social assistance program that seeks to increase protection to older adults. The monthly value of the transfer is COP 80,000 pesos and it is especially important in the coffee population because 37% of coffee producers are over 60 years of age.

## 5 Empirical strategy to estimate the causal effect

Tables 3 and 4 showed that, the data of this research, is characterized by (i) not being random and (ii) the existence of significant differences between treatment and control groups, before the treatment. As a consequence, the strategy to estimate the effects have to be quasi-experimental.

For talking about causality, it is necessary to ensure conditional independence or strict exogeneity. It means that the estimation has to be totally clear of any unknown variable that could also affect the outcome across the time or between treatment and control groups. Cerulli, G. (2022) confirmed that Difference-in-differences (DID) identification strategy, in a quasi-experimental context, is the most suitable in evaluation where the observational data are available before and after the treatment and data did not come from a random sample with evidence of the existence of differences between groups.

### *Estimation of main results*

Taking advantage of having an administrative record of the same Coffee Grower between 2011 and 2022, an estimation of causality is made by equation (5.1). The coefficient of interest is *Delta*, which captures the differential change (before and after FA) in coffee households relative to coffee households that have no FA beneficiaries.

$$Y_{it} = \beta_0 + \beta_1 FA_i + \beta_2 T_t + \delta(T_t * MFA_i) + \varepsilon_{it} \quad (5.1)$$

Where  $Y_{it}$  is one of 10 outcome of productive inclusion: -number of hectares planted with coffee, -number of coffee plants, -Proportion of plantations with variety resistant to Roya, - the proportion of young coffee plantations, - the proportion of coffee producers that have invested in a new land, - the proportion of coffee producers that have invested in high-value productive assets, - the education achievement of household -the education achievement of young, - living condition and - extreme poverty.

Moreover,  $FA_i$  is a dummy variable that takes the value of one if the coffee grower receives *Familias en Acción* program;  $T_t$  is a dummy variable that takes the value of one if time is 2022,  $T_t * FA_i$  is the interaction term that takes the value of one if time is 2022 and the coffee grower was treated. Finally,  $\varepsilon_{it}$  is the error term.

Furthermore, with the intention of correcting possible biases caused by differences between treatment and control groups before 2012 (Table 3 and 4) some variables were introduced to Eq. (5.1), specifically characteristics of coffee producers like gender, household size, and the number of children. Additionally, heterogeneous effects were estimated according to the relevant coffee producers' characteristics usually used to guide the Colombian coffee policy, Eq. (5.2).

$$Y_{it} = \beta_0 + \beta_1 FA_i + \beta_2 T_t + \delta(T_t * FA_i) + \beta_3 X_i + \beta_4 Z_i + \beta_5(T_t * FA_i * Z_i) + \varepsilon_{it} \quad (5.2)$$

where  $Z_i$  is a particular characteristic of the coffee producer that can reinforce synergies between FA and productive inclusion like gender, marital status, region and the conditions of being beneficiary of other monetary transfers from the national government like *Support to coffee plants renovation*

or *Colombia Mayor*. Now in Eq. (5.2) the coefficient of interest also *Delta* which now can change according to the level and direction of this coffee producer characteristics, plus *Beta sub five* for each characteristic. The total, *Delta plus Beta sub five* captures the differential in coffee producers when there are beneficiaries of FA and they have any of the characteristics in  $Z_i$ . Finally,  $\epsilon_{it}$  is the error term which now should not convey any information of unknown variables.

#### *Verification of robustness*

To check the robustness of the results, additional fixed effects of 602 municipalities  $\alpha_m$  were incorporated, Eq. (5.3). The intuition of fixed effects is to verify if any municipal characteristics has the ability to change the average treatment effect (ATE) represented by *Delta*

$$Y_{it} = \beta_0 + \beta_1 FA_i + \beta_2 T_t + \delta(T_t * FA_i) + \alpha_m + \epsilon_{it} \quad (5.3)$$

Besides, to ensure the conditional independence or strict exogeneity of the estimations is recommended to check parallel trends of the outcomes before treatment and the possible contagion effect. Unfortunately, because of lack of data only was possible to check the contamination effect.

The contamination effect could come from the intervention itself due to the nearness of the control and treated groups. According to OECD "the closer the comparison group to the project area, the more likely it is to be indirectly affected in some way by the intervention", for example, the control group can take advantage of an income growth of the treated group, selling them their farm or other assets. Moreover, habits like renovation or education or the improvement of living conditions could be imitated by the control group.

When analyzing the summary statistics in Table 4, a suspicion of contagion was generated because, in 2011, the mean area planted with coffee was greater for the control group (1,51 ha) compared with the treated group (1,44 ha). However, in 2022, the mean of one group reach the level of the mean of the other group (1,55ha for FA treatment families and 1,44 for the control group), hence it is possible to suspect that the reduction of the crop of the control group was due to purchases by the treatment group.

To analyze the contagion effect, Eq. (5.4) was estimated with the incorporation of a municipal variable weight, that represents the proportion of producers treated with FA relative to those not treated with FA, in each of the municipalities. Now, the coefficient of interest is *beta4* which says how the outcome changes when more producers receive the FA transfer in the municipality. If the coefficient is statistically significant, it can be said that there was contamination.

$$Y_{it} = \beta_0 + \beta_1 FA_i + \beta_2 T_t + \delta(T_t * FA_i) + \beta_3 share_{muni_i} + \beta_4 share_{muni_i} t22 + \epsilon_{it} \quad (5.4)$$

## 6 Results

In this section, I report the results from the estimation of the set of regression models described above.

## Main results

Table 5 summarizes the results of Eq. (5.1). Figures show that *Familias en Acción* strengthens the productive inclusion of Coffee Growers because they increase their input use, the investment in land, the purchase of high-value productive assets, the accumulation of human capital and improve living standards.

In particular, the results reveal that coffee producers that are beneficiaries of FA achieve 8,3% more area planted with coffee, 10,5% more investment in land, 34,9% more investment on high-value productive assets, 56,6% more human capital accumulation, and 8,2% improve living conditions relative to coffee producers which are not FA beneficiaries.

Table 5: Impact of Familias en Acción in productive inclusion of Coffee Growers in Colombia

Dimension of Productive Inclusion	Characteristic of productive Inclusion	FA * T22 (Delta)	Estandar error	Mean control group 22	Change respect control group	R-Square
<b>Increase in Inputs use (potential production)</b>	Area planted with coffee	0,12***	(0,0157)	1,44	8,3%***	0,1%
	Number of plants	0,07***	(0,0101)	8,75	0,8%***	4,0%
	Proportion of plantation resistant to Roya	0,00	(0,00457)	0,83	0,1%	19,6%
	Proportion of young coffee plantation	-0,48***	(0,00522)	9,62	-4,1%***	0,4%
<b>Incorporation of new productive assets</b>	Investment in Land	0,03***	(0,00454)	0,26	10,5%***	0,2%
	High-value assets	0,03***	(0,00267)	0,09	34,9%***	2,3%
<b>Increase of human capital of household</b>	Education achievement of household	0,17***	(0,00454)	0,30	56,6%***	6,0%
	Education achievement of young	0,54***	(0,0474)	8,45	6,4%***	15,3%
<b>Better standards of living</b>	Living conditions	0,05***	(0,00512)	0,64	8,2%***	0,7%
	Government clasification	0,06***	(0,00455)	0,34	19,2%***	21,0%

Note: Estándar error at coffee grower level is in parenthesis, \* p<0,05, \*\*\*p<0,01, \*\*\*\*p<0,001

How can the above results be explained? According to figures from FNC, by 2022, the average cost of installing one hectare was between COP 11 million and COP 17 million, 117 times the rural poverty line, and the cost of buying a new farm is 25 million per hectare (without coffee) and 40 million (with coffee), in departments like Cauca. As a consequence, a vulnerable-rural household requires a lot of hard work for several years to get this amount of money. In this context, the reception of a stable monetary resource for at least ten years can help to reach this goal, either

through savings or credit.

Additionally, the positive impact of *Familias en Acción* on the stock of human capital is consistent with program conditionalities. It is worth noting that the impact is high despite coffee being a labor-intensive family crop. Usually, it is expected some degree of difficulty to the increase of human capital in crop labor-intensive activities like coffee growing<sup>3</sup>. However, the positive results presented in this research, and other institutional statistics indicate a different landscape. Actually, according to DANE figures, by 2022, the number of children and adolescents between the ages of 5 and 17 who work in specialized coffee production is less than 1%. On the basis of FNC figures, by 2022, the school absence of children between 5 and 14 years only achieve 3,2%. The results of this study and the figures of DANE and FNC suggest that child labor and school absence in coffee-growing households have been successfully reduced and human capital has increased.

On the other hand, some minor and contrary to expectations effects are also shown in Table 5. For example, the effect of *Familias en Acción* on the number of plants was also positive, 0,8% in favor of FA beneficiaries but less than the effect over the area planted with coffee, investment of land and high-value productive assets. This results are telling us, coffee households are giving more priority to increasing the frontier of production (area planted with coffee and new land) than the densification of their currently crop; perhaps, thanks to the scope for expanding the number of plants was limited because the average of densification for both groups (treatment and control) by 2011, was above the optimum density of 5,500 trees.

Contrary to expectations, the effect of FA on the age of coffee plantation was negative and statistically significant. This result can telling us that coffee producers are giving priority with FA resources to buying new land than the investment in the rejuvenation of their coffee park; even is possible to think that coffee producers are buying new land with old coffee plantation.

By the same way, another unexpected result was the effect of *Familias en Acción* on the proportion of plantation resistant to *Roya*, which was not statistically significant despite the high growth of crop renovations between 2011 and 2022. This result could be explained because coffee growers have had access to other sources of resources to renew their coffee plantations. The first has been *el Incentivo a la Capitalización Rural* (ICR) in the head of the Ministry of Agriculture and Rural Development (MADR) and Finagro. Through this channel have been transferred millions of pesos to renovate coffee plantations between 2011 and 2022. The second channel has been *Programa de Apoyo a la Renovación de Cafetales*, financed with the National Coffee Fund, which has sought to promote renewal by providing an incentive in kind (fertilizer) to conserve and stabilize coffee production. According to FNC figures, COP 183.285 million have send to coffee growers.

Lastly, the indirect indicator of income, standards of living of coffee households, gains 8,2% more relative to the control group. This result evidence that CCT and PI programs can work together and generate good synergies to increase households incomes and reduce poverty.<sup>4</sup>

When all the structural characteristics of coffee producers were introduced to correct possible biases (Eq. (5.2)), the figures show that all the magnitudes of the impacts are slightly corrected,

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<sup>3</sup>Uribe-Castro found that, during the first wave of globalization in the 20th century, coffee cultivation increased the opportunity cost of education, which reduced school attendance and the supply of skilled labor in coffee-growing areas. This delayed industrialization, reduced income levels, and increased poverty in these regions.

<sup>4</sup>Unfortunately, FA program increases the probability of being classified as extremely poor in the official vulnerability index managed by the Colombian government (Sisben). This result opens the possibility to share some outcomes of this research with the National Planning Department, in order to propose a revision of the strategy classification of official extreme poverty households

keeping all the results just described. In addition to the above, very interesting results are obtained with the interaction of heterogeneous effects. For example, FA has a stronger effect on the area planted with coffee when the coffee producer is beneficiary of *Colombia Mayor*, the impact reach 7,43%, exceeding the total effect included in Eq.(5.2.) of 6,7% . Moreover, the effect of FA is higher on the area planted with coffee when the producer has been beneficiary of support to renewal its plantation and the coffee producer is from the South region or the household is led by a woman. In those cases, the effects of *Familias en Acción* reach 7,15%, 7,05%, and 6,88% respectively.

Additionally, the net effects of FA on investing in a new land are stronger, reaching 11,57% when the coffee producer has a partner and 10,77% if the coffee producer has been a beneficiary of coffee plants renovations program, both higher than the total effect of 9,5%. Likewise, the effect of FA on the education achievement of young is bigger reach 8,91% when the coffee producer is a female and 8,91% when the coffee producer have a partner.

Table 6: Impact of Familias en Acción in productive inclusion of Coffee Growers in Colombia with heterogenous effects

Dimension of Productive Inclusion	Characteristic of productive inclusion	Beta	Female producer	Having partner	Receive IGEC and money plus renovation	Beneficiary of Colombia Ederly	Largest producers region	Traditional producers region	Pioneers producers region	Caribbean producers region	Emerging producers region
Improve potential production	Area planted with coffee (ha)	Delta	0,0992*** (0,0172)	0,0911*** (0,0187)	0,103*** (0,0187)	0,0492*** (0,0169)	0,0564*** (0,0210)	0,0969*** (0,0168)	0,0851*** (0,0164)	0,0930*** (0,0156)	0,0910*** (0,0158)
		β5	-0,0218 (0,0244)	0,00400 (0,0222)	-0,0387 (0,00215)	0,0579* (0,0278)	0,0452* (0,00227)	-0,0594* (0,0270)	0,0177 (0,0318)	-0,116 (0,0721)	-0,155 (0,0942)
Incorporation of new productive assets	Land	Delta	0,0304*** (0,00499)	0,0302*** (0,00541)	0,0281*** (0,00553)	0,0211*** (0,00492)	0,0194** (0,00607)	0,0213*** (0,00487)	0,0265*** (0,00475)	0,0241*** (0,00460)	0,0246*** (0,00459)
		β5	-0,0213** (0,00707)	-0,0110 (0,00644)	-0,00976 (0,00637)	-0,0145* (0,00805)	0,00456 (0,00656)	0,0110 (0,00783)	-0,0190* (0,00919)	-0,0154 (0,0213)	-0,0577* (0,0273)
Education achievement	Education achievement of young (years)	Delta	0,556*** (0,0529)	0,398*** (0,0583)	0,484*** (0,0599)	0,416*** (0,0505)	0,591*** (0,0646)	0,459*** (0,0512)	0,486** (0,0496)	0,480*** (0,0478)	0,482*** (0,0477)
		β5	0,197* (0,0774)	0,199** (0,0711)	0,0141 (0,0711)	0,130 (0,0936)	-0,168* (0,0726)	0,138 (0,0850)	0,00196 (0,103)	0,420 (0,246)	0,720* (0,320)

Estándar error at coffee grower level is in parenthesis, \* p<0,05, \*\*\*p<0,01, \*\*\*\*p<0,001

### Robustness

The robustness is presented by the inclusion of **602 municipalities effects** in Eq. (5.3) and possible contaminations effect in Eq. (5.4.). The figures show that, by introducing the fixed effects, all the effects that have been found with (Eq. 5.1 and Eq. 5.2) keep the same direction and the same magnitude with a further capacity of the model prediction improvement described by R-square indicator (Appendix Table 1).

The results of a possible contagion effect show that in municipalities when there was more proportion of coffee producers with FA, the probability of having a greater number of plants, less coffee ages, a producer with new land, more productive assets, more formal education, and better living conditions is higher and the probability of having more area with coffee is lower. Despite that, the effects of FA on that productive inclusion outcomes remain in its direction and its magnitude is quite similar to the results in Eq. (5.2.) (Appendix Table 2)

## 7 Conclusions

This paper assesses the long-term impact of a Conditional Cash Transfer program, *Familias en Acción*, among coffee-producing households in Colombia. The evaluation shows that conditional transfers

have positive effects on the productive inclusion of coffee growers. The results confirm that this kind of program has positive effects on coffee households' capacities for income generation. The evaluation identifies some of the conditions that may increase the probability of success in this regard.

Specifically, *Familias en Acción* has a stronger effect on households led by women or have been beneficiaries of an additional monetary transfer programs like *Colombia Mayor* or Coffee plants renovation.

The findings of this study offer a new angle to the usual lazy work incentives problem that some studies attribute to conditional cash transfers (see Banerjee et al. 2017, for a critique of these studies), by specifying conditions under which transfers are more likely to be successful and households can definitively leave their poverty situation. This demolishes stereotypes and biases about the negative effects that these types of subsidies generate. The point is illustrated by the greater disposition of assets and income on the part of coffee-growing households benefiting from *Familias en Acción*.

The study concludes that in order to exploit synergies between CCT and PI programs both need a high-quality and long-life partnership, CCT needs to reach households with strong and long-term PI programs and PI programs need to be complemented with a long-term CCT intervention. As a consequence, contrary to what is established in the routes for overcoming poverty, PI programs should not go after conditional transfer, both programs should match in time and monitoring results to achieve poverty reduction.

## 8 References

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## 9 Appendix

Table 7: Impact of Familias en Acción on productive inclusion of Coffee Growers in Colombia with fixed effects

Dimension of Productive Inclusion	Characteristic of productive inclusion	Delta	Standard error	Mean control group 22	Change respect control group	R-Square
<b>Improve potential production</b>	Area planted with coffee	0,119***	(0,0113)	1,44	8,28%***	14,5%
	Number of plants	0,069***	(0,0071)	8,75	0,79%***	23,0%
	Quality of plants	0,00	(0,004)	0,83	0,1%	26,7%
	Coffee Plantation age	-0,02	(0,0051)	9,62	-0,20%***	4,7%
<b>Incorporation of new productive assets</b>	Land	0,027***	(0,0036)	0,26	10,5%***	5,6%
	Other assets	0,032***	(0,0031)	0,09	34,95%***	5,7%
<b>Increase of human capital of household</b>	Education achievement of household	0,171***	(0,0051)	0,30	56,53%***	9,1%
	Education achievement of young	0,556***	(0,0490)	8,45	6,58%***	20,4%
<b>Better standards of living</b>	Living conditions	0,053***	(0,0063)	0,64	8,24%***	21,4%
	Government clarification	0,065***	(0,0067)	0,34	19,2%***	25,8%

Table 8: Impact of Familias en Acción in productive inclusion of Coffee Growers in Colombia with test of contagion effect

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	area_coffee	ln_plants	resistant_y	age_planta-n	buy_newfarm	value_assets	education_t	years_educ-g	good_livin-s	extreme_po-y
timefa	0,0900*** (0,0158)	0,0402*** (0,0102)	0,00305 (0,00460)	-0,0237*** (0,00526)	0,0255*** (0,00457)	0,0313*** (0,00269)	0,176*** (0,00458)	0,597*** (0,0476)	0,0596*** (0,00516)	0,0637*** (0,00458)
share_muni	0,0185*** (0,000665)	0,00330*** (0,000430)	-0,000211*** (0,000194)	0,000512* (0,000222)	0,0000517 (0,000193)	-0,000794*** (0,000113)	-0,00342*** (0,000193)	-0,0601*** (0,00216)	-0,00312*** (0,000217)	0,00869*** (0,000193)
share_munit22	-0,000030*** (0,000208)	0,00646*** (0,000135)	0,00747*** (0,0000607)	0,00107*** (0,0000634)	0,000444*** (0,0000602)	0,00101*** (0,0000354)	0,00170*** (0,0000604)	0,0395*** (0,000642)	0,000758*** (0,0000601)	-0,00035*** (0,0000605)
Observations	148068	148054	148068	148068	148068	148068	148068	70966	148068	148068
R-squared	0,002	0,044	0,196	0,004	0,002	0,023	0,061	0,154	0,000	0,210
F	68,44	1696,1	9034,4	163,1	90,98	880,2	2380,2	3221,0	310,0	9814,0
p_value										

Standard errors in parentheses  
\* p<0.05, \*\* p<0.01, \*\*\* p<0.001