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Armando Barrientos
Juan Miguel Villa

Social Protection
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scl-sph@iadb.org

The Impact of Eligibility Recertification on Households Excluded from an Antipoverty Programme

Armando Barrientos
Global Development Institute

Juan Miguel Villa
Inter-American Development Bank

Abstract

The paper provides reliable estimates of the impact of recertification on ineligible households from Colombia's *Familias en Acción*, an antipoverty programme, relying on a regression discontinuity design. We find that exclusion is associated with a reversal of welfare, education attainment, and economic inclusion. The findings are unsurprising when set against expectations from theory and evidence on the impact of social transfer receipt, but have far reaching implications for the design and implementation of exit conditions. Current practice relying on the re-assessment of entry conditions to assess programme exit is shown to be counterproductive.

Keywords: conditional cash transfer, programme exit, Familias en Acción, Regression Discontinuity Design.

JEL Code: I38, P36

1. Introduction

It is widely acknowledged that antipoverty transfers, including social pensions, children and family subsidies, employment guarantees, and conditional cash transfers make an important contribution to the reduction of poverty. In this paper we focus on human development conditional cash transfers and in particular on the consequences of exclusion from these programmes following recertification. Conditional cash transfers provide income transfers contingent on household investment in human capital, especially schooling and health care (Fiszbein and Schady 2009). Stampini and Tornarolli (2012) noted that by 2010 conditional cash transfers reached 135 million people in Latin America, around a quarter of the population. They estimated that the poverty headcount rate would have been 13 percent higher in their absence. Programme entry is based inter alia on an assessment of the socio-economic status of households. To date, the dominant practice as regards programme exclusion has been to rely on a reassessment of entry conditions, with transfers terminated when participating households report a socio-economic status above the eligibility threshold. This paper studies the impact of exclusion for households previously participating in *Familias en Acción*, a human development conditional cash transfer programme in Colombia, but found to be ineligible after recertification. Applying a Regression Discontinuity Design based on welfare scores at recertification, we are able to compare outcomes observed four years after exclusion for households at the margins of eligibility. Outcomes for excluded households are compared with outcomes for households just remaining in the programme. We find that, for households at the margins of eligibility, exclusion it is associated with adverse employment and human capital accumulation outcomes. The

findings support the view that applying current exit rules constitutes a counterproductive strategy.

The empirical literature on conditional cash transfers has focused largely on entry conditions, paying scarce attention to exit conditions. A handful of studies have examined exclusion from conditional cash transfer programmes. González-Flores et al. (2012) studied programme exclusion in the urban context of *Oportunidades* while Alvarez et al. (2008) focused on the rural context. They find annual rates of exclusion in urban areas were double those in rural areas (3 percent) and mainly affected households on the margins of eligibility. Around one half of exclusions following recertification were due to changes in households' durable assets, and around one quarter of them was due to measurement errors in eligibility instruments. Another strand of literature focuses on estimating the effects of programmes on ex-participants, compared to never-participants, following exogenous exit. Barham et al. (2013a; 2013b) find that excluded children showed higher human capital levels than never participants, suggesting that truncated participation was better than no participation. To our knowledge, there are no studies identifying empirically the effects of exclusion on excluded households compared to the counterfactual that they remained as participants.

Analytical approaches can help us to predict the effects of exclusion following recertification.

Human development conditional cash transfers are expected to lead to changes in the pattern of consumption, human capital accumulation, and labour supply among beneficiary households.

Rubio-Codina (2010) develops a model of household labour supply identifying household

responses to transfer receipt. In the model each household member has total time allocated to non-labour and labour activities. Children's time allocated to schooling has associated costs, such as fees, uniforms, and transport. The transfer is in two parts, as in *Familias en Accion*: a fixed consumption transfers and a schooling transfer for each child of school age conditional on school attendance. The implication is that the consumption part of the transfer has pure income effect, whereas the schooling transfer has substitution effects in addition to the pure income effect (it reduces the costs of schooling and therefore the relative price of education, while at the same time placing restrictions on the time allocation of children). The substitution effects can be divided into two: the effect of a variation in household members' labour supply in response to a change in their reservation wage, the own substitution effect; and a cross-substitution reflecting the effect of a change in the reservation wage of one family member on all other family members' labour supply. The receipt of transfers therefore triggers a rise in household consumption, an increase in school attendance among children of schooling age, and changes in adults' labour supply in part compensating for potential reductions in child labour and in part responding to a reduction in care from children's increased school attendance.

Our hypothesis is that, for households at the margins of eligibility, exclusion from the programme following recertification effectively reverses the predicted effects from transfer receipt. Exclusion lowers consumption and school attendance. Expected changes in adult labour supply net out potential increases in labour supply in response to the income shock by adults and potential reductions in labour supply associated with childcare. To the extent that mothers provide most of the care for children, reduced school attendance increases their reservation

wage, although this effect will depend on the ages of children in their care, particularly whether they are of school age.

In order to identify empirically the impact of exclusion on participant households we estimate a range of outcomes observed in 2011 among households participating in Colombia's *Familias en Accion* programme in 2006 but excluded following recertification in 2007. Over 64,000 participating households were actually excluded in 2007 because their welfare score known as *Sisben*, was above the eligibility threshold. Using data for 2011, we observe the impact of exclusion from the programme on a range of household outcomes. Our identification strategy relies on a regression discontinuity design (RDD) with the 2006 *Sisben* score as the forcing variable. We test the external validity of the RDD by running placebo tests of the outcomes prior to the exclusion of households from the programme and by checking the consistency with RDD estimates at alternative cut-off points. This approach enables us to compare the outcomes for excluded households, at the margins of eligibility, with the likely outcomes had they stayed in the programme.

We focus on three outcomes: adult labour force participation, children schooling, and household welfare scores. These outcomes capture the effects of exclusion on household resource allocation, human capital accumulation, and socio-economic status. Our estimations show that exclusion of households at the margin of eligibility is consistent with a decrease of 1 percentage point in children's school attendance, leading to a cumulative effect of 0.12 years less of education. We also find that exclusion is associated with a 2.4 percentage point decline in female

employment and an increase of 1.3 percentage points in male employment mainly in informal work. Three years after exclusion, households are 3.8 percentage points more likely to be eligible for the programme than households remaining in the programme. Excluded households show a 3.7 percentage point higher probability of having children three years of age or younger, that is born after exclusion. Our estimates are robust to different selection of bandwidths, RDD specification and are consistent with different cut-off points around the programme eligibility threshold.

To the best of our knowledge, this is the first paper providing reliable estimates of the consequences of exclusion for affected households following recertification from conditional cash transfer programmes. Our findings are unsurprising in the sense that the effects from exclusion we observe largely reverse the effects associated with transfer receipt. However, our findings have far reaching implications for the design and implementation of conditional cash transfers programmes, and more broadly for antipoverty transfer programmes. Current practice applies entry conditions to assess programme exit. To the extent that our findings from *Familias en Accion* can be extended to similar programmes elsewhere, they suggest this constitutes a counterproductive strategy. It is counterproductive to exclude households at the margins of eligibility only to find that accumulated human capital is dissipated and gains in economic inclusion are reversed.

This paper has six sections. Section 2 describes the programme and the intervention we focus on (the exclusion of households). Section 3 introduces the estimation data. Section 4 presents the

RDD approach we use to obtain our estimates. Section 5 presents the estimation results and robustness checks. Section 6 concludes and discusses policy implications.

2. *Familias en Accion* and the exclusion of non-poor households

Conditional cash transfer programmes have been introduced in most countries in Latin America and they are emerging in other regions (Barrientos and Villa 2015b; Fiszbein and Schady 2009). In Colombia, the *Familias en Accion* programme was introduced in 2001 as part of an integrated antinarcotics strategy known as *Plan Colombia* to mitigate the effects of the 1999 economic crisis. *Familias en Accion* emulated conditional cash transfers in Mexico, Nicaragua, Brazil and Honduras, perceived to be effective in addressing poverty. The programme delivers income transfers in cash to households with children 17 years of age or younger. Transfers include a nutrition component and a schooling component. Nutrition transfers are delivered to households with children with 0-6 years of age, conditional on the monitoring of health status at health centres according to public health guidelines. During the first stage of the programme between 2001 and 2006, the programme delivered a nutrition transfer worth US\$50 regardless the number of young children. Schooling transfers are paid to households with children in schooling age and amounted to US\$7 for each child attending elementary schools and US\$14 for those attending high school up to the age of 17. Children born after enrolment were not entitled to the schooling transfer (Attanasio, Oppedisano, and Vera-Hernández 2015). The schooling transfers were suspended if children missed 20 percent of school classes. On average, nutrition and education transfers amounted to 20 percent of a participant's household income. Initially, the programme

was intended to deliver income transfers to 600,000 households with children in extreme poverty living in small municipalities. In the second part of the decade, the programme was scaled up with a target of 1.2 million eligible households by 2007 and 2.5 million households by 2010.

In its first phase, the programme was implemented in municipalities with less than 100,000 inhabitants with at least one financial institution. 732 out of the 1,100 Colombian municipalities met these criteria. The selection of households was based on *Sisben* scores. *Sisben* is a poverty identification system introduced in 1994. It is based on information from a household survey used to estimate the poverty status of households applying for government support. The survey collects information on the living conditions of the household, provision of running water, waste collection, electricity and sewage, household composition and education endowments.

Households' productive capacity is estimated by applying a set of weights to their observed variable values resulting in a *Sisben* score with a range of 0 - 100. The *Sisben* survey collects information for nearly three quarters of the Colombian population and can be considered as a census of the lowest income quintiles.

Since 1994 the *Sisben*'s survey and algorithm has changed three times. Between 2001 and 2006 households with a *Sisben-I* score below 38.5 and 18, in urban and rural areas respectively, were considered to be in extreme poverty and therefore entitled to participate in *Familias en Accion*.

In 2007 the programme entered a second phase aimed at expanding coverage up to 1,2 million households. Motivated by reports of manipulation of the *Sisben* by applicants and municipal officials (Camacho and Conover 2011), the government developed a new survey instrument and

a new formula to estimate *Sisben* scores. The new version of the *Sisben*, the *Sisben-II*, was designed to discourage further manipulations by keeping the algorithm away from the public domain and by centralizing the survey administration process. In 2007 the *Sisben-II* score threshold applied to establish eligibility for *Familias en Accion* became 11 and 17.5, in urban and rural areas, respectively. Comparability of *Sisben-I* and *Sisben-II* was not facilitated in the new design of the algorithm and participating households were automatically classified a poor and non-poor. In 2010 the *Sisben* survey was modified again with a new algorithm and data collection for households in the country at large. The third version of the *Sisben*, the *Sisben-III*, provided us with the outcome variables for participant and excluded households in 2006.

The expectation of the Colombian Government was to phase out *Familias en Accion* following economic recovery from the 1999 economic crisis, and the programme budget under the *Plan Colombia* made no provision beyond 2006. Political support for the programme ensured its continuation with a US\$1,5 billion loan from the Inter-American Development Bank and the World Bank. The programme was scaled up in 2007 to reach 1,2 million eligible households, abandoning the initially targeting method with the *Sisben-I* and adopting a new one with *Sisben-II*. After applying the *Sisben-II* formula, 64,106 households, out of 762,639 households participating in the programme between 2001 and 2006 were declared ineligible in 2007.

Without warning, support to ineligible households was terminated in 2007. This was in line with legal requirements to restrict transfers to families in extreme poverty and to minimise inclusion errors. We exploit this exogenous source of variation to assess the effects of the exclusion on households at the margins of eligibility with outcomes information available in the *Sisben-III*.

3. Data

To estimate the effects of exclusion from the programme, we rely on *Sisben* survey data with a collection cohort for 2006 and 2011 (*Sisben-I* and *Sisben-III*). The 2006 *Sisben* data includes information for 32,247,627 people, corresponding to nearly 72 percent of the Colombian population. The 2011 *Sisben* data contains information for 28,489,569 people. Merging the 2006 and the 2011 data revealed an attrition rate of 18.2 percent of participating households, mainly due to migration or death of the claimant's mother. We show that attrition does not pose a problem for internal validity of our analysis. We focus on households living in the 732 municipalities selected at the start of the programme. The working dataset includes 5,972,444 people who participated in *Familias en Accion* in 2006 and have valid data for 2011. They account for 1,235,844 households that participated in the programme in the period 2001-2010.

Table 1 below provides descriptive statistics for households in our working dataset at the 2006 baseline. One half of them own their own dwelling, with 85.6 percent having electricity service coverage, 50 percent live in dwellings with brick walls and 35.3 percent have earth floors. The average age of children in the sample is 7.49 years of age, with a mean school attendance rate of 72.6 percent. Male heads are found in 72.2 percent of households. The mean age of the head of household is 42.8 years. They have only 3.6 mean years of schooling, implying that on average they failed to complete elementary education. Just over 73 percent of heads are employed but only 3 percent of them contribute to health insurance, an indicator of formal employment.

Table 1. Household characteristics in 2006.

Pre-intervention characteristics	Overall
<i><u>Dwelling</u></i>	
Own of the dwelling	0.513 [0.500]
Electricity	0.856 [0.351]
Brick walls	0.508 [0.500]
Earth floor	0.353 [0.478]
Average household members	4.421 [2.852]
Average age of children	7.491 [3.755]
Household's children attend school	0.726 [0.446]
<i><u>Head of the household</u></i>	
Male	0.722 [0.448]
Age	42.82 [14.857]
Years of education	3.613 [3.054]
Employed	0.732 [0.443]
Employed with health insurance	0.300 [0.170]
Observations (households)	1,235,844

Source: authors' calculations based on Sisben data 2006. Note: standard deviations in brackets.

We are able to observe 2011 outcomes for households participating in the programme in 2006, including households excluded in 2007 and those remaining the programme. Our analysis will focus on labour supply and schooling outcomes providing an insight into household resource allocation and human capital accumulation effects associated with exclusion.

4. RDD methodology

Following Barrientos and Villa (2015a) and Hahn, Todd, and Klaauw (2001), we exploit the discontinuities around the eligibility threshold, as a source of exogenous variation, in order to identify a RDD. We apply the optimal bandwidth as derived by Imbens and Kalyanaraman (2011), supplemented by alternative bandwidths as robustness checks as described in Calonico et al. (2014a; 2014b).

Let $Y_i(1)$ and $Y_i(0)$ be a potential outcome (e.g. school attendance) observed for household i if the transfers from *Familias en Accion* are stopped or if the household continues with the benefits from the programme, respectively. Exit from the programme depends on household i obtaining a *Sisben* score, X_i , greater than the eligibility threshold, \bar{x} , that is $X_i > \bar{x}$. The average treatment effect of the intervention is then given by:

$$\tau = E[Y_i(1) - Y_i(0) | X_i = \bar{x}] \quad (6)$$

The treatment effect is then estimated non-parametrically by defining an estimand that accounts for the levels of the outcome on each side of the threshold, $\tau = \mu^+ - \mu^-$, with $\mu^+ \equiv \lim_{x \rightarrow \bar{x}^+} \mu(x)$, $\mu^- = \lim_{x \rightarrow \bar{x}^-} \mu(x)$ and $\mu(x) = E(Y_i | X_i = x)$. The most commonly used estimator for τ is given by a local polynomial of order p also on both sides of the eligibility threshold of the *Sisben* score:

$$\hat{\tau}_p(h_n) = \hat{\mu}_{+,p}(h_n) - \hat{\mu}_{-,p}(h_n) \quad (7)$$

where h_n is the bandwidth over which the kernel-based non-linear approach takes place. Instead of choosing an arbitrary bandwidth, we allow a data-driven algorithm following Imbens and

Kalyanaraman (2011) who proposed an optimal bandwidth that minimises the minimum square error (MSE):

$$\hat{h}_{IK,n,p} = \left\{ \frac{\hat{V}_{IK,p}}{2(p+1)\hat{B}_{IK,p}^2 + \hat{R}_{IK,p}} \right\}^{\frac{1}{(2p+3)}} n^{\frac{-1}{(2p+3)}} \quad (8)$$

where $\hat{V}_{IK,p}$ and $\hat{B}_{IK,p}$ are the estimators of the asymptotic variance and the asymptotic bias of $\hat{\tau}_p(h_n)$, respectively, and $\hat{R}_{IK,p}$ is introduced to prevent the denominator from being small and start with limited values of the bandwidth. To check the robustness of our estimates, we also run our RDD with the optimal bandwidth proposed by Calonico et al. (2014b) implemented with the Stata's user written command *rdrobust* which also shows a consistent non-parametric coefficient intervals following specifically for RDD.

Our strategy to identify the impact of exclusion from *Familias en Acción* relies on the structure of the working dataset. It includes (a) *Sisben-II* data collected by 2006; (b) the outcome of programme eligibility tests in 2007; and (c) *Sisben-III* data collected as follow-up in 2011. The analysis focuses on the discontinuity in the distribution of outcomes observed in 2011 associated with an exogenous termination of support for households in 2007, based on 2006 *Sisben-II* score and data. The appropriateness of the RDD relies on the absence of discontinuity in the outcome variables observed in 2006. This is confirmed below. Two recent studies have applied a RDD to *Sisben* data and tested for the appropriateness of the data. Baez and Camacho (2011) employ RDD to study potential manipulation of the *Sisben* score. They use a similar setting to the one adopted in this paper. Barrientos and Villa (2015a) rely on a RDD to study the labour supply

effects of participation in *Familias en Acción*. These studies test for possible manipulation in *Sisben* score and find no evidence of such behaviour in the post 2006 period by applying the test proposed by McCrary (2008).

The distribution of the selected outcomes exhibits continuity in the 2006 *Sisben-II* data. Table 2 below shows RDD estimates for each selected outcome prior to the exclusion of beneficiaries in 2007 by using Imbens and Kalyanaraman's optimal bandwidth (IK-BW), testing for a placebo effect. The analysis focuses on labour force participation and sectorial affiliation outcomes among adults, on school attendance and completed years of education among children below 18 years of age, and on socio-economic status as measured by *Sisben-II* scores. Whether workers contribute to a health insurance scheme serves as a proxy for affiliation to formal employment. As Table 2 below shows that there is no evidence of discontinuity, placebo or anticipation effects on the distribution of the relevant outcome variables at the threshold of eligibility when no ineligible withdrawal was made. None of the estimates is statistically significant. It is also apparent from these results that the RDD is not confounded by selection bias.

Table 2. Placebo RDD estimates for selected outcomes in the pre-intervention period.

Children (< 18)	Estimand	IK-BW	Observations
School attendance	-0.0021 (0.0081)	1.69	1,848,369
Male	-0.0142 (0.0112)	1.84	945,987
Female	-0.0003 (0.0102)	2.20	902,382
7 - 11	-0.0020 (0.0070)	2.23	856,308

12 - 17	-0.0032 (0.0131)	1.92	992,061
Years of education	0.0336 (0.0587)	1.90	1,848,348
Male	-0.0111 (0.0738)	1.68	945,975
Female	0.1280 (0.0891)	1.90	902,373
7 - 11	-0.0206 (0.0469)	1.59	945,975
12 - 17	0.0444 (0.0798)	1.22	856,304
<hr/> Adults <hr/>			
Employed	-0.0052 (0.0070)	2.09	2,856,019
Female	-0.0022 (0.0080)	1.80	1,500,962
Male	0.0047 (0.0092)	2.02	1,355,057
Employed with health insurance	-0.0023 (0.0118)	3.44	1,366,200
Female	-0.0023 (0.0160)	4.39	336,459
Male	-0.0022 (0.0136)	3.44	1,029,741
Unemployed	-0.0085 (0.0301)	2.70	2,856,019
Female	0.00274 (0.0027)	4.28	1,500,962
Male	-0.0176 (0.0554)	2.43	1,355,057
<hr/> Household <hr/>			
Eligible (<i>Sisben-II</i>)			
Urban	0.0015 (0.0412)	2.36	627,015
Rural	0.0072 (0.0259)	1.98	608,829

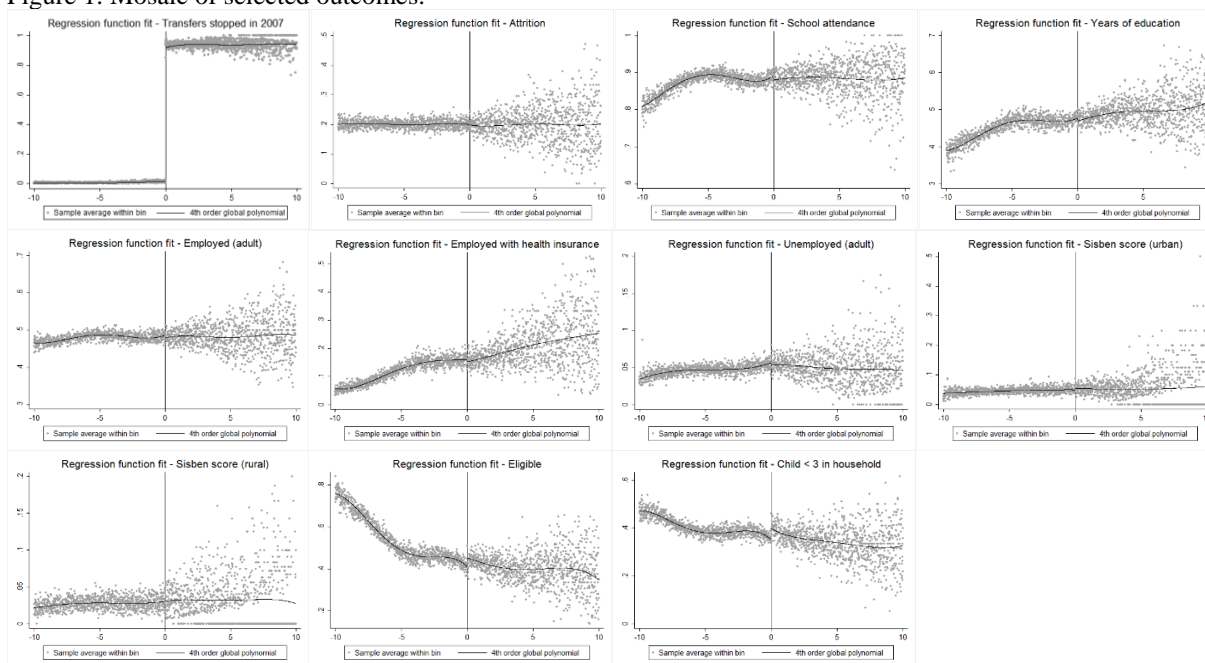
Attrited	0.0115 (0.0099)	3.59	1,235,844
Presence of children (< 3)	0.0089 (0.0079)	5.077	1,235,844
Urban	0.0120 (0.0112)	3.41	627,015
Rural	-0.0059 (0.0144)	4.584	608,829

Source: authors with data from *Sisben-II* in 2006.

Notes: IK-BW: Imbens and Kalyanaraman's bandwidth; Estimates with local linear regression.

Figure 2 below illustrates the distribution of selected outcomes over the running variable in 2011 three years after the exclusion of ineligible households. The *Sisben-II* score was rescaled with zero representing the eligibility thresholds for urban and rural areas. Starting with the distribution of treatment status, it is apparent from the Figure that participation in the programme is sharply discontinuous at the eligibility threshold, with only a few households with scores above the threshold managing to remain in the programme after 2007. The next panel investigates whether attrition of households between 2006 and 2011 is correlated with the eligibility threshold condition. This is rejected by the estimates. Adult household members also show some discontinuity at the eligibility threshold on labour markets outcomes, indicating lower labour force participation rates and lower affiliation to formal jobs. Discontinuities are observed on school attendance rates and completed year of education. School attendance is lower for excluded children can be observed for children at the eligibility threshold. This translates into lower completed years of education for excluded children. These findings are examined in more detail in the next section.

Figure 1. Mosaic of selected outcomes.



Source: Authors' estimation based on Sisben 2006 and 2011 data.

5. Results and discussion

Tables 3-5 below present our main results. As Gelman and Imbens (2014) note that high order polynomial lead to misleading estimations, we specify our RDD estimates with a local linear regression and check their robustness with a local quadratic linear regression. Here we present estimates based on the Imbens and Kalyanaraman optimal bandwidths. These result tables show the results for schooling, labour force participation, and household socio-economic status and demographics.

Starting with children, schooling estimates provide evidence on the impact of the programme exclusion on human capital accumulation (see Table 3 below). They are of particular concern given this is the main objective of *Familias en Acción*. The estimation results are consistently

negative. Children from households at the margins of eligibility in 2006 and excluded in 2007 show lower school attendance of just below 1 percentage point. This result applies for males and females and for younger and older children. All estimates are significant at the 5 percent level. The only variation in the estimates is a significantly lower school attendance rate among older children compared to younger children. Given high rates of school attendance among children in the sample, a 1 percent lower attendance is relatively small, but cumulative effects could be significant. The estimates for completed years of education are significantly lower for children from households at the margins of eligibility and excluded in 2007. The shortfall in completed years of education for children in excluded households is estimated at 0.12 years. This applies to males and females and to younger and older children. The estimates indicate that boys have a significantly higher shortfall in completed years of education compared to girls (0.168 and 0.129 years respectively); and older children show a significantly higher shortfall than younger children (0.074 and 0.174 years respectively).

The estimates on schooling can be interpreted as the loss in human capital accumulation for children excluded from the programme compared to the counterfactual situation had they remained in the programme.

Table 3. RDD estimates for selected outcomes for children.

Children (7 - 17 years of age)	Control mean	IK-BW		[95% Conf. Interval]		Obs.
		Coef.	BW			
School attendance	0.880	-0.0093 (0.0034)	1.56	-0.0159	-0.0027	1,848,369
Male	0.868	-0.0095 (0.0049)	1.503	-0.0190	0.0001	945,987
Female	0.893	-0.0088 (0.0044)	1.84	-0.0173	-0.0002	902,382
7 - 11	0.955	-0.0079 (0.0031)	2.02	-0.0140	-0.0020	856,308
12 - 17	0.818	-0.0115 (0.0054)	1.55	-0.0221	-0.0010	992,061
Years of education	4.696	-0.1238 (0.0308)	1.59	-0.1841	-0.0634	1,848,348
Male	4.494	-0.1682 (0.0344)	1.79	-0.2313	-0.0963	945,975
Female	4.902	-0.1293 (0.0361)	1.83	-0.2002	-0.0585	902,373
7 - 11	2.440	-0.0744 (0.0208)	1.73	-0.1153	-0.0336	945,975
12 - 17	6.576	-0.1746 (0.0433)	1.23	-0.2595	-0.0898	856,304

Source: authors with data from Sisben 2006 and 2011.

Notes: Robust standard errors following Calonico et al. (2014a). Control mean is within bandwidth. IK-BW: Imbens and Kalyanaraman's bandwidth; CCT-BW: Calonico et al.'s bandwidth. Estimates with local linear regression.

The sample of adults includes everyone aged 21 and over, over 2.8 million people (see Table 4 below). For the sample as a whole, the estimated difference in labour force participation in 2011 at the threshold of 2006 eligibility is small and negative but not statistically significant.

Disaggregating by sex shows important differences between males and females. For males, *Familias en Acción* participants at the threshold of eligibility in 2006 but excluded in 2007 show a 1.3 percentage point higher participation rate. This is significant at the 1 percent level.

Excluded females at the threshold of eligibility in 2006, show a 2 percent reduction in labour force participation, also significant at the 1 percent level. The estimated effects are in line with the expectations from the labour supply model presented by Rubio-Codina (2010).

Table 4. RDD estimates for selected outcomes for adults.

Adults	Control mean	IK-BW		[95% Conf. Interval]		Obs.
		Coef.	BW			
Employed	0.480	-0.0022 (0.0031)	2.29	-0.0083	0.0039	2,856,019
Female	0.244	-0.0208 (0.0051)	1.34	-0.0308	-0.0109	1,500,962
Male	0.752	0.0130 (0.0045)	1.45	-0.0308	-0.0109	1,355,057
Employed with health insurance	0.157	-0.0096 (0.0035)	2.28	-0.0165	-0.0027	1,366,200
Female	0.203	-0.0026 (0.0084)	1.95	-0.0190	0.0139	336,459
Male	0.142	-0.0111 (0.0044)	2.26	-0.0196	-0.0025	1,029,741
Unemployed	0.051	-0.0017 (0.0014)	2.44	-0.0044	0.0010	2,856,019
Female	0.032	-0.0014 (0.0014)	2.73	-0.0042	0.0013	1,500,962
Male	0.072	-0.0006 (0.0021)	3.15	-0.0048	0.0036	1,355,057

Source: authors with data from Sisben 2006 and 2011.

Notes: Robust standard errors following Calonico et al. (2014a). Control mean is within bandwidth. IK-BW: Imbens and Kalyanaraman's bandwidth; CCT-BW: Calonico et al.'s bandwidth. Estimates with local linear regression.

The estimates for whether adults in employment contribute to a health insurance scheme, an indicator of whether jobs are in the formal sector, indicate a lower incidence of contribution status for excluded participants at the margins of eligibility of around 1 percentage point. This is statistically significant at the 1 percent level. This estimate is important given the very small share of *Familias en Acción* participants who are in formal employment at the baseline (Table 4

above shows only 30 percent of heads of household contribute to a health insurance plan).

Disaggregating by sex shows that the lower formal employment effect applies only to males and not to females.

The withdrawal of transfer receipt, equivalent to an exogenous shortfall in unearned income, leads to a rise in participation among males. Considering the labour force participation and sectorial affiliation together, we can speculate that the observed difference in male employment reflects a shortening of job search for males in excluded households. This is consistent with a predicted income effect. For females excluded from the programme, lower participation rates are likely to reflect a net effect from the income shortfall on the one hand and a reduction in school attendance among children of school age and/or reduced capacity to afford childcare for children below school age. Among females, substitution effects appear to dominate income effects. A related literature for high income countries has documented the labour force participation incentives associated with income subsidies complementary to women's employment (Kleven 2014; Kolm and Lazear 2010). The relevance of these findings for conditional cash transfers in developing countries has been noted (Gahvari and Mattos 2007). The findings on the negative effects of exclusion on female employment mirror the positive effects of *Familias en Acción* participation on the labour force participation of women with young children established in the literature (Barrientos and Villa 2015a).

Table 5 below presents findings on the effects of exclusion on households' socio-economic status, as measured by *Sisben-III* scores in 2011, and on household demographics. The first set of

results focuses on household eligibility according to the *Sisben-III* score, where the dependent variable is a binary eligibility indicator. This suggests that excluded households in 2007 are 3.8 percentage points more likely to be eligible in 2011 than households at the margins of eligibility remaining in the programme. The impact of exclusion on eligibility in 2011 is greater, 4.2 percentage points, in rural areas. These findings point to a significant drop in socio-economic status as measured by *Sisben* scores and contradict expectations that excluded households would leave extreme poverty sustainably

The results on household demographics indicate there is a significant increase in the presence of children three years and younger among excluded households at the margins of eligibility in 2006, a 4.1 percentage point increase. This suggests excluded households at the margins of 2006 eligibility responded to the exclusion from *Familias en Acción* by having more children.

Table 5. RDD estimates for selected outcomes.

Households	Control mean	IK-BW		[95% Conf. Interval]		Obs.
		Coef.	BW			
Eligibility score (Sisben-III)						
Urban	39.42	-0.7463 (0.2136)	1.84	-1.1649	-0.3276	627,015
Rural	27.46	-1.1232 (0.1994)	2.13	-1.1649	-0.3276	608,829
Eligible	0.440	0.0385 (0.0055)	1.56	0.0278	0.0492	1,235,844
Urban	0.352	0.0170 (0.0064)	1.82	0.0044	0.0297	627,015
Rural	0.564	0.0419 (0.0073)	2.28	0.0277	0.0561	608,829
Pregnant woman in HH	0.094	-0.0019 (0.0019)	4.70	0.0277	0.0561	1,235,844
Urban	0.095	-0.0026 (0.0023)	3.541	-0.0071	0.0019	627,015
Rural	0.094	-0.0033 (0.0022)	6.682	-0.0077	0.0010	608,829
Presence of children U-3	0.374	0.0414 (0.0061)	1.59	0.0295	0.0534	1,235,844
Urban	0.376	0.0419 (0.0072)	1.46	0.0277	0.0560	627,015
Rural	0.380	0.0367 (0.0081)	3.3	0.0209	0.0525	608,829

Source: authors with data from Sisben 2006 and 2011.

Notes: IK-BW: Robust standard errors following Calonico et al. (2014a). Control mean is within bandwidth. Imbens and Kalyanaraman's bandwidth; CCT-BW: Calonico et al.'s bandwidth. Estimates with local linear regression.

Taken together, these results suggest that exclusion from *Familias en Acción* resulted in negative and significant effects on the allocation of household resources, human capital accumulation, and socio-economic status for some households at the margins of eligibility in 2006.

6. Robustness checks

Now we turn to the robustness check of our RDD estimates of their main outcomes. We first present a set of results according to a quadratic specification of the RDD following the suggestions by German and Imbens (2014). We test the robustness of the results presented in Tables 3-5 by looking whether the quadratic estimates are within the estimated confidence intervals according to the robust estimation of the standard errors following Calonico et al. (2014a). Second, we use an alternate bandwidth estimation proposed by Calonico et al. (2014b) to check the extent to which our results are sensitive to an alternative bandwidth selection. Third, we check the consistency of our estimates by presenting RDD estimates assuming an arbitrary threshold of minus and plus 2 points away from the *Sisben-II* score eligibility threshold. This arbitrary selection allows us to see whether our results are driven by the detection of spurious estimates around the threshold.

Table 5 below shows the results of the robustness checks. The first column presents the estimations of the coefficients accounting for the IK bandwidth similar to the one presented in Tables 3-5 but under a specification of local quadratic regression. For all the selected outcomes the coefficients are within the confidence intervals shown in Tables 3-5, which confirms that our results are not driven by the specification of the RDD. The second column presents the RDD estimates with an alternative selection of the bandwidth on a local linear regression. The results are not surprisingly different from those presented in Tables 3-5, in fact an alternative selection of the bandwidth also yields coefficients within the confidence interval. Finally, the estimates of

the RDD with 2 points away the *Sisben-II* score show non-significant coefficients, close to zero, implying that our estimates are consistent at the margins of eligibility of the *Familias en Accion* programme. In sum, we can confirm that our estimated coefficients in Tables 3-5 are not driven by the RDD specification, the selection of the bandwidth or spurious significant estimates.

Table 5. Robustness checks on the RDD estimates for selected outcomes.

Children (7 - 17)	IK-BW (quadratic)		CCT-BW (linear)		IK-BW (linear)		Obs.
	Coef.	BW	Coef.	BW	Cut-off - 2	Cut-off + 2	
School attendance	-0.00844 (0.0040)	1.56	-0.0090 (0.0034)	1.37	0.0039 (0.0030)	-0.0020 (0.003)	1,848,369
Years of education	-0.1524 (0.0360)	1.59	-0.1169 (0.0296)	1.25	-0.0084 (0.0273)	0.0053 (0.0330)	1,848,348
Adults							
Employed	-0.0021 (0.0032)	2.29	-0.0031 (0.0034)	2.29	0.0020 (0.0030)	0.0036 (0.0092)	2,856,019
Employed with health insurance	-0.0100 (0.0030)	2.28	-0.0098 (0.0040)	1.94	0.0013 (0.004)	0.0047 (0.0032)	1,366,200
Unemployed	-0.0017 (0.0013)	2.44	-0.0026 (0.0016)	1.76	0.0012 (0.0013)	-0.0026 (0.0021)	2,856,019
Household							
Eligibility score (Sisben-III)							
Urban	-0.7461 (0.2064)	1.84	-0.7461 (0.2113)	1.89	0.1447 (0.228)	-0.0540 (0.343)	627,015
Rural	-1.1229 (0.1906)	2.13	-1.1620 (0.2164)	1.73	0.0556 (0.1758)	0.0475 (0.2723)	608,829
Eligible	0.0385 (0.0053)	1.56	0.0440 (0.0066)	1.20	-0.0012 (0.01)	-0.0029 (0.0060)	1,235,844
Pregnant woman in HH	-0.0023 (0.0019)	4.70	-0.0024 (0.0019)	3.08	-0.0015 (0.0013)	0.0008 (0.0020)	1,235,844
Presence of children U-3	0.0383 (0.0053)	1.59	0.0410 (0.0058)	1.46	0.005 (0.004)	0.0008 (0.0056)	1,235,844

Source: authors with data from Sisben 2006 and 2011.

Notes: Robust standard errors following Calonico et al. (2014a). IK-BW: Imbens and Kalyanaraman's bandwidth; CCT-BW: Calonico et al.'s bandwidth. IK-BW (quadratic) estimates with local quadratic linear regression; CCT-BW (linear) estimates with local linear regression; IK-BW (linear) estimates with local linear regression.

7. Conclusions

The paper provides reliable estimates of the impact of programme exclusion following recertification on households at the margins of eligibility in Colombia's *Familias en Acción*.

Relying on a RDD we found that for households at the margins of eligibility in 2007, exclusion effectively reverses gains in human capital accumulation and economic inclusion. Children in households excluded from the programme show lower school attendance and fewer completed years of education when compared with children in households that remained in the programme. Exclusion also had measurable effects on the allocation of household productive resources. It is associated with a reduction in labour force participation among women, an increase in labour force participation among men, and a reduction in formal employment. Households excluded from the programme in 2007 show lower welfare scores as measured by *Sisben* scores than households remaining in the programme in 2011, indicating an increase in programme eligibility. The estimated effects effectively reverse transfer receipt outcomes at the margins of eligibility. For households at the margins of eligibility in 2006, exclusion results in adverse outcomes on resource allocation, human capital accumulation, and socio-economic status.

These findings are unsurprising when compared with expectations from theory, but they have far reaching implications for programme design and implementation. They suggest that current practice in conditional cash transfer programmes employing entry conditions to assess programme exit is counterproductive. Exclusion has adverse welfare effects on human capital accumulation and economic inclusion for households at the margins of eligibility.

The findings support new thinking on the design and implementation of exit conditions in conditional cash transfers. Agencies implementing conditional cash transfer programmes are paying increasing attention to exit conditions and have adopted a range of strategies to address this issue (Cecchini and Madariaga 2011; Medellín et al. 2015). Innovations include guaranteeing the receipt of transfers for a specified period of time following changes in socio-economic conditions of participant households; reduced level of transfers for households exiting programmes but remaining vulnerable to poverty; and strategies to improve the employability of exiting households, sometimes referred to as 'graduation' (Banerjee et al. 2015). In 2013, *Familias en Acción* introduced a guaranteed two years leave to remain in the programme for households with *Sisben* scores above the entry threshold and up to a vulnerability threshold. Research on these strategies will throw light on their relative effectiveness. These innovations in programme design and implementation are in line with the findings in the paper. Research into the analytical grounding for these strategies remains an urgent challenge.

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