Antipoverty transfers and labour force participation effects

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Abstract

The paper examines labour market outcome effects from participation in *Familias en Acción* in urban areas, a conditional cash transfer programme in Colombia. There is considerable interest in the potential impact of antipoverty transfers on labour market outcomes in developing countries. The available literature finds at best very marginal effects, both positive and negative, of participation on labour market outcomes. Relying on a regression discontinuity design and a large panel dataset, the paper finds significant and largely positive effects on labour market outcomes. These effects are heterogeneous in household composition and gender, confirming that the effects of antipoverty transfers on labour supply reflect a re-organisation of household productive resources in response to the transfer.

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1. Introduction

The introduction of large-scale antipoverty transfers in developing countries draws attention to their potential effects on the labour supply of participant households. In conditional cash transfer programmes, especially given their focus on households and on investment in children's human capital, labour supply effects are important to assessing programmes' effectiveness. This paper examines the labour force participation effects of Colombia's *Familias en Acción* (FA). The analysis relies on a regression discontinuity design applied to a large administrative dataset. Labour force participation effects are identified for thresholds of programme eligibility scores in urban locations incorporated into *Familias en Acción* in 2007. The approach and data employed permit an accurate identification of intention to treat labour supply effects, and make a contribution to the growing literature on the impact of conditional cash transfers. The results confirm that conditional cash transfer programmes encourage a re-allocation of household labour resources, with a small net increase in labour force participation.

Economic theory predicts that income transfers will impact on the labour supply of recipients (Moffitt, 2002). In the textbook utility maximisation model, an income windfall will enable recipients to increase consumption across the board, including leisure. This suggests a rebalancing of labour and non-labour time. In the context of antipoverty income transfers, labour supply effects for participants are harder to predict, especially as groups in poverty are very likely to be in an adverse segment of their budget line associated with highly inelastic labour supply. Mothers have strong preferences for time spent caring for their infants and parents have a strong interest in expanding the set of opportunities open to their offspring. Public schools enable mothers to work, but set limits to the time they have available for work. Income transfers with school conditions have mixed labour supply effects. They reduce child labour time available for work and enhance the opportunities for parents to work. At the same time they restrict the work of mothers, as they are responsible for compliance with the conditions and often need to substitute for their children's contribution to housework and care (Gahvari and Mattos, 2007; Molyneux, 2006). Sound empirical analysis is needed to account for the net labour supply effects of conditional cash transfers, and antipoverty transfers more broadly (Moffitt and Rangarajan, 1989).

Labour supply effects are important to the evaluation of antipoverty transfer programmes. Antipoverty programmes are not welfarist (Kanbur, et al., 1995). They are not aimed at ensuring that participant households reach a minimum level of utility, but rather that they reach a minimum level of consumption. In addition, conditional cash transfers require a minimum level of human capital investment. An antipoverty income transfer leading to a proportional reduction in labour supply, and therefore income, could well be welfare enhancing, but would be considered a failure in its own, non-welfarist, terms. Moffit (2006) provides another reason for keeping a close eye on the labour supply effects of antipoverty transfers. Based on his research in the

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USA, he argues that most societies share two main values that underpin social policy. First, citizens should enjoy at least (Fernandez and Saldarriaga, 2013; Ferro, et al., 2010) basic living standards; and second, they should be in work. Leaving aside the issue of whether work values are paternalistic (USA) or based on collectivist views (Sweden), employment and labour income are essential to secure long-term exit from poverty (González de la Rocha, 2007).

There is a growing literature examining the labour supply effects of conditional cash transfer programmes.[1] Studies have used a variety of data and methods to identify effects on the extensive margin (participation) and on the intensive margin (hours). The analysis has been productively extended to related variables, including occupational choice, time use, and earnings. The literature has yielded mixed results. The range of data, methods and programme design accounts in large part for the variation in the findings from the literature. Three studies on Argentina's *Asignacion Universal por Hijo*, using the same dataset but different methods, come to very different conclusions regarding the labour supply effects of the programme (Bosch and Guajardo, 2012; Groisman, et al., 2012; Maurizio and Vásquez, 2012). A meta-analysis of child labour effects from antipoverty programmes, for example, concludes that "interventions based on transfers of resources (whether unconditional and conditional, in cash or in kind) tend to reduce child labour" (de Hoop and Rosati, 2012: 43); but this effect cannot be guaranteed, as some programmes show no impact, or a negative impact. On adult labour, studies show a variety of positive, negative and null effects. There is no consensus on the direction of the effects, let alone their size.

This applies to *Familias en Acción* too, as available studies fail to provide clear-cut results. Villa (2011) showed that households participating in *Familias en Acción* have lower labour participation rates than non-participants in the population. However, it was noted that beneficiary households were younger (consequently less experienced), and had significantly lower educational qualification. An evaluation of *Familias en Acción* conducted by Institute for Fiscal Studies, and Econometria-SEI (2006) concluded that the programme marginally increased the participation rate of urban females and rural males, but found no significant impact on hours worked per week. Attanasio et al. (2010) examined the effect of programme participation on children's time use. They find a significant increase in school attendance, explained by a reduction of domestic work and, at the margins, in income-generating activities. Significant reductions in child labour are only observed for 14-17 year olds in urban areas. The authors suggest this finding "*is perhaps not surprising if children are important labour inputs in agriculture and there is greater flexibility in hours worked for children in this sector*" (Attanasio, et al., 2010: 199).

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[1] See inter alia (Alzúa, et al., 2010; Attanasio, et al., 2010; Bazzi, et al., 2012; Carvalho, 2008a, 2008b; CEPAL, 2011; Cortez Reis and Camargo, 2007; Fernandez and Saldarriaga, 2013; Ferro, et al., 2010; Ferro and Nicollela, 2007; Foguel and Paes de Barros, 2008; Freije, et al., 2006; Rodriguez Oreggia and Freije Rodriguez, 2008; Rubio-Codina, 2010; Schady and Araujo, 2008; Skoufias and di Maro, 2008; Skoufias and Parker, 2001; Skoufias, et al., 2008; Texeira, 2010).

This paper contributes to the literature in several respects. First, the paper will provide additional evidence on the labour supply effects of antipoverty transfers in urban areas. In the literature, labour supply effects appear to be better defined econometrically in rural areas. As a consequence we know a lot less about how the effects apply in urban areas. Second, the analysis in the paper relies on regression discontinuity design to identify and estimate potential effects. The available literature on the labour supply effects of conditional cash transfers identifies effects largely through marginal effects in regression analysis. Some studies have applied regression discontinuity to study the labour supply effects of social pensions, where an age-based eligibility enforces a discontinuity in outcomes (Borrella and Sartarelli, 2013; Eyal and Woolard, 2011; Sinaert, 2008). Our paper relies instead on discontinuities arising from programme eligibility thresholds.[2] Third, the large administrative dataset we employ in the paper enables reliable identification of discontinuous effects, and permits a more detailed analysis of the effects through sample restrictions without reducing the power and significance of the estimators. We adopt a non-parametric approach to estimation. A concern with non-parametric estimation of regression discontinuity estimates is the trade-off between restricting the bandwidth around the threshold, whilst retaining a sufficient number of observations to ensure accurate measurement of the effects. In Colombia, households applying for public assistance are required to provide information on their socio-economic conditions, with resulting datasets having a census-like quality for households in the bottom two quintiles. Eligibility for *Familias en Acción* and other public programmes is established by welfare score generated from this information. For a very large number of households in municipalities which had not participated in the programme, our data allow us to associate intention to treat and local average treatment effects in 2006 with observed household labour market outcomes in 2010.

The rest of the paper is divided into four sections. Section 2 describes *Familias en Acción* transfers and a brief model of how these transfers could impact on the labour market outcomes of participant households. Section 3 discusses methods and data. Section 4 presents the results and discusses its implications. A final section concludes.

2. Transfers and labour force participation effects

The section begins with a brief outline of *Familias en Acción* transfers, which is followed by a brief discussion of expectations regarding the effects of antipoverty transfers on labour supply.

2.1 *Familias en Acción* transfers

The *Familias en Acción* programme was introduced in 2001 by the government of Colombia with the aim of supporting the poorest households in the human capital investment of their children. It was part of a social investment fund intended to counteract the adverse effects of the

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[2] Lee and Lemieux (2009) draw a distinction between applied work relying on age discontinuities and other sources of discontinuity. Regression discontinuity design can only parallel randomised experiment in a context where there is some uncertainty over whether individuals ultimately receive the treatment. This might not apply in some old-age-related transfers.

economic crisis in the late 1990s. In common with similar programmes in Latin America, *Familias en Acción* is premised on the view that addressing intergenerational poverty persistence is best done by combining direct transfers to households with utilisation of health care and education services for their children. In 2010, the programme provided monthly transfers for each child attending school of US$7.5 and US15, respectively, in rural and urban areas. Transfers for children in secondary schools in large cities were higher, averaging US$25 per month. In addition, households with children aged 0 to 6 were entitled to a monthly transfer of US$30. The transfers are paid bimonthly to the mother and are conditional on minimum school attendance, immunisation, health check-ups, and on mothers attending nutrition and health sessions.

Eligibility for participation in *Familias en Acción* is determined by a proxy-means test known as SISBEN. Households wishing to apply for a wide range of public programmes and assistance must register with SISBEN and provide information on their socio-economic conditions. The survey information is processed and yields a household welfare score, or SISBEN score, which ranges between 0 and 100. The score rises with the welfare status of the household. The statistical model generating the score from the household information is not in the public domain, to avoid potential manipulation. Until 2010, the National Planning Department would set specific thresholds for the purposes of determining eligibility for participation in public programmes, with different levels set for urban and rural areas.[3] Eligibility to participate in *Familias en Acción* applies to households with scores of 0-11 and 0-17.5 in urban and rural areas, respectively. As an illustration, a household living in an urban area without utilities, with poor dwelling materials, in overcrowded conditions and with low human capital is likely to obtain a SISBEN score below 11. Registration for *Familias en Acción* is repeated every three or four years in the same location. It is estimated that between 60 and 80 percent of eligible mothers are actually registered on the programme.

The programme has been implemented in stages, starting from municipalities with less than 100,000 inhabitants with high levels of deprivation, and eventually covering the entire country. In 2007 all geographic restrictions were lifted and the programme began operating in large cities. By 2007, the programme reached 1.5 million households with 6.3 million individuals, around half of them children.

2.2 Labour supply effects of antipoverty transfers

Economic theory predicts that an income windfall will lead to a re-allocation of labour resources among recipients (Moffitt, 2002). The design of antipoverty income transfers and the constraints operating on resource allocation for households in poverty merit some attention in this context. Conditional cash transfer programmes require children to attend school for a minimum amount of time, and compliance has knock-on effects on their capacity to work. The restrictions on child labour are probably stronger in the case of market work than in a family farm or workshop, or in

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[3] After 2010, the programme agencies are able to set their own eligibility thresholds.

housework. Conditions have effects on adult labour too, with parents likely to substitute for their children's reduction in work (Rubio-Codina, 2010). This, of course, assumes households are employing their productive resources in an optimal fashion before the transfer. To the extent that, in the absence of the transfers, households are credit or liquidity constrained or face non-linearity in production, small transfers might have far-reaching effects for households unable to achieve an optimal allocation of their productive resources in the absence of a transfer (Barrientos, 2012).[4]

Rubio-Codina (2010) develops a model of household labour supply which throws considerable light on labour supply effects from human development income transfer programmes, and will help us think through the empirical work which follows.[5] Take a household with members I, $1 \ldots I$, where adults are separated out as $a = 1, \ldots A$, children as $q = 1 \ldots Q$, and children receiving a transfer as $k = 1, \ldots K \leq Q$. The household maximises a utility function of the type

$$U = U(C, L, \ldots, L\_I; X, \varepsilon),$$

where C is household aggregate consumption and L_I is individual I's leisure. X represents observable heterogeneity and ε denotes unobservable household heterogeneity. Each household member has time T which can be allocated to different activities j. Children can allocate s time toschooling. The household budget constraint is

$$\sum_i \sum_{j \neq s} w_i^j h_i^j + Y \geq pC + \sum_{i=q} w_i^s h_i^s$$

Here, h is hours allocated to productive activities j or schooling s; w_i^j is the marginal return to activity j by individual i. Importantly, w_i^s is the direct cost of schooling, such as fees, uniforms, transport, etc.

The transfer is in two parts, a household nutrition transfer $B > 0$, and a schooling transfer for each child of school age up to a maximum number $t_s > 0$. This implies that the household nutrition part of the transfer works as pure income effect, whereas the schooling part of the transfer has in addition substitution effects (it reduces the costs of schooling w_s and therefore the relative price of education, while at the same time placing restrictions on the time allocation of children). Rubio-Codina writes the total effect of the transfer on hours of work for participant households as:

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[4] Ardington et al. (2009) find that household labour supply in South Africa responds positively to female pensioners' first receipt of the transfer. The fact that female pensioners can provide a regular source of income and care, makes it feasible for their daughters to migrate in search of employment. In the spatially segregated labour markets left by apartheid, this is a common route to employment.
[5] Readers interested in the details of the model should consult Rubio-Codina (2010).

$$dh_i^j = \frac{\partial \hat{h}_i^j}{\partial w_i^s} dw_i^s + \sum_{k \neq i} \frac{\partial \hat{h}_i^j}{\partial w_k^s} d\partial w_k^s + \left[-\sum_k h_k^j dw_k^s + dY \right] \frac{\partial h_i^j}{\partial Y} \quad \forall\, i, j$$

The first term describes own-substitution effects of the transfer; the second term describes the cross-substitution effects; and the third term describes the income effects. The first term denotes a response to the reduction in the costs of schooling brought about by the schooling part of the transfer. The second term sums up the cross-substitution effects arising from other children living in the household and benefiting from the transfer. The final term, the income effect, affects all members of the household. This provides us with a framework with which to examine the process of labour re-allocation brought about by participation in the programme.

In practice, the overall effects of a programme like *Familias en Acción* are likely to be small. School attendance requirements apply to all children in the programme, but prior to the programme most households did send their children to school. The schooling requirement works at the margin, for the small group of households who did not send their children to school before the programme but do so after the programme. The re-allocation of labour is more significant for these households, but not for those who had their children in school before the programme.[6] The income effect applies to all households. The effects of the transfer on labour supply will be greatest for households facing constraints in their resource allocation prior to the programme.

2. Methods and data

This section provides information on the methodological approach adopted to estimate labour force participation effects and on the datasets that will be used in the analysis below.

3.1 Regression discontinuity and estimation

The analysis below estimates the effects of participation in *Familias en Acción* on labour market outcomes within a regression discontinuity design. Lee and Lemieux (2009) demonstrate that regression discontinuity design "is not 'just another' evaluation strategy, and that causal inferences from RD designs are potentially more credible than those from typical 'natural experiment' strategies" (Lee and Lemieux, 2009: 1). They show that regression discontinuity is a close cousin of randomised experiments in settings where agents are unable to precisely control the assignment variable around the eligibility threshold, with the implication that randomisation is a consequence of agents' imperfect control. Regression discontinuity designs can provide accurate estimates of impact in appropriate settings.

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[6] The percentage point increase in school attendance rates after the introduction of PROGRESA in Mexico were below 1 percent for primary school children and between 4 and 6 percent for secondary school children.

The focus of the impact evaluation of an antipoverty programme is to establish whether participation in a programme denoted by $x_i \in [0,1]$, with $x_i = 0$ for non-participation and participation denoted by $x_i = 1$. Consider an outcome y_i for an individual i, the outcome is hypothesised to depend on participation in a programme. We can only observe individuals who have been treated $x_i = 1$ and those who have not $x_i = 0$, y_{1i} denoting the outcome with treatment and y_{0i} denoting the outcome in the absence of the treatment. In a linear regression setting, the impact of the programme can be written as $y_i = \alpha_i + x_i \cdot \beta_i$, where the outcome level for non-eligible individuals is represented by $\alpha_i \equiv y_{0i}$ and the effect of the programme on the outcome of interest is captured by $\beta_i \equiv y_{1i} - y_{0i}$.

In a regression discontinuity design, treatment x_i is known to depend on a variable, z_i, so that the treatment indicator is $x_i = f(z_i)$. In the sharp regression discontinuity design, z_i is discontinued at point z_0 . If z_i is a programme assignment rule with an eligibility threshold at z_0 , a case in point for this paper, then $x_i = 1$ for eligible individuals and $x_i = 0$ otherwise. In the fuzzy regression discontinuity design x_i is assumed to depend on the probability of treatment around the threshold. The conditional expectation of the probability of participation in the programme can be specified as a random variable x_i with $f(z) \equiv E[x_i | z_i = z] = Pr[x_i = 1 | z_i = z]$, and also discontinuous at z_0.

Hahn, et al. (2001) demonstrate that given the conditions for a regression discontinuity design are given, a general constant estimand for the treatment effect can be defined as follows:

$$\beta = \frac{y^+ - y^-}{x^+ - x^-} \tag{1}$$

Where $y^+ \equiv lim_{z \to z_0^+} E[y_i | z_i = z]$ and $y^- \equiv lim_{z \to z_0^-} E[y_i | z_i = z]$. In other words, the estimand is defined by the difference of the outcome close to the threshold at z_0, divided by the difference in the probability of eligibility. For the sharp regression discontinuity design the denominator equals 1, while in the case of the fuzzy regression discontinuity design the denominator varies randomly.[7]

The limits derived from (1) highlight the significance of the bandwidths. The difference in the outcomes is also expressed by $E[y_i | z_i = z_0 + e] - E[y_i | z_i = z_0 - e]$ where e is an arbitrary number known as the bandwidth. The effect of the programme is then the difference of the outcome around the threshold with observations within a distance denoted by e.

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[7] Imbens and Angrist (1994) argue that the estimation of the fuzzy regression discontinuity design emulates an instrumental variable estimation, and the estimand for the former is the same as the Wald's estimator in the instrumental variable analysis.

As suggested by Imbens and Lemieux (2007), we estimate (1) using a non-parametric local linear regression following Fan (1992) and specified by Hahn et al., (2001) as:

$$(\hat{a}, \hat{b}) \equiv argmin \sum_{i=1}^{n} (y_i - a - b(z_i - z_0))^2 K\left(\frac{z_i - z_0}{h}\right) 1(z_i > z_0), \tag{2}$$

where the $K\left(\frac{z_i - z_0}{h}\right)$ corresponds to the smoothing kernel function with a bandwidth denoted in this case as $h > 0$. Given the asymptotic properties of the local linear regression, we follow Imbens and Kalyanaraman (2012) and define an optimum bandwidth, h^*, for each outcome variable. This procedure is based on the minimisation of the mean squared error whose resulting bandwidth does not inherit the biases from the distribution and regression function.

The regression discontinuity design is based on several assumptions that could be tested (Lee and Lemieux, 2009). The next sub-section describes the data used in the analysis, and the appropriateness of applying a regression discontinuity design on these data is examined in the subsequent sub-section.

3.2 Data and outcome variables

To estimate the effects of participation in *Familias en Acción* we make use of two waves of SISBEN household data collected in 2006 and 2010. SISBEN collects information on households applying for public programmes, and the information is used to compute a household welfare score which determines eligibility. The survey has a census quality for low-income groups, in that it covers the vast majority of the population in the bottom two quintiles. *Familias en Acción* was initially implemented in rural areas, but later on the government took the decision to extend coverage nationwide and include urban areas too. In 2006, SISBEN collected information in urban areas, mainly provincial capital cities and their metropolitan areas, to determine eligibility among urban households. The programme was then implemented in urban areas in 2007. In 2010, SISBEN collected a new wave to update the welfare scores and include new households. In the analysis below, we use the 2006 data as the baseline and examine labour market outcomes with the 2010 data. This enables us to associate eligibility in 2006 with labour outcomes three years after the implementation of the programme.

In constructing the working dataset, we included only households in urban areas which joined the programme in 2007. We can rule out any contamination from households with experience of participating in the programme prior to 2007. Although the programme was initially restricted to rural areas, it was implemented in some urban areas with a high incidence of households displaced by the conflict. In our working dataset we have explicitly excluded these urban areas. The National Planning Department carried out a validation exercise in October 2006 cross-referencing the 2006 SISBEN data with programme administrative records. Based on this exercise we can confirm that our working dataset does not include households with experience of participation in the programme prior to 2007.

The 2006 SISBEN household data include welfare scores for 2,304, 419 households, 957,925 of which are eligible according to their welfare scores and 1,346,494 are non-eligible. This represents 10,406,494 people, divided into 5,034,068 eligible and 5,372,426 non-eligible individuals. Not all eligible households were found to be registered on *Familias en Acción* – in fact only 63 percent of eligible households obtained registration on the programme in the selected cities.[8] A small proportion of non-eligible households, 3 percent, did manage to register on the programme. Matching the 2006 and 2010 SISBEN data shows some attrition. In the 2010 data, 20.2 percent of original households are missing. The rate of attrition among eligible households was 21.7 percent, while attrition among ineligible households was 19.1 percent. Our large working dataset is particularly appropriate to regression discontinuity estimation, as it reduces the risk of having to rely on a few observations around the threshold.

Our labour outcomes variables are constructed from three main questions in the SISBEN survey: a standard question on household members' economic activity in the previous month; a question on how long unemployed respondents have been looking for a job; and a question on health insurance coverage.

The activity question is standard. It requires the survey respondents to provide information on the economic activity of all household members in the last month. Active household members can be employed, as salaried workers, self-employed, employers or familiar unpaid workers, or unemployed and seeking employment. A follow-up question requires information on the number of weeks the unemployed have been searching for a job. Additional categories include: studying, housework, rentier, retired, and disabled.

The survey also includes a question on the health coverage of each household member. It provides several options: (i) whether they are covered as members of the armed forces; (ii) whether they contribute to Social Insurance; (iii) whether they contribute to other health insurance institutions; (iv) whether they contribute to a an employer health insurance scheme or receive health insurance as a retiree from an employer scheme; (v) whether they are included in the subsidised health insurance component; (vi) whether they have health protection as an indigenous person; or (vii) whether they have no health insurance. The 'employed with health insurance' variable was constructed as a binary variable, with a value of 1 indicating individuals living in a household where someone contributes to any employer health insurance scheme (options (i) to (iv) above), and 0 for others. This variable is important, because it provides information on the sectoral affiliation of individuals, i.e., whether they work in formal or informal employment.

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[8] A study by Marcelo (2009) found that eligible but not registered households fell into two groups. One group consisted of households who were unaware of the programme, while a second group knew about the programme, but declined to participate. These groups were about equal in size.

The final working dataset only includes adults aged 21 years of age in the 2010 follow-up survey. This represents a sample of 3,038,946 individuals, 45.1 percent of whom are eligible. Descriptive statistics for the sample and sub-samples are in Table 2.

3.3 Testing for the appropriateness of the regression discontinuity approach

In this section we test for the appropriateness of the regression discontinuity approach. In the context of assessing the labour market outcomes of *Familias en Acción* with a regression discontinuity specification, it is important to pay attention to two important features. First, the assignment of welfare scores and the eligibility threshold should not be controlled by potential participants. They should be free from any possible manipulation. Second, the discontinuity of the outcome variable around the threshold should be directly caused by the implementation of the programme. No discontinuity in the outcomes of interest should occur in the absence of the intervention.

Here, we test for the presence of the conditions required to support the application of a regression discontinuity design. First, we explore the distribution of welfare scores to demonstrate there are no significant breaks in welfare scores around the eligibility score. Second, and as indicated above, regression discontinuity relies on the deterministic treatment generating a discontinuity on a function $f(x_i)$ which is otherwise smooth (Hahn, et al., 2001; Lee and Lemieux, 2009). We examine rates of participation in *Familias en Acción* by welfare scores to determine whether the programme threshold generates a break at the eligibility threshold. Third, we compare the distribution of a selected outcome before and after introduction of the programmes, hypothesising that the function is smooth and continuous before the programme but discontinuous for the treatment group after the programme is introduced. Fourth, we explore potential confounders. The Colombian government uses welfare scores for a variety of public programmes; the issue then arises that discontinuities at the *Familias en Acción* threshold may in fact be confounded by other public programmes using the same threshold scores.

Figure 1 provides a histogram of the population in the working dataset by SISBEN welfare scores. The distribution is bi-modal, with a small increase in the density at the *Familias en Acción* eligibility score marked with the broken line. Otherwise, there are not large discontinuities in the distribution of welfare scores.

Figure 1. Distribution of welfare scores
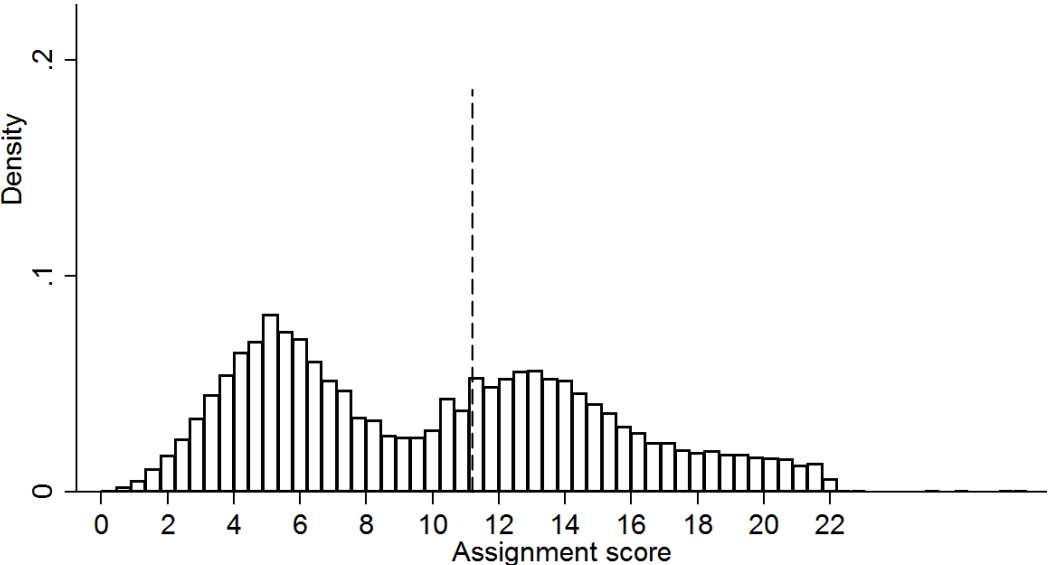
Source: Authors' calculations using SISBEN 2006 data.

Are there significant discontinuities in reported outcome variables at baseline? Table 1 presents regression discontinuity results for all the outcome variables estimated at the baseline. As can be observed from the results, there are no significant discontinuities in the outcome variables in the sample population before the introduction of the programme.

Table 1. Regression discontinuity estimates with 2006 SISBEN (pre- programme) data

Pre-programme variables	Wald estimate	S.E.	OBW
% Male	0.001	0.002	0.74
Average age	0.146	1.099	0.89
% with primary education	0.009	0.008	0.78
% with secondary education	-0.008	0.008	0.93
% Household with children aged 0-6	0.000	0.000	0.30
Household size	0.089	0.070	0.81
Age of household's head	0.251**	0.126	0.76
Labour force participation	0.005	0.009	0.13
Labour force participation – male	0.003	0.004	0.92
Labour force participation – female	0.005	0.010	0.18
% Employed	-0.001	0.002	0.94
% Employed – male	-0.001	0.001	0.61
% Employed – female	-0.001	0.001	0.69
% Employed with health insurance	0.016	0.062	0.16
% Employed with health insurance – male	0.019	0.036	0.99
% Employed with health insurance – female	0.007	0.008	0.19
% Unemployed	0.004	0.004	0.19
% Unemployed – male	0.002	0.003	0.93
% Unemployed – female	0.000	0.003	0.24
Weeks of job search	-0.154	0.357	1.18
Weeks of job search – male	0.001	0.050	2.06
Weeks of job search – female	-0.342	0.340	1.30

Observations: The estimations are obtained with SISBEN 2006 data prior to the programme implementation.
Notes:
(i) ** significant at 5%
(ii) SE stands for standard errors.
(iii) OBW stands for Optimal Band Width as defined in Imbens and Kalyanaraman (2012).

Does the programme treatment impose a discontinuity at the threshold of eligibility? Figure 2 shows the percentage of participation in *Familias en Acción* granted by welfare scores. As can be seen, there is a large discontinuity at the threshold of eligibility. The information in the figure is also helpful to understand the differences between the Sharp regression discontinuity design yielding intention to treat (ITT) estimates, and the fuzzy regression discontinuity design yielding local average treatment effects (LATE). Recalling (1), the ITT assumes that participation and eligibility overlap exactly, that is, the probability of participation in *Familias en Acción* for households with welfare score below 11 is equal to 1. In practice, the overlap between eligibility

Figure 2. Rates of participation in *Familias en Acción* by welfare scores
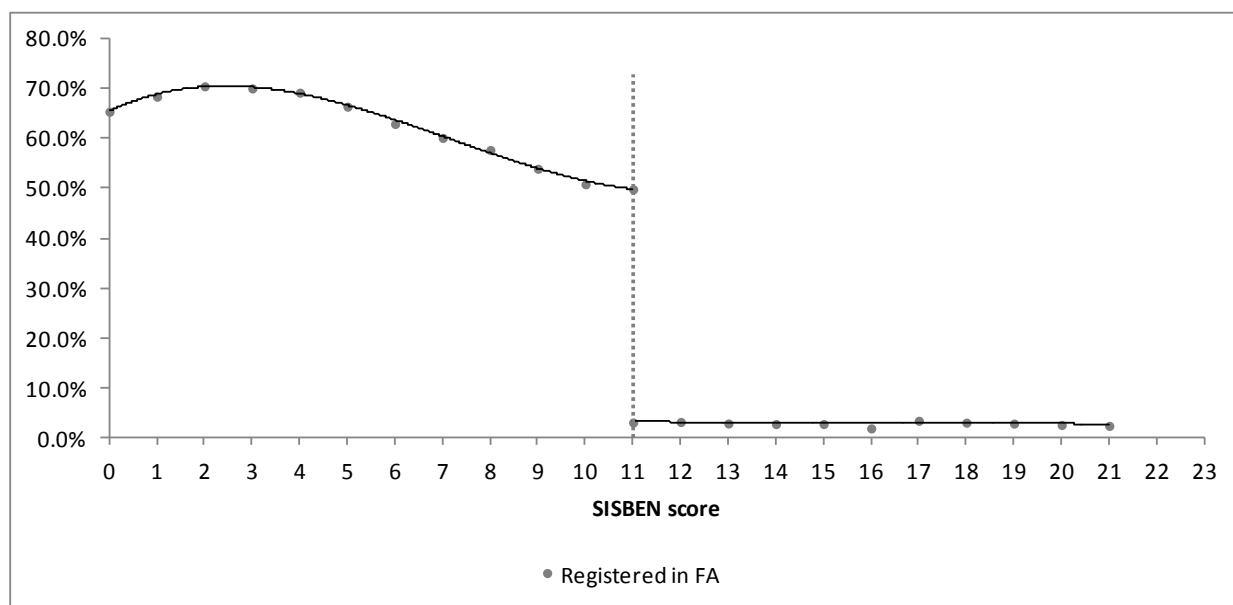
Source: Authors' calculations using SISBEN data 2006.

and participation in *Familias en Acción* is not exact, as there are households who are eligible but are not participating, and households who are not eligible but somehow manage to participate in the programme. The estimates provided by the fuzzy regression discontinuity design accounts for the imperfect overlap between participation and eligibility by constructing probabilities of participation around the threshold of eligibility. The fuzzy regression discontinuity design explicitly models errors in assignment.

Could participation in other public programmes using welfare scores confound the effects of *Familias en Acción*? *Familias en Acción* is not the only public programme relying on welfare scores to determine eligibility. If other programmes employ *Familias en Acción* threshold eligibility scores, it would make it difficult to attribute observed discontinuities in outcome variables to the latter. We investigated this issue using the 2008 Colombia Living Standards Survey, which contains information on participation in some other social transfers. Comparing rates of participation in public programmes for households just above and just below the eligibility thresholds for *Familias en Acción*, it was not possible to find any significant differences. The only exception was the school feeding programme in urban areas, where households with welfare scores just above the threshold showed significantly higher rates of participation than households just below the thresholds scores (7.2 percentage points). This confirms that participation in other social programmes is unlikely to confound the regression discontinuity results presented in the next section.

The main focus of this section has been on testing for the appropriateness of the regression discontinuity approach. In line with this objective, we have shown that the distribution of welfare scores in the sample shows no large jumps at the eligibility threshold; that the introduction of

Familias en Acción introduces a sharp discontinuity in treatment at the eligibility threshold; that there are no discontinuities in outcome variables at the baseline; and that the use of welfare scores to determine eligibility for other public programmes is unlikely to confound the results from applying regression discontinuity. The conditions needed to apply the regression discontinuity approach are therefore present. The next section focuses on the results.

3. Results and discussion

The main results are presented in this section. The focus is on labour market outcome variables, including labour force participation, employment, health insurance status, and job search. The estimates of labour supply outcomes are first presented for all adults aged 21 or above in 2010, and for adults aged 21 to 35 in 2010. The large number of observations in the working dataset allows the analysis to disaggregate the sample by household composition, in order to explore potential restrictions on labour force participation faced by households with young children. In additional estimations, we restrict the sample to single adults with children aged 0 to 6, and households with two or more adults and children 0 to 6. Sample restrictions help identify labour supply effects for males and females too.

The fact that *Familias in Acción* eligibility is defined by welfare score and a well defined cut-off point allows the use of regression discontinuity design to identify effects. We focus on two different but related sets of estimates. First, sharp regression discontinuity design provides estimates of the intention to treat effect (ITT). Second, fuzzy regression discontinuity design provides estimates of the local average treatment effect (LATE). These estimates take account of the realised participation in the programme of eligible households. The ITT estimator yields a lower effect than the fuzzy-RD (Angrist and Pischke, 2008).

Table 2 provides descriptive statistics on the different samples. This information is important to help contextualise and interpret the regression discontinuity effects. At this stage, it is important to note that the group of households with one adult and children aged 0-6 has salient differences in descriptive statistics to the full sample of adults and sub-groups. In particular, this group is predominantly female and has lower education levels, but also higher rates of employment and lower rates of inactivity. Significantly, the welfare scores for this group are not very different from the rest of the sample. The other important point to note is that mean labour market outcomes for the full sample do not differ much between eligible and non-eligible groups, except perhaps in the fact that non-eligibles have higher rates of formal employment.

Table 2. Descriptive statistics for the working dataset and sub-groups

Variable (%)	Aged 21 and over		Aged 21-35 years		Adult + children 0-6		Adults + children 0-6	
	Eligible	Non-eligible	Eligible	Non-eligible	Eligible	Non-eligible	Eligible	Non-eligible
Male	43.2	44.0	42.7	44.9	26.6	25.4	45.0	45.8
age*	41.8	42.3	28.8	28.5	41.0	42.4	41.8	42.3
Welfare score* (0 - 100 scale)	5.9	13.1	5.8	12.4	6.0	13.9	5.8	12.9
Education level								
None	7.9	5.0	2.8	2.2	7.8	6.3	7.9	4.8
Primary	47.6	37.5	30.4	19.3	47.3	38.8	47.6	37.3
Secondary	42.2	51.8	62.6	67.9	42.6	50.3	42.1	51.9
Technician	1.1	2.5	2.2	4.5	1.1	2.2	1.1	2.4
Undergraduate	1.1	3.1	1.9	5.9	0.9	2.0	1.0	3.2
Graduate	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1
Activity last month								
Inactive	10.3	9.5	8.6	8.3	5.9	6.2	10.8	9.8
Employed	53.9	54.6	55.1	58.1	71.9	69.7	51.8	53.1
Unemployed	4.2	4.8	6.2	7.4	3.6	4.1	4.2	4.8
Studying	1.4	2.0	3.0	4.9	0.7	0.7	1.4	2.1
Housework	29.0	25.6	27.0	21.0	16.1	14.9	30.5	26.6
Rentier	0.3	0.6	0.1	0.1	0.8	1.2	0.2	0.5
Retired	0.7	2.6	0.0	0.1	0.7	2.7	0.6	2.5
Disabled	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2
Labour force participation – Male	84.0	81.2	86.7	84.1	88.4	84.5	83.7	81.0
Labour force participation – Female	38.5	42.3	42.4	50.5	70.9	70.2	33.4	38.4
Share of adults active in household [a] level	61.5	61.5	66.7	69.1	-	-	0.5	0.5
Employed w/ health insurance	15.6	36.2	19.0	40.3	10.9	22.8	16.3	37.9
Employed w/ health insurance – Male	15.2	35.1	18.4	37.9	11.5	20.4	15.4	36.0
Employed w/ health insurance –Female	16.3	37.8	20.1	43.5	10.6	23.8	18.2	41.4
Weeks of job search*	16.1	17.5	16.0	17.3	15.2	16.3	16.2	17.5
Weeks of job search – Male	15.9	17.2	15.5	16.8	14.4	15.6	15.9	17.3
Weeks of job search – Female	16.6	17.9	16.5	17.8	15.6	16.5	16.7	18.1
Observations	1,373,385	1,665,561	533,618	615,328	142,247	151,202	1,233,671	1,516,547

Source: Calculated from SISBEN 2010 data with eligibility defined by 2006 welfare scores. * Variable is not a percentage. a: Variable is computed at the household level.

We now turn to the main results. They are presented in Table 3. Starting with the results for labour force participation using the sharp regression discontinuity design, the estimates for the whole sample do not suggest significant effects on labour force participation. These effects are defined more clearly when sample restrictions are applied. When focusing solely on males, the estimates are positive and significant for the sample containing adults aged 21 and over and for the sample 21-35 years of age. The effects on labour force participation among males at the threshold of eligibility are positive, significant, but small, at 2.3 percent for all adult males and 2.9 percent for males aged 21 to 35.[9]

When the sample is restricted to adults in single adult households with children 0-6, the estimated difference in participation at the threshold of eligibility is again positive and borderline significant, but much larger. For this group, eligibles show close to 9 percent higher rates of participation than non-eligibles. As women outnumber males three to one in this group, it is noticeable that the difference for females is positive, significant and also large at 6 percent. This is the only labour force participation estimate which appears to be significant for females. The estimate for females is highly significant.

As expected the estimates for the fuzzy regression discontinuity design are much larger than the estimates using the sharp regression discontinuity design. This is because they focus on participation as opposed to eligibility. It is noteworthy that the fuzzy regression discontinuity estimate for the sample of individuals in single adult households with young children rises to 24.7 percent, a very large effect.

This demonstrates that the programme effects on labour force participation are concentrated on households with one adult and young children, and that the disaggregation by household composition and sex is crucial to capture these effects. For the sample of adults as a whole, no significant effects can be observed. This confirms that receipt of antipoverty transfers like *Familias en Acción* does not necessarily lead to adverse effects on labour force participation, and helps us reject claims that these programmes could have observable moral hazards behavioural responses. More positively, the results suggest that among households facing constraints on their capacity to allocate their labour resources, antipoverty transfers can have strong positive effects in raising participation rates. Interestingly, standard microeconomic models of labour force participation would predict that adverse labour supply effects are likely to be a function of the level of the transfer. In fact, the households receiving the consumption supplement (income effects) show the strongest positive effects on labour force participation.

Turning to employment, the table presents only the estimates for males, as the estimates for the whole sample and for females did not generate significant results. They confirm significant difference in employment at the threshold of eligibility. The estimated effects are in line with the labour force participation effects, suggesting that the differences in activity rates are largely

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[9] The estimations controlled for the trend inthe outcome variable around the threshold. We used the Stata programme rdob.ado available on the Guido Imbens' website: http://scholar.harvard.edu/imbens/scholar_software/regression-discontinuity (accessed 4 June 2013).

Table 3. Regression discontinuity results

Outcome variable	21 years old and over			21-35 years old			One adult in household + children 0-6			Two or more adults in household + children 0-6		
	Sharp	Fuzzy	OBW	Sharp	Fuzzy	OBW	Sharp	Fuzzy	OBW	Sharp	Fuzzy	OBW
Labour participation							0.087*	0.241*	0.92			
							(0.018)	(0.050)				
Labour participation – Male	0.023*	0.047*	0.24	0.029*	0.079*	0.28				0.017***	0.040**	0.36
	(0.008)	(0.017)		(0.010)	(0.029)					(0.010)	(0.023)	
Labour participation – Female							0.061*	0.105*	0.70			
							(0.013)	(0.022)				
Employed – Male	0.028*	0.071*	0.28	0.025**	0.059**	0.35						
	(0.008)	(0.020)		(0.012)	(0.027)							
Employed with health insurance – Female	0.032*	0.064*	0.06							-0.029**	0.039**	- 0.55
	(0.003)	(0.007)								(0.015)	(0.020)	
Weeks of job search	0.329**	1.735**	2.80				-2.750*	-3.705*	3.66			
	(0.163)	(0.859)					(1.092)	(1.471)				
Weeks of job search – Male	0.657*	2.913*	3.00	0.584**	2.289**	2.88						
	(0.190)	(0.845)		(0.246)	(0.968)							
Weeks of job search – Female							-3.188*	-4.386*	3.79			
							1.266	1.741				

Authors' estimation based on SISBEN 2010 data with eligibility defined by 2006 data.
Observations are restricted to individuals aged 21 and above.
Empty cells are for zero or non-significant effects.
* significant at 1%; ** significant at 5%; *** significant at 10%.
Standard errors in brackets.
OBW stands for Optimal Band Width (Imbens and Kalyanaraman 2012).

explained by differences in employment in the sample. The effects are larger for the fuzzy regression discontinuity design.[10]

The data contains information on whether employment includes health insurance coverage. As discussed above, coverage of health insurance as part of the employment package in Colombia is a very good predictor of formality in employment. In fact, informality is often defined and measured as the absence of employee benefits mandated by law. The estimates of the difference at the threshold of eligibility indicate a positive and significant effect for women, or 3.2 percent for the sharp regression discontinuity design and double that for the fuzzy design. These estimates suggest that the *Familias en Acción* programme in Colombia facilitates formal employment among women beneficiaries when compared to non-eligible women, at the margins of eligibility. None of the estimates of this effect for males turned out to be significant. This is an interesting result, on which there is very little qualitative evidence for Colombia, which could illuminate on the specific channels through which these effects might operate.

Finally, we turn to the results on job search. The SISBEN questionnaire collects information on job search from individuals reporting being active in the labour market and looking for employment. This is measured in weeks of job search. The estimated effects are all positive, suggesting a more extended job search for eligible individuals at the threshold of eligibility compared to non-eligible individuals. The estimates are significant for the full sample of adults. They are significant for males in the full sample of adults aged 21 and over and in the 21-35 age group. The estimated effects from the fuzzy regression discontinuity estimation are much larger: over three times larger than the sharp estimates. For the sample as a whole, the discontinuity effects are 2.9 weeks in the fuzzy estimation and 0.3 weeks in the sharp estimation.

They are also significant for women in households with children aged 0 to 6, but for these groups the job search discontinuity effects are negative, indicating a shortening of job search. Here the measured discontinuity effects for the sharp and the fuzzy design are very similar, At the threshold of eligibility unemployed women living alone with young children have 3.1 fewer weeks of job search than eligible women in the sharp model, and 4.3 fewer weeks of job search in the fuzzy model. It is interesting that the job search estimates are of a different sign for males and females, and negative for single women with young children.

To sum up the main findings, we established that participation in *Familias en Acción* does not lead to significant effects on the activity rates of all adults, but the programme has significant and positive effects for specific sub-groups. It has marginal positive effects on the participation of males, including those in households with two or more adults and young children. But larger effects on the activity rates of adults in households with one adult and young children, a group in

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[10] Further sample restrictions done as part of the study but not revealed here indicate significant and positive employment rate differences at the threshold of eligibility for the sample of adults in Bogotá, the capital city, the estimated difference is around 2 percent. Results are significant and negative for women in Bogotá, a -4 percent difference for this group; but with a positive and significant difference for single women with young children in the sample.

which women outnumber men three to one. We also established that participation in the programme increases employment rates of males at the threshold of eligibility and the employment of women in formal employment. The results also point to a lengthening in job search among males and a shortening of job search among women in households with one adult and young children.

Taken together, the findings suggest rejecting concerns over potential adverse effects of antipoverty transfer programmes on labour market incentives and outcomes. This is important in order to lift concerns about dependency effects from well designed and implemented programmes in low- and middle-income countries. The fact that antipoverty transfers have few adverse effects on labour market incentives, especially when compared with the vast literature on these effects in high-income countries (Moffitt, 2002), has several explanations. In low- and middle-income countries, antipoverty transfers provide a fixed supplement to the income and consumption of households in poverty, as opposed to income maintenance benefits common in high-income countries, which fill in the poverty gap for households. Moreover, in low- and middle-income countries, antipoverty transfers are widely shared within extended households. In low- and middle-income countries, income taxes are restricted to a small

segment of high earners and seldom reach low-income groups, whereas in high-income countries it is the combination of income taxes and benefits which generates benefit traps. Antipoverty transfers in low- and middle-income countries entitlement tests are focused on socio-economic status and seldom have work tests.

More positively, the findings add to the growing body of evidence suggesting that antipoverty transfer programmes can be a powerful instrument helping households to overcome constraints in the allocation of their productive resources (Ardington, et al., 2009; Barrientos, 2012). This implies that labour supply effects depend to a large extent on the nature and scale of constraints facing households in poverty. The impact of *Familias en Acción* on households with young children was found to be quite different, depending on whether households had one or more adults. The particular features of urban labour markets in Colombia and household composition are important here. Our findings suggest the need to pay attention to labour supply effects at a disaggregated level. Perhaps the broader conclusion is that antipoverty programmes have important labour supply effects for some groups of participants, but less so for other groups. Antipoverty transfer programmes have the potential to help households in poverty to overcome constraints and open up sustainable paths out poverty.

5. Conclusions

The paper examined the effects of participation in *Familias en Acción* on labour outcomes. Our strategy to identify these effects relied on a regression discontinuity design, in which the forcing variable was the welfare score used to determine eligibility for participation. A large panel dataset enabled the analysis to associate welfare scores defined in 2006, prior to the

implementation of the programme in urban areas in Colombia in 2007, with labour market outcomes in 2010. We find that for a full sample of adults in urban areas, the differences in activity at the margins of eligibility are positive but not significant, confirming the main findings in the literature that antipoverty transfer programmes have very marginal effects on labour supply. Disaggregating the sample by gender suggest a small but positive increase in the labour supply of males. Disaggregating the sample by the household composition in households with children aged 0-6 finds large and positive effects on activity rates among households with single adults. As in these households women adults outnumber adult males three to one, there is also a strong gender dimension to these effects. In addition, we find a positive effect of the programme on formal employment among women, and a positive effect on the length of job search among men, this effect being negative for single adult households with young children. In most cases, the size of the effects is moderate to small.

Our approach to estimating these effects and the large panel dataset employed gives substantive internal validity to the findings. Lee and Lemieux (2009) make a strong case for approaching regression discontinuity design as a form of randomised experiment, especially for observations around the discontinuity threshold. Providing the regression discontinuity design is appropriate and with the aid of large datasets enabling the minimisation of biases in the estimates, regression discontinuity estimates can be preferable to competing methods. The randomisation inherent in the regression discontinuity design has the implication that the view that estimates have applicability only in the neighbourhood of the discontinuity threshold is perhaps unduly pessimistic (Lee and Lemieux, 2009).

The findings suggest that labour supply effects from participation in antipoverty programmes are small, but generally positive and that the effects are heterogeneous in household composition and gender. Overall, the observed labour supply effects point to the fact that households respond to antipoverty transfers, such as *Familias en Acción*, by re-allocating their household productive resources, labour being the most significant for low- and middle-income households. A re-allocation of productive resources is likely to have larger effects among households facing stronger constraints prior to the implementation of the transfer programme.

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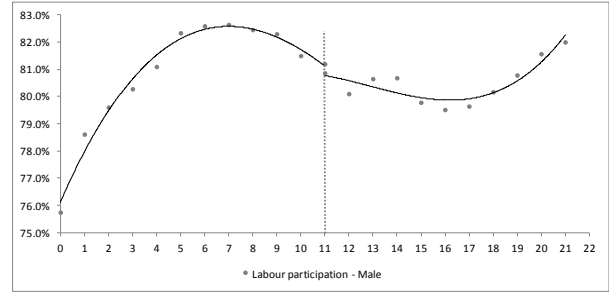
Appendix 1: Outcome figures

Figure A1: Labour force participation by welfare score.
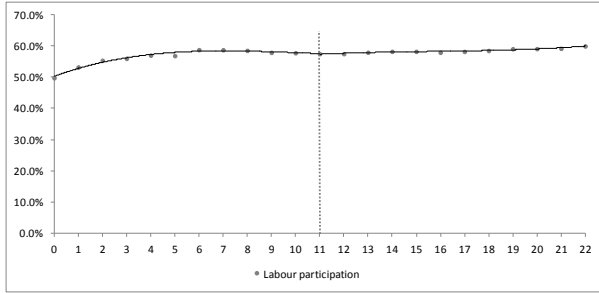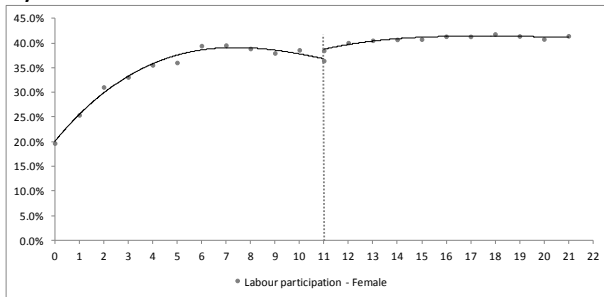

Source: Data from 2010 using welfare scores from 2006.

Figure A2: Labour force participation (males) by welfare score.

Source: Data from 2010 using welfare scores from 2006.

Figure A3: Labour force participation (females) by welfare score.
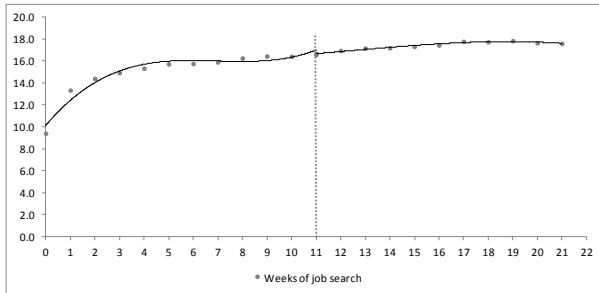

Source: Data from 2010 using welfare scores from 2006.

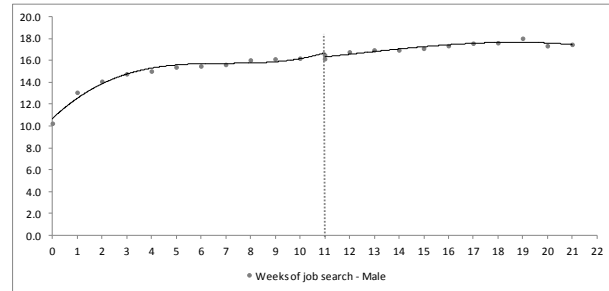Figure A4: Employed (male) by welfare score.

Source: Data from 2010 using welfare scores from 2006.

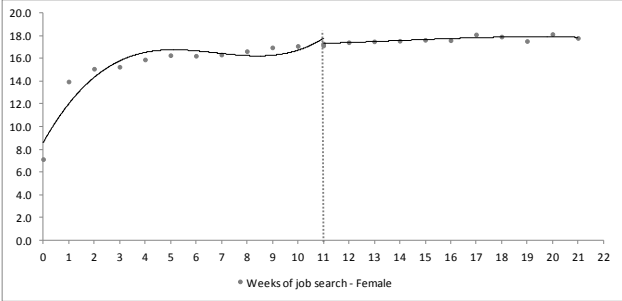Figure A5: Weeks of job search by welfare score.

Source: Data from 2010 using welfare scores from 2006.

Figure A6: Weeks of job search (male) by welfare score.

Source: Data from 2010 using welfare scores from 2006.

Figure A7: Weeks of job search (female) by welfare score.

Source: Data from 2010 using welfare scores from 2006.

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The Brooks World Poverty Institute (BWPI) creates and shares knowledge to help end global poverty.

BWPI is multidisciplinary, researching poverty in both the rich and poor worlds.

Our aim is to better understand why people are poor, what keeps them trapped in poverty and how they can be helped - drawing upon the very best international practice in research and policy making.

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