Household Income Trajectories, PROGRESA-Oportunidades, and Child Well-being at Pre-school Age in Rural Mexico

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Abstract

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Keywords

Child poverty; child well-being; rural Mexico; income trajectories; PROGRESA-Oportunidades

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Introduction

During the first five years in life, children undergo drastic physical, cognitive, and emotional changes (Berk 2007; Shonkoff and Philipps 2000). Evidence (Blau 1999; Duncan and Brooks-Gunn 1997; Gershoff *et al* 2007) has consistently pointed out that poverty suffered during this period undermines children's development and capabilities. Therefore, numerous early childhood intervention programmes have aimed at counterbalancing the negative effects of deprivation on children. Oportunidades, originally named PROGRESA, is a conditional cash transfer programme that started in 1997 in some of the poorest rural communities in Mexico, which provides a monetary aid to each child in school age living in recipient households. In order to receive the benefit, all members of the household are required to take part in regular medical check-ups and school-aged children need to meet certain attendance standards. Additionally, infants and expecting mothers receive a nutritional supplement. PROGRESA-Oportunidades has experienced several changes since its creation: in 2003 the programme was expanded to urban areas and to include teenagers attending high school and in 2008 a monetary benefit for the elderly and a cash transfer for helping the household to meet the costs of public services were also included. In late 2014, the programme was announced to incorporate additional employment and financial services and was renamed as Prospera[i].

Research on the effects of PROGRESA-Oportunidades on children has found a positive impact of the programme on better growth in height, lower prevalence of anaemia (Behrman and Hoddinott 2005; Fernald, Gertler, and Neufeld 2009; Leroy, Ruel, and Verhofstadt 2009; Rivera *et al* 2004), and improved cognitive and socio-emotional outcomes (Fernald, Gertler, and Neufeld 2008). This paper contributes to the evaluations on the effects of PROGRESA-Oportunidades on children by incorporating a longitudinal perspective of household poverty, which seems especially important in childhood studies given the dynamic and plastic nature of child development (Brooks-Gunn 1997; Lewit, Terman, and Behrman 1997; Strohschein 2005; Wagmiller *et al* 2006). Longitudinal approaches of poverty have been used in childhood studies by using average household income over a period of time (Blau 1999; Korenman, Miller and Sjaastad 1995), by categorising poverty experiences according to duration of low-income (Wagmiller *et al* 2006), or by looking at income trajectories (Dearing, McCartney, and Taylor 2001; Strohschein 2005). This paper follows this last approach by looking at the effects of PROGRESA-Oportunidades on the relationship between overall household income trajectories and indicators of well-being at pre-school age in rural Mexico. This is,

by looking at income's starting point and overall changes over time, and whether PROGRESA-Oportunidades shaped these.

This article is based on the premise that investments on children, like PROGRESA-Oportunidades, boost their capabilities to enjoy their childhood in the here and now, exercise their rights, fulfil their corresponding roles in society, and prepare for the future. Three hypothesis are explored: (H1) The level of poverty in which the child was born is associated with child well-being at pre-school age regardless of income trajectory over time; (H2) declining household income is associated with worse indicators of well-being and improving household income is associated with better outcomes; and (H3) PROGRESA-Oportunidades has positive effects on child development, which could be observed as early as the pre-school years.

Data and Methods

The study extracts information from the Survey of Socio-Economic Characteristics of the Households and the Household Evaluation Surveys (ENCASEH/ENCEL, from their names in Spanish), which is the survey designed to evaluate PROGRESA-Oportunidades. The baseline consists of two questionnaires, one conducted in October 1997 and another one in March 1998 and six subsequent waves were carried out: October 1998, March 1999, November 1999, and March 2000, October 2000, and August in 2003. The sample includes all households from 506 rural communities, from which 320 were randomly assigned as treatment and 186 as control, which were allocated in a waiting list to be included in the programme in 2000. Hence, the ENCASEH/ENCEL 1997-2000 provides information for around 25,000 households and 140,000 individuals in each wave. In 2003, a new control group was added to evaluate the impact of the programme on those who started benefiting from it in 2000 (the original control group). This round of the panel expanded the questionnaire to include biometric information and tests for cognitive development, motor co-ordination, and socio-emotional wellness for children aged 2-6 years, their mothers, and teenagers.

This piece of work extracts information from children who were born between January 1997 and November 1999, so it is possible to follow their circumstances from around the time of birth to the moment when the indicators of child well-being are provided (2003). As a result, there are around 2,300 children aged 4-6 years in 2003 for whose socio-economic information is available throughout the panel.

Variables[ii]

Dependent variables: The dependent variables were obtained from the ENCEL 2003 and were organised in four dimensions of child well-being: physical health, cognitive ability, motor co-ordination, and emotional competence at 4-6 years of age. Physical health was measured by height-for-age and weight-for-age. Cognitive ability was assessed through the Hispano-American version of the Peabody Picture Vocabulary Test (PPVT) and the Woodcock-Johnson Test, which assess vocabulary, memory, and oral comprehension. Motor co-ordination was measured through the McCarthy test, which refers to children´s ability to: walk backwards, walk on tip-toes, walk in a straight line, skip, and stand on one foot. Emotional competence was measured through a short version of the Achenbach Child Behaviour Checklist, including 25 questions on social, emotional, and conduct problems according to parental assessment.

Independent variable: The independent variable is household income, which was measured by adding any income received during the last six months by main payroll employment or gained in the informal labour market, pensions, interests, rent, and public transfers. Figures were deflated to look at real income in 1997 terms; top and bottom 1% of the sample were excluded to eliminate outliers; and equivalisation was applied to account for household composition. Equivalisation, which assigns weights to each household member according to their age and how many people from each age group live in the household, was applied using the OECD scale (OECD 2013), which is commonly used in Mexico as well as in other OECD countries. Finally, equivalised income figures were transformed into logarithm to normalise the distribution. This process was repeated for each wave of the panel between 1997 and 2003.

Taking into account that this is a longitudinal survey and therefore children in the sample were born in different waves of the panel, it was necessary to link year-based information with time-points in the child´s life. Therefore, household income around birth refers to indicators of the first wave in which the child appears in the panel. Information at 12, 18, 24, 30, 36, and 42 months of the child´s life was calculated with the subsequent waves. Current household income was extracted from the 2003 survey, so it refers to the specific age of children in that wave.

Controls: Child well-being is controlled for gender, ethnicity (indigenous or non-indigenous), proportion of children in the household, maternal age, and maternal education level, which have

been found to be predictors of child outcomes in existing evidence (Aldaz-Carroll and Moran 2001; Desai 1995; Duncan, Brooks-Gunn, and Klebanov 1994; Gershoff *et al* 2007; Guo and Harris 2000; Griffore and Phenice 2008; McCulloch and Joshi 2002; Smith, Brooks-Gunn, and Klebanov 1997; Whitehurst and Fischel 2000). Household income is controlled for participation in PROGRESA-Oportunidades to look at the effect of the programme on the treatment versus the control group, and indigenous background. Indigenous background is included as a control for both child well-being and household material circumstances because it controls for possible phenotype differences that could be shown particularly in height-for-age and for language differences that could be shown in the Peabody and Woodcock-Johnson Tests as well as for financial differences at the household level.

Models

The models measure the extent to which PROGRESA-Oportunidades shaped the overall trajectories of household income over time and their association with indicators of child well-being at pre-school age. The theoretical foundations of the models are based on the Human Capital Investment Theory, which asserts that child development is the result of tangible and intangible investments in the child (Becker 1981). Material investments on children could take the form of nutrition, healthcare, books, or access to cultural and educative events. Non-material investments on children include "skills and abilities, personality, appearance, reputation, and appropriate credentials" (Becker and Tomes 1986, S6). Consequently, when resources are limited, children find scarce opportunities to flourish physically, intellectually, and socially and the indicators of child development are negatively affected. Therefore, the models are based on the assumption that low income undermines the capacity of households to provide nutrition, education, healthcare, and other investments in children. As argued elsewhere (Bennett 2006; Brooks-Gunn and Duncan 1997; Lewit, Terman, and Behrman 1997), income is not sufficient but is necessary for providing goods and services that are beneficial for children. By providing some income aid, PROGRESA-Oportunidades is assumed to positively influence investments on children.

The analysis was conducted with Structural Equation Modelling (SEM), an umbrella method that allows the creation of concepts (latent variables) based on observed indicators as well as the inclusion of various statistical procedures in a single model. "Based on knowledge of the theory, empirical research, or both, [the researcher] postulates relations between observed measures and

the underlying factors a priori and then tests this hypothesized structure statistically" (Kline 2005, 6). With SEM, it is possible to develop complex models that handle simultaneous relationships between numerous independent variables and outcome variables, in a cross-sectional as well as in a longitudinal way. Given its confirmatory nature and the technical sophistication that it can handle, SEM is helpful in testing theories and assumed interactions between concepts, either measured as latent variables or as observed variables. In this paper, the models test hypothesised relationships about household income, socio-economic characteristics, and child well-being as well as the effects of PROGRESA-Oportunidades on child development.

The modelling strategy was conducted in three stages: the modelling of household income over time, the modelling of child well-being, and the association between those two along with the effects of the cash transfer programme on children. To examine the longitudinal experience of household income for the sample over the period 1997-2003, it was necessary to model the underlying pattern of income over time by establishing a starting point (intercept) and its rate of change over time (slope). The income trajectory of the sample is embedded in the Mexican context in the late nineties, which corresponds to the immediate period after the crisis of 1995. Even though household income increases in real terms after the second half of 1999, it is not until 2003 when households reached the same level that they had in 1997 (World Bank 2005). As summarised in Table 1, aggregate figures for income in this sample show that there was a slight decline after 1997 and a slow but steady recovery after the second half of 1999: Mean OECD-equivalised weekly income in this sample went from 81.23 Mexican Pesos in 1997 to its lowest point, 56.58 Mexican Pesos, in March 1999. Then, it showed a stable increase up to 94.86 in September 2003.

(Table 1 here)

Known as piece-wise modelling, the longitudinal experience of household income is modelled to reflect the economic trend during this period through by incorporating two slopes that mark key time-points in this sample: one that measures the overall decline from 1997 to mid-1999 and another one that measures the generally observed recovery until 2003[iii]. Annex 1 shows the graph of the actual mean income of the sample between 1997 and 2003 and the two calculated slopes of the income trajectory model.

Child well-being (illustrated in Figure 1; factor loadings presented in Table 2) was examined through four latent variables: physical health, cognitive ability, motor co-ordination, and emotional competence. Each latent variable is measured through observed indicators that are related with each other in statistical and substantial ways; physical health is measured through height-for-age and weight-for-age; cognitive ability is measured through questions that assess memory and vocabulary; motor co-ordination is measured through physical ability tests; and emotional competence is measured through behavioural indicators. Using SEM to develop a measurement model of child well-being presents some advantages over other statistical methods: by including latent variables for each dimension of child development it is possible to refer to broader dimensions of well-being instead of looking at each indicator independently; for example, it is possible to evaluate the effects of income on "cognitive ability" instead of on performance on each item of the questionnaires. Also, SEM makes it possible to account for correlations between dimensions of child well-being which are related in developmental terms but not necessarily affected by income or the cash transfer in the same way.

(Figure 1 here)

(Table 2 here)

Finally, a model was developed to evaluate whether overall income trajectory and PROGRESA-Oportunidades were associated with child well-being in 2003. This model linked income trajectory and participation in the cash transfer programme to the measurement model of child well-being. In concrete, the analysis of the association between household income over the child´s life, PROGRESA-Oportunidades, and child well-being at age 4-6 years was conducted by simultaneous regressions for each of the four dimensions of child well-being (physical health, cognitive ability, motor co-ordination, and emotional competence) on the intercept and the slopes of household income, which were in turn regressed on whether the household received the cash transfer or not. While the regressions on the intercept examine whether initial level of household income is associated with indicators of well-being 4-6 years later, the regressions on the slopes assess the extent to which income change is associated with such indicators of child development.

Given that children were born at different moments of the panel, a model was created for each age cohort to make it possible to adjust the household income data available in the ENCASEH-ENCEL to the child´s life-experience. These models look at the household income trajectory from

around the time the child was born until he or she reached 4-6 years of age. For all cohorts, the models examine the association between the indicators of well-being and the level of household income around the time the child was born (captured by the intercept). The effects of changes in household income are captured by the slopes. For the 6-year-old cohort, the models examine the extent to which overall declining slope from October 1997 to mid-1999 and the general recovery slope after mid-1999 are associated with indicators of well-being in September 2003.For the 5-year-olds, the models look at the effects of the declining slope from 1998 to mid-1999 and the recovery slope from that point onwards on indicators of well-being in 2003. For the 4-year-old cohort, indicators of well-being are examined through a sole slope, from mid-1999 to 2003, which reflects their life-time experience.

Results

Table 3 presents the results on the association between household income trajectories[iv] and the dimensions of child well-being measured in 2003. The three models show robust goodness-of-fit tests, with CFI and TLI of almost .90 for the models for the 6 and 5-year-olds and .93 for the 4-year-olds; RMSEA lower than .06 for all of them, and relatively low Chi-Squares[v].

The interpretation of the effects of household income on child well-being needs to take into consideration that household income is measured in natural logarithmic figures. Natural logarithmic figures represent the exponent by which the constant *e* (2.72) needs to be raised to produce the original value. Logarithmic values are a smaller scale of original values; each logarithmic unit is set on the base *e*. Therefore, the effects of log-income on child well-being are not linear even though the regression function has been set as linear. Hence, the interpretation of coefficients in a regression model where the predictors are given in logarithmic units but outcome variables are given in their original scale is: For a coefficient with a value *x*, the expected effect on the outcome variable is the product of *x* by the logarithm of a supposed change in the predictor. For example, the expected effect of a 10% increase in household income on a domain of child well-being would be the product of multiplying the un-standardised coefficient yielded on that domain by log(1.10). Therefore, results are also provided in tables with un-standardised coefficients, expected effects if initial household income increased by 10%, and expected effects of mean rate of income change.

(Table 3 here)

6-year-olds

(Figure 2 here)

For the 6-year-old cohort (Figure 2), the intercept is positively associated with the physical health and cognitive dimensions of well-being. In other words, higher levels of initial household income are associated with better outcomes in the nutritional status of children and their performance in the cognitive ability tests. Specifically, an increase in household income of 2.72 times (1 unit increase in logarithmic income) around the time of birth would be associated with a gain of .57 points of the Standard Deviation (SD) of physical health and with an increase in .95 points of the SD of cognitive ability at age 6 years, compared to the average child in this cohort. Another interpretation would be that a 10% increase in household income would represent a gain of 2.6% in physical health and of 3.7% in cognitive ability (Table 3).

The slopes are also positively associated with physical health and cognitive ability. Generally, positive changes in household income are expected to be reflected in better outcomes for children and declines in household income are expected to be reflected in worse outcomes for children. Each unit that household income is reduced during the period between 1997 and March 1999 (Slope 1), is associated with a reduction of .64 of a SD for each of the physical domain and with a reduction of 1 SD of the cognitive domain. In other words, an average decline in household income of around 25% ($1-\exp^{-.30}$) would be associated with worse physical health by 10% and worse cognitive ability by around 14%.

Slope 2, which represents mean household change from mid-1999 to 2003, proves to be associated in a statistically significant way with cognitive ability at age 6 years, with a standardised coefficient of .48 (Figure 2). In average, mean increase of household income was of 35% ($\exp^{.30}$); this would be expected to be associated with an improvement of 8.7% in cognitive ability (Table 3).

With regard to the effects of PROGRESA-Oportunidades on the intercept and slope of household income for the 6-year-olds (Table 4), the programme was found to be significantly associated in a negative way with the intercept. This reflects that children whose household income was lower in the first place were the ones who received the programme (implying an accurate targeting). Nevertheless,

the programme did not show a statistically significant association with any of the slopes, suggesting that it did not influence the overall income experience for this cohort.

(Table 4 here)

5-year-olds

(Figure 3 here)

For the 5-year-old cohort, the intercept is associated with differences in the physical and cognitive domains. As Figure 3 shows, each point increase in initial household log-income (2.72 times the raw figure of income in Mexican pesos) refers to a gain of .18 and .22 points in the SD of physical health cognitive ability, respectively. Differently expressed (Table 3), a 10% increase in household income around the time of birth would expect a gain of 1.4% in physical health and of almost 1% in cognitive ability at age 5 years.

Contrary to hypothesised, the slopes are not always associated with the domains of well-being. Slope 1, which reflects the overall change in household income from 1997 to mid-1999 is not statistically associated with any of the domains of well-being at age 5 years. Nevertheless, Slope 2, which reflects an overall increasing trend of household income between mid-1999 and 2003, is significantly associated with physical health and cognitive ability. As Figure 3 illustrates, each point increase in log-income from mid-1999 to 2003 is associated with an increase of .14 and .17 points of the SD of physical health and cognitive ability, respectively. That is, the mean experience of household income for this cohort was of an around 22% ($exp^{.20}$) increase from mid-1999 to 2003. This average improvement in household income would account for better physical and cognitive well-being by 2.2% and 1.8%, correspondingly (Table 3).

With regard to the effects of PROGRESA-Oportunidades on the intercept and slope of household income for the 5-year-olds (Table 4), it was also found to be significantly associated in a negative way with the intercept, meaning that children who were originally worse off started to receive the cash transfer. Contrary to the effects of the programme on the income trajectories of the 6-year-olds, the programme had a statistically significant association with Slope 1 for the 5-year-olds, suggesting that it had a positive impact in the income experience of this cohort between late 1998 and 1999, possibly as a buffer against the effects of the crisis that just had hit.

4-year-olds

(Figure 4 here)

The association between the intercept and the domains of well-being for the 4-year-old cohort are consistent with the two other cohorts: higher initial levels of household income are generally associated with better child outcomes. Specifically, as Figure 4 illustrates, an increase in household income around the time of birth of 2.72 times (1 point increase in logarithmic income of the intercept) would account for a gain of .32 points in the SD of physical health, .47 points in the SD of cognitive ability, and .30 points in the SD of motor co-ordination. Alternatively, a 10% increase in initial household income would represent an improvement of 5.2% in physical health, of 4% in cognitive ability, and of 3.1% in motor co-ordination (Table 3).

The rate of change of household income from mid-1999 to 2003 (Slope) is also positively associated with two domains of well-being. As shown in Figure 4, each point increase in household income is associated with an improvement of .12 points in the SD of physical health and .27 points in the SD of motor co-ordination. Using the mean rate of household income improvement, which was an average of .20 for this cohort, it is possible to estimate that an average increase in household income of 22% ($exp^{.20}$) would represent 11.6% better physical health and 12.9% better motor co-ordination at age 4 years (Table 3).

With regard to the effects of PROGRESA-Oportunidades on the intercept and slope of household income for the 4-year-olds (Table 4), similarly to the other cohorts, the programme was found to be significantly associated in a negative way with the intercept. Additionally, the programme was also positively associated with the slope, reflecting that the cash transfer had a beneficial influence in the income trajectory of this cohort between 1999 and 2003.

The association between household income and child development

Results from the three cohorts show that household income around the time of birth is positively associated with child outcomes at 4-6 years of age, which is aligned with the findings in previous

research (Dearing, McCartney, and Taylor 2001; Strohschein 2005). For the three cohorts, results indicate that initial level of household income was positively associated with physical health and cognitive ability. In addition, initial household income was also significantly associated with motor co-ordination for the 4-year-olds.

The finding that household income around the time of birth is associated with differences in indicators of well-being at age 4-6 years (H1) is a crucial one. Household income "operates both directly and indirectly on child development. Advantaged households can use their resources to situate themselves in safe neighborhoods, send their children to better-quality schools, and purchase goods and services that engage their children both socially and cognitively. In contrast, poor households spend a greater proportion of their income meeting the basic needs of shelter, food, and clothing, and are thus limited in their ability to provide their children with a similarly stimulating and secure environment. Indirectly, economic hardship can negatively affect the wellbeing of parents, putting children at risk by changing the quality of the parent-child relationship through punitive or neglectful parenting practice" (Strohschein 2005, 360).

The fact that children´s "starting point" (measured through the intercept) with regard to their household income is significantly associated with indicators of well-being at pre-school age implies that disadvantaged children face a gap even before entering other structures that may accelerate social stratification. For instance, in Latin America, one of the social structures that has been found to re-create instead of reduce social gaps is in fact the schooling system (Reimers 2001). The significant associations between household income and certain child outcomes are particularly distinctive in this sample, given that it is comprised only by households living in poor rural communities. Firstly, these findings reinforce the argument that the level of poverty in which the child was born into matters for child outcomes at pre-school age, even after considering changes in household income the child's life. And secondly, results provide further evidence about the impact that programmes like PROGRESA-Oportunidades have on children, visible as early as the pre-school years.

Effects of income changes on child development

Existing evidence on the association between overall income trends during times of economic crisis and child development has found diverse results. While the lingering effects of economic

recessions on people, and particularly in vulnerable groups like children, have been documented (Duncan and Brooks-Gunn 1997; Duncan *et al* 1998; Ravallion 2008; Wagmiller *et al* 2006), certain indicators of child well-being have been found to improve during economic downturns. For example, McKenzie (2003) found that school enrolment in Mexico has higher during the 1994-1996 crisis than before or after that period; and Schady (2004) found that child labour in that country was also lower during the crisis than before or after. Ferreira and Schady (2009) argue that in Latin American countries education outcomes are counter-cyclical possibly because an economic crisis means falling child wages which lead to increased demand for schooling.

In models developed in this paper, the association between income changes over time and well-being indicators at pre-school age (H2) is presenting mixed results. Slope 1, which indicates generally declining household incomes between 1997 and 1999, is associated with some domains of well-being for the 6-year-olds but is not associated in a statistically significant way for the 5-year-olds. Specifically, Slope 1 appears to result in worse outcomes in the physical and cognitive domains for the oldest cohort. A possible explanation is that the effects of declining incomes are manifested in outcomes for the 6-year-olds and not for the 5-year-olds because the negative trend lasted longer for the former group (their first 2 years of life) than for the latter (at most one year).

On the contrary, positive trends of household income are generally associated with better indicators of child well-being. Slope 2, which measures an average improving trend in income between 1999 and 2003, is positively associated with some domains of child well-being for all cohorts of children. Specifically, an improving income trend is associated with better physical health, and motor co-ordination for the 4-year-olds; with better physical health and cognitive ability for the 5-year-olds; and with better cognitive ability for the 6-year-olds. These results could be understood in the light of two observations. One, Slope 2 marks the same trajectory for all cohorts: from mid-1999 to late-2003. And two, the start of Slope 2 represents different moments for each cohort: around the time of birth for the 4-year-old cohort; around age 1 year for the 5-year-old cohort; and around age 2 for the 6-year-old cohort. Taking these two elements into consideration, the differences in the association between Slope 2 and the dimensions of child well-being is perhaps related to the way in which child development takes place: if different dimensions of well-being develop at different rates, changes in household income would appear to be significantly associated with them at different ages. That is, if disparities in motor co-ordination are the greatest around age 4 years but fade away around age 5 years, changes in

household income would matter for the former age-group but not for the latter. Also, if disparities in physical health are more obvious between ages 4 and 5 years than at age 6 years, improvements in household income would be associated with physical health at younger age rather than later. Additionally, if disparities in cognitive ability emerge around the age of 5 years, changes in household income would be associated with performance in the cognitive tests at ages 5 and 6 years but not at age 4. Findings in these models are somewhat similar to previous findings in the literature: "for children in poverty, decreases in income-to-needs were associated with worse outcomes and increases were associated with better outcomes" (Dearing, McCartney and Taylor 2001, 1779).

The effect of Oportunidades: From higher household income to better child outcomes

The association between income changes and indicators of child well-being at pre-school age raise important implications with regard to early childhood intervention programmes or cash transfer programmes like PROGRESA-Oportunidades. In these models, PROGRESA-Oportunidades was found to be positively associated with the income trajectory for the younger two cohorts. The effect of the programme on Slope 1 for the 5-year-old and the 4-year-old cohorts is considerably important. As expected for a cash transfer, for children aged 5 years in 2003, receiving PROGRESA-Oportunidades meant an income of 1 SD ($p < .01$) above of those who did not. This reveals the buffering effect that the programme had on household income in the period after the crisis, suggesting that the cash benefit was positive for household income. For the 4-year-olds, children who lived in households that received the cash transfer increased their income in .93 points of a SD compared to those who did not.

The positive association between being a beneficiary of PROGRESA-Oportunidades and household income could be seen as obvious. However, the effects of the programme on children should be understood as indirect, acting through income, and read under the light of the Human Capital Investment theory. In concrete, PROGRESA-Oportunidades is understood to have an indirect effect on children through the increase in household income that would facilitate better nutrition, better clothing, and better housing than without the cash transfer. This provides support to the hypothesis (H3) that the programme benefitted children indirectly through improving the income conditions of their households. This is consistent with existing evidence on the impact of PROGRESA-Oportunidades on pre-school children, which has mainly been found to be positive (Andalon 2007; Cuevas *et al*, 2016; Fernald,

Gertler, and Neufeld 2009; Gertler and Fernald 2004; Leroy *et al* 2008), taking into consideration that households saw their income increased thanks to the cash transfer. Additionally, the programme also has nutritional, health, and educational components, which could be argued to have a direct effect on infants who took the nutritional supplements and attended the compulsory regular check-ups. Nevertheless, Manley, Fernald and Gertler recently found that "improvements in child development are more linked to the transfers themselves than to other portions of the programme" (2015, 121).

Following the assumptions from the Human Capital Investment theory, increases in household resources would facilitate larger investments in children and consequently better outcomes. The specific ways in which income was invested on children or whether income was associated with quality of parenting cannot be tested using this database. However, empirical evidence elsewhere (Dearing, McCartney, and Taylor 2001; Lugo-Gil and Tamis-LeMonda 2008; Lee *et al* 2009; Wagmiller *et al* 2006) has found that higher income and better material conditions are associated with better indicators of well-being, acting through better nutrition, education, healthcare, and quality parenting.

Other issues

(Table 5 here)

As Table 5 shows, ethnicity was found to be significantly associated with the income intercept, indicating that indigenous households had lower initial level of household income than non-indigenous households. Extensive research has found that indigenous groups in Latin America (CDI, 2016; Hall and Patrinos, 2004) live in the poorest and most marginal areas, tend to have the lowest levels of education and income, and are more likely to suffer from unemployment and health problems. In this sample, indigenous children manifested worse outcomes for health, cognitive, and motor co-ordination than did non-indigenous children. However, indigenous background was not significantly associated with income changes (slopes) between 1997 and 2003. Thus, results indicate that indigenous and non-indigenous households faced the same overall income trajectory between 1997 and 2003 as there are no statistically significant differences in longitudinal income during this period between the two groups. This suggests that indigenous and non-indigenous households were equally affected after the crisis and that income changes are related to other socio-demographic characteristics or to structural issues and not to ethnicity *per se.*

Finally, there are important findings related to the relationship between initial income level and subsequent income experience. For the three cohorts, the intercept is negatively correlated with the slopes. In other words, higher levels of initial income are associated with deeper declines over time. This suggests that households with relatively higher income were expected to be affected by the 1995 crisis in a harsher way than households in the lower end of the income distribution. These results could be derived from a floor-effect, given that the households in this sample have considerably low incomes. These kind of ceiling effects have been found elsewhere: "due in part to 'ceiling or floor'/ 'regression to the mean' effects, such that if a child starts high, he or she has more room to drop, while those who start low do not" (Yang and Schaninger 2010, 235).

Conclusions

This paper explored the extent to which different longitudinal experiences of household income, influenced by the conditional cash transfer programme PROGRESA-Oportunidades, are associated with child well-being at pre-school age. Using longitudinal data for household income between 1997 and 2003 for a sample of children living in rural Mexico, Structural Equation Models were used to capture the association between household income around the time of birth (intercept), overall trajectory of income change over time (slope), taking part in PROGRESA-Oportunidades, and four dimensions of child well-being: physical health, cognitive ability, motor co-ordination, and emotional competence.

Results for three cohorts of children aged 4, 5 and 6 years in 2003 show that, generally, household income around the time of the child's birth is positively associated with well-being at pre-school age. Also, results indicate that overall improving trajectories of household income over the child's life are expected to benefit children. Furthermore, PROGRESA-Oportunidades had a significant positive impact in the income trajectories of the two younger cohorts, which implies an indirect benefit for child development through assumed better investments on children.

Programmes like PROGRESA-Oportunidades could help disadvantaged households to level the starting point for children. According to the results in this study, the positive effects of this type of programmes could be seen as early as the pre-school years. This is important because a vast amount of research has concentrated in how early childhood interventions are associated with outcomes during

adolescence or adulthood, neglecting "the importance of child well-being in the here and now" (Tomlinson, Walker, and Williams 2008, 3). Examining the effects of programmes like PROGRESA-Oportunidades on children help not only to evaluate the effectiveness of early childhood interventions or cash transfer programmes but also to consolidate the idea developed by many scholars (Ben-Arieh 2002; Biggeri and Mehrotra 2008; Camfield, Streuli, and Woodhead 2009) that childhood as a period of life with intrinsic value.

Results in this paper contribute to our knowledge on the association between household income and child development, as well as on the evidence on early childhood interventions. The association found between household income and indicators of child well-being at pre-school age points to the potential benefits of cash transfers on children during the early years, which could be translated into better nutrition, health, and education, especially when conditionalities for such investments are established.

This work has presented a novel approach by using a method that allows the examination of the association between household income, participation in PROGRESA-Oportunidades, and indicators of child health, cognitive development, motor co-ordination, and emotional competence simultaneously. Structural Equation Modelling has the advantage of including various dependent and independent variables, which present a more comprehensive view of child development than evaluations of income on a single developmental indicator.

Further work could be done to unpack the sets of interactions between long-term household income, the effects of early childhood programmes, and other socio-economic variables that shape child development. For example, it would be interesting to examine whether timing of poverty affects children differently and if programmes like PROGRESA-Oportunidades could counterbalance the scarring effects of recurrent and long-term poverty.

Endnotes

i. This paper will refer to the programme as PROGRESA-Oportunidades because those were the names in place when the survey was carried out.
ii. Descriptive statistics are presented in Annex 1.
iii. Various types of slopes were tried. However, the combination of two linear slopes not only shows the best fit statistics but is also supported by the contextual circumstances of the crisis that hit Mexico in 1996, for which recovery signs started to appear in 1999.
iv. The results for the piece-wise modelling for household income trajectory are provided in Annex 3.
v. Typical values that indicate a strong model for the three most widely used tests are: CFI = .90 or higher; TLI = .90 or higher; RMSEA = .05 or lower; and a relatively low Chi-Square. Even though some of the values of the models are be slightly lower than these thresholds, especially for the 6-year-olds given the sample size, common practice is to evaluate the strength of a model by looking at these tests conjointly (Byrne 2001; Kline 2005).

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(Annex 1 here)

(Annex 2 here)

(Annex 3 here)

Table 1. Mean, maximum, and minimum household income; 1997-2003

OECD-equivalised household weekly income in 1997 prices, excluding top and bottom 1% of the sample		1997-September	1998-October	1999-March	1999-November	2000-March	2000-November	2003-September
Mexican Pesos	Maximum	525.00	406.82	246.95	373.95	383.51	498.62	547.53
	Mean	81.23	61.48	56.48	68.28	72.55	70.60	94.86
	Minimum	2.88	2.01	1.67	5.00	5.36	4.02	4.69
Logarithm	Maximum	6.26	6.01	5.51	5.92	5.95	6.21	6.31
	Mean	4.09	3.81	3.71	4.00	4.07	4.01	4.26
	Minimum	1.06	0.70	0.52	1.61	1.68	1.39	1.54
	Number of cases	1779	1663	1463	1670	1688	1635	1782
	Own calculations using Consumer Price Index for each time-point, available at Bank of Mexico´s website							

Table 2. Factor loadings of the measurement model of child well-being

Measurement Model of Child Well-Being			
Dimension of Well-being	**Indicator**	**Un-Standardised Estimate** p < .001	**Standardised Estimate** p < .001
Physical Health	Height-for-Age	1.00+	1.00
	Weight-for-Age	0.58	0.61
Cognitive Ability	Woodcock-Johnson Memory for Names	1.00+	0.64
	Woodcock-Johnson Visual Closure	1.24	0.78
	Woodcock-Johnson Memory for Phrases	0.97	0.62
	Peabody Picture Vocabulary Test	1.17	0.74
Motor Co-ordination	Test 3 : walking on tip-toes	1.00+	0.77
	Test 1: walking backwards	0.98	0.76
	Test 6: skipping	0.87	0.67
	Test 4: standing on the other foot	0.86	0.66
	Test 5: walking on a straight line	1.00	0.77
Emotional Competence	Item 1: arguing	1.00+	0.58
	Item 12: jealousness	0.92	0.53
	Item 2: bragging	1.02	0.59
	Item 4: crying too much	0.99	0.58
	Item 6: demanding too much attention	0.95	0.55
	Item 5: abusiveness	1.00+	0.66
	Item 7: destroying own belonging	0.84	0.55
	Item 8: destroying others´ belongings	0.94	0.62
	Item 9: disobeying	0.81	0.54
	Item 18: getting involved in fights	1.06	0.70
	Item 19: getting involved with problematic people	0.80	0.53
	Item 3: feeling lonely	1.00+	0.58
	Item 11: guiltless	0.75	0.44
	Item 13: afraid of acting wrong	1.07	0.63
	Item 14: feels that has to be perfect	0.70	0.41
	Item 15: feeling unloved	1.32	0.77
	Item 16: feeling that others are out to get him/her	1.25	0.73
	Item 17: feeling inferior	1.30	0.76
	Item 20: prefers to be along	0.67	0.39
	Item 25: feeling guilty	1.22	0.71
	Item 21: cheating	1.00+	0.60
	Item 22: nervous/tense	1.00	0.55
	Item 23: anxious/fearful	0.82	0.49
	Item 26: overtired	1.00	0.60
	Item 24: feels dizzy	1.05	0.62
Second order (sub-divisions of emotional competence)	Misbehaviour	1.00+	0.92
	Aggresiveness	1.09	0.87
	Self-Esteem	0.84	0.77
	Somatisation	0.98	0.87
+ Fixed at 1 to establish the scale.			
ChiSquare: 1238.718 (df = 332). CFI: .912; TLI: .938; RMSEA: .038; N: 1854			

Table 3. Effects of intercept and slopes on each cohort; un-standardised coefficients

		Intercept		Slope 1		Slope 2	
		Un-standardised Coefficient (b)	**(b) x log(1.10)**	**Un-standardised Coefficient (b)**	**(b) x log(.75)**	**Un-standardised Coefficient (b)**	**(b) x log(1.35)**
6-year-olds	**Physical**	0.622***	0.026	0.830***	-0.104	0.335 NS	-
	Cognitive	0.891***	0.037	1.122***	-0.140	0.668***	0.087
	Motor	0.659NS	-	0.983 NS	-	0.849 NS	-
	Emotional	-0.053 NS	-	0.088 NS	-	0.032 NS	-
5-year-olds		**Un-standardised Coefficient (b)**	**(b) x log(1.10)**	**Un-standardised Coefficient (b)**	**(b) x log(.88)**	**Un-standardised Coefficient (b)**	**(b) x log(1.22)**
	Physical	.338***	.014	-0.037 NS	-	.261**	.022
	Cognitive	.250***	.009	0.053 NS	-	.203***	.018
	Motor	-0.052 NS	-	-0.045 NS	-	-0.01 NS	-
	Emotional	-0.081 NS	-	.006 NS	-	-0.042 NS	-
4-year-olds		**Un-standardised Coefficient (b)**	**(b) x log(1.10)**	N/A		**Un-standardised Coefficient (b)**	**(b) x log(1.22)**
	Physical	1.267***	0.052			1.339**	.116
	Cognitive	0.957***	0.040			0.189 NS	-
	Motor	0.757***	0.031			1.886***	.129
	Emotional	0.014 NS	-			0.229 NS	-
	*** significant at .01 NS = Not significant N for 6-year-old cohort= 158 N for 5-year-old cohort = 870						

Table 4. Effects of PROGRESA-Oportunidades and ethnicity on the intercept and slopes

		Intercept	Slope 1	Slope 2
6-year-olds	**PROGRESA-Oportunidades**	-.436***	.852 NS	.005 NS
	Ethnicity	-.430***	-.651 NS	.149 NS
5-year-olds	**PROGRESA-Oportunidades**	-.273***	1.00***	.038 NS
	Ethnicity	-.317***	-.155NS	-.109 NS
4-year-olds	**PROGRESA-Oportunidades**	-.491***	N/A	.930***
	Ethnicity	-.471***	N/A	.233 NS
	*** significant at .01 ** significant at .05 NS = Not significant			

Table 5. Effects of socio-demographic controls on the measurement model of child well-being

Control / Cohort	**6-year-olds** N = 158	**5-year-olds** N = 870	**4-year-olds** N = 655
Gender	Physical: .174^{NS} Cognitive: .017^{NS} Motor: .034^{NS} Emotional: .072^{NS}	Physical: .032^{NS} Cognitive: .078^{NS} Motor: .045^{NS} Emotional: .012^{NS}	Physical: .048^{NS} Cognitive: .036^{NS} Motor: -.016^{NS} Emotional: -.067^{NS}
Indigenous background	Physical: -.225* Cognitive: -.411*** Motor: .646^{NS} Emotional: -.164^{NS}	Physical: -.125*** Cognitive: -.206*** Motor: -.114** Emotional: -.078^{NS}	Physical: -.181*** Cognitive: -.252*** Motor: -.225*** Emotional: -.082^{NS}
Proportion of children in the household	Physical: -.055^{NS} Cognitive: -.144* Motor: .241^{NS} Emotional: -.033^{NS}	Physical: -.132** Cognitive : -.210*** Motor: .044^{NS} Emotional: .053^{NS}	Physical: -.131*** Cognitive: -.152*** Motor: -.122** Emotional: .032^{NS}
Maternal education level	Physical: .263** Cognitive: .336*** Motor: .203^{NS} Emotional: -.090^{NS}	Physical: .235*** Cognitive: .392*** Motor: .121** Emotional : .035^{NS}	Physical: .254*** Cognitive: .382*** Motor: .161*** Emotional: .066^{NS}
Maternal age	Physical: .292** Cognitive: .081^{NS} Motor: -.643^{NS} Emotional: .146^{NS}	Physical : .127** Cognitive : .091** Motor: -.005^{NS} Emotional: .030^{NS}	Physical : .127*** Cognitive: .121*** Motor: .104* Emotional : .095*
Standardised coefficients. ***significant at .01 **significant at .05 * significant at .10 NS = Not significant			

Figure 1. Measurement model of child well-being.

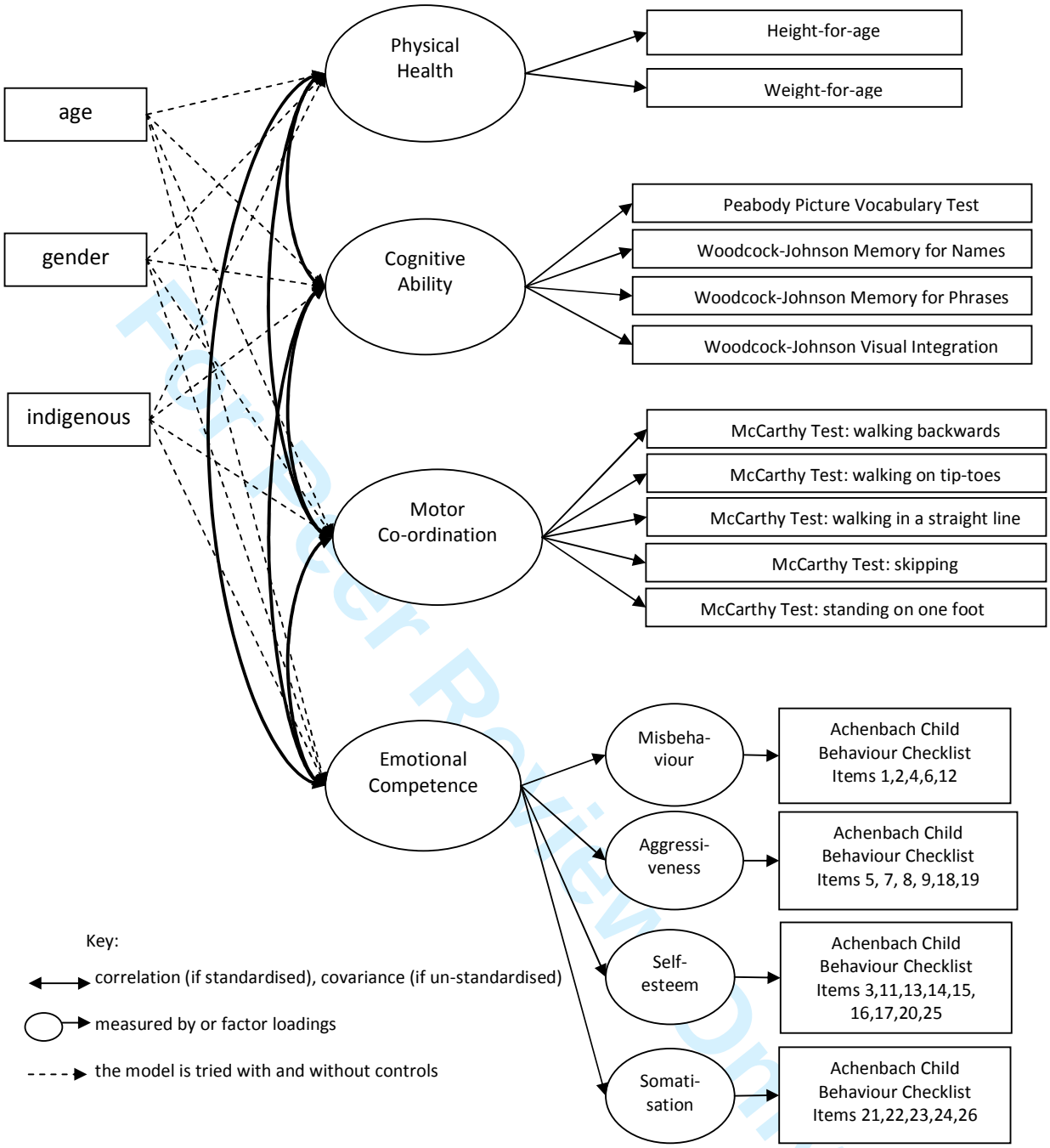
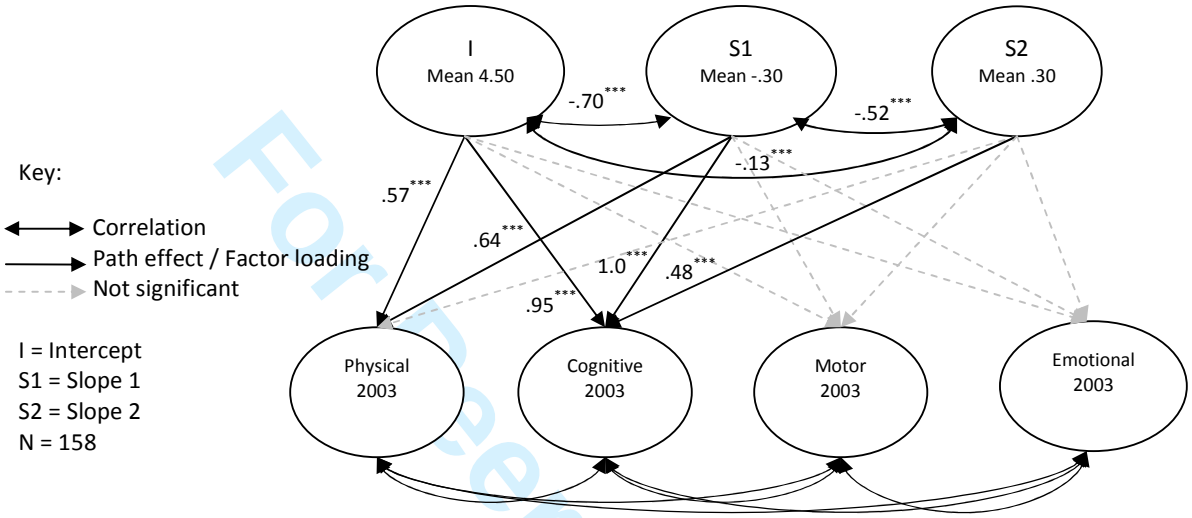
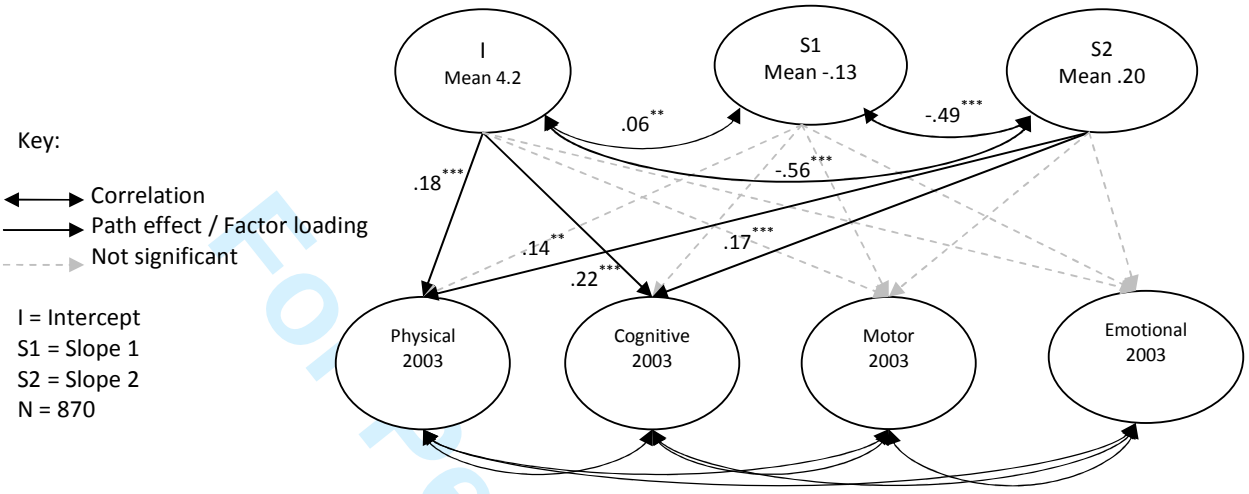


Figure 2. Results for 6-Year-olds: Effects of household income trajectory on child well-being



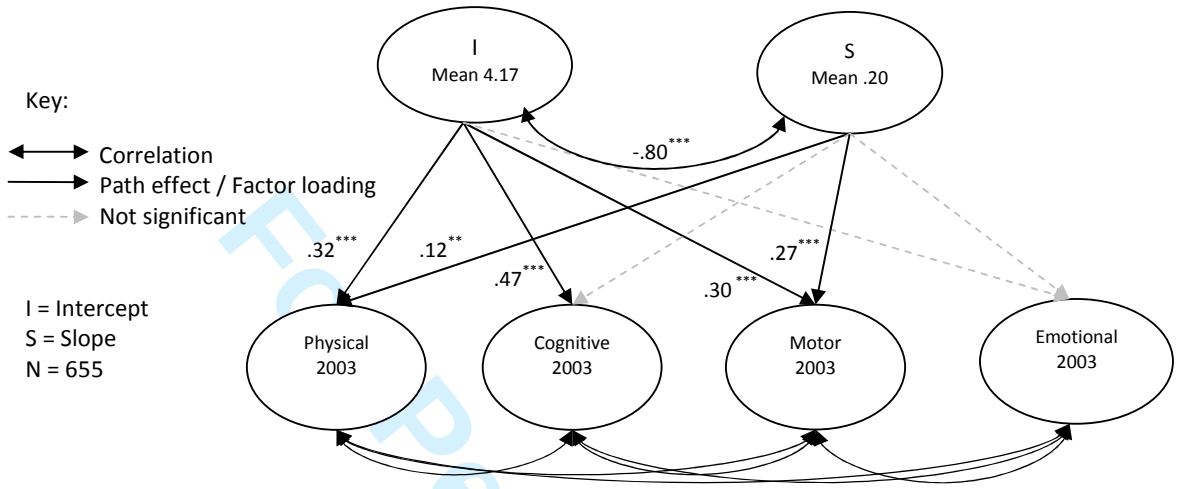
Standardised coefficients. Only significant are shown. *** significant at .01.
ChiSq = 189.388 (df = 109) CFI = .833 TLI = .850 RMSEA = .06
Controls on Intercept and Slopes: PROGRESA-Oportunidades and indigenous background
Controls on child well-being: child gender, ethnicity, proportion of children in the household, maternal age, maternal education

Figure 3. Results for 5-Year-olds: Effects of household income trajectory on child well-being



Standardised coefficients. Only significant are shown. *** significant at .01. ** significant at .05.
Even though the theoretical model for the 5-year-olds starts on 1998; income for 1997 had to be included as MPlus needs at least 3 time-points to calculate a slope.
ChiSq = 1094.02 (df = 337) CFI = .818 TLI = .853 RMSEA = .050
Controls on Intercept and Slopes: PROGRESA-Oportunidades and indigenous background
Controls on child well-being: child gender, ethnicity, proportion of children in the household, maternal age, maternal education

Figure 4. Results for 4-Year-olds: Effects of household income trajectory on child well-being



Standardised coefficients. Only significant are shown. *** significant at .01. ** Significant at .05
ChiSq = 485.044 (df = 259) CFI = .930 TLI = .945 RMSEA = .034
Controls on Intercept and Slopes: PROGRESA-Oportunidades and indigenous background
Controls on child well-being: child gender, ethnicity, proportion of children in the household, maternal age, maternal education

Annex 1. Descriptive statistics

Age of child	4 years: 45.7%	5 years: 50.5%	6 years: 3.8%
Gender	Female: 49.7%	Male: 50.3%	
Indigenous background	Yes: 42.8%	No: 57.0%	No Answer: 0.2%
Oportunidades	Yes: 76.6%	No: 23.4%	
Maternal education (years of formal education)	0 (no education): 17.5 % 1 year: 3.5% 2 years: 9.0 % 3 years: 12.0% 4 years: 7.9%	5 years: 5.4% 6 years: 31.2% 7 years: 1.2% 8 years: 1.4%	9 years: 9.3% 10 years: 0.1% 11 years: 0.5% 12 years: 1.2%

	Healthy range (within 2 SD of WHO norm)	Out of healthy range (below 2 SD of WHO norm)
Height-for-age	71.1%	28.9%
Weight-for-age	91.6%	8.4%

Woodcock-Johnson and PPVT

	Stanine 1 (highest)	Stanine 2	Stanine 3	Stanine 4	Stanine 5	Stanines 6-9 (lowest)
Woodcock-Johnson Memory for Names	47.9%	13.5%	11.7%	11.1%	8.7%	7.1%
Woodcock-Johnson Visual Closure	34.8%	13.7%	15.5%	12.0%	12.5%	11.6%
Woodcock-Johnson Memory for Phrases	22.6%	10.5%	16.0%	15.6%	14.9%	20.4%
Peabody Picture Vocabulary Test	42.9%	19.5%	15.5%	9.3%	6.1%	6.7%

McCarthy Tests (% of children)

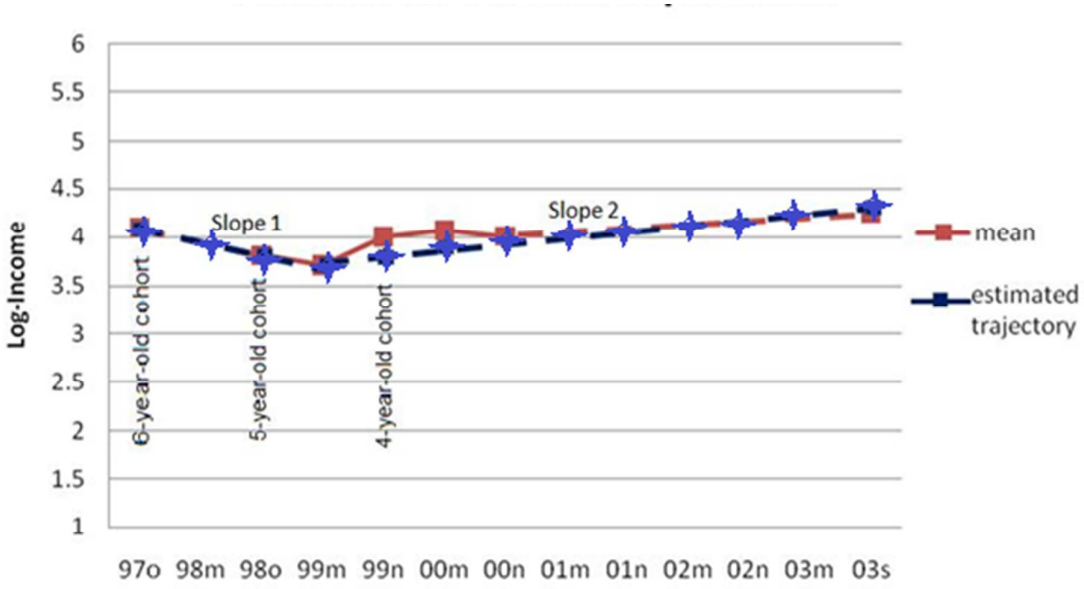
	Not able	Able		Not able	Partially able	Able
McCarthy Test 1: walking backwards	4.5%	95.5%	McCarthy Test 2: standing on one foot	1.8%	29.6%	68.6%
McCarthy Test 3: walking on tip-toes	7.3%	92.7%	McCarthy Test 4: standing on the other foot	2.0%	29.7%	68.2%
McCarthy Test 5: walking in a straight line	7.2%	92.8%	McCarthy Test 6: skipping	19.9%	33.3%	46.7%

Achenbach Child Behavior Checklist (% of children)

	Yes	Some-times	No		Yes	Some-times	No
Item 1: arguing	43.5	19.4	37.1	Item 14: perfectionism	44.2	11.4	44.4
Item 2: bragging	26.5	12.9	60.6	Item 15: feels unloved	26.1	12.9	61.0
Item 3: feeling lonely	25.8	11.8	62.4	Item 16: paranoid	29.5	13.4	57.1
Item 4: crying	27.5	20.4	52.0	Item 17: feels inferior	15.1	8.2	76.6
Item 5: abusiveness	20.7	14.5	64.7	Item 18: fighting	20.6	11.9	67.5
Item 6: demands attention	43.9	15.3	40.8	Item 19: problematic	13.9	9.4	76.7
Item 7: destroys own belongings	39.1	13.3	47.5	Item 20: prefers to be alone	34.6	14.3	51.1
Item 8: destroys other´s belongings	22.4	10.1	67.5	Item 21: cheats and lies	17.8	17.3	64.9
Item 9: disobeying	37.6	29.9	32.5	Item 22: nervous	32.1	14.1	53.7
Item 11: feels guiltless	26.8	13.3	59.9	Item 23: anxious	36.5	13.9	49.6
Item 12: jealousness	49.7	11.7	38.6	Item 24: feels dizzy	7.2	7.3	85.5
Item 13: is afraid of acting wrong	33.6	0.93	57.2	Item 25: feels guilty	18.1	10.6	71.3
				Item 26: overtired	21.8	12.3	65.9

N = 1870

Annex 2. Household mean income trajectory of the sample, 1997-2003



Source: own elaboration

Annex 3. Results for piece-wise modelling of household income trajectory by cohort

	6-year-olds	5-year-olds	4-year-olds
Number of cases	178	947	745
Chi Square (df)	33.096 (20)	59.896 (20)	18.798 (10)
CFI & TLI	.880; .838	.915; .885	.963; .948
RMSEA	.061	.046	.034
	Coefficients		
Mean for Intercept	4.601***	4.173***	4.251***
Mean for Slope 1	-.336**	-.272***	N/A
Mean for Slope 2	.260**	.334***	.123**
Variance for Intercept	.086***	.119***	.062***
Variance for Slope 1	.000+	.000+	N/A
Variance for Slope 2	.022**	.021***	.000+
Correlation Intercept with Slope 1	N/C	N/C	N/A
Correlation Intercept with Slope 2	-.692***	-.691***	N/C
Correlation Slope 1 with Slope 2	N/C	N/C	N/A
Effects of controls on Intercept	ops: -.436*** ind: -.430***	ops: -.273*** ind: -.317***	ops: -.491*** ind: -.471***
Effects of controls on Slope 1	ops: .852NS ind: -.651NS	ops: 1.00*** ind: -.155NS	N/A
Effects of controls on Slope 2	ops: .005NS ind: .149NS	ops: .038NS ind: -.109NS	ops: .930*** ind: .233NS

Means for intercept and slopes are un-standardised values. Correlations between intercept and slope 2 are standardised values. Effects of controls on the intercept and slopes are standardised regression coefficients.
N/A = Not Available because 4-year-olds were born around the start of the second slope.
+ Variance fixed at 0; this is common practice in piece-wise modelling (Muthén and Muthén, 2007, 2011).
N/C = Not Computed because the variance of the Slope 1 was fixed as 0 and therefore correlations with the intercept and Slope 2 cannot be computed. ops = PROGRESA-Oportunidades. ind = indigenous background.
*** significant at .01 ** significant at .05 NS = Not Significant