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Contents

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Summary

This working paper examines the relationship of birth order with time use and parental educational aspirations for school-age children between 4-17 years old. It inspects the role of birth order in time investments, using extensive (school enrolment and child work binary outcomes) and intensive margins (continuous time use outcomes). It also investigates if parental aspirations vary by birth order as potential mechanism explaining time use allocation. Results indicate that being the second born sibling in two-child families has a significant and negative effect on child work. The youngest sibling is 10.8 percentage points less likely to participate in child work and spending 0.81 hours (about 49 minutes) less in care activities of other household members. The results on child work are robust to differences in family size, observed endowments (birthweight and cognitive score), and families with "complete" fertility decisions. I found no conclusive evidence of birth order effects for school participation, time spent in educational activities (school or studying), and time spent in leisure. Notwithstanding the negative result between higher birth order siblings and child work, parents are equally likely to aspire for the highest level of education, a University/Postgraduate degree for both children.

1. Introduction

There is an increasing interest to understand the dynamics and mechanisms along the life-cycle process of skill development and the intergenerational transmission of human capital. Past research documents that the family into which a child is born has a large impact on the course of her/his life. Cunha and Heckman (2007) developed a model on the technology of skill formation of human capital, documenting that child outcomes differences emerge from an early age (even before birth). Interest in the role of birth order driving different outcomes in children initiated from the findings of psychologists and sociologists (R.B. Zajonc, 1976; R.B. Zajonc & Markus, 1975). In the economics literature, the most popular explanations for the presence of birth order effects are resource constraints (e.g. income, access to credits, time spent at work versus home), household environments, biological effects, and cultural effects (Ejrnæs & Pörtner, 2004). One line of research sets parental investments or shifts on parental behaviour after observing the child's endowments as driver behind birth order and skill development differentials (Brenøe & Molitor, 2018; Ejrnæs & Pörtner, 2004; Lehmann, Nuevo-Chiquero, & Vidal-Fernandez, 2016; Pavan, 2016). Recent work by Molnár (2018) points to differential parental investment and differential time efficiency as important mechanisms behind widening skill gaps in early childhood.

In this paper, I analyse the relationship of birth order with time use and parental educational aspirations for Peru. Examining this topic within a context of high levels of inequality, is crucial to understand factors and mechanisms to help reduce inequalities early on. First, I investigate the role of birth order as a key determinant of time use allocation, using extensive (school enrolment and child work binary outcomes) and intensive margins (time use outcomes). Second, I examine if parental aspirations vary by birth order, one potential mechanism that might explain the child's time investments. A major challenge in empirical studies into birth order is the endogeneity of fertility, which affects both family size and outcomes between children within the household. My empirical strategy restricts the sample to two-child families (only siblings born to the same mother) and relies on identification across households using a Correlated Randoms Effects model to overcome the endogeneity of family size.[1] One motivation of the analysis in this paper lies in the limited literature on time use as one input or channel for skill development and human capital transmission. Another motivation relates to improving our understanding of individual and household behaviour looking at time use of children and the role of parental aspirations in resource provision.

For the first part on birth order differences, I find that higher birth order has a significant and negative effect on child work. In a two-sibling family and controlling for age, the second

[1]See Section 4 for a detailed explanation on the empirical strategy.

born child is 10.8 percentage points less likely to participate in child work; and spending 0.81 hours (about 49 minutes) less in care activities of other household members (e.g. younger siblings, elderly, or members with disabilities). The results on child work are robust to differences in family size, observed endowments (birthweight and cognitive score) and families with “complete” fertility decisions. I found no conclusive evidence of birth order effects for school participation, time spent in educational activities (school or studying) and time spent in leisure. The limitations due to sample restrictions are addressed in Section 4.

For the second part on parental aspirations, trying to unpack one possible channel driving the negative effect for second born siblings, I find parents are equally likely to aspire for the highest level of education, a University/Postgraduate degree, regardless to birth order. This finding holds for two and three children families. Furthermore, the negative effect in child work (i.e. time spent in care activities) for the second born, remains irrespective if parents aspire or not for their second born child to get a University/Postgraduate degree.[2] Nevertheless, findings for this part are restricted due to data constrains discussed at length in Section 6.

My contribution is the following: first, unlike much previous work, I expand the analysis of time use beyond the school enrolment and child work participation indicators taking advantage of rich time use measures collected from Young Lives, an ongoing longitudinal household study in Peru and three other countries. Examining how individuals allocate their time outside of the market is vital for increasing our understanding of the dynamics of economic change and welfare (Gimenez-Nadal & Sevilla, 2012). I examine four different outcomes of daily time distribution including hours spent at school, hours spent studying outside of school, hours spent on leisure activities and hours spent on child work. The disaggregation of time use activities complements recent work efforts done by Keane, Krutikova and Neal (2018), Borga (2018), and Espinoza-Revollo and Porter (2018). Stiglitz, Sen and Fitoussi (2009) among others have advocated in favour and proposed an array of measures of household economic activity to assess the quality of life, including time spent in leisure activities (Gimenez-Nadal & Sevilla, 2012). However, there is limited literature documenting any outcomes related to leisure activities for aged-school children. I also go beyond the standard definition of child work, following Morrow and Boyden (2018), and Espinoza-Revollo and Porter (2018), and look at disaggregated measures of child work, considering work within and outside the household and not exclusively for pay. Distinct from this previous work, I examine how the distribution of different types of work relates to the birth order position of the child within the family. Analysis of the production and domestic work within the children’s homes is imperative for appropriate policy-making that reflects local circumstances (Morrow & Boyden, 2018). The present analysis also complements the limited literature on the link between parental aspirations and

[2]Findings for this part are restricted due to data constrains discussed at length in Section 6.

household (individual) resource allocation decisions. Dizon-Ross (2018) documents how parents tailor educational investments according to their (inaccurate) beliefs about their children's ability. Among the Young Lives countries, Morrow and Boyden (2018) document that Peru has the highest percentage of caregivers (81%) aspiring for their children to attend university; while Favara (2017) finds that for Ethiopia, being the oldest sibling decreases by 4.6 percentage points child's aspiration to attend University. Nonetheless, there is still limited literature on how aspirations shape decision making (Attanasio & Kaufmann, 2014; Chiapa, Garrido, & Prina, 2012).

The analysis of this paper proceeds as follows. Section 2 goes through related literature on birth order and child's outcomes. Section 3 describes the data and outcomes. Section 4 discusses the empirical estimation strategy. Section 5 presents descriptive analysis and main results, including sensitivity analyses for family size, observed endowments and complete fertility decisions. Section 6 examines the relationship between birth order differences and parental aspirations; and finally, Section 7 concludes.

2. Related Literature

Most theories explaining intra-household resource allocation and relying on the resource dilution model[3], predict negative relationships between human capital development and higher birth order (Black, Devereux, & Salvanes, 2005; Moshoeshoe, 2016). Empirically, the direction of birth order effects is still unclear given the mixed results, when looking at evidence from developed and developing countries. Findings from developed economies confirm better outcomes for firstborn children including more years of education, better achievement in cognitive tests, higher IQ, higher wages, and firstborn girls engaging in less risky behaviours (i.e. are less likely to give birth while teenagers) (Black, Devereux, & Salvanes, 2007; Lehmann et al., 2016; Pavan, 2016). For education outcomes, studies indicate recurrent negative birth effects for younger siblings in developed countries (Black et al., 2005; de Hann, 2005; Grätz, 2018) but for developing countries evidence is varied. While Ejrnaes and Pörtner (2004), Emerson and Souza (2008), and de Hann, Pluge and Rosero (2014) find positive effects in completed years of education and/or educational achievement for Philippines, Brazil and Ecuador, Moshoeshoe (2016) find negative effects in enrolment and/or completed years of education for Lesoto for higher birth order siblings. On the inconsistency of birth order effects in education, he hints the divergence in findings are due to context-specific factors, related to

[3]The resource dilution model postulates that parental resources are finite and that as the number of children in the family increases, the resources accrued by any one child necessarily decline. Siblings are competitors for parents' time, energy, and financial resources and so the fewer the better (Downey, 2001).

the development of the country per se. On labour, studies using developing countries data and controlling for age, firmly document that higher birth order siblings are less likely to work, (Ejrnæs & Pörtner, 2004; Emerson & Souza, 2008; Moshoeshoe, 2016; Seid & Gurmu, 2015).

Outside the labour supply context, economists have overlooked the role of time use on skill acquisition and other well-being outcomes. Previous research on time use has investigated extensively the trade-off between education and child labour, mostly using binary outcomes of school enrolment and work participation (Cuesta, 2018; Ejrnæs & Pörtner, 2004; Emerson & Souza, 2008; Moshoeshoe, 2016; Seid & Gurmu, 2015). While investigating the trade-off between education and labour decisions is important, it offers an incomplete picture on how parents and children choose how to adjust resources across different margins, including time allocation among diverse activities. In his time allocation theory, Becker (1965) recognises that distribution and efficiency of non-working time might be more important to economic welfare than that of working time.

Driven by the parental investments channel, another narrow conceptualisation of time use surges when empirical analyses focus exclusively on the quantity and sometimes quality of parental time (or parent-child interactions) (Del Bono, Francesconi, Kelly, & Sacker, 2016; Molnár, 2018; Price, 2008). Beyond parental time, understanding the time use of children within the context of the household will improve our understanding of individual and household behaviour, along with the economic decision-making processes of households (Espinoza-Revollo & Porter, 2018). Likewise, own children's time distribution is informative of what is likely to matter for children's wellbeing since where they spend their time will also determine the friends they make, the activities they take part in and the risks they may be exposed to (Borga, 2018).

Most studies that find younger siblings are less involved in work rely on a narrow definition of what "work" includes. In all fairness, the choice of a "child labour" definition for empirical analysis is not straightforward (Edmonds, 2009). The debate has lasted for many years, led by the International Labour Organisation (ILO)[4], advocating for the elimination of child labour. One restriction of the child labour definition stems from these international regulations, where for many years, only working for pay and outside the household was classified as child work. It is not until very recently that working within or for their household is now also considered as child work. The other restriction is due to data limitations. Using Peruvian (D. Levison & Moe, 1998) and Mexican (D. Levison, Moe, & Knaul, 2001) data, two analyses document that whether there is a trade-off between schooling attainment and work, depends on whether work

[4]ILO emits international regulations for governments to eliminate child labour. The main consensus thus far has been the definition of what is considered as hazardous work and the minimum age of engagement to work on these high-risk occupations.

includes domestic work, particularly for girls (Edmonds, 2009). In recent reports, Morrow and Boyden (2018) use descriptive information of children's working activities and qualitative experiences advocating for a more nuanced and comprehensive vision of child work for the four countries in the Young Lives study. Espinoza-Revollo and Porter (2018) offer a detail account of the evolving nature of time use during childhood and the influences that shape this process across the two Young Lives children cohorts[5]. Both reports fail to provide any causal explanation for child work (time use) and exclude birth order as explanatory factor for time-use trends.

Following latest research using Young Lives data (Cuesta, 2018; Espinoza-Revollo & Porter, 2018; Keane, Krutikova, & Neal, 2018; Morrow & Boyden, 2018), I employ the term child work, instead of child labour. The difference between both terms is that child work considers work as "*part of children's everyday lives"* (Morrow & Boyden, pp. 5), recognising the daily life context of families from middle and low-income countries, where most children have always played a significant role in the production and domestic work within their homes (Morrow & Boyden, 2018). In short, the main difference is that it incorporates domestic work into the analysis of child work.

Finally, until which point child labour is harmful or beneficial for accumulation of human capital is an empirical question per se. There is a growing literature on the impact of child work on outcomes, providing important insights on its consequences. In education, Emerson, Ponczek and Souza (2017) find that for girls, working while attending school translates into 5% and 13% decrease of a standard deviation in Mathematics and Portuguese test scores, respectively. The magnitude of the negative impact increases with student's ability; and, even if the child is no longer working, lingering and cumulative negative effects on child's test scores persist from having worked while in school. Beegle, Dehejia and Gatti (2006) document child labour has negative consequences on school participation and educational attainment in Vietnam. Zabaleta (2011) examines the effect of child labour on distinct educational outcomes (years of education, grade for age, completion of primary education, and completion of at least a year of secondary education), finding a detrimental effect of working over three hours a day. Yet these studies are constrained to the standard (and narrow) definition of market work. In a more recent study, Keane, Krutikova and Neal (2018) study trade-offs among time spent on the full vector of activities listed by Young Lives for accumulation of human capital. They find that both domestic chores and economic activities are detrimental to the development of cognitive skills if they crowd out school time. The detrimental effect of work time is even greater if it crowds out time spent studying at home. Finally, Espinoza-Revollo and Porter (2018) document that, for Peru, children of all ages in rural areas work significantly more than those

[5]More information on the Young Lives data in Section 3.

in urban areas and that gender differences are not significant when considering the aggregate measure of work or education.

3. Data

The data for this paper comes from the Peruvian Younger Cohort of the Young Lives study. One specific aim of the sample restrictions for the analysis is maximise capturing school-age children, including not only the Young Lives child but also her/his siblings. With that end, I use data from the 2009 (Round 3) and 2012 (Round 4) survey rounds, comprising most of the school-aged children between 4-17 years old. Round 5 (2016) of data collection was made publicly available only until August 2018. However, at this later period, families with children where the Young Lives child has higher birth order will be more likely to be dropped from the sample as the older sibling/s most likely has "aged out" the 17-years-old limit. Likewise, I exclude the earlier data collection periods, Round 1 (2002) and Round 2 (2006), as do not contain enough school-eligible children, particularly younger siblings from the Young Lives child. Although compulsory education in Peru starts at age three, data collection of time use is only for family members aged between four and 17 years old.[6]

Furthermore, I restrict the analysis to two children families (considering completed family size reported in Round 4) and only include siblings born to the same mother. The reasons for this are twofold. First, to address endogeneity of fertility decisions (family size); and second, to attempt avoid including siblings with larger age differences between them. These and other methodological challenges are described in more detail in Section 4. Moreover, only families that were present in both rounds and siblings with complete information of time-inputs and no missing information on a set of background measures including: main caregiver years of education, if child attended six or more months of preschool education, birth-space in years between siblings, child's language, household food expenditure, and wealth index, are included in the sample. After imposing the previous restrictions, the analytic sample for the study is set to 1336 children from 458 households observed in Round 3 and Round 4.[7]

[6]The General Education Law of 2003 establishes mandatory preschool education for ages three to five (before it was only for children aged five years old. The other compulsory levels of education include primary education (ages 6-11), secondary education (ages 12-14), *bachillerato academico* and *bachillerato tecnico* (ages 14-16).

[7]There are 12 problematic household ids that were excluded from the sample, related to the sibling's definition used (born to the same mother).

3.1 Time use outcomes

The present analysis takes advantage of the fact that Young Lives collected time use information not only for the "Young Lives" child, but for all household members aged five[8] to 17 years old at the time of the survey. Information on time allocation is reported by main caregiver when child is between four and 11 years old and by the child from 12 years onwards. It is plausible to argue that parents of school-age children can control more directly the time spent at school and studying, while at the same time, having more say in the type of child work children engage (Ejrnæs & Pörtner, 2004). Time use data is reported as number of hours the child spent on different activities on a typical weekday (Monday-Friday) in the last week. Regarding measurement error, some limitations of time use measures include having reported hours, not minutes; and data collected when school was in session, not capturing seasonality and possible underestimation of work done over the weekend (Espinoza-Revollo & Porter, 2018). However, even if these limitations translate into some noise of our time use outcome, is a lesser concern given its use as dependent variable, where at the most, the estimates' standard errors will increase, affecting precision.

As stated in Section 1, I investigate both extensive margins (school and child work participation indicators) and intensive margins (time use continuous outcomes). I construct the binary outcomes of school enrolment and child work participation with time data allocated to school and child work. For this, I use age normative cut-offs following official regulations from Peru's government (Ministry of Education) and the International Labour Organisation (ILO). A child is classified as enrolled (attending full-time education) or in child work according to the following age-ranges and quantity of time listed in Table 1.

Table 1. Description of binary indicators*

Outcome	Age range (years)	Weekly amount of time
School Enrolment[1]	4-5	▪ Child spent 16 or more weekly hours at school;
	6-11	▪ Child spent 30 or more weekly hours at school;
	12-17	▪ Child spent 35 or more weekly hours at school;
Child work participation[2]	4-11	▪ Child spent more than zero weekly hours working;
	12-14	▪ Child spent 14 or more weekly hours working;
	15-17	▪ Child spent 36 or more weekly hours working;

[1]A child was classified as enrolled (participating in FTE) based on age and weekly hours cut-offs from normative documents from UNESCO and the Ministry of Education in Peru (UNESCO, 2010). For the ages 4-5 years old, 25 hours is the upper limit for preschool education offered in *Jardines*, a more institutional type of preschool. I used the lower bound of 16 hours a week, offered by *PRONOEI*, a public programme offering preschool education in marginal urban and rural areas (Cueto et al., 2016).[2] For child work participation, I used age specific cut-offs established by the International Labour Organisation (ILO). Young Lives collected data on what ILO considers light work and domestic work. The term light work is used to characterise the market work of children aged 12-14 in non-hazardous activities and for less than 14 hours per week. ILO Convention No. 138 stipulates that National laws or

[8]Although official documentation from Young Lives establishes data collection of time use was for all household members starting age 5, for Peru the starting age was 4 years old.

regulations may permit the employment or work of persons between 13 to 15 years old on light work that is unlikely to be harmful to their health and development; and not such as to prejudice their attendance at school, their participation in vocational or training programmes approved by the competent authority (e.g. Ministries of Education) or their capacity to benefit from the instruction received (Article 7, section 1). Peru's minimum age of commitment to engage in light work is 12 years old. Adolescents between 15 and 17 years may not work more than six hours a day, or over 36 hours a week (Article 56, Law 27337).

On the continuous outcomes, Young Lives collected time use information on eight different activities.[9] For simplification, in the main results I estimate the effect of birth order among four of the original eight activities asked in the household survey, comprising the four child work related activities into one combined outcome.[10] The themes explored with the four time use outcomes can be split into education, recreational and child work. The observed four outcomes are listed in Table 2.

Table 2. Description of Time-inputs*

Category		Outcome
Education	1	Number of hours per day the child spent at school (including travel time);
	2	Number of hours per day the child spent studying at home (including homework, extra classes, learning languages);
Recreational	3	Number of hours per day the child spent in leisure activities (playing, seeing friends, using the internet, eating, drinking, bathing etc.);
Child Work	4	(a) Number of hours per day the child spent in child-working activities such as caring for others (caring for younger children or sick household members); (b) Household chores (fetching water, cleaning, cooking, etc.); (c) Domestic tasks (farming, herding, etc); and/or (d) Working outside household on paid activities.

*I am excluding from the analysis reported time spent sleeping. As a robustness test, I examine time use outcomes as percentage of the day spent in each activity to incorporate time spent sleeping in the analysis. These results are reported in Section 5.3. Information of time-use was collected for all children living in the household, which were between the ages four and 17. One restriction on the recreational time-inputs is that is not possible to disentangle the time spent in each individual activity defined as "leisure" in the questionnaire. The questionnaire only lists for the interviewer different examples of leisure activities spanning from playing to eating, while the latter might be better understood as routine/basic needs activity. An additional limitation is that time-spent at school includes transport, but I am controlling in the regression for cluster and location variables.

3.2 Other variables

The choice of explanatory variables is partly dictated by the availability of information in both rounds and the empirical model, described in Section 4. The time-invariant variables include: a female dummy indicator, binary indicators of child's language, ethnicity, and religion, a binary indicator of preschool attendance, a set of dummies indicating place of residence at birth, including region (Coast, Jungle, Mountain) and area (Urban/Rural); mother's age, main

[9]To collect time-use data, 24 pebbles/seeds were offered to main caregivers and children which in turn have to distribute them into eight cups illustrating different activities. In Peru, the total time could range between 22 and 26 hours as interviewers allowed to count more than 24 hours if the child was doing different activities at the same time (e.g. household chores and caring for siblings/family members) (Espinoza-Revollo & Porter, 2018).

[10]As part of the complementary analysis and probing on child work estimates, I do investigate birth order effects for each of the child work outcomes.

caregiver years of education; and age-difference among both siblings in years. The time variant controls include a household wealth index, a binary indicator of household cattle ownership in the past 12 months[11], household monthly expenditure in food items per capita[12], and a binary indicator if household head is female. Furthermore, I also include child's age dummies and cluster-village dummies, to control for year and village effects, respectively. Table 3 reports means and SDs for the main variables for the analytic sample, including mean comparisons against the Young Lives sample with all the family members aged four and 17 years-old (including all family sizes).

There are some small but significant differences between the two children families from the analytic sample and the Young Lives full sample. There are expected differences on birth order and number of siblings. More than 90% of the children in both samples has access to some preschool education. Mothers are around 2.7 years younger in the analytic sample than in the Young Lives sample. When baseline data collection took place (i.e. when the Young Lives child was between 0 and 2 years old), mothers were 24.5 years old, while for the Young Lives sample they were 27 years old. Main caregiver in two child families are more educated. They have about 10 years of completed education (equivalent to completed secondary education and one year of high school), almost three years more than in the Young Lives sample. Furthermore, two children families are wealthier and had a higher food monthly expenditure, while the Young Lives sample had a higher percentage of families owning livestock in the past year (67% against 49%), which means a higher probability for children to potentially engage in herding.

Table 3. Means and SDs (in parentheses) of analytic sample and Young Lives sample*

	Analytic Sample	*Young Lives Sample*	*Diff. in means*
	(I)	*(II)*	*(III)*
Child Characteristics			
Age (in years)	9.228 (2.843)	9.503 (3.142)	-0.275***
Birth order	1.449 (0.498)	2.716 (1.813)	-1.267***
Female (%)	0.504 (0.500)	0.499 (0.500)	0.005
Children attended preschool (%)	0.965 (0.184)	0.941 (0.236)	0.024***
Language is Spanish (%)	0.954 (0.209)	0.822 (0.383)	0.132***
Religion is Catholic (%)	0.839 (0.368)	0.807 (0.395)	0.032***
Other religion (%)	0.107 (0.309)	0.146 (0.353)	-0.039***
Ethnicity is Mestizo (%)	0.894	0.921	-0.027***

[11]If the household owns cattle it might be expected to both increase the income of the household and reduce the cost of children as they could work in herding).
[12]Often used as a proxy for permanent income.

	Analytic Sample	Young Lives Sample	Diff. in means
	(I)	(II)	(III)
	(0.307)	(0.269)	
Ethnicity is White (%)	0.081 (0.273)	0.049 (0.216)	0.032***
Household Characteristics			
Number of siblings	2 (0.000)	4.047 (2.051)	-2.047***
Wealth index	0.647 (0.181)	0.538 (0.204)	0.109***
Household owned any livestock in the past 12 months	0.492 (0.500)	0.674 (0.469)	-0.182***
Monthly expenditure in food items per capita	154.105 (79.594)	117.679 (66.173)	36.426***
Parental Characteristics			
Mom age (at birth)	24.463 (5.471)	27.030 (6.464)	-2.567***
Caregiver years of education (at birth)	9.912 (3.865)	7.088 (4.578)	2.824***
Head of household is female (%)	0.167 (0.373)	0.127 (0.333)	0.040***
Region Characteristics			
Child lives in Coast region (%)	0.451 (0.498)	0.301 (0.459)	0.150***
Child lives in Mountain region (%)	0.412 (0.492)	0.548 (0.498)	-0.136***
Child lives in Jungle region (%)	0.138 (0.345)	0.151 (0.358)	-0.013***
Child lives in Urban area (%)	0.821 (0.383)	0.623 (0.485)	0.198***
Child lives in Rural area (%)	0.179 (0.383)	0.377 (0.485)	-0.198***
Observations (Children)	1336	7409	

[3]Column I includes analytic sample restrictions described in 3.1. Column II includes YL sample, restricted to households observed in Round 3 and Round 4 and children aged 4-17 years old. Column III reports differences in means from Column I and Column II, where: ***p<0.001, **p<0.01, *p<0.1 Other religion category includes Evangelic, Mormon and Hindu. [4]The wealth index is a composite measure of three sub-indexes: a housing quality index, access to services index, and consumer durables index. The three sub-indexes were estimated consistently across rounds and only variables common to the four available rounds at that moment were included. The housing quality sub-index is the average of the following dummy indicators: crowding, main material of walls, main material of rood, and main material of floor; the access to services sub-index is the averaged of the following dummy indicators: access to electricity, access to safe drinking water, access to sanitation, and access to adequate fuels for cooking: the consumer durables index is the average of a set of dummy variables denoting if a household member owns at least one of each consumer durable. The list of consumer durables included: radio, television, bicycle, motorbike, automobile, landline phone, mobile phone, refrigerators, stove, blender, iron, and record player. [5]Food expenditure per capita expressed in real terms of the national currency (*Soles*) adjusted for local inflation and for household size across time. See Azubuike and Briones (2016) and Marion (2018) for more details on the wealth index and food expenditure, respectively.

4. Empirical Strategy

An empirical analysis of birth order differences is complex given the endogeneity of fertility, with unobserved preferences affecting both family size and outcomes of children within the household.

To overcome the endogeneity of family size, my empirical strategy restricts the sample to two-child families (only siblings born to the same mother) and relies on identification across households. Families who choose to have different numbers of children are likely to be fundamentally different both in observed and unobserved characteristics. Whilst we can control for the former, we cannot control for unobserved differences – however, restricting the analysis for two children families removes must of the confounding due to family size differences (and higher likelihood of homogeneity in family unobserved characteristics), I estimate birth order effects with a Random Effects[13] (RE) model, denoted in Eq (1):

$$\gamma_{ift} = \theta_t + \beta_j(Birth\ order_{if} = j) + \varphi x_{ift} + \alpha z_{ft} + (\mu_f + \varepsilon_{ift}) \qquad (1)$$

where i indexes the child, f indexes the family, t indexes the time period, and j indicates the birth order of the child ($j = 1, 2$). Y_{ift} is the dependant variable (i.e., school and child work binary indicators or time use continuous variables); θ_t denotes a time-varying intercept; β_j is the parameter of interest, capturing differences for being the second born ($j = 2$) with respect to the first born ($j = 1$) omitted category; x_{ift} denotes a vector of time-variant and invariant child characteristics that affect Y_{ift}, including age of the child, birth space between siblings, child's language, child's ethnicity, child's religion, if child attended preschool, and child's sex, all defined as dummies; z_{ft} is a vector of time-variant and time-invariant family characteristics, including a household wealth index, an indicator of household cattle ownership, household monthly expenditure in food per capita, mother's age, main caregiver years of education, a dummy for sex of household head, and dummies denoting family place of residence[14]; μ_f is the family level residual constant across time, while ε_{ift} is the idiosyncratic error term that varies across children and time (hereafter consider as white noise). The μ_f term is in effect a measure of "similarity", which allows for dependence as is related to all family level repeated measures (Bell & Jones, 2015).

Eq (1) assumes two children families share the same observed and unobserved characteristics ($Cov(x_{ift}, \mu_f) = 0$), and extends that assumption to child-level characteristics and their residuals ($Cov(x_{ift}, \varepsilon_{ift}) = 0$)[15]. However, there still might be (un)observed heterogeneity within two children families even if they are more similar than single child or high

[13]Also called multilevel models, hierarchical linear models and mixed models (Bell & Jones, 2015; Rabe-Hesketh & Skrondal, 2012; Schunck & Perales, 2017). Eq (1) also assumes that μ_f and ε_{ift} are normally distributed, and hence, an overall measure of the respective variances can be estimated as: $\mu_f \sim N(0, \sigma_\mu^2)$ and $\varepsilon_{ift} \sim N(0, \sigma_\varepsilon^2)$. Regardless, even when the Normality assumptions are violated, RE models perform well (Bell & Jones, 2015).

[14]The list of family location covariates includes dummies for region (Coast, Mountain, or Jungle) and area (Urban or Rural) where family lived at baseline, and time-variant dummies for villages.

[15]Known in the literature as the exogeneity assumption of Random Effects models.

birth order families. After conducting a set of relevant tests[16], I relax the assumption of $Cov(x_{ift}, \mu_f) = 0$, and replace it with $\mu_f = \pi\bar{x}_f + v_f$, resulting in a correlated random effects (CRE) model as shown in Eq (2) below[17]:

$$\gamma_{ift} = \theta_t + \beta_j(Birth\, order_{if} = j) + \varphi x_{ift} + \alpha z_{ft} + \pi\bar{x}_f + v_f + \varepsilon_{ift} \quad (2)$$

where $\bar{x}_f$, the cluster mean of x_{ift}, picks up any correlation between this variable and the family level error v_f. The family-level characteristics included in $\bar{x}_f$ are the household wealth index, the household cattle ownership indicator, household monthly expenditure in food per capita and sex of household head[18]. Each estimation is clustered at the family level, to account for the variation that occurs at this level and any time-invariant variables, including $Birth\, order_{if}$. Introducing $\mu_f = \pi\bar{x}_f + v_f$ in Eq (2), allows to both account for (and include) family-level factors that are correlated with birth order and child outcomes, and consistent estimation of level-one (child) effects, including time-invariant predictors (Mundlak, 1978; Schunck, 2013; Wooldridge, 2010). An advantage of the CRE approach is the possibility to make simple, robust tests of correlation between heterogeneity and covariates (effectively, testing $\pi = 0$) (Bell & Jones, 2015; Schunck & Perales, 2017).

Other well-known methods to account for (un)observed heterogeneity within families and endogeneity in family size are family Fixed Effects (FE) and Instrumental Variables (IV). Debate between disciplines against or in favour between FE and RE is extensively covered elsewhere (Bell & Jones, 2015; Elzinga & Gasperini, 2015; Wooldridge, 2010). A prime motivation for using a RE model is that it allows to examine relationships between the characteristics of the family-level unit and the child-level outcome of interest including family-level covariates (Clarke, Crawford, Steele, & Vignoles, 2010). Furthermore, I cannot estimate

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[16]A Durbin-Wu-Hausman Test after a second stage regression on $\widetilde{birth\, order}_{if}$ residuals shows RE (Eq 1) is not consistent (DWH $X^2\,(1) = 3.05$, *p-value* = 0.081). Furthermore, results from a Wald test conducted to compare the RE (Eq 1) model against the CRE (Eq 2) model, shows the CRE model fits the data better (Wald $X^2\,(69) = 34322.11$, *p-value* = 0.000); and results on the zero correlation assumption ($\pi = 0$) from Eq (2), show the null hypothesis is rejected, join test (Wald $X^2\,(4) = 1.73$, *p-value* = 0.786). These results are also considered as evidence against the RE model (Schunck, 2013; Wooldridge, 2010).

[17]For clarification, I estimate two CRE probit models for the binary indicators. When looking at both binary outcomes (school and child work participation), previous studies have used a bivariate probit model, assuming parents jointly allocate the child's time between those activities (Emerson & Souza, 2008; Seid & Gurmu, 2015). The bivariate probit model is used where a dichotomous indicator is the outcome of interest and the determinants of the probable outcome includes qualitative information in the form of a dummy variable where, even after controlling for a set of covariates, the possibility that the dummy explanatory variable is endogenous cannot be ruled out a priori (Chuhui, Poskitt, & Zhao, 2016; Seid & Gurmu, 2015). I ran bivariate probit models as robustness check, results are quite similar from separate probit models and listed in Table A4 in the Appendix.

[18]In practice, $\bar{x}_f$ is only calculated for time-variant covariates. Time effects, age and round, are excluded from the cluster mean calculation as their averages will be all the same and they are collinear with the regression constant. See Table A1 in the Appendix showing the within and between variation of the variables among both rounds.

a family FE model as my coefficient of interest, β_j, does not vary across time and within family (given I am using observed birth order in last round available). Family size is also invariant, as I am focusing on two children families for the main analysis. On IV, twin births and siblings sex composition are two widely instruments employed on this literature. Due to data restrictions, finding a valid exogenous instrument seemed unfeasible plus any argument in favour of the chosen IV is always debatable (e.g. arguing country and cultural preferences for boys over girls) and would increase the likelihood of incurring in Type II error.

Finally, whilst the identification strategy is cleaner by comparing birth order effects within siblings and between families of the same parity, it reduces the representativeness of the sample, with a cost upon the external validity of the results. Likewise, a key issue from Eq (2) is to estimate an unbiased coefficient of $Birth\ order_{if}$. This is done by controlling for a rich list of child-level characteristics that are associated with children being the second born child and with the outcome of interest, denoted in x_{ift}. Regardless, a set of sensitivity checks to probe the estimates are conducted in Section 5.3.

5. Results

This section enlists and discusses the main results derived from estimating Eq (2) for the binary and continuous time use outcomes, by pooling together the complete analytic sample and controlling for the full vector of child[19] and family characteristics denoted in Section 4.

5.1 School enrolment and work participation

Table 4 below shows the percentage distributions for the school enrolment and child work indicators for the analytic sample when children were 7-8 years old. There are no differences regarding school enrolment as about 80% of first and second born children are enrolled at school around those ages. There is a higher percentage of first-born children involved in child-work (75%) with respect to their younger sibling (68%) when both reached the same age range.

Table 4. Percentage distribution for school attendance and child-work participation

Ages 7-8		First born (j =1)	Second born (j =2)	Diff. in means
School enrolment	**(%)**	0.814	0.804	0.009
Child-work participation	**(%)**	0.745	0.684	0.060
Observations			1336	

[19]Including age and gender, so the birth order estimate is not confounded by these effects. In Section 5.3, one sensitivity analysis includes restricting the sample to same sex families.

*Own calculation using time use data normative cut-offs by age for full-time enrolment (if at ages 4-5 years old was spending 16 or more weekly hours at school, if at ages 6-11 years old was spending 30 or more weekly hours, and if at ages 12-17 years old was spending 35 or more weekly hours) and child work participation (if at ages 4-5 years old was involved in any child work activity for one or more weekly hours, if at ages 12-14 was working 14 or more weekly hours, and if at ages 15-17 was working 36 or more weekly hours).

Examining this relationship under Eq (2), Table 5 presents the Average Marginal Effects (AMEs) for the CRE probit models for school and child work participation. Results indicate that, being the second born decreases the probability of child work by 10.7 percentage points in a two-child family (significant at less than 1% level). The finding is consistent with previous results using developing countries data (Emerson & Souza, 2008; Moshoeshoe, 2016; Seid & Gurmu, 2015). The result on school enrolment for birth order is also negative but smaller in magnitude and not statistically significant. This finding is aligned with Ethiopia (Seid & Gurmu, 2015) and Lesoto (Moshoeshoe, 2016), but opposed to evidence from Philippines (Ejrnæs & Pörtner, 2004) and Brazil (Emerson & Souza, 2008).

An interesting finding for school enrolment is the negative relationship between this outcome and age. As child gets older, it decreases the probability of school enrolment.[20] This finding concurs with the transition to upper secondary in Peru by age 14, suggesting children leave school when reaching that grade (Espinoza-Revollo & Porter, 2018). For child work, the negative birth order effect is similar in magnitude whether if the household head is female, decreasing the probability of engaging in child work by 10.8 percentage points.[21] AMEs for other variables and results from the bivariate probit model, which is similar to main results here (-0.091, significant at the 5% level), are reported in Table A3 and Table A4, respectively, in the Appendix.

Table 5. Average Marginal Effects: school enrolment and child work

	School enrolment (I)	*Child work participation* (II)
AME: Birth order (j =2)	-0.023 (0.031)	-0.103** (0.033)
p-value $H_0: \beta_1 = \beta_2 = 0$	0.393	0.002
Observations	1324	1253

***p<0.001, **p<0.01, *p<0.05. Standard errors in parentheses. Each column presents a separate regression. All regressions include controls reported in Table A3 in the Appendix. For child work participation, age 4 observations are dropped from estimation as this category predicts failure perfectly. Testing the null hypothesis for zero correlation between heterogeneity and covariates ($\pi = 0$), gives a *p-value* of 0.297 (Column I) and a *p-value* of 0.708 (Column II).

[20]About 67 percentage points less by age 16, significant at less than 1% level.
[21]Significant at the 1% level.

5.2 Time use in education, leisure, and work

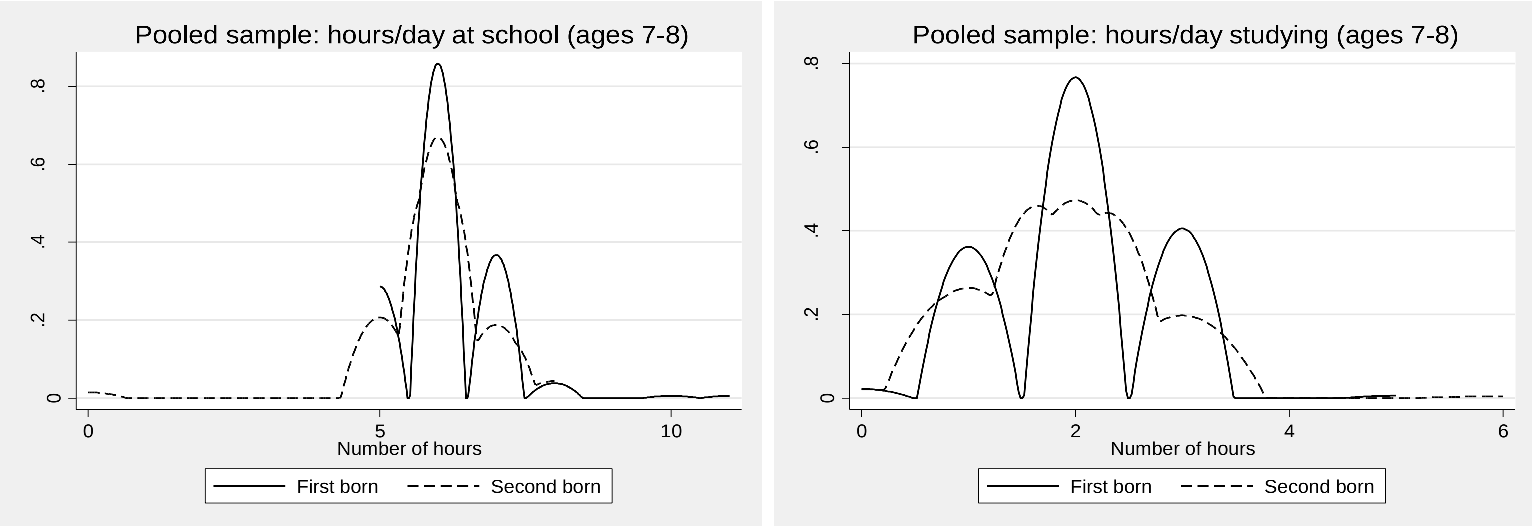
Table 6 reports means and difference in means of time use, when both children were the same age (between 7-8 years old), while Figures 1a and 1b display Kernel density estimates of time use for first and second born children using the analytic sample. There are no sizeable differences between first and second born children in time use for educational activities. In contrast, results show that second born child consistently spends less time in child-work activities (0.62 hrs/37 min) and more time in leisure activities (0.46 hrs/28 min), and both differences are statistically significant at the 1% level. Figure 4b displays a highly left-skewed distribution on time use related to child work (most of the sample of children work between zero and less than two hours).

Table 6. Means and difference in means of time use by analytic sample

	Hrs/day at school			*Hrs/day studying outside school*			*Hrs/day in leisure*			*Hrs/day in child-work*		
	First born (*j* =1)	Second born (*j* =2)	Diff. in means	First born (*j* =1)	Second born (*j* =2)	Diff. in means	First born (*j* =1)	Second born (*j* =2)	Diff. in means	First born (*j* =1)	Second born (*j* =2)	Diff. in means
	(Ia)	*(Ib)*	*(Ic)*	*(IIa)*	*(IIb)*	*(IIc)*	*(IIIa)*	*(IIIb)*	*(IIIc)*	*(IVa)*	*(IVb)*	*(IVc)*
2 siblings	6.128	5.987	0.141	2.017	1.898	0.119	3.969	4.427	-0.458**	1.638	1.018	0.620***
Observations (children)							1336					

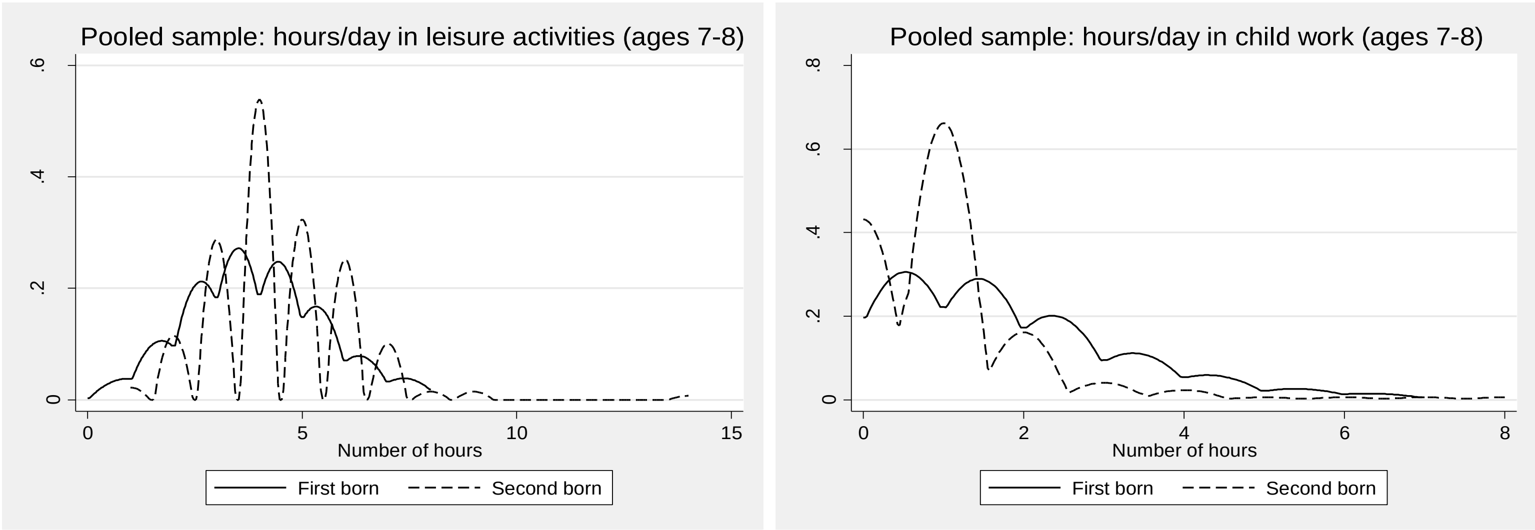
***p<0.001, **p<0.01, *p<0.05. All estimates include sample restrictions (listed in Section 3). Outcomes of time-use are winsorized (trimmed) at the 95th percentile.

Figure 1a. Distribution of hours spent at school and studying by birth order (ages 7-8 years old)



*Kernel density graphs of time-use outcomes for first and second born children when both were between 7-8 years old. Outcomes of time-use are winsorized (trimmed) at the 95th percentile.

Figure 1b. Distribution of hours spent in leisure and child work by birth order (ages 7-8 years old)



*Kernel density graphs of time-use outcomes for first and second born children when both were between 7-8 years old. Outcomes of time-use are winsorized (trimmed) at the 95th percentile.

Tables 7a and 7b present the estimation results for the CRE model (Eq 2). Point estimates in Table 7a imply that time spent at school and in child work activities (aggregate) decreases with birth order, while it increases for time spent in leisure. However, only coefficients of birth order for child work and leisure are statistically significant (Columns III and IV). Specifically, being the second born child decreases the quantity of time spent in child work by 0.81 hrs (48 min) and increases the amount of time spent in leisure activities by 0.33 hours (20 min), contrary to the first born. See Table A5 in the Appendix for the coefficients on the rest of the variables.[22]

However, the test on the null hypothesis that the coefficients of the cluster-means are jointly equal to zero ($\pi = 0$), is rejected (at the 5% level) for the estimates of hours spent at school (Column I) and hours spent in leisure (Column III). It means that for both outcomes the CRE birth order estimate is inconsistent, i.e. there are time-invariant unobservables related to the outcome[23]; and only the coefficients for time spent in child work and time spent studying outside school, are valid and consistently estimated under CRE assumptions. To correct for this, I employ the Hausman-Taylor (HT) estimator to control for heterogeneity differences in families (due to the rejection of the zero-correlation hypothesis) for Columns I and III outcomes. Hausman and Taylor (1981) developed an IV estimator based on the random-effects transformation, allowing to obtain consistent estimation for the endogenous time-invariant regressor. It makes the stronger assumption that some specified regressors are uncorrelated with the fixed effect (Cameron & Trivedi, 2009). Results from HT estimation are qualitatively similar to the main results[24] and listed in Table A12 in the Appendix.

Table 7a. CRE estimates

	Hrs/day at school (I)	*Hrs/day studying outside school* (II)	*Hrs/day in leisure* (III)	*Hrs/day in child-work* (IV)
Birth order (j =2)	-0.120	0.071	0.328**	-0.813***
	(0.071)	(0.062)	(0.118)	(0.104)
p-value $H_0: \beta_1 = \beta_2 = 0$	0.092	0.251	0.005	0.000
R-squared	0.293	0.207	0.260	0.360

[22]Regarding the other predictors, there is a positive relationship between age and hours spent in child work, increasing while the child gets older and reaching up to 2.9 hrs by age 17. Another important variable is the child-spacing between siblings. The amount of time spent in child work modestly decreases while the gap in years among both siblings gets larger. The first substantial decrease comes when the birth spacing goes from seven (-0.45 hrs) to eight years (-0.73 hrs). There is a small but significant (at the 5% level) gender difference in the quantity of hours spent in child work. If the child is a girl, she spends 0.141 hrs (9 minutes) more in child work activities per day.

[23]For time spent at school, the variable that stands out is the family cluster-mean for wealth index (1.536***). It means one unit increase in the family wealth index translates to an increase of 1.5 hours spent at school. For time spent in leisure, the distinct coefficient corresponds to the family cluster-mean of food expenditure is (-0.004*).

[24]The coefficient for hours spent at school (Column I) change sign from negative to positive (from -0.120 to 0.251 hrs) and for hours spent in leisure (Column III) it decreases (from 0.328 to 0.153 hrs), with respect to the CRE main results. None of them are statistically significant.

	Hrs/day at school (I)	Hrs/day studying outside school (II)	Hrs/day in leisure (III)	Hrs/day in child-work (IV)
Observations	1336	1336	1336	1336

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression. All regressions include controls reported in Table A5 in the Appendix. Testing the null hypothesis for zero correlation between heterogeneity and covariates ($\pi = 0$), gives the following *p-values:* 0.000 (Column I), 0.085 (Column II), 0.022 (Column III), and 0.360 (Column IV). See Table A12 in the Appendix for Hausman-Taylor estimates for Columns I and III.

Disaggregating each of the child work activities (Table 7b) reveals a key insight into the type of child work Peruvian children spent more (less) by birth order. As mentioned before, most children are not involved in paid work outside the household. We find that the negative effect of birth order for child work is driven by time spent in caring activities. The second born child spends 0.81 hrs (49 min) less per day in care activities than the firstborn sibling. The effect is larger than any of the other determinants in the model, regardless of the age of the child and birth-spacing among siblings.[25] There are no significant gender differences in the division of labour, only to mention that girls spent more time in household chores than boys, about 0.094 hrs more.[26] The zero-correlation assumption at the family level ($\pi = 0$) holds for all regressions. Coefficients for the rest of the predictors for Table 7b are listed in Table A6 in the Appendix.

Table 7b. CRE estimates: child work disaggregated

	Hrs/day care (V)	Hrs/day chores (VI)	Hrs/day household tasks (VII)	Hrs/day paid work (VIII)
Birth order (j =2)	-0.808***	0.024	0.003	-0.001
	(0.054)	(0.048)	(0.055)	(0.024)
p-value $H_0: \beta_1 = \beta_2 = 0$	0.000	0.608	0.957	0.963
R-squared	0.313	0.233	0.172	0.080
Observations	1336	1336	1336	1336

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression. All regressions include controls (not reported in table) reported in Table A6 in the Appendix. Testing the null hypothesis for zero correlation between heterogeneity and covariates ($\pi = 0$), gives the following *p-values:* 0.800 (Column V), 0.579 (Column VI), 0.744 (Column VII), and 0.390 (Column VIII).

In sum, results from this section suggest the negative effect for the second born sibling in child work, related to time spent in caring activities is substantial, especially compared to the rest of the predictors for time use. This result is in line with previous empirical evidence using middle and low-income country data (Ejrnæs & Pörtner, 2004; Emerson & Souza, 2008;

[25]In fact, only for ages seven (-0.151 hrs), 10 (-0.285 hrs), and 11 (0.374 hrs), coefficients are significant at the 1% level but still smaller than the birth order effect. The same applies for birth-spacing, as only when the space gap between siblings is 10 (-0.305 hrs) and 15 (-0.224 hrs) years, coefficients are significant at the 1% and 5% level, respectively.
[26]Girls spent more time in hours related to care (0.038 hrs), while boys spent more time in paid work (0.021 hrs), but none of the coefficients are statistically significant.

Moshoeshoe, 2016; Seid & Gurmu, 2015), where findings point to negative effects between children of higher birth order and child work.

In contrast, findings are unclear for time spent in education. The birth order effect of hours spent at school goes from negative to positive after the Hausman-Taylor correction although coefficients in both methods are not significant. A similar pattern is observed in Seid and Gurmu (2015) when addressing endogeneity of family size by IV estimation[27]; while the Correlated Random Effects estimate for hours spent studying outside school is positive and also not significant. These results relate to the mixed evidence of birth order effects in developing countries for educational outcomes (de Hann, Pluge, & Rosero, 2014; Ejrnæs & Pörtner, 2004; Emerson & Souza, 2008; Moshoeshoe, 2016).

Finally, on leisure results, the adjustment after HT led to a decrease in the birth order coefficient for the second born child, from 0.328 hrs to 0.153 hrs and resulting in no longer being statistically significant.

5.3 Sensitivity analysis

To address concerns of omitted variable bias, external validity, an further endogeneity in family size[28], I conduct three different sensitivity checks, re-estimating Eq (2) by: (1) adding birthweight and a cognitive score to proxy for child's ability (mild sample restriction); (2) restricting the analytic sample to children with "older" mothers, who are less likely to still be making fertility decisions and adding birthweight (strongest sample restriction)[29]; and (3) comparing same-sex two children families with three children families (weaker sample restriction). [30]

[27]Their school enrolment average marginal effect is negative and insignificant in models not controlling for endogeneity of family size (-0.002) and becomes positive in their preferred bivariate probit IV specification (0.014), but still insignificant.

[28]Emerson and Souza (2008) argue that the family size variable can be endogenous for two main reasons. First, it could be that it is correlated with the error term because it is measuring two different things, completed fertility for some families, and current children for families that have not yet finished having kid. The second way fertility might be correlated with the error term is because investment in children and number of children could be jointly determined.

[29]Mother's mean age for the analytic sample is 24 years old (at baseline). In this restriction, I use the mean age observed in the 75 percentiles, 28 years old (at baseline). Naturally, sample size for this check, also including birthweight, is considerably smaller (*N* = 265) from the main analytic sample (*N* = 1336).

[30]The mean number of children in the unrestricted sample of Young Lives children is 4.3. However, the total fertility rate for Peru, following the global fertility trend, has been decreasing in the past 50 years and in 2016 it was 2.4 births per women (Bank, 2018). Hence, using two-children families for the main results offers a closer account of the current family composition in Peru.

5.3.1 Less restricted sample: Family size

To test for heterogeneity in the effect of birth order by family size, I estimate all CRE regressions for the time-use continuous outcomes separately by different family sizes with same-sex children (e.g. two boys, two girls, three boys, three girls).[31] Table 8a below compares estimates between families with two children (Columns Ia-IVa) and three children (Columns Ib-IVb). When comparing the estimates with three children families, the birth order coefficient for the third born is equivalent to the second born child in two sibling families (in magnitude and statistical significance). On average, being the second born sibling in a two-child family and the third born sibling in three children families decreases the daily number of hours spent caring for any other household member by 0.787 hrs (47 min), whilst the second born in three child families spends 0.348 hrs (21 min) less, in contrast of their firstborn sibling. For two children families, the negative effect of time spent in child work for the second born child remains significant, though restricting the analysis to same-sex siblings reduces the magnitude of the coefficient by 0.133 hrs with respect to the main results in Table 7a (going from -0.813 to -0.682 hrs).

Including three child families in the analysis brings more informative results for time spent in leisure. The second and third born child spend more hours in leisure activities, up to 0.276 hrs (17 min) and 0.534 hrs (32 min) more than the oldest sibling. Results for all coefficients are included in Table A7 in the Appendix.[32]

When decomposing child work in Table 8b, the birth order coefficient for hours spent in care activities is negative, significant (at less than 1% level), and same in magnitude for the second born in two sibling families and for the third born in three child families, amounting to -0.787 hrs (47 min). There is also a negative effect for the second born in three child families but smaller than for the third born (-0.348 hrs/21 min). Surprisingly, there is a small positive birth order effect for the second and third born in three child families for daily hours worked in paid activities. The result of 0.154 hrs (9 min) is only significant for the second born child (at the 5% level). See Table A8 in the Appendix for the complete list of coefficients.[33]

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[31]I also examined birth order differences for four children families. However, sample size decreases dramatically (only 426 children-data points observations), as there are not enough same-sex four children families, and inference is invalid (standard errors increase). For four siblings, the negative birth order effect in child work for the fourth child is smaller in magnitude (in contrast with two and three child families), and positive for the second and third born, but none of the coefficients are statistically significant. Results are available upon request.

[32]There is a clear inverse relationship for both two, and three sibling families, between age and the amount of time in leisure. Values range from -0.597 hrs (36 min) to -0.961 hrs (58 min) at age five, and from -2.100 hrs (126 min) to -2.741 hrs (165 min) by age 17, respectively. In families with three siblings if child ethnicity is White, it means a 1.093 hr increase in leisure activities.

[33]On the rest of the predictors, it seems the birth order effect is driven by siblings aged 15 years old and older, as it is when the first substantial increase is observed. Youngsters aged 15, 16, and 17 spend between 0.884 and 2.70 hrs more in paid work. There are larger gender differences (still small in

As in the main results, the zero-correlation hypothesis ($\pi = 0$) that estimation by CRE is consistent, i.e. no correlation between heterogeneity and covariates, fails for hours spent at school (Columns Ia and Ib) and hours spent in child work (Column IVb). Hausman-Taylor estimates are reported in Table A13 in the Appendix.[34]

magnitude) in the division of labour for same-sex families, in contrast with the main results from Table 7b (coefficients found in Table A6). In two children families, girls spent more time in hours related to care (0.098 hrs/6 min), while boys spent more time in paid work in both two (0.047 hrs/3 min) and three (0.109 hrs/7 min) sibling families. These results are aligned with Crivello and Espinoza-Revollo (2018).

[34]HT results show the coefficients for hours spent at school switch sign for Column Ia (from -0.136 to 0.782) and for the second born in Column Ib (from -0.092 to 0.099); while increasing for the third born child in Column Ib (from -0.151 to -0.891). For hours spent in child work (Column IVb), coefficient for the second born increases (from -0.150 hrs to -0.409 hrs), whilst decreasing for the third born and is no longer statistically significant (from -0.681 hrs to -0.594 hrs).

Table 8a. Sensitivity CRE: By Family Size

	2 siblings				3 siblings			
	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*	*Hrs/day at school*	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(Ia)	(IIa)	(IIIa)	(IVa)	(Ib)	(IIb)	(IIIb)	(IVb)
Birth order (*j* =2)	-0.136 (0.091)	0.082 (0.076)	0.280 (0.151)	-0.682*** (0.128)	-0.092 (0.086)	-0.017 (0.065)	0.276* (0.115)	-0.150 (0.136)
Birth order (*j* =3)					-0.151 (0.139)	-0.084 (0.099)	0.534** (0.189)	-0.681*** (0.173)
p-value $H_0: \beta_1 = \beta_2 = 0 \mid \beta_1 = \beta_2 = \beta_3 = 0$	0.132	0.28	0.063	0.000	0.496	0.603	0.015	0.000
R-squared	0.301	0.209	0.272	0.367	0.350	0.226	0.301	0.413
Observations	1076	1076	1076	1076	1035	1035	1035	1035

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression. All regressions include controls reported in Table A7 in the Appendix. Columns Ia-IVa correspond to two sibling families, excluding 12 households where the sibling definition confounds the true family size. Columns Ib-IVb correspond to three sibling families, excluding 17 problematic household ids and 2 households with twins. Testing the null hypothesis of zero correlation between heterogeneity and covariates ($\pi = 0$), gives the following *p-values:* 0.000 (Column Ia), 0.231 (Column IIa), 0.292 (Column IIIa), 0.590 (Column IVa), 0.060 (Column Ib), 0.354 (Column IIb), 0.705 (Column IIIb), and 0.001 (Column IVb).

Table 8b. Sensitivity CRE: By Family Size (child-work disaggregated)

	2 siblings				3 siblings			
	Hrs/day care	*Hrs/day chores*	*Hrs/day household tasks*	*Hrs/day paid work*	*Hrs/day care*	*Hrs/day chores*	*Hrs/day household tasks*	*Hrs/day paid work*
	(Va)	(VIa)	(VIIa)	(VIIIa)	(Vb)	(VIb)	(VIIb)	(VIIIb)
Birth order (*j* =2)	-0.787*** (0.062)	0.028 (0.055)	0.070 (0.071)	0.011 (0.039)	-0.348*** (0.075)	0.021 (0.051)	0.039 (0.059)	0.154* (0.076)
Birth order (*j* =3)					-0.789*** (0.090)	-0.061 (0.070)	0.049 (0.090)	0.147 (0.075)
p-value $H_0: \beta_1 = \beta_2 = 0 \mid \beta_1 = \beta_2 = \beta_3 = 0$	0.000	0.607	0.324	0.784	0.000	0.239	0.805	0.118
R-squared	0.327	0.253	0.180	0.094	0.256	0.304	0.278	0.220
Observations	1076	1076	1076	1076	1035	1035	1035	1035

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression. All regressions include controls reported in Table A8 in the Appendix. Columns Ia-IVa correspond to two sibling families, excluding 12 households where the sibling definition confounds the true family size. Columns Ib-IVb correspond to three sibling families, also excluding 17 households where the sibling definition confounds the true family size and 2 households with twins. Testing the null hypothesis of zero correlation between heterogeneity and covariates ($\pi = 0$), gives the following *p-values:* 0.579 (Column Va), 0.817 (Column VIa), 0.495 (Column VIIa), 0.326 (Column VIIIa), 0.075 (Column Vb), 0.100 (Column VIb), 0.273 (Column VIIb), and 0.220 (Column VIIIb).

5.3.2 Restricted sample: birthweight, PPVT score and "older" mothers

Another check of birth order effects and further controlling for endogeneity on fertility decisions, is to examine if parents adjust on time use margins after observing their children endowments. Two variables analysed previously (with established literature in family and birth order studies) are birthweight (Black et al., 2007; Del Bono, Ermisch, & Francesconi, 2012) and cognitive outcomes (Conley, Pfeiffer, & Velez, 2007; Heiland, 2009; Lehmann et al., 2016). I use PPVT score to proxy for cognitive outcome as this outcome was collected for both the Young Lives child and for a younger sibling.[35] Adding birthweight and age adjusted PPVT score[36] (in Table 9 below), only marginally affects the variability observed in the birth order coefficient for daily hours spent in leisure (from 0.328 to 0.271 hrs) and for hours spent in caring activities (from -0.808 to -0.773 hrs). A standard deviation increase in PPVT score amounts only to 0.088 hrs (5 min) more in time spent at school, and 0.132 hrs (8 min) less in time spent studying. Birthweight coefficients are almost zero (when rounded to the third decimal). Coefficients of birthweight and PPVT score reported in Table A9 in the Appendix.

To test if incomplete fertility could be at play in birth order effects, I estimate birth order effects for a sample where the mother is 28 years old at baseline and add birthweight as observed endowment. A caveat of this comparison is that the sample size dramatically shrinks by imposing the age restriction for mothers, representing only the 20% of the main analytic sample (265 vs. 1336). The direction of the birth order effect remains, but the magnitude shifts. The negative effect in hours spent at school increases (from -0.120 to -0.380 hrs) and becomes significant at the 5% level, while for hours spent in care decreases by half (from -0.808 to -0.481 hrs).

Furthermore, the zero-correlation hypothesis ($\pi = 0$) fails for Columns I, IV, and V. The Hausman-Taylor (HT) results (listed in Table A14 in the Appendix), show the coefficient for hours spent at school increases in both Column I (from -0.124 to -0.424 hrs) and Column IV (from -0.380 to -0.765 hrs), but the latter is no longer statistically significant. For hours spent in leisure (Column V), the coefficient increases (from 0.173 to 0.336 hrs). None of the HT estimates are statistically significant.

[35] Both birthweight and PPVT score were collected only for younger siblings (if present at the moment of the interview) and for a subsample of households. Thus, sample size is limited, and the known data restriction disclaimers apply for this section.

[36] I use an age adjusted PPVT outcome to make feasible comparisons among both siblings. The age reference is 4-6 years old, hence the information for PPVT scores for the Young Lives child comes from Round 2 of data collection, while the sibling's PPVT score may come from Round 3 or Round 4, if her/his age was between 4-6 years old.

Table 9. Sensitivity CRE: birthweight, PPVT score & mother's age

	Birthweight and PPVT score			Mom age (28+) and birthweight		
	Hrs/day at school	*Hrs/day in leisure*	*Hrs/day care*	*Hrs/day at school*	*Hrs/day in leisure*	*Hrs/day care*
	(I)	(II)	(III)	(IV)	(V)	(VI)
Birth order (*j* =2)	-0.124	0.271*	-0.773***	-0.380*	0.173	-0.481***
	(0.075)	(0.131)	(0.061)	(0.176)	(0.315)	(0.107)
p-value $H_0: \beta_1 = \beta_2 = 0$	0.099	0.039	0.000	0.030	0.582	0.000
R-squared	0.270	0.218	0.316	0.443	0.356	0.375
Observations	955	955	955	265	265	265

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression. All regressions include controls listed in Table A9. Testing the null hypothesis of zero correlation between heterogeneity and covariates ($\pi = 0$), gives the following p-values: 0.004 (Column I), 0.086 (Column II), 0.862 (Column III), 0.002 (Column IV), 0.047 (Column V), and 0.460 (Column VI).

One last robustness test involves transforming the continuous time use outcome into percentage. In that way, we can incorporate time spent sleeping into the analysis and have the full 24-hour snapshot of time use activities among both siblings. Figure 2 depicts the proportion of the day the first and second born spent in each activity. Overall, there are not clear differences among activities, except for time spent in child work (0.036 percentage points difference); and the new insight regarding time spent sleeping, where most than 40% of the day is devoted to this activity. Estimating birth order effects with the transformed outcomes, findings in Table 10 are consistent with main results. The second born child spends less time in child work, 3.2% less of her/his day relative to her/his older sibling and more time in leisure activities.

Figure 2. Proportion of the day spent in each activity

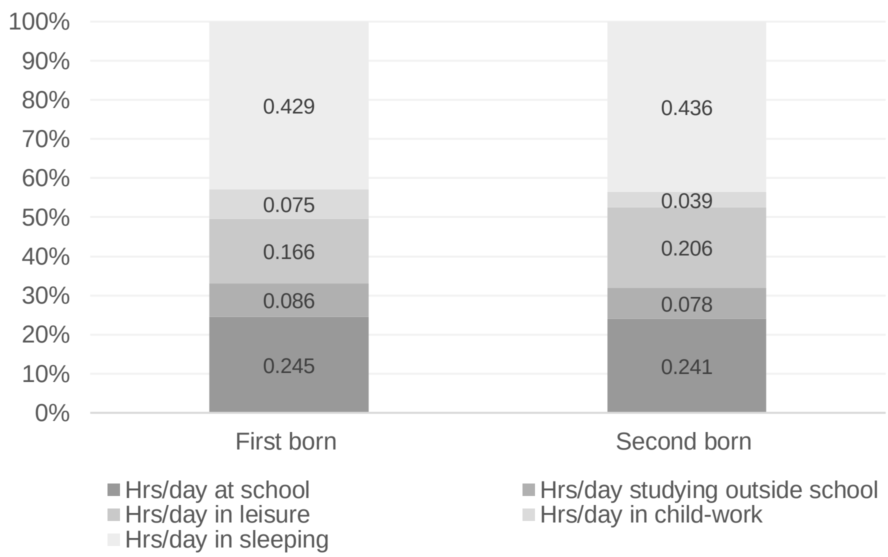

Table 10. Sensitivity CRE: Time use as percentage

	Prop. at school (I)	*Prop. studying outside school* (II)	*Prop. in leisure* (III)	*Prop. in child-work* (IV)	*Prop. sleeping* (V)
Birth order (j =2)	0.002	0.005**	0.018***	-0.032***	0.006*
	(0.003)	(0.003)	(0.005)	(0.004)	(0.003)
p-value $H_0: \beta_1 = \beta_2 = 0$	0.476	0.042	0.000	0.000	0.055
R-squared	0.279	0.214	0.294	0.364	0.263
Observations	1336	1336	1336	1336	1336

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression. All regressions include controls listed in Table 3 (not reported here)[37]. Testing the null hypothesis for zero correlation between heterogeneity and covariates ($\pi = 0$), gives the following *p-values:* 0.000 (Column I), 0.067 (Column II), 0.020 (Column III), 0.736 (Column IV), 0.541 (Column V).

After testing the robustness of the birth order findings with alternative specifications, is possible to confirm that the negative effect in child work for the second born sibling, particularly for hours spent in care, is robust for two child families. The negative effect holds for higher parity families, where similar negative effects in magnitude related to birth order are observed for the last born in three child families and is invariant when adjusting for PPVT score and birthweight.[38]

Evidence for time in educational activities remains mixed, while for time in leisure, only when augmenting the analysis to three children families we observe a positive effect for both, second and third born siblings. Nonetheless, these effects are smaller in magnitude when compared to the other variables in the specification and to the negative birth order effect in child work.

6. Investigating Mechanisms: Parental Educational Aspirations

This section attempts to unpack one potential mechanism driving the birth order differences in the previous section, and in doing so, complementing the literature linking the role of parental early aspirations for their children with time-use investments. Beyond the resource constraint, how parents (children) allocate differential investments, including time, in the household context, is linked to parental beliefs about the productivity and usefulness of those investments (Attanasio, Boneva, & Rauhn, 2018). As stated in Sections 1 and 2, there is still limited literature on how aspirations shape decision making (Attanasio & Kaufmann,

[37]Available upon request.

[38]Although, as discussed earlier, for the check on families with "complete" fertility (older mothers), the sample only represents 20% of the main analytic sample (265 vs. 1336 children-data points). The negative effect for the younger sibling sustains though its magnitude is almost reduced by half (from -0.808 to -0.481 hrs).

2014; Chiapa et al., 2012), and on parental perceptions about the returns to their time investments (Attanasio et al., 2018; Cunha, Elo, & Culhane, 2013).

The main drawback of this section is only having information on parental aspirations for the Young Lives child and not for the rest of the siblings, reducing sample size and restricting to cross-sectional methods for the analysis. Despite this limitation, the comparison might improve our understanding of how household decisions are made, based on how parental aspirations vary by birth order, and how it may explain time use allocation.

Following previous studies, Table 11a displays the correlation matrix between birth order, holding the highest educational aspiration, i.e. a University/Postgraduate degree (UniPost) [39], PPVT score, and if child is a girl; while Table 11b shows the distribution of parental aspirations and the mean of the standardised PPVT score for both two and three child families with same-sex children. Although small in magnitude, we notice there is a negative association between birth order and parental aspirations, and positive relationship between birth order and PPVT score (significant at the 5% level). There is a positive correlation between UniPost parental aspiration and PPVT score, only significant for two-child families. For both family sizes, there is a small negative association between holding a UniPost aspiration and if child is a girl, but not statistically significant. Likewise, the proportion of children that parents have a UniPost parental aspiration is higher for the firstborn child, than for the second born, despite the latter having a higher PPVT score (when both children where about 4-6 years old). This holds for both two and three sibling families, though in all cases the percentages are quite high, where at least above 75% of parents aspire for a UniPost degree. For the third born child, the proportion for a UP degree parental aspiration is almost the same as for the second born child (slightly higher), but the difference with respect to her/his oldest sibling is not statistically significant. The second born child outperforms her/his oldest and youngest sibling, as measured by the PPVT score in both family sizes.

Table 11a. Correlation matrix of birth order and UniPost parental aspiration

	2 siblings				3 siblings			
	Birth order	University/ Postgraduate	Std PPVT	Child is female	Birth order	University/ Postgraduate	Std PPVT	Child is female
Birth order	1.000				1.000			
University/ Postgraduate	-0.276*	1.000			-0.224*	1.000		
Std PPVT	0.095*	0.098*	1.000		0.113*	0.025	1.000	
Child is female	-0.005	-0.046	0.028	1.000	0.013	-0.039	-0.049	1.000

***p<0.001, **p<0.01, *p<0.05.

[39] Young Lives variable on parental aspiration distinguishes among different education levels, including No education, Grade 1-Grade 11, Vocational Education (incomplete and complete), Pedagogical Institution (incomplete and complete), University (incomplete and complete), and Postgraduate.

Table 11b. Means and difference in means of parental aspiration and Std. PPVT score

	2 siblings			3 siblings				
	First born (j =1)	Second born (j =2)	Diff. in means	First born (j =1)	Second born (j =2)	Third born (j =3)	Diff. in means (j =1 vs. j =2)	Diff. in means (j =1 vs. j =3)
University/ Postgraduate (prop.)	0.873	0.812	0.061**	0.847	0.750	0.776	0.093**	0.067
Standardised PPVT score	0.363	0.493	-0.130*	0.076	0.255	0.208	-0.179*	-0.132
Observations	760			504				

***p<0.001, **p<0.01, *p<0.05.

To inspect the relationship between birth order and parental educational aspirations for two and three child families of the same sex within a framework model, I use a probit model denoted in Eq (3):

$$Pr(\gamma_{ijft}\text{=1} \mid (Birth\ order_{if} = j), x_{ift}) = \Phi(\theta_t + \beta_j(Birth\ order_{if} = j) + \varphi x_{ift} + \psi(Birth\ order_{if} = j) * \kappa_{ift}) \quad (3)$$

where Pr represents the probability of the parent holding the highest educational aspiration, a UniPost degree, defined as a binary indicator (equal to 1 for parents who aspire to obtain that degree, and 0 otherwise), for their child of birth order ($j = 2, 3$) with respect to the firstborn child ($j = 1$) (omitted category); ψ is an interaction term parameter capturing differences of birth order by age adjusted PPVT score included in κ_{ift}; x_{ift} denotes a vector of family/child/household characteristics described in Section 2.

Furthermore, I estimate and extended version of Eq (2) examining the joint role of lagged parental aspirations (when child was about five years old) and birth order as determinants of time-use allocation as depicted in Eq (4):

$$\gamma_{ift} = \theta_t + \beta_j(Birth\ order_{if} = j) + \tau P_{ift-2} + \vartheta(Birth\ order_{if} = j) * P_{ift-2} + \varphi x_{ift} + \varrho\kappa_{ift} + \alpha z_{ft} + \pi\bar{x}_f + v_f + \varepsilon_{ift} \quad (4)$$

where Y_{ift} is hours spent at school or hours spent in care[40]; τ denotes the parameter for the binary indicator of the lagged UniPost parental aspiration ($P = 0{,}1$); ϑ is the interaction term parameter, capturing differences of parental aspirations ($P = 0{,}1$) by birth order ($j = 2, 3$) with respect to the first born ($j = 1$); and κ_{ift} is the age-adjusted PPVT score.

[40]Only looking at these outcomes given the persistent negative effect for child work and the mixed evidence for time use in education.

In Table 12a I report the Average Marginal Effect (AME) for Eq (3). Results align with the correlations obtained earlier in Table 9a. There is a negative association between birth order and parental aspirations for a UniPost degree for both family sizes, but in this case, none is statistically significant. Compared to firstborns, second and third born siblings are respectively 9.6 and 12 percentage points less likely that parents aspire for them to have a UniPost degree. PPVT age adjusted score is only relevant for two children families (Column I), where one standard deviation increase in the score leads to 5.7 percentage points more likely that parents aspire for a UP degree for their second born child. The average marginal effects of the rest of the predictors in the model provide are reported in Table A10 in the Appendix.

Table 12a. Average Marginal Effects: Parental aspirations and birth order

	2 siblings	**3 siblings**
	University/ Postgraduate (I)	*University/ Postgraduate* (II)
Birth order (j =2)	-0.048 (0.034)	-0.082 (0.060)
Birth order (j =3)		-0.068 (0.051)
Std PPVT score	0.057** (0.017)	0.053 (0.043)
p-value H_0: $\beta_1 = \beta_2 = 0$ & $\psi_1 = \psi_2 = 0$ | $\beta_1 = \beta_2 = \beta_3 = 0$ & $\psi_1 = \psi_2 = \psi_3 = 0$	0.293	0.013
Observations	760	504

***p<0.001, **p<0.01, *p<0.05. Standard errors in parentheses. Each column represents a separate probit regression. Testing the null hypothesis of zero correlation between heterogeneity and covariates ($\pi = 0$), gives the following *p-values*: 0.296 (Column I) and 0.805 (Column II).

I proceed to estimate Eq (4) only for two children families, given the shrinkage in sample size denoted in Table 12a above for three-child families. Effectively, there are no differences in time spent in care if parents aspire or not for a UniPost degree for their second born child. The youngest sibling spends between 0.742 and 0.753 hrs (~45 min) less in caring activities. Conditioning on parental aspiration, the coefficient for time spent in care remains virtually unchanged with respect to the estimate in Table 12b (Column Ia) (-0.787 hrs). The coefficient for time-spent at school does vary if parents do not hold the highest educational aspiration. The daily number of hours spent at school for the youngest child decreases from 0.175 (11 min) to 0.515 hrs (31 min) in contrast with her/his oldest sibling but the difference is not statistically significant. Average marginal effects for the rest of the predictors are reported in Table A11 in Appendix.

Table 12b. Average Marginal Effects: Joint effect parental aspirations and birth order

	2 siblings	
	Hrs/day at school (I)	*Hrs/day care* (II)
Birth order (j =2)	-0.226* (0.098)	-0.751*** (0.071)
University/Postgrad (p =1)	0.164 (0.144)	-0.050 (0.091)
Birth order (j =2)* University/Postgrad (p =0)	-0.515 (0.325)	-0.742*** (0.162)
Birth order (j =2)* University/Postgrad (p =1)	-0.175 (0.095)	-0.753*** (0.073)
p-value $H_0: \beta_2 = \tau_2 = \vartheta_{21} = 0$	0.106	0.000
R-squared	0.168	0.326
Observations	760	760

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression. Testing the null hypothesis of zero correlation between heterogeneity and covariates ($\pi = 0$), gives the following *p-values*: 020 (Column I) and 0.432 (Column II).

After this section, we can highlight two results. First, parents are equally likely to aspire for the highest level of education, a UniPost degree, regardless to birth order. This finding holds for two and three children families; and second, even after conditioning for parental aspirations, the negative relationship of birth order and time spent in child work, i.e. care activities, for the second born remains.

7. Conclusions

The importance of time in the production of skills and other child outcomes is increasingly recognised in the literature. Although, there is still limited understanding of child's time use as one input or channel for skill development and human capital transmission. This paper documents the relationship between birth order and child's time use. There are two main motivations for the present analysis. One is due to the wide variation in findings in the previous literature examining the role of birth order with children's outcomes. The second is the little attention child's time use has received considering: a) a more comprehensive list of time allocation activities; and b) an expanded conceptualisation of child work, including time for household production. The identification strategy to overcome endogeneity of family size and estimate causal effects relies on examining this relationship for two-child families and identification across households.

I find that higher birth order has a significant and negative effect on child work. In a two-sibling family, the second born child is 10.8 percentage points less likely to participate in child work; and spending 0.81 hours (about 49 minutes) less in care activities of other household members (e.g. younger siblings, elderly, or members with disabilities). The results on child work are robust to a range of specifications including time use as different outcomes (e.g. as binary indicators, continuous outcomes, and as percentage measures), variations in family size (e.g. two versus three siblings), observed endowments (e.g. birthweight and cognitive score), families with “complete” fertility decisions, and irrespective of parental educational aspirations for both siblings. The magnitude of the effect is substantial when compared to other predictors in the model and other previous studies. Furthermore, looking to a broader range of time use activities, it seems the time unspent in child work is reallocated in expanded time spent in leisure rather than time spending at school or studying. I found no conclusive evidence of birth order effects for school participation and time spent in educational activities (school or studying). According to Moshoeshoe (2016), education effects related to birth order in developing countries, seem to be context-specific and linked to each country level of development.

When probing the child work results and examining if parental educational aspirations influence time investments, I find that parents hold the highest parental aspiration (e.g. a University/Postgraduate degree) regardless of birth order; and that holding that educational aspiration do not affect time use allocation between first and second born siblings at least for child work.

We could argue that time is an input controllable by families and relatively easy to adjust. All these results have implications on how this distribution/redistribution of time use, in turn, affects other child’s outcomes. When we put in context the negative relationship between child work and birth order looking into weekly and monthly hours, the second born child spends around four weekly hours less than her/his firstborn sibling in child work related to care activities, which in turn amounts to 16 hours per month. What could a child achieve if having 16 hours to spare with her/his time? Conversely, what do the firstborn child could achieve if having 16 hours to spare with her/his time?

There is a significant focus on policies aiming to increase quantity/quality to school (e.g. extending the length of the school day) and on policies to reduce child work, with narrow emphasis on labour market work. According to Keane, Krutikova, and Neal (2018) policies to reduce child work will only lead to gains in human capital if they nudge families to reallocate the freed-up time to the subset of possible alternative activities that are more productive than working. There is also increasing awareness that some children’s work can be benign or even beneficial (concerning skills), and child contributions may be vital for household survival, particularly among the poorest families (Morrow & Boyden, 2018). One priority should be to incorporate time use for household production in the definition and measurement of child work. Likewise, there is still much scope to design and implement more integrated efforts to reduce the pressure of care work experienced by firstborn children, particularly at school-age stages crucial to child development. Schooling is essential for human capital formation, and it is a human capital investment which mainly happens during childhood.

Although we can claim that the negative birth order effect for child work (effectively hours spent in caring activities) is an internally valid result, it comes with a cost on the external validity for larger family sizes (e.g. more than three children). However, similar results are encountered in studies examining birth order and child market labour participation, where higher birth order children are less likely to participate in labour (Moshoeshoe, 2016; Seid & Gurmu, 2015). Intuitively, the negative effect in child work for higher birth order siblings makes sense given the inverse relationship nature of birth order with age. Furthermore, findings from the analysis can be generalised to other middle-income countries with similar socioeconomic context, large levels of inequalities, and historical high incidence of child work participation as Peru.

Neglecting measurement error can result in misleading conclusions. There is more scope to improve issues on measurement error related to time use data. Possible solutions include explicitly listing a more extensive set of activities for the 24-hour day (e.g. pertinent to the broad concept of the activities included under the “leisure” construct within the Young Lives data) and collect time use data for both typical a day and a weekend day. Other solutions involve alternatives in the time use data collection like employing time use diaries for the person and sending text messages as reminders to fill out the information. This technique has been proven cost-effective to enhance participation. Likewise, further research is needed to examine other potential mechanisms explaining household dynamics and behaviours in resource allocation.

References

Attanasio, O., Boneva, T., & Rauhn, C. (2018). *Parental Beliefs about Returns to Different Types of Investments in School Children*. HCEO Global Working Group Working Paper Series (2018-032). Chicago, Illinois.

Attanasio, O., & Kaufmann, K. (2014). Education choices and returns to schooling: Mothers' and youths' subjective expectations and their role by gender. *Journal of Development Economics, 109*(C), 203-216.

Azubuike, O., & Briones, K. (2016). *Young Lives Rounds 1 to 4 Constructed files*. Retrieved from Oxford: https://www.younglives.org.uk/sites/www.younglives.org.uk/files/YL-TN35_Young%20Lives%20Constructed%20Files%20R1-R4_0.pdf

World Bank (2018). *Fertility rate, total (births per woman)*. Retrieved from: https://data.worldbank.org/indicator/SP.DYN.TFRT.IN

Bell, A. J. D., & Jones, K. (2015). Explaining Fixed Effects: Random Effects modelling of Time-Series Cross-Sectional and Panel Data. *Political Science Research and Methods, 3*(1), 133-153. doi:10.1017/psrm.2014.7

Black, S., Devereux, P., & Salvanes, K. (2005). The More the Merrier? The Effect of Family Size and Birth Order on Children's Education. *The Quarterly Journal of Economics, 120*, 669-700.

Black, S., Devereux, P., & Salvanes, K. (2007). *Older and wiser? Birth order and IQ of young men*. IZA Discussion Papers, (3007). Bonn, Germany.

Borga, L. G. (2018). Children's Own Time Use and its Effect on Skill Formation. *The Journal of Development Studies, 55*(5), 876-893. doi:10.1080/00220388.2018.1499893

Brenøe, A., & Molitor, R. (2018). Birth Order and Health of Newborns. *Journal of Population Economics, 31*(2), 363–395.

Cameron, C. A., & Trivedi, P. K. (2009). *Microeconometrics Using Stata*. Texas, USA: Stata Press.

Chiapa, C., Garrido, J., & Prina, S. (2012). The Effect of Social Programs and Exposure to Professionals on the Educational Aspirations of the Poor. *Economics of Education Review, 31*(5), 778–798.

Chuhui, L., Poskitt, D. S., & Zhao, X. (2016). *The Bivariate Probit Model, Maximum Likelihood Estimation, Pseudo True Parameters and Partial Identification*. Monash Econometrics and Business Statistics Working Papers, (16/16).

Clarke, P., Crawford, C., Steele, F., & Vignoles, A. (2010). *The Choice Between Fixed and Random Effects Models: Some Considerations for Educational Research*. IZA Discussion Paper Series, (5287). Bonn, Germany.

Conley, D., Pfeiffer, K. M., & Velez, M. (2007). Explaining sibling differences in achievement and behavioral outcomes: The importance of within- and between-family factors. *Social Science Research, 36*(3), 1087-1104. doi:10.1016/j.ssresearch.2006.09.002

Cuesta, A. (2018). *Child Work and Academic Achievement: Evidence from Young Lives in Ethiopia*. Young Lives Student Paper.

Cueto, S., León, J., Miranda, A., Dearden, K., Crookston, B. T., & Behrman, J. R. (2016). Does pre-school improve cognitive abilities among children with early-life stunting? A longitudinal study for Peru. *International Journal of Educational Research, 75*, 102-114.

Cunha, F., Elo, I., & Culhane, J. (2013). *Eliciting maternal expectations about the technology of cognitive skill formation*. NBER Working Paper, (19144).

de Hann, M. (2005). *Birth Order, Family Size and Educational Attainment*. Tinbergen Institute Discussion Paper, (TI 2005-116/3).

de Hann, M., Pluge, E., & Rosero, J. (2014). Birth Order and Human Capital Development: Evidence from Ecuador. *Journal of Human Resources, 49*(2), 359-392. doi:10.1353/jhr.2014.0008

Del Bono, E., Ermisch, J., & Francesconi, M. (2012). Intrafamily resource allocations: a dynamic structural model of birth weight. *Journal of Labor Economics, 30*(3), 657–706.

Del Bono, E., Francesconi, M., Kelly, Y., & Sacker, A. (2016). Early maternal time investment and early child outcomes. *The Economic Journal, 126*(596), F96–F135.

Downey, D. B. (2001). Number of siblings and intellectual development. The resource dilution explanation. *Am Psychol, 56*(6-7), 497-504.

Edmonds, E. (2009). *Defining child labour: A review of the definitions of child labour in policy research*. Working Paper, International Programme on the Elimination of Child Labour (IPEC). Geneve.

Ejrnæs, C., & Pörtner, M. (2004). Birth Order and Intrahousehold Allocation of Time and Education. *The Review of Economics and Statistics, 86*, 1008-1019.

Elzinga, A., & Gasperini, B. (2015). *Correlated Random Effects Model: an Application to the Exchangeability of Siblings and Twins*. Brown University. Retrieved from https://pdfs.semanticscholar.org/b802/c87eaee019b248a4bff3d1e60e99aa1ac466.pdf

Emerson, P. M., & Souza, A. P. (2008). Birth Order, Child Labor, and School Attendance in Brazil. *World Development, 36*(9), 1647-1664. doi:10.1016/j.worlddev.2007.09.004

Espinoza-Revollo, P., & Porter, C. (2018). *Evolving Time Use of Children Growing Up in Ethiopia, India, Peru and Vietnam, 2006-2016*. Young Lives Working Paper, (180). Oxford.

Gimenez-Nadal, J., & Sevilla, A. (2012). Trends intimeallocation:Across-countryanalysis. *European Economic Review, 56*, 1338–1359. doi:10.1016/j.euroecorev.2012.02.011

Grätz, M. (2018). Competition in the Family: Inequality between Siblings and the Intergenerational Transmission of Educational Advantage. *Sociological Science, 5*, 246-269. doi:10.15195/v5.a11

Heiland, F. (2009). Does the birth order affect the cognitive development of a child? *Applied Economics, 41*(14), 1799-1818.

Keane, M., Krutikova, S., & Neal, T. (2018). The Impact of Child Work on Cognitive Development: Results from Four Low to Middle Income Countries. *IFS Working Paper*.

Lehmann, K., Nuevo-Chiquero, A., & Vidal-Fernandez, M. (2016). The Early Origins of Birth Order Differences in Children's Outcomes and Parental Behavior. *Journal of Human Resources, 53*(123-156). doi:10.3368/jhr.53.1.0816-8177

Levison, D., & Moe, K. (1998). Household work as a deterrent to schooling: An analysis of adolescent girls in Peru. *Journal of Developing Areas, 32*, 339-356.

Levison, D., Moe, K., & Knaul, F. (2001). Youth education and work in Mexico. *World Development, 29*, 167-188.

Marion, P. (2018). *A Guide to Young Lives Rounds 2 to 5 Consumption Aggregates*. Technical Note, (49). Oxford.

Molnár, T. L. (2018). *How Do Mothers Manage? Universal Daycare, Child Skill Formation, and the Parental Time-Education Puzzle*. Montréal, Canada.

Morrow, V., & Boyden, J. (2018). *Responding to children's work: Evidence from the Young Lives study in Ethiopia, India, Peru and Vietnam*. Retrieved from Oxford:

Moshoeshoe, R. (2016). *Birth Order Effects on Educational Attainment and Child Labour: Evidence from Lesotho*. ERSA working paper, (621).

Mundlak, Y. (1978). On the Pooling of Time Series and Cross Section Data. *Econometrica, 46*(1), 69-85.

Pavan, R. (2016). On the Production of Skills and the Birth Order Effect. *Journal of Human Resources, 51*(3), 699–726.

Price, J. (2008). Parent-Child Quality Time: Does Birth Order Matter? *Journal of Human Resources, 43*(1), 240-265.

Rabe-Hesketh, S., & Skrondal, A. (2012). *Multilevel and Longitudinal Modeling Using Stata* (Third ed.): Stata Press.

Schunck, R. (2013). Within and between estimates in random-effects models: Advantages and drawbacks of correlated random effects and hybrid models. *The Stata Journal, 13*(1), 65-76.

Schunck, R., & Perales, F. (2017). Within- and between-cluster effects in generalized linear mixed models: A discussion of approaches and the xthybrid command. *The Stata Journal, 17*(1), 89-115.

Seid, Y., & Gurmu, S. (2015). The role of birth order in child labour and schooling. *Applied Economics, 47*(49), 5262-5281.

Wooldridge, J. (2010). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: The MIT Press.

Zajonc, R. B. (1976). Family Configuration and Intelligence. *Science, 192*(4236), 227-236. doi:10.1126/science.192.4236.227

Zajonc, R. B., & Markus, G. B. (1975). Birth order and intellectual development. *Psychol Rev, 82*(1), 74–88.

Appendix

Table A1. Mean and variation of outcomes and controls

	Mean	*SD*	$SD_{between}$	SD_{within}
Outcomes				
School enrolment	0.716	0.451	0.348	0.297
Child work participation	0.615	0.487	0.394	0.305
Hrs/day at school	5.984	1.138	1.012	0.659
Hrs/day studying outside school	2.008	0.910	0.757	0.544
Hrs/day in leisure activities	4.158	1.708	1.481	1.002
Hrs/day in child-working activities	1.682	1.660	1.364	0.966
Child Characteristics				
Age (in years)	9.228	2.843	2.302	1.896
Birth order	1.449	0.498	0.500	0.000
Female (prop.)	0.504	0.500	0.500	0.000
Children attended preschool (prop.)	0.965	0.184	0.192	0.000
Language is Spanish (prop.)	0.954	0.209	0.219	0.000
Religion is Catholic (prop.)	0.839	0.368	0.370	0.000
Other religion (prop.)	0.107	0.309	0.312	0.000
Ethnicity is Mestizo (prop.)	0.894	0.307	0.307	0.000
Ethnicity is White (prop.)	0.081	0.273	0.272	0.000
Household Characteristics				
Number of siblings	2.000	0.000	0.000	0.000
Wealth index	0.647	0.181	0.170	0.065
Household owned any livestock in the past 12 months	0.492	0.500	0.447	0.235
Monthly expenditure in food items per capita	154.105	79.594	67.654	45.041
Parental Characteristics				
Mom age (at birth)	24.463	5.471	5.399	0.000
Caregiver years of education (at birth)	9.912	3.865	3.898	0.000
Head of household is female (prop.)	0.167	0.373	0.339	0.165
Region Characteristics				
Child lives in Coast region (prop.)	0.451	0.498	0.498	0.000
Child lives in Mountain region (prop.)	0.412	0.492	0.493	0.000
Child lives in Jungle region (prop.)	0.138	0.345	0.343	0.000
Child lives in Urban area (prop.)	0.821	0.383	0.384	0.000
Child lives in Rural area (prop.)	0.179	0.383	0.384	0.000
Observations (Children)	734			
Observations (Children-Data points)	1336			

*Descriptive statistics for analytic sample (n = 1336)

Table A2. CRE estimates: binary indicators (all controls)

	School enrolment (I)	*Child work* (II)
Age in years (age=5)	0.887*	0.401
	(0.481)	(0.285)
Age in years (age=6)	-1.061***	0.664**
	(0.315)	(0.309)
Age in years (age=7)	-0.491*	1.197***
	(0.257)	(0.240)
Age in years (age=8)	-0.488*	1.093***
	(0.256)	(0.237)
Age in years (age=9)	0.107	1.548***
	(0.388)	(0.358)
Age in years (age=10)	-0.421	0.805**
	(0.359)	(0.345)
Age in years (age=11)	-0.154	2.298***
	(0.288)	(0.307)
Age in years (age=12)	-1.724***	-0.280
	(0.287)	(0.274)
Age in years (age=13)	-1.683***	0.250
	(0.399)	(0.388)
Age in years (age=14)	-1.397***	0.165
	(0.410)	(0.411)
Age in years (age=15)	-1.992***	-
	(0.504)	
Age in years (age=16)	-2.194***	-1.252*
	(0.489)	(0.653)
Age in years (age=17)	-1.691***	-1.183**
	(0.466)	(0.560)
Child is female	0.077	0.146
	(0.088)	(0.093)
Wealth index	-0.480	-0.475
	(0.575)	(0.608)
Household owned any livestock in the past 12 months	-0.008	0.024
	(0.150)	(0.156)
Monthly expenditure in food items per capita	-0.000	-0.000
	(0.001)	(0.001)
Mom age at Round 1 (YL child age~)	0.002	0.013
	(0.011)	(0.011)
Caregiver years of education at Round 1	-0.001	-0.049***
	(0.016)	(0.017)
Head of household is female	0.036	-0.441**
	(0.214)	(0.223)
Children attended preschool	0.481**	0.310
	(0.216)	(0.246)
Child speaks Spanish	0.180	-0.516
	(0.262)	(0.333)
Child religion Catholic	-0.566**	0.042
	(0.234)	(0.206)
Child religion is Other	-0.578**	0.200
	(0.260)	(0.248)
Child ethnicity is White	-0.470	-0.092
	(0.388)	(0.376)
Child ethnicity is Mestizo	-0.378	0.254
	(0.352)	(0.345)
Child lived at Coast	0.256	0.989**
	(0.367)	(0.418)
Child lived at Mountain	-0.205	0.506
	(0.338)	(0.396)
Child lived Urban area	-0.105	-0.205
	(0.188)	(0.209)
Year gap between siblings (year gap=2)	-0.653**	-0.634**
	(0.286)	(0.284)

	School enrolment (I)	*Child work* (II)
Year gap between siblings (year gap=3)	-0.518* (0.288)	-0.342 (0.291)
Year gap between siblings (year gap=4)	-0.282 (0.301)	-0.508* (0.301)
Year gap between siblings (year gap=5)	-0.627** (0.284)	-0.367 (0.290)
Year gap between siblings (year gap=6)	-0.608** (0.288)	-0.506* (0.292)
Year gap between siblings (year gap=7)	-0.532* (0.306)	-0.617** (0.302)
Year gap between siblings (year gap=8)	-0.852*** (0.318)	-0.946*** (0.324)
Year gap between siblings (year gap=9)	-0.732** (0.325)	-0.466 (0.332)
Year gap between siblings (year gap=10)	-0.751** (0.354)	-0.808** (0.368)
Year gap between siblings (year gap=11)	-0.054 (0.362)	-0.223 (0.371)
Year gap between siblings (year gap=12)	-0.315 (0.569)	0.505 (0.600)
Year gap between siblings (year gap=13)	-	-0.215 (0.770)
Year gap between siblings (year gap=14)	-0.771 (1.144)	-0.408 (1.162)
Year gap between siblings (year gap=15)	-	-
Year gap between siblings (year gap=26)	-	-2.214* (1.152)
Family cluster-mean: Head of household is female	-0.229 (0.281)	0.358 (0.301)
Family cluster-mean: wealth index	1.028 (0.663)	0.112 (0.722)
Family cluster-mean: HH owned livestock past 12 months	-0.081 (0.199)	0.137 (0.210)
Family cluster-mean: Food expenditure per capita	0.001 (0.001)	-0.001 (0.001)
Observations (children-data points)	1,324	1,320
Observations (children)	728	733
Observations (families)	458	458
p-value $H_0: \beta_1 = \beta_2 = 0$	0.393	0.001
p-value $H_0: \pi = 0$	0.296	0.630

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A3. CRE Average Marginal Effects for binary indicators

	School enrolment (I)	*Child work* (II)
Birth order (=2)	-0.026 (0.031)	-0.107*** (0.033)
Age in years (age=5)	0.085* (0.043)	0.127 (0.089)
Age in years (age=6)	-0.283*** (0.084)	0.213* (0.097)
Age in years (age=7)	-0.105* (0.048)	0.376*** (0.069)

	School enrolment (I)	Child work (II)
Age in years (age=8)	-0.104* (0.047)	0.346*** (0.069)
Age in years (age=9)	0.017 (0.059)	0.464*** (0.090)
Age in years (age=10)	-0.087 (0.077)	0.258* (0.107)
Age in years (age=11)	-0.028 (0.050)	0.585*** (0.071)
Age in years (age=12)	-0.522*** (0.065)	-0.080 (0.080)
Age in years (age=13)	-0.507*** (0.116)	0.078 (0.122)
Age in years (age=14)	-0.404** (0.123)	0.051 (0.128)
Age in years (age=15)	-0.611*** (0.142)	-
Age in years (age=16)	-0.670*** (0.124)	-0.268** (0.101)
Age in years (age=17)	-0.510*** (0.141)	-0.259** (0.097)
Child is female	0.019 (0.022)	0.036 (0.023)
Mom age at Round 1 (YL child age~)	0.001 (0.003)	0.003 (0.003)
Caregiver years of education at Round 1	0.000 (0.004)	-0.012** (0.004)
Head of household is female	0.009 (0.053)	-0.108* (0.054)
Wealth index	-0.12 (0.143)	-0.116 (0.149)
Household owned any livestock in the past 12 months	-0.002 (0.037)	0.006 (0.038)
Monthly expenditure in food items per capita	0.000 (0.000)	0.000 (0.000)
Children attended preschool	0.120* (0.054)	0.076 (0.06)
Year gap between siblings (year gap=2)	-0.146* (0.057)	-0.150* (0.063)
Year gap between siblings (year gap=3)	-0.111* (0.056)	-0.078 (0.064)
Year gap between siblings (year gap=4)	-0.057 (0.058)	-0.118 (0.067)
Year gap between siblings (year gap=5)	-0.139* (0.056)	-0.084 (0.064)
Year gap between siblings (year gap=6)	-0.134* (0.058)	-0.118 (0.065)
Year gap between siblings (year gap=7)	-0.115 (0.061)	-0.145* (0.068)
Year gap between siblings (year gap=8)	-0.200** (0.069)	-0.229** (0.073)
Year gap between siblings (year gap=9)	-0.167* (0.070)	-0.108 (0.075)
Year gap between siblings (year gap=10)	-0.172* (0.080)	-0.194* (0.086)
Year gap between siblings (year gap=11)	-0.010 (0.067)	-0.050 (0.083)
Year gap between siblings (year gap=12)	-0.064	0.097

	School enrolment (I)	Child work (II)
	(0.122)	(0.106)
Year gap between siblings (year gap=13)	-	-0.048 (0.176)
Year gap between siblings (year gap=14)	-0.178 (0.309)	-0.093 (0.280)
Year gap between siblings (year gap=15)	-	-
Year gap between siblings (year gap=26)	-	-0.526* (0.217)
Child speaks Spanish	0.045 (0.065)	-0.126 (0.081)
Child religion Catholic	-0.141* (0.058)	0.010 (0.050)
Child religion is Other	-0.144* (0.065)	0.049 (0.061)
Child ethnicity is White	-0.117 (0.097)	-0.022 (0.092)
Child ethnicity is Mestizo	-0.094 (0.088)	0.062 (0.084)
Child lived at Coast	0.064 (0.091)	0.242* (0.102)
Child lived at Mountain	-0.051 (0.084)	0.124 (0.097)
Child lived Urban area	-0.026 (0.047)	-0.050 (0.051)

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A4. Average Marginal Effects: bivariate probit

	Joint: School enrolment & Child work (I)	*School enrolment* (II)	*Child work participation* (III)
AME: Birth order (j =2)	-0.091* (0.036)	-0.026* (0.010)	-0.004 (0.008)
p-value $H_0: \beta_1 = \beta_2 = 0$	0.011		
Observations	1336		

***p<0.001, **p<0.01, *p<0.05. Standard errors in parentheses. Each column presents average marginal effects from a joint bivariate probit equation.

Table A5. CRE estimates (all controls)

	Hrs/day at school (I)	*Hrs/day studying outside school* (II)	*Hrs/day in leisure* (III)	*Hrs/day in child-work* (IV)
Age in years (age=5)	0.968*** (0.222)	0.217* (0.128)	-0.707** (0.284)	0.127 (0.171)
Age in years (age=6)	1.211*** (0.253)	0.711*** (0.174)	-1.258*** (0.308)	0.246 (0.196)
Age in years (age=7)	1.541*** (0.185)	0.688*** (0.107)	-1.556*** (0.230)	0.423*** (0.159)
Age in years (age=8)	1.593*** (0.184)	0.755*** (0.107)	-1.787*** (0.238)	0.450*** (0.141)

	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(I)	(II)	(III)	(IV)
Age in years (age=9)	1.833***	1.112***	-2.209***	1.143***
	(0.214)	(0.194)	(0.279)	(0.259)
Age in years (age=10)	1.578***	1.128***	-1.538***	0.204
	(0.264)	(0.157)	(0.440)	(0.269)
Age in years (age=11)	1.663***	0.940***	-2.490***	1.581***
	(0.181)	(0.125)	(0.251)	(0.184)
Age in years (age=12)	1.850***	1.175***	-2.514***	0.984***
	(0.191)	(0.129)	(0.258)	(0.185)
Age in years (age=13)	2.214***	1.240***	-2.905***	1.453***
	(0.273)	(0.194)	(0.416)	(0.365)
Age in years (age=14)	1.827***	1.134***	-2.321***	1.433***
	(0.298)	(0.237)	(0.485)	(0.373)
Age in years (age=15)	1.720***	1.699***	-2.583***	1.095*
	(0.363)	(0.391)	(0.570)	(0.570)
Age in years (age=16)	1.340***	1.271***	-2.828***	2.166***
	(0.436)	(0.306)	(0.481)	(0.645)
Age in years (age=17)	0.698	1.427***	-2.184***	2.863***
	(0.686)	(0.493)	(0.566)	(0.816)
Child is female	0.075	0.140***	-0.276***	0.141*
	(0.062)	(0.049)	(0.090)	(0.075)
Wealth index	-0.707*	-0.565*	1.235*	-0.708
	(0.407)	(0.294)	(0.723)	(0.574)
Household owned any livestock in the past 12 months	0.032	-0.055	-0.156	0.116
	(0.091)	(0.091)	(0.163)	(0.134)
Monthly expenditure in food items per capita	-0.001	-0.001**	0.003***	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Mom age at Round 1 (YL child age~)	-0.001	-0.010*	-0.005	0.015
	(0.007)	(0.006)	(0.012)	(0.011)
Caregiver years of education at Round 1	0.008	0.036***	0.019	-0.045***
	(0.012)	(0.008)	(0.020)	(0.016)
Head of household is female	0.005	-0.089	-0.021	-0.037
	(0.126)	(0.112)	(0.225)	(0.210)
Children attended preschool	1.399***	0.278	-0.768	-0.132
	(0.399)	(0.198)	(0.467)	(0.419)
Child speaks Spanish	0.060	-0.079	-0.052	-0.160
	(0.275)	(0.167)	(0.302)	(0.272)
Child religion Catholic	-0.312***	-0.180	-0.060	0.109
	(0.116)	(0.135)	(0.209)	(0.152)
Child religion is Other	-0.284*	-0.314**	-0.061	0.368*
	(0.148)	(0.146)	(0.261)	(0.205)
Child ethnicity is White	-0.340	-0.114	0.814**	-0.045
	(0.275)	(0.152)	(0.402)	(0.366)
Child ethnicity is Mestizo	-0.311	-0.166	0.565	0.241
	(0.251)	(0.126)	(0.362)	(0.342)
Child lived at Coast	0.295	0.112	-0.782*	0.589**
	(0.274)	(0.194)	(0.417)	(0.263)
Child lived at Mountain	0.065	0.278	-0.020	0.276
	(0.220)	(0.191)	(0.404)	(0.263)
Child lived Urban area	-0.127	0.025	0.128	0.266
	(0.127)	(0.110)	(0.178)	(0.165)
Year gap between siblings (year gap=2)	-0.254	0.048	0.259	-0.546**
	(0.203)	(0.149)	(0.320)	(0.239)
Year gap between siblings (year gap=3)	-0.129	-0.024	0.109	-0.264
	(0.203)	(0.153)	(0.298)	(0.235)
Year gap between siblings (year gap=4)	0.054	-0.006	-0.182	-0.044
	(0.203)	(0.155)	(0.303)	(0.267)

	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(I)	(II)	(III)	(IV)
Year gap between siblings (year gap=5)	-0.219 (0.213)	0.066 (0.159)	0.129 (0.305)	-0.364 (0.242)
Year gap between siblings (year gap=6)	-0.147 (0.211)	0.009 (0.159)	0.079 (0.299)	-0.189 (0.240)
Year gap between siblings (year gap=7)	-0.192 (0.204)	-0.050 (0.154)	0.338 (0.299)	-0.451* (0.236)
Year gap between siblings (year gap=8)	-0.258 (0.205)	0.067 (0.167)	0.461 (0.338)	-0.730*** (0.244)
Year gap between siblings (year gap=9)	-0.284 (0.243)	-0.080 (0.178)	0.402 (0.382)	-0.556** (0.277)
Year gap between siblings (year gap=10)	-0.224 (0.246)	0.282* (0.170)	0.185 (0.381)	-0.922*** (0.255)
Year gap between siblings (year gap=11)	0.131 (0.256)	0.229 (0.208)	-0.053 (0.364)	-0.658** (0.269)
Year gap between siblings (year gap=12)	-0.050 (0.331)	0.014 (0.323)	-0.531 (0.578)	0.166 (0.304)
Year gap between siblings (year gap=13)	0.756* (0.424)	0.362 (0.270)	0.023 (0.512)	-0.146 (0.382)
Year gap between siblings (year gap=14)	-0.500** (0.249)	0.183 (0.188)	0.071 (0.379)	0.503 (0.310)
Year gap between siblings (year gap=15)	-0.320 (0.271)	-0.025 (0.203)	-0.991** (0.399)	1.258*** (0.288)
Year gap between siblings (year gap=26)	-1.569*** (0.279)	1.083*** (0.206)	1.167*** (0.391)	-1.195*** (0.329)
Family cluster-mean: Head of household is female	-0.324* (0.175)	-0.042 (0.177)	0.167 (0.284)	0.254 (0.263)
Family cluster-mean: wealth index	1.536*** (0.458)	0.600 (0.382)	-1.344* (0.748)	-0.365 (0.621)
Family cluster-mean: HH owned livestock past 12 months	-0.155 (0.134)	-0.034 (0.127)	0.149 (0.214)	0.115 (0.173)
Family cluster-mean: Food expenditure per capita	0.001 (0.001)	0.002* (0.001)	-0.004** (0.002)	0.000 (0.001)
Observations (children-data points)	1,336	1,336	1,336	1,336
Observations (children)	734	734	734	734
Observations (families)	458	458	458	458
p-value $H_0: \beta_1 = \beta_2 = 0$	0.092	0.251	0.005	0.000
p-value $H_0: \pi = 0$	0.000	0.085	0.022	0.785
R-squared	0.293	0.207	0.260	0.360

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A6. CRE estimates: child work disaggregated (all controls)

	Hrs/day care	*Hrs/day chores*	*Hrs/day tasks*	*Hrs/day paid work*
	(V)	(VI)	(VII)	(VIII)
Age in years (age=5)	-0.021 (0.062)	0.178* (0.103)	0.011 (0.071)	-0.031 (0.060)
Age in years (age=6)	-0.050 (0.071)	0.377*** (0.126)	-0.026 (0.085)	-0.046 (0.070)
Age in years (age=7)	-0.151** (0.059)	0.472*** (0.081)	0.158** (0.070)	-0.067 (0.068)
Age in years (age=8)	-0.073 (0.053)	0.441*** (0.082)	0.158** (0.069)	-0.061 (0.070)
Age in years (age=9)	0.182	0.786***	0.154	-0.016

	Hrs/day care	*Hrs/day chores*	*Hrs/day tasks*	*Hrs/day paid work*
	(V)	(VI)	(VII)	(VIII)
	(0.112)	(0.145)	(0.103)	(0.065)
Age in years (age=10)	-0.285**	0.501***	0.046	-0.053
	(0.127)	(0.133)	(0.096)	(0.069)
Age in years (age=11)	0.374***	0.882***	0.302***	-0.025
	(0.084)	(0.093)	(0.104)	(0.074)
Age in years (age=12)	0.047	0.771***	0.141*	0.011
	(0.085)	(0.097)	(0.084)	(0.091)
Age in years (age=13)	-0.133	0.996***	0.480**	0.123
	(0.209)	(0.155)	(0.200)	(0.143)
Age in years (age=14)	0.173	1.081***	0.116	0.010
	(0.238)	(0.180)	(0.131)	(0.101)
Age in years (age=15)	-0.256	1.216***	-0.024	-0.066
	(0.216)	(0.344)	(0.197)	(0.355)
Age in years (age=16)	-0.086	1.203***	0.314	0.248
	(0.259)	(0.233)	(0.218)	(0.274)
Age in years (age=17)	-0.143	1.025***	0.938*	0.596
	(0.264)	(0.265)	(0.512)	(0.435)
Child is female	0.038	0.094**	-0.003	-0.021
	(0.041)	(0.038)	(0.034)	(0.017)
Wealth index	-0.231	-0.205	-0.365	0.124
	(0.277)	(0.283)	(0.310)	(0.114)
Household owned any livestock in the past 12 months	0.046	0.019	0.107	-0.036
	(0.068)	(0.078)	(0.067)	(0.028)
Monthly expenditure in food items per capita	-0.001	0.001	0.000	-0.000
	(0.000)	(0.001)	(0.001)	(0.000)
Mom age at Round 1 (YL child age~)	0.004	0.007	0.005	-0.002
	(0.004)	(0.005)	(0.005)	(0.003)
Caregiver years of education at Round 1	-0.008	-0.010	-0.018**	-0.003
	(0.008)	(0.007)	(0.008)	(0.003)
Head of household is female	-0.009	-0.015	-0.097	0.021
	(0.097)	(0.099)	(0.110)	(0.049)
Children attended preschool	-0.049	0.007	-0.211	0.079*
	(0.100)	(0.145)	(0.282)	(0.047)
Child speaks Spanish	-0.054	0.017	-0.076	-0.142
	(0.109)	(0.135)	(0.176)	(0.133)
Child religion Catholic	-0.023	0.123	0.030	-0.032
	(0.086)	(0.101)	(0.079)	(0.041)
Child religion is Other	0.096	0.314***	-0.038	-0.052
	(0.107)	(0.121)	(0.092)	(0.049)
Child ethnicity is White	0.009	0.097	-0.045	-0.056
	(0.136)	(0.228)	(0.143)	(0.065)
Child ethnicity is Mestizo	0.080	0.239	-0.045	-0.031
	(0.118)	(0.212)	(0.143)	(0.068)
Child lived at Coast	0.223	0.168	0.081	0.070
	(0.137)	(0.157)	(0.126)	(0.056)
Child lived at Mountain	0.107	-0.125	0.242	0.010
	(0.124)	(0.117)	(0.203)	(0.061)
Child lived Urban area	0.122	-0.108	0.153	0.077*
	(0.085)	(0.074)	(0.108)	(0.039)
Year gap between siblings (year gap=2)	-0.038	-0.128	-0.269	-0.028
	(0.094)	(0.116)	(0.168)	(0.029)
Year gap between siblings (year gap=3)	0.023	-0.022	-0.190	0.020
	(0.101)	(0.113)	(0.167)	(0.038)
Year gap between siblings (year gap=4)	0.129	-0.005	-0.207	0.083
	(0.115)	(0.118)	(0.177)	(0.069)
Year gap between siblings (year gap=5)	0.091	-0.067	-0.218	-0.072*
	(0.103)	(0.111)	(0.181)	(0.043)
Year gap between siblings (year gap=6)	0.139	-0.136	-0.094	-0.018
	(0.105)	(0.112)	(0.181)	(0.029)

	Hrs/day care (V)	*Hrs/day chores* (VI)	*Hrs/day tasks* (VII)	*Hrs/day paid work* (VIII)
Year gap between siblings (year gap=7)	0.003 (0.112)	-0.065 (0.118)	-0.264 (0.164)	-0.042 (0.029)
Year gap between siblings (year gap=8)	-0.134 (0.122)	-0.142 (0.124)	-0.296* (0.166)	-0.040 (0.031)
Year gap between siblings (year gap=9)	-0.199 (0.132)	-0.029 (0.120)	-0.243 (0.170)	0.049 (0.077)
Year gap between siblings (year gap=10)	-0.305*** (0.111)	-0.112 (0.132)	-0.415** (0.167)	-0.004 (0.037)
Year gap between siblings (year gap=11)	-0.171 (0.123)	-0.129 (0.135)	-0.195 (0.181)	-0.021 (0.028)
Year gap between siblings (year gap=12)	-0.198 (0.222)	0.092 (0.255)	0.391 (0.376)	0.005 (0.038)
Year gap between siblings (year gap=13)	-0.187 (0.140)	0.202 (0.208)	-0.121 (0.342)	-0.025 (0.061)
Year gap between siblings (year gap=14)	-0.002 (0.128)	0.449*** (0.152)	-0.413** (0.196)	0.096* (0.055)
Year gap between siblings (year gap=15)	-0.224* (0.132)	0.287* (0.153)	1.307*** (0.170)	0.042 (0.052)
Year gap between siblings (year gap=26)	0.228 (0.141)	-0.831*** (0.174)	-0.511*** (0.184)	0.062 (0.064)
Family cluster-mean: Head of household is female	0.084 (0.128)	0.025 (0.127)	0.149 (0.147)	0.038 (0.082)
Family cluster-mean: wealth index	-0.001 (0.312)	-0.255 (0.320)	0.078 (0.349)	-0.205 (0.147)
Family cluster-mean: HH owned livestock past 12 months	-0.060 (0.086)	-0.017 (0.098)	0.079 (0.091)	0.065* (0.035)
Family cluster-mean: Food expenditure per capita	0.000 (0.001)	-0.001 (0.001)	-0.000 (0.001)	0.001 (0.001)
Observations (children-data points)	1,336	1,336	1,336	1,336
Observations (children)	734	734	734	734
Observations (families)	458	458	458	458
p-value $H_0: \beta_1 = \beta_2 = 0$	0.000	0.608	0.957	0.963
p-value $H_0: \pi = 0$	0.800	0.579	0.744	0.390
R-squared	0.313	0.233	0.172	0.080

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A7. Sensitivity CRE: Family Size (all controls)

	2 siblings				**3 siblings**			
	Hrs/day at school (Ia)	*Hrs/day studying outside school* (IIa)	*Hrs/day in leisure* (IIIa)	*Hrs/day in child-work* (IVa)	*Hrs/day at school* (Ib)	*Hrs/day studying outside school* (IIb)	*Hrs/day in leisure* (IIIb)	*Hrs/day in child-work* (IVb)
Age in years (age=5)	0.964*** (0.241)	0.220 (0.155)	-0.597* (0.339)	0.098 (0.214)	0.685** (0.272)	0.308* (0.160)	-0.961*** (0.356)	-0.065 (0.157)
Age in years (age=6)	1.168*** (0.274)	0.673*** (0.200)	-1.113*** (0.319)	0.280 (0.230)	1.129*** (0.253)	0.431*** (0.148)	-1.373*** (0.362)	0.365** (0.186)
Age in years (age=7)	1.459*** (0.205)	0.665*** (0.126)	-1.573*** (0.256)	0.391** (0.195)	1.569*** (0.225)	0.700*** (0.132)	-1.680*** (0.323)	0.682*** (0.153)
Age in years (age=8)	1.511*** (0.205)	0.734*** (0.127)	-1.764*** (0.258)	0.486*** (0.178)	1.463*** (0.217)	0.641*** (0.136)	-1.787*** (0.300)	0.811*** (0.160)
Age in years (age=9)	1.727*** (0.267)	1.064*** (0.215)	-2.042*** (0.355)	1.559*** (0.369)	1.647*** (0.252)	0.857*** (0.161)	-2.299*** (0.361)	1.290*** (0.227)
	1.592***	1.086***	-1.926***	0.178	1.393***	0.790***	-2.350***	1.471***

	2 siblings				3 siblings			
	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*	*Hrs/day at school*	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(Ia)	(IIa)	(IIIa)	(IVa)	(Ib)	(IIb)	(IIIb)	(IVb)
Age in years (age=10)	(0.306)	(0.185)	(0.423)	(0.350)	(0.228)	(0.162)	(0.356)	(0.285)
Age in years (age=11)	1.612***	0.860***	-2.423***	1.754***	1.601***	0.761***	-2.422***	1.744***
	(0.200)	(0.138)	(0.286)	(0.215)	(0.232)	(0.146)	(0.334)	(0.194)
Age in years (age=12)	1.747***	1.139***	-2.440***	1.144***	1.807***	0.878***	-2.627***	1.692***
	(0.215)	(0.141)	(0.301)	(0.217)	(0.223)	(0.156)	(0.325)	(0.199)
Age in years (age=13)	2.075***	1.223***	-2.800***	1.380***	2.158***	0.810***	-2.884***	2.066***
	(0.315)	(0.208)	(0.492)	(0.418)	(0.327)	(0.209)	(0.453)	(0.323)
Age in years (age=14)	1.786***	1.136***	-2.816***	1.796***	1.716***	0.791***	-3.131***	2.461***
	(0.327)	(0.297)	(0.594)	(0.455)	(0.297)	(0.208)	(0.474)	(0.390)
Age in years (age=15)	1.599***	1.358***	-3.170***	2.111***	1.506***	0.537**	-2.555***	3.425***
	(0.445)	(0.442)	(0.502)	(0.722)	(0.373)	(0.218)	(0.461)	(0.666)
Age in years (age=16)	1.182**	1.102***	-2.545***	2.502***	1.328***	0.692**	-2.969***	3.047***
	(0.483)	(0.340)	(0.531)	(0.721)	(0.454)	(0.275)	(0.427)	(0.614)
Age in years (age=17)	0.618	1.355***	-2.100***	3.067***	-0.340	0.665	-2.741***	3.902***
	(0.696)	(0.513)	(0.616)	(0.844)	(0.678)	(0.425)	(0.561)	(0.961)
All children are female	0.047	0.130**	-0.166	0.148*	0.108	0.024	-0.064	-0.032
	(0.075)	(0.060)	(0.110)	(0.089)	(0.081)	(0.060)	(0.119)	(0.119)
Wealth index	-0.696	-0.583*	0.996	-0.875	-0.157	0.251	-0.637	0.950
	(0.435)	(0.334)	(0.777)	(0.680)	(0.543)	(0.390)	(0.839)	(0.758)
Household owned any livestock in the past 12 mths	0.025	0.037	-0.151	0.115	0.154	0.006	0.067	-0.155
	(0.099)	(0.098)	(0.181)	(0.154)	(0.151)	(0.115)	(0.201)	(0.198)
Monthly expenditure in food items per capita	-0.000	-0.001	0.002*	0.000	-0.001	-0.000	-0.000	0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mom age at Round 1	0.002	-0.011	0.001	0.002	0.020**	0.015**	-0.016	-0.013
	(0.008)	(0.007)	(0.014)	(0.013)	(0.010)	(0.007)	(0.013)	(0.013)
Caregiver years of education at Round 1	0.005	0.037***	0.019	-0.047***	0.008	-0.001	0.037*	-0.008
	(0.011)	(0.009)	(0.020)	(0.017)	(0.015)	(0.011)	(0.021)	(0.018)
Head of household is female	-0.027	-0.104	-0.108	-0.016	0.225	-0.053	0.334	-0.376
	(0.145)	(0.124)	(0.264)	(0.247)	(0.201)	(0.179)	(0.309)	(0.283)
Children attended preschool	1.351***	0.134	-0.344	-0.341	1.711***	0.725***	-0.872**	-0.569*
	(0.410)	(0.213)	(0.312)	(0.469)	(0.355)	(0.146)	(0.386)	(0.338)
Child speaks Spanish	0.143	-0.209	0.125	-0.018	0.229	0.168	-0.236	-0.561*
	(0.265)	(0.198)	(0.245)	(0.257)	(0.237)	(0.129)	(0.304)	(0.330)
Child religion Catholic	-0.382***	0.003	-0.220	0.235	0.114	0.251*	0.329	-0.974***
	(0.138)	(0.117)	(0.226)	(0.183)	(0.167)	(0.138)	(0.298)	(0.371)
Child religion is Other	-0.333*	-0.066	0.035	0.303	0.120	0.037	0.233	-0.621
	(0.173)	(0.127)	(0.269)	(0.230)	(0.176)	(0.151)	(0.331)	(0.379)
Child ethnicity is White	-0.309	-0.115	0.641	-0.075	-0.785**	-0.362	1.093*	-0.744
	(0.295)	(0.163)	(0.417)	(0.374)	(0.366)	(0.264)	(0.653)	(0.601)
Child ethnicity is Mestizo	-0.305	-0.073	0.423	0.231	-1.010***	-0.267	0.758	-0.733
	(0.268)	(0.133)	(0.366)	(0.350)	(0.320)	(0.203)	(0.621)	(0.550)
Child lived at Coast	0.134	0.127	-0.677	0.603**	0.079	0.073	-0.069	0.325
	(0.303)	(0.208)	(0.451)	(0.305)	(0.369)	(0.219)	(0.657)	(0.449)
Child lived at Mountain	0.140	0.103	0.093	0.361	0.067	-0.093	-0.449	0.559
	(0.237)	(0.171)	(0.418)	(0.305)	(0.323)	(0.164)	(0.646)	(0.450)
Child lived Urban area	-0.236*	-0.072	0.223	0.358**	-0.322**	-0.018	-0.071	0.212
	(0.141)	(0.119)	(0.188)	(0.182)	(0.156)	(0.099)	(0.223)	(0.225)
Year gap between siblings (gap=1)					-0.128	0.134	-0.153	-0.250
					(0.288)	(0.220)	(0.504)	(0.383)
	-0.287	0.013	0.334	-0.713**	-0.078	0.059	0.106	-0.346

	2 siblings				3 siblings			
	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*	*Hrs/day at school*	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(Ia)	(IIa)	(IIIa)	(IVa)	(Ib)	(IIb)	(IIIb)	(IVb)
Year gap between siblings (gap=2)	(0.276)	(0.221)	(0.276)	(0.324)	(0.242)	(0.211)	(0.425)	(0.353)
Year gap between siblings (gap=3)	-0.206 (0.284)	-0.092 (0.219)	0.181 (0.264)	-0.164 (0.321)	-0.027 (0.225)	0.072 (0.206)	-0.138 (0.448)	-0.392 (0.318)
Year gap between siblings (gap=4)	-0.045 (0.273)	-0.011 (0.213)	0.007 (0.263)	-0.108 (0.343)	-0.112 (0.226)	0.004 (0.209)	0.042 (0.425)	-0.262 (0.337)
Year gap between siblings (gap=5)	-0.281 (0.281)	-0.002 (0.207)	0.266 (0.250)	-0.358 (0.307)	-0.056 (0.260)	-0.101 (0.221)	-0.170 (0.446)	-0.269 (0.364)
Year gap between siblings (gap=6)	-0.230 (0.277)	-0.057 (0.205)	0.224 (0.245)	-0.220 (0.310)	-0.174 (0.263)	-0.146 (0.227)	-0.243 (0.447)	-0.154 (0.341)
Year gap between siblings (gap=7)	-0.264 (0.275)	-0.112 (0.213)	0.461* (0.254)	-0.401 (0.318)	-0.173 (0.279)	-0.067 (0.230)	0.083 (0.461)	-0.395 (0.356)
Year gap between siblings (gap=8)	-0.343 (0.276)	-0.004 (0.219)	0.619** (0.284)	-0.751** (0.321)	-0.005 (0.258)	0.034 (0.227)	0.228 (0.445)	-0.575 (0.353)
Year gap between siblings (gap=9)	-0.239 (0.283)	-0.137 (0.229)	0.316 (0.306)	-0.529 (0.340)	-0.167 (0.250)	-0.007 (0.229)	0.062 (0.479)	-0.280 (0.418)
Year gap between siblings (gap=10)	-0.288 (0.298)	0.240 (0.222)	0.270 (0.323)	-0.938*** (0.334)	-0.128 (0.265)	-0.042 (0.241)	0.112 (0.479)	-0.155 (0.389)
Year gap between siblings (gap=11)	0.065 (0.311)	0.172 (0.242)	0.100 (0.312)	-0.685** (0.330)	-0.077 (0.411)	-0.057 (0.280)	0.160 (0.626)	-0.354 (0.607)
Year gap between siblings (gap=12)	-0.083 (0.367)	-0.077 (0.363)	-0.592 (0.479)	0.263 (0.368)	-0.646 (0.549)	-0.159 (0.335)	-0.490 (0.508)	0.025 (0.418)
Year gap between siblings (gap=13)	0.722 (0.483)	0.340 (0.393)	-0.189 (0.517)	-0.324 (0.470)	-0.617 (0.401)	-0.050 (0.233)	1.056* (0.565)	0.046 (0.392)
Year gap between siblings (gap=14)	-0.632** (0.302)	0.175 (0.245)	0.091 (0.342)	0.601 (0.385)				
Year gap between siblings (gap=15)	-0.371 (0.328)	0.044 (0.252)	-1.425*** (0.376)	1.641*** (0.375)				
Year gap between siblings (gap=26)	-1.633*** (0.339)	0.997*** (0.254)	1.122*** (0.378)	-0.935** (0.406)				
Family cluster-mean: Head of household is fem	-0.390** (0.199)	-0.007 (0.180)	0.294 (0.330)	0.295 (0.303)	-0.698** (0.297)	-0.166 (0.219)	-0.424 (0.478)	0.802** (0.407)
Family cluster-mean: wealth index	1.545*** (0.486)	0.495 (0.444)	-0.966 (0.826)	0.027 (0.695)	0.545 (0.617)	-0.168 (0.447)	0.784 (0.955)	-1.432 (0.920)
Family cluster-mean: HH owned livestock past 12 months	-0.147 (0.148)	-0.152 (0.142)	0.204 (0.236)	0.270 (0.200)	-0.218 (0.199)	-0.316** (0.161)	-0.269 (0.303)	0.573** (0.285)
Family cluster-mean: Food expenditure per capita	0.001 (0.001)	0.001 (0.001)	-0.002 (0.002)	0.000 (0.001)	0.002 (0.002)	0.000 (0.001)	-0.001 (0.002)	-0.004* (0.003)
Observations (children-data points)	1,076	1,076	1,076	1,076	1,035	1,035	1,035	1,035
Observations (children)	599	599	599	599	583	583	583	583
Observations (families)	386	386	386	386	272	272	272	272
p-value $H_0: \beta_1 = \beta_2 = 0 \mid \beta_1 = \beta_2 = \beta_3 = 0$	0.132	0.28	0.063	0.000	0.496	0.603	0.015	0.000
p-value $H_0: \pi = 0$	0.000	0.231	0.292	0.59	0.060	0.354	0.705	0.001
R-squared	0.301	0.209	0.272	0.367	0.350	0.226	0.301	0.413

	2 siblings				3 siblings			
	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*	*Hrs/day at school*	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(Ia)	(IIa)	(IIIa)	(IVa)	(Ib)	(IIb)	(IIIb)	(IVb)

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A8. Sensitivity CRE: Family Size child work disaggregated (all controls)

	2 siblings				3 siblings			
	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*	*Hrs/day at school*	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(Ia)	(IIa)	(IIIa)	(IVa)	(Ib)	(IIb)	(IIIb)	(IVb)
Age in years (age=5)	-0.030 (0.076)	0.226* (0.117)	-0.019 (0.090)	-0.046 (0.077)	-0.020 (0.074)	0.044 (0.091)	-0.107 (0.081)	0.006 (0.044)
Age in years (age=6)	-0.040 (0.082)	0.396*** (0.143)	-0.021 (0.095)	-0.058 (0.085)	0.027 (0.093)	0.299*** (0.104)	-0.010 (0.078)	0.023 (0.047)
Age in years (age=7)	-0.165** (0.070)	0.456*** (0.092)	0.192** (0.088)	-0.092 (0.088)	0.028 (0.083)	0.475*** (0.075)	0.108* (0.063)	0.072 (0.046)
Age in years (age=8)	-0.029 (0.069)	0.435*** (0.093)	0.173** (0.081)	-0.075 (0.094)	0.055 (0.083)	0.526*** (0.082)	0.163** (0.071)	0.060 (0.043)
Age in years (age=9)	0.253* (0.147)	0.984*** (0.204)	0.241 (0.157)	-0.003 (0.078)	0.309** (0.138)	0.697*** (0.108)	0.190** (0.082)	0.085 (0.060)
Age in years (age=10)	-0.335** (0.152)	0.402** (0.178)	0.141 (0.117)	-0.057 (0.088)	0.103 (0.163)	0.863*** (0.126)	0.366*** (0.125)	0.094 (0.073)
Age in years (age=11)	0.430*** (0.093)	0.892*** (0.102)	0.384*** (0.123)	-0.034 (0.095)	0.350*** (0.106)	0.835*** (0.084)	0.300*** (0.093)	0.154** (0.077)
Age in years (age=12)	0.120 (0.093)	0.760*** (0.105)	0.226** (0.102)	-0.004 (0.114)	0.313*** (0.109)	0.811*** (0.093)	0.321*** (0.096)	0.132** (0.065)
Age in years (age=13)	-0.088 (0.240)	0.923*** (0.171)	0.422** (0.200)	0.190 (0.197)	0.268 (0.189)	1.007*** (0.146)	0.343** (0.155)	0.181* (0.106)
Age in years (age=14)	0.313 (0.308)	1.259*** (0.214)	0.197 (0.140)	0.010 (0.121)	0.821*** (0.207)	0.935*** (0.172)	0.374* (0.226)	0.302* (0.156)
Age in years (age=15)	0.012 (0.294)	1.486*** (0.459)	0.215 (0.289)	-0.147 (0.585)	0.441 (0.270)	0.998*** (0.212)	0.895*** (0.323)	0.884** (0.441)
Age in years (age=16)	-0.034 (0.262)	1.170*** (0.253)	0.454* (0.242)	0.278 (0.311)	0.157 (0.181)	1.138*** (0.214)	0.414* (0.223)	1.120* (0.588)
Age in years (age=17)	-0.077 (0.276)	1.002*** (0.271)	1.049** (0.532)	0.639 (0.441)	0.083 (0.263)	0.866*** (0.216)	0.533 (0.430)	2.270** (1.024)
All chidren are female	0.098** (0.046)	0.066 (0.048)	-0.011 (0.044)	-0.047** (0.024)	0.094 (0.061)	0.038 (0.048)	-0.094* (0.052)	-0.109* (0.065)
Wealth index	-0.387 (0.323)	-0.402 (0.309)	-0.251 (0.348)	0.233 (0.144)	0.619* (0.343)	0.479 (0.310)	-0.187 (0.376)	-0.083 (0.578)
Household owned any livestock in the past 12 months	0.044 (0.076)	0.010 (0.085)	0.114 (0.075)	-0.043 (0.032)	0.046 (0.100)	-0.049 (0.102)	0.058 (0.059)	-0.226 (0.192)
Monthly expenditure in food items per capita	-0.001** (0.000)	0.001 (0.001)	0.001 (0.001)	-0.001 (0.000)	0.001 (0.001)	-0.000 (0.001)	0.000 (0.001)	0.001 (0.001)
Mom age at Round 1	-0.001 (0.005)	0.007 (0.006)	-0.002 (0.007)	-0.002 (0.004)	0.003 (0.007)	-0.003 (0.006)	-0.008 (0.006)	-0.002 (0.005)
Caregiver years of education at Round 1	-0.010 (0.009)	-0.015** (0.007)	-0.016* (0.009)	-0.001 (0.003)	-0.008 (0.009)	0.005 (0.009)	0.003 (0.008)	-0.011 (0.007)
Head of household is female	0.025 (0.112)	-0.042 (0.109)	-0.073 (0.130)	0.039 (0.056)	-0.314** (0.129)	-0.109 (0.148)	-0.095 (0.121)	0.279 (0.238)

	2 siblings				3 siblings			
	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*	*Hrs/day at school*	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(Ia)	(IIa)	(IIIa)	(IVa)	(Ib)	(IIb)	(IIIb)	(IVb)
Children attended preschool	-0.101 (0.111)	0.001 (0.148)	-0.374 (0.328)	0.072 (0.057)	-0.055 (0.136)	0.140 (0.115)	-0.436** (0.162)	-0.152 (0.195)
Child speaks Spanish	0.047 (0.145)	0.012 (0.146)	0.010 (0.161)	-0.209 (0.179)	-0.044 (0.149)	-0.368** (0.145)	0.013 (0.187)	-0.057 (0.158)
Child religion Catholic	0.104 (0.098)	0.144 (0.115)	0.018 (0.079)	-0.046 (0.056)	-0.252 (0.194)	-0.142 (0.108)	-0.056 (0.113)	-0.439 (0.311)
Child religion is Other	0.179 (0.115)	0.320** (0.141)	-0.124 (0.101)	-0.093 (0.069)	-0.172 (0.201)	0.051 (0.117)	-0.041 (0.125)	-0.375 (0.286)
Child ethnicity is White	0.064 (0.138)	0.094 (0.226)	-0.110 (0.156)	-0.053 (0.074)	-0.725*** (0.269)	-0.359* (0.205)	0.439* (0.255)	-0.168 (0.189)
Child ethnicity is Mestizo	0.121 (0.116)	0.295 (0.207)	-0.108 (0.156)	-0.050 (0.076)	-0.749*** (0.238)	-0.377** (0.181)	0.506** (0.254)	-0.200 (0.190)
Child lived at Coast	0.337** (0.143)	0.059 (0.172)	0.069 (0.134)	0.052 (0.047)	0.193 (0.213)	0.245 (0.208)	-0.208 (0.198)	0.061 (0.116)
Child lived at Mountain	0.101 (0.134)	-0.179 (0.133)	0.302 (0.240)	0.040 (0.080)	0.268 (0.199)	0.138 (0.153)	-0.077 (0.207)	0.150 (0.117)
Child lived Urban area	0.176** (0.089)	-0.146* (0.077)	0.179 (0.122)	0.083* (0.045)	0.113 (0.121)	0.260*** (0.095)	-0.132 (0.118)	-0.083 (0.084)
Year gap between siblings (gap=1)					-0.284 (0.197)	-0.503*** (0.174)	0.361** (0.170)	0.211 (0.168)
Year gap between siblings (gap=2)	-0.161 (0.126)	-0.074 (0.172)	-0.297** (0.137)	-0.031 (0.052)	-0.296* (0.178)	-0.451*** (0.169)	0.105 (0.144)	0.262* (0.157)
Year gap between siblings (gap=3)	-0.059 (0.130)	0.128 (0.160)	-0.059 (0.150)	0.020 (0.074)	-0.205 (0.159)	-0.464*** (0.162)	0.070 (0.141)	0.183 (0.183)
Year gap between siblings (gap=4)	0.017 (0.146)	0.038 (0.162)	-0.103 (0.153)	0.072 (0.090)	-0.323* (0.174)	-0.498*** (0.170)	0.131 (0.142)	0.420** (0.198)
Year gap between siblings (gap=5)	-0.009 (0.135)	0.040 (0.151)	-0.131 (0.145)	-0.098** (0.046)	-0.151 (0.184)	-0.356** (0.180)	0.187 (0.171)	0.021 (0.175)
Year gap between siblings (gap=6)	0.024 (0.134)	-0.057 (0.153)	0.003 (0.146)	-0.048 (0.040)	-0.217 (0.198)	-0.347* (0.181)	0.132 (0.143)	0.303* (0.171)
Year gap between siblings (gap=7)	-0.093 (0.140)	0.036 (0.161)	-0.133 (0.138)	-0.064 (0.042)	-0.300* (0.175)	-0.382** (0.191)	0.115 (0.144)	0.209 (0.151)
Year gap between siblings (gap=8)	-0.260* (0.149)	-0.046 (0.161)	-0.195 (0.141)	-0.059 (0.043)	-0.445** (0.196)	-0.589*** (0.193)	0.188 (0.159)	0.216 (0.150)
Year gap between siblings (gap=9)	-0.338** (0.155)	0.093 (0.161)	-0.137 (0.144)	0.051 (0.069)	-0.348 (0.252)	-0.371* (0.215)	0.185 (0.182)	0.240 (0.158)
Year gap between siblings (gap=10)	-0.461*** (0.139)	0.002 (0.173)	-0.310** (0.137)	-0.017 (0.053)	-0.368* (0.218)	-0.449** (0.210)	0.474** (0.208)	0.203 (0.168)
Year gap between siblings (gap=11)	-0.297** (0.147)	-0.039 (0.172)	-0.098 (0.151)	-0.036 (0.046)	-0.403* (0.227)	-0.086 (0.372)	-0.020 (0.196)	0.055 (0.154)
Year gap between siblings (gap=12)	-0.307 (0.236)	0.177 (0.266)	0.552 (0.377)	0.005 (0.050)	-0.226 (0.300)	0.121 (0.211)	0.091 (0.144)	0.122 (0.185)
Year gap between siblings (gap=13)	-0.214 (0.163)	0.275 (0.260)	-0.332* (0.186)	-0.021 (0.084)	0.186 (0.190)	-0.701*** (0.164)	0.226 (0.217)	0.301* (0.180)
Year gap between siblings (gap=14)	-0.114 (0.165)	0.590*** (0.195)	-0.248 (0.172)	0.097 (0.082)				
Year gap between siblings (gap=15)	-0.164 (0.168)	0.469** (0.205)	1.479*** (0.152)	0.013 (0.060)				
Year gap between siblings (gap=26)	0.152 (0.171)	-0.683** (0.210)	-0.283* (0.167)	0.095 (0.076)				
Family cluster-mean: Head of household is female	0.080 (0.146)	0.060 (0.142)	0.186 (0.171)	-0.001 (0.086)	0.350* (0.193)	0.140 (0.185)	0.153 (0.179)	-0.090 (0.211)

	2 siblings				3 siblings			
	Hrs/day at school	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*	*Hrs/day at school*	*Hrs/day studying outside school*	*Hrs/day in leisure*	*Hrs/day in child-work*
	(Ia)	(IIa)	(IIIa)	(IVa)	(Ib)	(IIb)	(IIIb)	(IVb)
Family cluster-mean: wealth index	0.196 (0.361)	0.135 (0.326)	-0.019 (0.405)	-0.353* (0.199)	-0.823** (0.398)	-0.595 (0.380)	0.055 (0.443)	0.155 (0.697)
Family cluster-mean: HH owned livestock past 12 months	0.007 (0.093)	0.028 (0.109)	0.110 (0.109)	0.070* (0.036)	0.021 (0.143)	0.123 (0.150)	0.213** (0.103)	0.217 (0.186)
Family cluster-mean: Food expenditure per capita	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.002 (0.001)
Observations (children-data points)	1,076	1,076	1,076	1,076	1,035	1,035	1,035	1,035
Observations (children)	599	599	599	599	583	583	583	583
Observations (families)	386	386	386	386	272	272	272	272
p-value $H_0: \beta_1 = \beta_2 = 0 \mid \beta_1 = \beta_2 = \beta_3 = 0$	0	0.607	0.324	0.784	0	0.239	0.805	0.118
p-value $H_0: \pi = 0$	0.579	0.817	0.495	0.326	0.075	0.1	0.273	0.225
R-squared	0.327	0.253	0.18	0.094	0.256	0.304	0.278	0.22

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A9. Sensitivity CRE: birthweight and PPVT score (all controls)

	Birthweight and PPVT score			Mom age (28+) and birthweight		
	Hrs/day at school (I)	*Hrs/day in leisure* (II)	*Hrs/day in care* (III)	*Hrs/day at school* (IV)	*Hrs/day in leisure* (V)	*Hrs/day in care* (VI)
Round (round=4)	2.793*** (0.832)	7.078*** (1.063)	0.703* (0.420)	9.608*** (1.935)	4.536 (3.786)	-0.086 (0.232)
Age in years (age=5)	1.413*** (0.456)	-1.128** (0.526)	-0.020 (0.118)	-0.994** (0.480)	-0.529 (0.840)	-0.063 (0.320)
Age in years (age=6)	1.449*** (0.473)	-1.189** (0.594)	-0.028 (0.142)	1.273*** (0.456)	-2.822*** (0.893)	-0.174 (0.447)
Age in years (age=7)	1.975*** (0.373)	-2.077*** (0.451)	-0.119 (0.099)	0.388 (0.313)	-2.593*** (0.593)	-0.083 (0.205)
Age in years (age=8)	1.994*** (0.374)	-2.270*** (0.464)	-0.033 (0.088)	0.289 (0.318)	-2.773*** (0.543)	-0.002 (0.207)
Age in years (age=9)	2.465*** (0.449)	-2.446*** (0.566)	0.161 (0.166)	0.026 (0.607)	-3.854*** (1.116)	-0.068 (0.449)
Age in years (age=10)	2.285*** (0.476)	-1.936*** (0.625)	-0.171 (0.190)	-0.040 (0.638)	-3.535*** (1.317)	-0.274 (0.462)
Age in years (age=11)	2.198*** (0.424)	-2.877*** (0.514)	0.343** (0.154)	-0.256 (0.525)	-3.233*** (0.933)	0.258 (0.400)
Age in years (age=12)	2.385*** (0.429)	-2.888*** (0.530)	0.090 (0.151)	0.103 (0.538)	-3.864*** (0.888)	0.140 (0.403)
Child is female	0.055 (0.065)	-0.163 (0.104)	0.003 (0.050)	-0.188 (0.134)	-0.290 (0.256)	0.094 (0.062)
Wealth index	-0.717 (0.436)	1.121 (0.785)	-0.340 (0.348)	-1.664* (1.010)	2.870 (2.005)	-0.754 (0.550)
Household owned any livestock in the past 12 months	0.017 (0.096)	-0.065 (0.179)	0.080 (0.074)	0.087 (0.195)	-0.401 (0.354)	0.051 (0.089)
Monthly expenditure in food items per capita	-0.001 (0.001)	0.004*** (0.001)	-0.000 (0.000)	-0.001 (0.001)	0.001 (0.001)	0.000 (0.000)

	Birthweight and PPVT score			Mom age (28+) and birthweight		
	Hrs/day at school (I)	*Hrs/day in leisure* (II)	*Hrs/day in care* (III)	*Hrs/day at school* (IV)	*Hrs/day in leisure* (V)	*Hrs/day in care* (VI)
Mom age at Round 1 (YL child age~)	-0.002 (0.009)	0.003 (0.014)	0.000 (0.006)	-0.030 (0.025)	-0.009 (0.046)	-0.003 (0.009)
Caregiver years of education at Round 1	0.005 (0.012)	0.027 (0.022)	-0.008 (0.009)	0.036 (0.027)	-0.098** (0.049)	0.013 (0.011)
Head of household is female	-0.002 (0.135)	0.053 (0.258)	-0.028 (0.119)	-0.324 (0.220)	-1.367** (0.663)	-0.063 (0.352)
Children attended preschool	0.573 (0.370)	0.123 (0.297)	0.036 (0.093)	-0.093 (0.462)	-0.660 (0.902)	-0.355 (0.262)
Child speaks Spanish	0.084 (0.247)	0.285 (0.348)	-0.180 (0.160)	-0.919 (0.597)	1.828* (1.054)	-0.579*** (0.191)
Child religion Catholic	-0.330** (0.140)	-0.124 (0.229)	0.028 (0.116)	0.041 (0.256)	-0.644 (0.480)	-0.152 (0.111)
Child religion is Other	-0.384** (0.167)	-0.035 (0.290)	0.189 (0.141)	-0.541 (0.506)	0.595 (0.896)	-0.129 (0.200)
Child ethnicity is White	-0.429 (0.266)	0.899** (0.434)	-0.077 (0.164)	-2.050*** (0.440)	3.847*** (1.090)	-0.020 (0.259)
Child ethnicity is Mestizo	-0.335 (0.245)	0.602 (0.395)	0.034 (0.152)	-2.485*** (0.416)	3.847*** (1.108)	0.171 (0.273)
Child lived at Coast	0.490** (0.228)	-0.929** (0.451)	0.169 (0.168)	0.463 (0.370)	1.292** (0.600)	0.065 (0.292)
Child lived at Mountain	-0.075 (0.182)	-0.138 (0.447)	0.116 (0.150)	-0.277 (0.347)	2.037*** (0.593)	0.253 (0.206)
Child lived Urban area	-0.161 (0.133)	0.192 (0.195)	0.146 (0.101)	-1.407*** (0.436)	0.414 (0.681)	0.318** (0.140)
Year gap between siblings (gap=2)	-0.247 (0.202)	0.100 (0.286)	-0.082 (0.117)	1.017* (0.524)	-1.887*** (0.720)	-0.329 (0.459)
Year gap between siblings (gap=3)	-0.154 (0.206)	0.080 (0.304)	-0.077 (0.126)	0.512 (0.492)	-1.606** (0.741)	-0.221 (0.438)
Year gap between siblings (gap=4)	-0.086 (0.205)	-0.243 (0.296)	0.147 (0.148)	0.717 (0.462)	-2.039*** (0.745)	-0.112 (0.462)
Year gap between siblings (gap=5)	-0.254 (0.218)	0.042 (0.300)	0.028 (0.128)	0.759 (0.489)	-1.608** (0.785)	-0.259 (0.480)
Year gap between siblings (gap=6)	-0.159 (0.207)	0.007 (0.287)	0.055 (0.121)	1.034* (0.543)	-1.572* (0.846)	-0.295 (0.443)
Year gap between siblings (gap=7)	-0.211 (0.206)	0.263 (0.303)	-0.045 (0.134)	0.913* (0.504)	-1.179* (0.704)	-0.410 (0.443)
Year gap between siblings (gap=8)	-0.336 (0.213)	0.400 (0.339)	-0.187 (0.146)	0.849 (0.542)	-1.182 (0.888)	-0.207 (0.452)
Year gap between siblings (gap=9)	-0.456* (0.238)	0.334 (0.382)	-0.232 (0.148)	-0.031 (0.554)	0.385 (0.909)	-0.184 (0.497)
Year gap between siblings (gap=10)	-0.281 (0.257)	0.009 (0.391)	-0.408*** (0.135)	1.303** (0.664)	-2.764*** (0.938)	-0.383 (0.483)
Year gap between siblings (gap=11)	-0.003 (0.257)	-0.145 (0.351)	-0.234 (0.145)	1.142** (0.535)	-1.944** (0.917)	-0.183 (0.449)
Year gap between siblings (gap=12)	-0.071 (0.329)	-0.693 (0.564)	-0.263 (0.229)	0.994 (0.627)	-2.316* (1.240)	-0.389 (0.442)
Year gap between siblings (gap=13)	0.674* (0.402)	-0.176 (0.547)	-0.163 (0.154)	1.808*** (0.550)	-2.716*** (1.022)	-0.341 (0.446)
Year gap between siblings (gap=14)	-0.582** (0.240)	0.151 (0.384)	-0.051 (0.164)	1.302** (0.595)	-1.360 (0.969)	-0.627 (0.470)
Year gap between siblings (gap=15)	-0.101 (0.251)	-1.438*** (0.403)	-0.299* (0.174)	1.277* (0.750)	-4.077*** (1.175)	-0.280 (0.478)
Year gap between siblings (gap=26)	-1.490*** (0.280)	0.585 (0.431)	0.253 (0.190)	0.123 (0.594)	-0.489 (1.106)	0.119 (0.464)
Family cluster-mean: Head of household is female	-0.151 (0.179)	-0.070 (0.340)	0.007 (0.148)	-0.155 (0.320)	1.522* (0.814)	0.010 (0.389)

	Birthweight and PPVT score			Mom age (28+) and birthweight		
	Hrs/day at school (I)	*Hrs/day in leisure* (II)	*Hrs/day in care* (III)	*Hrs/day at school* (IV)	*Hrs/day in leisure* (V)	*Hrs/day in care* (VI)
Family cluster-mean: wealth index	1.297*** (0.486)	-1.415* (0.814)	0.179 (0.392)	3.295** (1.285)	-1.208 (2.433)	0.522 (0.561)
Family cluster-mean: HH owned livestock past 12 months	-0.097 (0.144)	0.125 (0.224)	-0.086 (0.091)	-0.466* (0.258)	0.432 (0.539)	-0.054 (0.145)
Family cluster-mean: Food expenditure per capita	0.001 (0.001)	-0.003** (0.002)	0.000 (0.001)	0.003** (0.001)	-0.006* (0.003)	-0.001* (0.001)
Birthweight (grams)	0.000** (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Standardised Age-Adj PPVT score	0.088* (0.048)	-0.132* (0.072)	-0.003 (0.035)	-	-	-
Observations (children-data points)	955	955	955	265	265	265
Observations (children)	493	493	493	137	137	137
Observations (families)	426	426	426	126	126	126
p-value $H_0: \beta_1 = \beta_2 = 0$	0.099	0.039	0.000	0.03	0.582	0.000
p-value $H_0: \pi = 0$	0.004	0.086	0.862	0.002	0.047	0.460
R-squared	0.270	0.218	0.316	0.443	0.356	0.375

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A10. Average Marginal Effects: Parental aspirations & birth order (all controls)

	2 siblings *University/ Postgraduate* (I)	**3 siblings** *University/ Postgraduate* (II)
Standardised Age-Adj PPVT score	0.057*** (0.017)	0.053 (0.043)
All children are female	-0.021 (0.022)	0.003 (0.030)
Mom age at Round 1 (YL child age~)	0.006 (0.003)	0.003 (0.004)
Caregiver years of education at Round 1	0.001 (0.004)	0.000 (0.005)
Head of household is female	-0.049 (0.036)	0.085 (0.104)
Wealth index	0.067 (0.130)	0.217 (0.271)
Household owned any livestock in the past 12 months	-0.061 (0.038)	0.037 (0.061)
Monthly expenditure in food items per capita	0.000 (0.000)	0.000 (0.001)
Children attended preschool	0.080* (0.039)	0.08 (0.100)
Year gap between siblings (gap=2)	-0.003 (0.046)	0.027 (0.082)
Year gap between siblings (gap=3)	-0.108 (0.073)	-0.02 (0.085)
Year gap between siblings (gap=4)	-0.034 (0.056)	-0.070 (0.106)
Year gap between siblings (gap=5)	-0.023 (0.049)	0.087 (0.115)
Year gap between siblings (gap=6)	-0.088 (0.054)	-0.047 (0.102)
Year gap between siblings (gap=7)	-0.045 (0.052)	0.077 (0.107)
Year gap between siblings (gap=8)	0.036 (0.049)	-0.045 (0.121)
Year gap between siblings (gap=9)	-0.098	0.064

	2 siblings *University/ Postgraduate* (I)	**3 siblings** *University/ Postgraduate* (II)
	(0.066)	(0.104)
Year gap between siblings (gap=10)	-0.042	-0.089
	(0.061)	(0.119)
Year gap between siblings (gap=11)	-0.038	-0.079
	(0.064)	(0.128)
Year gap between siblings (gap=12)	-0.186*	-0.415*
	(0.085)	(0.201)
Year gap between siblings (gap=13)	-0.400*	-
	(0.173)	
Year gap between siblings (gap=14)	-0.716***	-
	(0.101)	
Child speaks Spanish	-0.038	0.114
	(0.070)	(0.109)
Child religion Catholic	0.066	-0.066
	(0.049)	(0.139)
Child religion is Other	0.057	-0.037
	(0.056)	(0.138)
Child ethnicity is White	0.116	-0.493
	(0.075)	(.)
Child ethnicity is Mestizo	0.13	-0.544
	(0.068)	(.)
Child lived at Coast	-0.754***	0.691
	(0.143)	(0.544)
Child lived at Mountain	-0.832***	0.034
	(0.107)	(0.151)
Child lived Urban area	-0.006	-0.011
	(0.037)	(0.053)
Family cluster-mean: Head of household is female	0.008	0.009
	(0.052)	(0.101)
Family cluster-mean: wealth index	0.088	0.294
	(0.158)	(0.335)
Family cluster-mean: HH owned livestock past 12 months	0.112*	0.008
	(0.051)	(0.083)
Family cluster-mean: Food expenditure per capita	0.000	0.000
	(0.000)	(0.001)
Observations (children-data points)	760	504

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses.

Table A11. CRE estimates: Joint parental aspiration and birth order (all controls)

	Hrs/day at school (I)	*Hrs/day in care* (II)
Parental Aspiration: University/Postgrad (p =1)	0.035	-0.046
	(0.144)	(0.133)
Birth order (j =2)* University/Postgrad (p =1)	0.340	-0.010
	(0.332)	(0.162)
Age in years (age=7)	-0.012	-0.023
	(0.325)	(0.512)
Age in years (age=8)	-0.004	0.130
	(0.302)	(0.511)
Age in years (age=10)	-	0.008
		(0.514)
Age in years (age=11)	-0.462	0.673
	(0.362)	(0.532)
Age in years (age=12)	-0.347	0.404
	(0.377)	(0.535)
All children are female	0.069	0.076
	(0.072)	(0.059)
Wealth index	-0.373	-0.583
	(0.380)	(0.417)
Household owned any livestock in the past 12 months	-0.017	0.086

	Hrs/day at school	*Hrs/day in care*
	(I)	(II)
	(0.098)	(0.090)
Monthly expenditure in food items per capita	-0.001	-0.001*
	(0.001)	(0.001)
Mom age at Round 1 (YL child age~)	0.004	-0.003
	(0.008)	(0.007)
Caregiver years of education at Round 1	0.002	-0.012
	(0.011)	(0.010)
Head of household is female	0.158	-0.003
	(0.152)	(0.151)
Children attended preschool	0.314	-0.034
	(0.410)	(0.172)
Child speaks Spanish	0.103	0.089
	(0.244)	(0.228)
Child religion Catholic	-0.399***	0.164
	(0.154)	(0.138)
Child religion is Other	-0.349*	0.218
	(0.181)	(0.159)
Child ethnicity is White	-0.333	0.063
	(0.287)	(0.158)
Child ethnicity is Mestizo	-0.307	0.147
	(0.261)	(0.142)
Child lived at Coast	0.203	0.333*
	(0.283)	(0.196)
Child lived at Mountain	-0.150	0.134
	(0.233)	(0.181)
Child lived Urban area	-0.118	0.234**
	(0.129)	(0.117)
Year gap between siblings (gap=2)	-0.265	-0.255
	(0.259)	(0.187)
Year gap between siblings (gap=3)	-0.152	-0.130
	(0.259)	(0.184)
Year gap between siblings (gap=4)	-0.143	-0.020
	(0.249)	(0.206)
Year gap between siblings (gap=5)	-0.226	-0.120
	(0.260)	(0.191)
Year gap between siblings (gap=6)	-0.127	-0.024
	(0.252)	(0.190)
Year gap between siblings (gap=7)	-0.187	-0.165
	(0.252)	(0.191)
Year gap between siblings (gap=8)	-0.366	-0.320
	(0.256)	(0.198)
Year gap between siblings (gap=9)	-0.309	-0.359*
	(0.258)	(0.202)
Year gap between siblings (gap=10)	-0.282	-0.554***
	(0.286)	(0.191)
Year gap between siblings (gap=11)	0.089	-0.339*
	(0.287)	(0.197)
Year gap between siblings (gap=12)	0.010	-0.381
	(0.369)	(0.272)
Year gap between siblings (gap=13)	1.035**	-0.330
	(0.448)	(0.221)
Year gap between siblings (gap=14)	-0.459	-0.178
	(0.300)	(0.240)
Family cluster-mean: Head of household is female	-0.491**	0.035
	(0.193)	(0.185)
Family cluster-mean: wealth index	0.579	0.432
	(0.468)	(0.472)
Family cluster-mean: HH owned livestock past 12 months	-0.160	-0.002
	(0.131)	(0.110)
Family cluster-mean: Food expenditure per capita	0.001	0.001
	(0.001)	(0.001)
Standardised Age-Adj PPVT score	0.084	-0.020
	(0.056)	(0.043)

	Hrs/day at school	*Hrs/day in care*
	(I)	(II)
Observations (children-data points)	760	760
Observations (children)	397	397
p-value $H_0: \beta_1 = \beta_2 = 0$	0.106	0.000
p-value $H_0: \pi = 0$	0.020	0.432
R-squared	0.168	0.326

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A12. Hausman-Taylor estimates

	Hrs/day at school	*Hrs/day in leisure*
	(I)	(II)
Birth order (j =2)	0.251	0.153
	(0.306)	(0.301)
Wealth index	-0.184	
	(0.531)	
Monthly expenditure in food items per capita		0.003*
		(0.001)
Observations	1336	1336
p-value $H_0: \beta_1 = \beta_2 = 0$	0.412	0.610
p-value coef. problematic covariate[1] $= 0$	0.729	0.014

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column represents a separate regression.

Table A13. Hausman-Taylor estimates: Family Size

	2 siblings	**3 siblings**		
	Hrs/day at school	*Hrs/day at school*	*Hrs/day child work*	*Hrs/day in care*
	(Ia)	(Ib)	(IIb)	(IIIb)
Birth order (j =2)	0.782	0.099	-0.409	-0.336
	(0.588)	(0.367)	(0.484)	(0.254)
Birth order (j =3)		-0.307	-0.594	-0.891
		(0.920)	(1.555)	(0.427)
Head of household is female	-0.072	0.387	-0.591	
	(0.200)	(0.214)	(0.322)	
Wealth index	-0.227			0.639
	(0.576)			(0.495)
Household owned any livestock in the past 12 months			-0.193	
			(0.232)	
Observations	1076	1035	1035	1035
p-value $H_0: \beta_1 = \beta_2 = 0 \mid \beta_1 = \beta_2 = \beta_3 = 0$	0.183	0.788	0.699	0.090
p-value $H_0: \pi = 0$	0.881	0.071	0.153	0.197

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column represents a separate regression.

Table A14. Hausman-Taylor estimates: birthweight, PPVT score, & mother's age

	Birthweight and PPVT score		Mom age (28+) and birthweight	
	Hrs/day at school	*Hrs/day in leisure*	*Hrs/day at school*	*Hrs/day in leisure*
	(Ia)	(IIa)	(Ib)	(IIb)
Birth order (j =2)	-0.424 (0.610)	1.551* (0.934)	-0.765 (0.995)	0.336 (1.498)
Wealth index	-0.414 (0.605)		-1.214 (1.239)	
Monthly expenditure in food items per capita		0.004** (0.002)	-0.001 (0.001)	0.001 (0.002)
Head of household is female				-1.632 (1.069)
Observations	955	955	265	265
p-value $H_0: \beta_1 = \beta_2 = 0$	0.488	0.097	0.442	0.822
p-value $H_0: \pi = 0$	0.494	0.033	0.428	0.246

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression. Each column represents a separate regression.

Table A15. Random Effects estimates

	Hrs/day at school (I)	*Hrs/day studying outside school* (II)	*Hrs/day in leisure* (III)	*Hrs/day in child-work* (IV)
Birth order (j =2)	-0.130* (0.072)	0.063 (0.062)	0.348*** (0.119)	-0.810*** (0.103)
Observations (children-data points)	1,336	1,336	1,336	1,336
Observations (children)	734	734	734	734
p-value $H_0: \beta_1 = \beta_2 = 0$	0.071	0.314	0.004	0.000

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.

Table A16. Random Effects estimates: child work disaggregated

	Hrs/day care (V)	*Hrs/day chores* (VI)	*Hrs/day tasks* (VII)	*Hrs/day paid work* (VIII)
Birth order (j =2)	-0.811*** (0.054)	0.029 (0.047)	0.005 (0.056)	-0.003 (0.024)
Observations (children-data points)	1,336	1,336	1,336	1,336
Observations (children)	734	734	734	734
p-value $H_0: \beta_1 = \beta_2 = 0$	0.000	0.543	0.933	0.897

***p<0.001, **p<0.01, *p<0.05. Clustered robust standard errors at the family level in parentheses. Each column presents a separate regression.