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Abstract

In this paper we investigate birth order and gender effects on the development of children's human capital in India. We investigate both indicators of the child's current stock of human capital and of investment into their continued human capital accumulation, distinguishing between time investments and pecuniary investment into school quality. Our results show that in India, birth order effects are mostly negative. More specifically, birth order effects are negative for indicators of children's accumulated human capital stock and for indicators of pecuniary investments into school quality. These results are more in line with previous results from developed countries than from developing countries. However, for time investments, which are influenced by the opportunity cost of child time, birth order effects are positive. Gender aspects are also important. Girls are disadvantaged within families, and oldest son preferences can explain much of the within-household inequalities which we observe.

JEL codes: D13, I20, J16, O15

Keywords: Birth order, Son preferences, Gender, Human Capital, Education.

1. Introduction

In this paper we investigate birth order and gender effects on the development of children's human capital in India. Our data on education inputs and outcomes is unusually rich. We investigate both indicators of the child's current stock of human capital and of investment into their continued human capital accumulation, distinguishing between time investments and pecuniary investment into school quality. We also examine the impact on child labor and height for age. While not educational variables per se, these are relevant in understanding educational human capital accumulation.

Higher birth order children are found in larger families. An analysis of birth order effects thus has to address the close relation between birth order and family size. In the Indian context family size is also related to child gender, with girls more often living in larger families (Jensen, 2003). To control for family size and other differences across families, we employ a within family model using sibship fixed effects. This is a common approach to avoid confounding family size effects with within-household inequalities. We also estimate separate regressions for each sibship size.

There is an extensive literature showing negative birth order effects on human capital in developed countries. First-born children tend to perform better on measures of educational outcomes.[1] Several competing explanations for the negative relationship have been postulated in the literature. These are mainly based on the idea that average resources per child decline as the number of children in the family increase. The literature from developing countries is much smaller, but suggests the opposite relationship. Later-born children tend to have better educational outcomes (Ejrnæs & Pörtner, 2004; Tenikue & Verheyden, 2010; De Haan et al, 2014). The suggested explanation is more binding resource constraints combined with increasing family income over time, in particular if older siblings can contribute to household income (Parish and Willis, 1993; Sawada & Lokshin, 2009).

Our results show that birth order effects are mostly negative in India. This is more in line with the findings in developed countries than with those in developing countries. The results for time

[1] See for example Conley & Glauber (2006), Kantarevic & Mechoulan (2006), Heiland (2009), De Haan (2010), Hotz & Pantano (2015) and Lehmann et al (2016) for evidence from the United States. A similar pattern is found in several other high income countries (Black et al, 2005; Booth & Kee, 2009; Silles, 2010; Kristensen & Bjerkedal, 2010; Bonesrønning & Massih, 2011; Härkönen, 2014; Barclay, 2015; Mechoulan & Wolff, 2015).

investment indicators do, however, follow the typical developing country pattern. For all other outcomes, birth order effects are always negative. First-born children more often attend a private school, and their families spend more on their education. They have completed more grades, and they perform better on reading, writing and math tests.

Having established negative birth order effects, we attempt to reconcile these results with positive birth order effects in other developing countries. One possibility is that different education indicators have different birth order effects. The previous literature has mostly estimated effects on time investment indicators, though completed grades has also been used. We include a much wider range of indicators of both investment and human capital stock. Our results for time investment indicators indeed show a similar pattern as in the previous literature from developing countries. Birth order effects on child labor are negative, and birth order effects on enrollment and school hours are positive in families where effects exist.

Earlier papers from developing countries have found evidence supporting an important role of financial resource constraints. Hence, another potential explanation behind differences in results could be that such financial resource constraints are less important for human capital development in India than in previously studied countries. Our results suggest that credit constraints and poverty only matter in the case of time investments. This speaks for shifting focus from credit constraints in general, which should affect also pecuniary investment, towards opportunity costs of child time, which should matter most for time investments in credit constrained households.

Another potential explanation for the observed negative birth order effects in India is son preferences, favoring in particular the oldest son. Jayachandran and Pande (2015) show negative birth order effects in India for early life health outcomes, and argue that strong son preferences, where in particular the oldest son is favored, drive these results. Our results provide some support for this hypothesis, with oldest sons enjoying a particular advantage in educational investments. Son preference does not, however, appear to fully explain the observed negative relationship.

Our results also indicate that girls are disadvantaged within families, both with regard to investment into their human capital accumulation and with regard to the human capital stock that they possess. The one exception where girls do not appear to be disadvantaged is with regard to

completed grades. This is despite the fact they are disadvantaged with regard to school enrollment as well as hours spent on schooling, thus suggesting that girls might be better provided with some ability of importance for academic success. Girls are not equally disadvantaged in all families: they are less so in small families, in rich families, and in families or geographical areas where we have reasons to expect weaker son preferences.

This paper contributes to the existing literature in several ways. Foremost, we contribute to the small but growing literature on birth order effects on education in developing countries. We employ a wider range of measures of human capital compared to most of the existing literature, including both measures of children's human capital stock and of different forms of education investment. This allows for a more nuanced picture of the relationship between birth order and human capital development. We can thus shed further light on both the extent to which birth order effects in developing countries differ from those in developed countries, and on the reasons behind such differences. In particular, we show that birth order effects are not always positive in developing countries, and that they might differ depending on the type of education indicator. Positive birth order effects are more likely for time investment, since these are influenced by the opportunity cost of child time. They are less likely for indicators of pecuniary investments into school quality or for indicators of children's accumulated human capital stock. An additional contribution is that this is, to the best of our knowledge, the first paper that investigates the effect of birth order on educational attainment in India using family fixed effects. We also contribute to the literature on the consequences of son preferences in India. We confirm that boys are favored over girls within families for a wide range of outcomes, and further show that this applies especially for oldest sons. Boys, and in particular oldest sons, are more advantaged in investment into their education than in the human capital stock they possess. Moreover, gender-specific fertility stopping rules can explain some of the birth order and gender patterns observed in the Indian families. However, oldest son preferences do not appear to fully explain the negative birth order effects in education.

The remainder of the paper is structured as follows: Section 2 reviews the previous research, section 3 presents the data and variables, section 4 introduces the conceptual framework and empirical model, while section 5 presents the main results. Section 6 investigates the potential

mechanisms credit constraints and son preferences, and section 7 discusses and concludes the paper.

2. Review of previous research

Empirical findings on birth order effects in developed and developing countries

While early empirical research consistently exhibited a negative relationship between birth order and education, the results were often based on cross-sectional data, and did not speak to a causal mechanism. More recently, however, researchers have been able to establish a causal relationship by means of instrumental variables and/or fixed effects estimations. Much of this newer research uses data from the United States and confirms a negative birth order effect on education. Earlier born children have on average higher educational attainment and perform better on various tests of ability (Conley & Glauber, 2006; Kantarevic & Mechoulan, 2006; Heiland, 2009; De Haan, 2010; Lehmann et al, 2016; Hotz & Pantano, 2015). A similar pattern is found in several other high income countries, including the United Kingdom (Booth & Kee, 2009; Silles, 2010), Germany (Härkönen, 2014), France (Mechoulan & Wolff, 2015), Norway (Black et al, 2005; Kristensen & Bjerkedal, 2010; Bonesrønning & Massih, 2011), and Sweden (Barclay, 2015).

There has been less investigation into the effect of birth order on educational outcomes in developing countries. The existing literature has found positive birth order effects in the Philippines (Ejrnæs & Pörtner, 2004), Ecuador (De Haan et al, 2014), Bolivia (Zeng et al, 2012), sub-Saharan Africa (Tenikue & Verheyden, 2010), Nicaragua and Guatemala (Dammert, 2010), and Ethiopia (Lindskog, 2013). This is the exact opposite relationship as compared to the results in high income countries. However, in the cases where the above studies have split the sample between relatively rich and relatively poor households, the results in the relatively rich households are weak or even reversed, with a negative relationship between birth order and education outcomes.

While the majority of studies have found a linear relationship between birth order and education, there are a few exceptions. Dayioğlu et al (2009) find a non- monotonous relationship between birth order and school attendance in urban Turkey, while Sanhueza (2009) finds a non-monotonous relationship between birth order and years of schooling in Chile. In both cases, middle born children appear to fare worse than their older and younger siblings.

There are two studies of birth order effects on education outcomes in India that we are aware of. These studies come to conflicting conclusions. Makino (2012) investigates the relationship between birth order and test scores. She finds that there are no birth order effects for girls, while there are significant negative birth order effects for boys with older brothers. Her main strategy to deal with the correlation between birth order and family size is the use of a relative birth order measure. She performs some within-household regressions, but her data include few families with more than one sibling. Kumar (2016) investigates the relationship between birth order and years of schooling. His results show significant positive birth order effects. He controls for family size and uses gender of the first-born as an instrument. However, the gender of siblings might have an independent effect on educational outcomes in India. Hence, it remains unclear if it is really birth order effects that drive his results. Therefore, the effect of birth order on educational outcomes in India remains an open question.

Suggested pathways though which birth order could affect schooling

Several theories address the negative relationship between birth order and educational attainment in developed countries. One hypothesis is that biological factors drive the observed relationship. The general argument is that earlier born children are healthier for reasons relating to mothers' health and behavior during pregnancy. Empirical results on this theory tend to conflict. Some studies find that first-born have better early life/biological outcomes while others find the opposite.[2] Regardless, negative birth order effects in education persist even when controlling for early-life outcomes. Furthermore, Kristensen & Bjerkedal (2007) find that IQ scores of Norwegian military conscripts is dependent on the individual's social rank within the family, not strict biological birth order. Similarly, Barclay (2015) finds a negative birth order effect in a sample restricted to families where all siblings are adopted. This indicates that biological factors do not play a key role in determining this effect. Therefore, the biological view does not seem to be the most relevant.

A model that is more in line with the results found in Kristensen & Bjerkedal (2007) and Barclay (2015) is the confluence model. This model was developed in the psychology literature in the

[2] Lehmann et al (2016) find for example that mothers reduce their cigarette consumption less with later-born children. In contrast, Black et al (2011) in a study on birth order and IQ in Norway find that early born children have, if anything, a slight disadvantage at birth.

mid-1970s to explain a negative relationship between birth order and intelligence. The model argues that the intellectual environment within the family is crucial for the intellectual development of children (Zajonc & Markus, 1975; Zajonc, 1976; Zajonc et al. 1979). The intellectual environment, in turn, is modelled as a weighted average of the parents' and children's intelligence. Each child added to the family enters into a lower intellectual environment compared to the previous child. This leads to negative birth order effects. The model also predicts that spacing between siblings will be important, with closely spaced children facing a greater disadvantage than more widely spaced children. Zajonc et al (1979) further argue that the earlier born children may benefit from having younger siblings to teach, meaning that last-born and only children are at a disadvantage compared to others of the same birth order.

Another postulated explanation to the negative relationship between birth order and educational attainment is the resource dilution hypothesis. This hypothesis is similar to the confluence model, but in this case the important inputs to child development are parents' time and material resources. As family size increases, there will be less time and money per child. First-born children will therefore have the advantage of relatively more parental resources, at least during the period when they are the only child. Each additional child will have a similar advantage over their later-born siblings, but a disadvantage compared to their older siblings. The advantage faced by earlier born children is exacerbated by the fact that early-life investments in human capital have a persistent positive impact on educational outcomes. It also increases the productivity of future investments (Cunha & Heckman, 2007).

Hao et al (2008) model strategic parental behavior whereby parents discipline their first-born children more strictly in order to serve as an example to the later-born children. The first-borns thus gain an advantage from the additional parental attention. Hotz and Pantano (2013) test the model empirically on data from the United States. They find that parents' disciplinary actions towards their children decrease with birth order.

The models discussed above all predict negative birth order effects, despite differences in the underlying mechanisms. In many developing countries, however, positive birth order effects on human capital accumulation have been found. One hypothesis is that credit constraints can explain these positive birth order effects. Families facing a credit constraint will be unable to fully equalize the amount of resources allocated to each child. They may therefore be more likely

to have their early-born children participate in labor or child care and less likely to participate in education (Lafortune and Lee, 2014). Later-born children thus benefit from the extra income generated by their older siblings. They also benefit from the fact that household income tends to increase over time (Parish and Willis, 1993).

Ejrnæs & Pörtner (2004) present a model where household fertility is endogenous. Parents employ a fertility stopping rule dependent on the endowment of their children, meaning they stop having children once a child with a sufficiently high endowment is born. Further, parents choose to reinforce rather than compensate differences between children via investments in human capital. These strategies lead to positive birth order effects, as last-born children will be the children with the highest endowments and thus receive the most human capital investment.

Are boys and girls treated differently in Indian families?

Birth order effects and intra-household allocation of resources may differ by gender, both in a developed and a developing country setting (Härkönen, 2014; Kristensen & Bjerkedal, 2010; Dayioğlu et al., 2009; Ejrnæs & Pörtner, 2004). Often, the results show that girls are disadvantaged within the household.[3]

One explanation, often applied to India in particular, is that a preference for sons lies behind these results (Behrman, 1988; Pande, 2003, Jayachandran and Pande, 2015). Son preferences influence a wide range of behaviors in India, and a number of studies document that girls fare worse than boys (Arnold et al., 1998; Barecello et al., 2014). Some researchers claim that this can be attributed to girls on average living in larger families due to gender-specific fertility stopping rules rather than due to unfavorable treatment of girls within a given family. This implies equal treatment within households but unequal outcomes between households (Jensen, 2003). However, there is evidence that girls are not treated equally within families, but rather fare worse than their male siblings. For example, Barecello et al. (2014) find that boys in India receive significantly higher early life investments than their female siblings, measured in terms of parental time, vaccinations, breastfeeding, etc. Azam and Kingdon (2013) use the 1993 and 2004 waves of the IHDS to investigate whether girls are disadvantaged in India. They find that within families, girls are disadvantaged in enrollment, education expenditure and the private-public school choice.

[3] There are exceptions to this where girls instead face an advantage; for example Ejrnæs & Pörtner (2004) and Kristensen & Bjerkedal (2010)

They also find that girls' disadvantage is more pronounced when looking at the within family specification compared to the between family specification.

Jayachandran and Pande (2015) investigate the role of preferences in favor of the oldest son in particular in driving negative birth order effects in height for age. They find that oldest sons are taller than their younger siblings, and that the birth order gradient is steeper in India than in the sub-Saharan African data they compare with. Similar results are found with other measures of early life health investments, such as pre- and post-natal health checks and vaccinations. Daughters in India are found to be at a particular disadvantage vis-à-vis daughters in Africa if they do not have any older brothers. This is driven by the fact that in families where there is a strong son preference, there is an incentive to increase family size until a boy is born. When daughters are born into the family before a son, the family will have an incentive to save resources for the male child they hope to have in the future. These results indicate that a combination of strategic parental decisions and resource dilution interact to produce negative birth order effects in India. Jayachandran and Pande find that the steep birth order gradient is driven by the Hindus. They further find that the negative birth order effects are not present in matrilineal Kerala.

Son preferences are often framed as parents placing a higher weight on the utility of male children than of female children. Another potential explanation is that the returns to educating boys may be significantly higher than the returns to educating girls. This could be either due to labor market conditions or patrilocal traditions. Conversely, the opportunity costs of educating girls may be higher (Kumar, 2013). It is likely that both of these aspects influence parental decisions.

3. Data and variables

Our data comes from the 2004 - 05 and 2011 - 12 rounds of the India Human Development Survey (IHDS). This is a nationally representative survey of 42152 households covering 1420 villages and 1042 urban neighborhoods in India. The data has been collected as part of a joint project between the University of Maryland in the United States and the National Council of Applied Economic Research in India. The surveys were administered via interviews conducted in the local language, and cover a wide variety of socioeconomic topics. We have information that

links each child to their mother. In order to determine the birth order of a child, we make use of the eligible women file. This includes the birth history of all women in the sample between the ages 15 and 49. We restrict the sample to cases where both the mothers and their husbands have not been previously married, creating a sample of full siblings (i.e. without half siblings or step-siblings). As there are cases where extended families are living in one household, we observe cases where there is more than one sibship per household. We exclude multiple birth children (twins, triplets), since their birth order is not well-defined. For the sake of our analysis, we further restrict our sub-sample to families where the sibship size is between 2 and 6.[4]

The estimation sample differs across different dependent variables. Most dependent variables are estimated on children aged 6 to 17, but test scores are only available for children age 8-11. There needs to be non-missing data from at least two children in a sibship for it to be included in the estimation sample. Often there is data on more than one child from each of the two surveys. Sibships are also included if there is data from one child in 2004-05 and another child in 2011-12. This substantially increases the test scores estimation sample.

Variables

Our main explanatory variable is absolute birth order. We construct dummy variables for birth orders one, two, three and four plus, the last of which takes a value of one if the child's birth order is 4, 5 or 6 and zero otherwise. A particular strength of the data set is that it includes an unusually rich set of educational information. We have variables measuring enrollment, hours spent in school or doing homework, type of schooling, school related expenses, completed grades, and test scores for reading, writing and mathematics. The data also includes variables that do not directly measure educational outcomes, but which are still relevant to understand human capital accumulation. We use information on child labor and height-for-age Z scores (HAZ). The information on child labor is relevant since it represents an alternative use of child time. HAZ is relevant since it is a measure that will capture differences in early life investment and environment (Silventoinen, 2003; Li et al., 2003). It has been shown to be correlated with both health human capital and cognitive and non-cognitive skills (Glewwe et al., 2001; Alderman et al., 2001).

[4] We exclude larger families, since they are not common, and since we do not want unusual families to drive the high birth order results.

As mentioned earlier, our dependent variables can be categorized into indicators of the child's current human capital stock and investments into the child's continued human capital accumulation. The indicators of current human capital are the scores on reading, writing and mathematics tests, the number of completed grades, and the height-for-age z-score. Cunha and Heckman (2008) show that test scores are not only influenced by cognitive, but also non-cognitive skills. The same is likely to hold for completed grades. Our indicators of investments are *enrollment*, *child labor*, *total hours*, *private school* and *expenses*. The first three are indicators of time invested in schooling, where the total hours most directly corresponds to what we intend to measure. Enrollment and child labor are also valuable indicators of children's time use, and they are the main variables that have previously been studied in a developing country context. Private schooling and school expenses are indicators of investment into school quality.

Though *total hours* is only collected for children who are enrolled, we set it to zero for all children who are not enrolled and estimate it on the full sample. *Private school* and *Expenses* is also collected only for children who are enrolled in school, and in the main estimations we estimate them on the conditional samples. Thus the estimation samples for these outcomes are endogenous. We run robustness estimations were we have coded the expenses, and the private school attendance as zero for all children who are not enrolled in school, but prefer to keep the estimations based on the conditional samples in the main analysis since they are easier to interpret. The test scores for reading, writing and mathematics have been collected for all children age 8-11 at the time of the survey.

Enrollment, *child labor*, and *private school* are dummy variables taking a value of 1 if the child is enrolled in school, works more than 240 hours a year, or is enrolled in a private school, respectively, and zero otherwise. *Total hours* combines the hours of school, hours of homework and hours of private tuition per week used by the child, while *expenses* measures the cost of school fees, books, uniforms, bus fare and private tuition fees in rupees. The *reading score* runs from 0 (cannot read) to 4 (read a story), with the intermediate values 1 (letter), 2 (word) and 3 (paragraph). The *writing score* is equal to zero if the child cannot write and one if the child can write with 2 or less mistakes. The *math score* runs between 0 (cannot count) and 3 (division), with the intermediate values 1 (number) and 2 (subtraction). The test scores variables are the same as Makino (2012) uses in her analysis. We have an additional round of data from 2010-11

and thus have a much larger sample of families with at least two children in the data. This allows us to rely on a within-sibship analysis. We have standardized the test scores and the numbers of completed grades, such that they measure age-specific standard deviations from the mean, using the sample population as the age-specific reference. The *HAZ* was constructed using the WHO reference tables from 2007.

4. Theoretical framework and empirical model

Theoretical framework

In this sub-section we sketch a theoretical framework for current human capital stock and investment into continued human capital accumulation. This serves to guide the structure and interpretation of our empirical results. Starting with the human capital stock, there is now compelling evidence of the importance of early life investment and complementarities between early and late childhood. Hence, we use the human capital production function in Cunha and Heckman (2007) as our point of departure. In contrast to earlier models of human capital accumulation such as Becker and Tomes (1994), childhood consists of many periods. It is important to at least distinguish early childhood from late childhood. School investment occurs during late childhood.

Human capital, in the form of different cognitive and non-cognitive skills and abilities, depends on parental characteristics, initial endowments and investments. Formally, human capital of sibling i in the next period $h_{t+1,i}$ is a function of parental characteristics, ω, current human capital, $h_{t,i}$, and various investments, $I_{t,i}$: $h_{t+1,i} = f(\omega, h_{t,i}, I_{t,i})$. The parental characteristics could be thought of more broadly as encompassing home environment, such that sibling interaction would also be included. This implies that ω differs across siblings. Complementarities between early and late childhood implies that late childhood investment will have higher returns for children who already possess higher human capital. That is $\frac{\delta^2 f(\cdot)}{\delta h \delta I} > 0$, which creates an equity efficiency trade-off for late childhood investment.

The current stock of human capital, which is what we estimate empirically, is the outcome of initial endowments of the child, home environment, and all prior investments in the child's human capital;

(1) $h_{\tau,i} = f(\omega_i, h_{0,i}, I_{t\epsilon(0,\tau),i})$.

We do not observe the arguments of the human capital production function, but estimate the reduced form effects of gender and birth order. While there are no reasons to expect that initial endowments $h_{0,i}$ should differ systematically with gender or birth order, ω_i will differ by birth order if it includes sibling interaction. Earlier investments $I_{t\epsilon(0,\tau),i}$ might vary with both birth order and gender. Note that current human capital could be viewed both as the outcome of human capital formation up until data collection and as arguments in the human capital production function.

Next, to arrive at an expression for education investment, we assume the simplest possible model. There are two periods; the current (late childhood of the children) and the future (when the children are grown-up). Parents invest in children's human capital in the current period to maximize the sum of their utility over the two periods. Parents receive utility from household consumption in the current period, c_1, and from household consumption and grown-up children's human capital in the next period, c_2 and $h_{2,i}$. We abstract from discount rates and interest rates to simplify. Parents' utility function is $U = u(c_1) + u(c_2, \theta_i h_{2,i})$. They maximize total expected utility subject to the human capital production functions of their children and subject to the current and future period budget constraints. The human capital production function of each child is $h_{2,i} = f(\omega_i, h_{2,i}, I_{j,i})$. The current period budget constraint is $y_1^p + \sum_i y_{1,i} = c_1 + \sum_{i,j} p_j I_{i,j} + s$, where parents income, y_1^p, is given, but where child income, $y_{1,i}$, depends on child labor, and thereby on the time they invest in education. Let w_i be the child wage rate. Then $y_{1,i} = w_i(1 - I_{i,j})$ for time investments. Returning to the budget constraint, p_j is the pecuniary cost of investment *j*, and *s* is savings. The future period budget constraint is $y_2^p + s = c_2$. The θ:s are the value to parents of grown-up children's human capital, and can vary across children. It can be thought of as including both altruism and different types of transfers to the parents.[5] Substitution of constraints into the utility function and maximization with respect to human capital investments gives the following first order condition for time investments and pecuniary investment into school quality respectively:

[5] Transfers to parents could have been modeled as part of future period income instead, but we prefer to keep it as simple as possible.

(2) $$\theta_s \frac{\delta f(\cdot)}{\delta I_{i,j}} = \frac{\delta u(\cdot)}{\delta c_1}(w_s + p_j),$$

(3) $$\theta \frac{\delta f(\cdot)}{\delta I_{i,j}} = \frac{\delta u(\cdot)}{\delta c_1} p_{j,}$$

where the right hand side is the marginal cost of investment *j* for child *s*, and the left hand side is the parents' marginal benefit of that investment. The marginal benefit increases with θ_i, parents' valuation of increased human capital for child *i*, and with $\frac{\delta f(\cdot)}{\delta I_{i,j}}$, the marginal productivity of investment *j* in increasing child *i*'s human capital. If, as in the model of Cunha and Heckman, we assume that $\frac{\delta^2 f(\cdot)}{\delta I \delta h} > 0$, then an investment will increase human capital more among children who already possess higher human capital, creating an equality- efficiency trade-off. Turning to the marginal cost of investment *j*, it increases with p_j, the pecuniary cost, and, for time investments, w_i, the opportunity cost of child time. The impact of these costs on parents' marginal utility also increases with $\frac{\delta u(\cdot)}{\delta c_1}$, the marginal utility of increased current period consumption. This term is higher among credit constrained households, creating a downward pressure on educational investment in these families.

Again, we estimate the reduced form effects of birth order and gender. With the exception of p_j, all other terms can differ with birth order and gender. Parents' valuation of child human capital, θ_i, can differ either because of differential degrees of altruism, or because children are expected to contribute differently to parents in their old age. The marginal productivity of the investment, $\frac{\delta f(\cdot)}{\delta I_{i,j,}}$, differs if the current human capital stock differs. The marginal utility of current period consumption, $\frac{\delta u(\cdot)}{\delta c_1}$, differs with birth order if the family is credit constrained and family income, as has been suggested, increases over time. The marginal cost depends on the interaction between the marginal utility of current period consumption and the opportunity cost and the pecuniary cost respectively. Edmonds (2006) shows how children of different birth order and gender have different comparative advantage, with older children more productive in child labor. While younger siblings should be equally productive when they reach a certain age, this will influence their educational investments less if the family is by then less credit constrained. Depending on context, there might also be differences in returns to child labor between boys and girls.

Empirical model

We are interested in within-household inequalities in human capital formation. Are there any systematic inequalities related to birth order and gender? By necessity birth order is correlated with family size, and in India gender has also been shown to be so (Jensen, 2003). To ensure that we do not confuse differences in human capital accumulation across families, depending on for example family size, with within-household inequalities we use sibship fixed effect. In addition we control for a full set of age dummies and survey round. The basic model is

$$y_{ist} = \alpha + \beta_1 * birthorder2_{is} + \beta_2 * birthorder3_{is} + \beta_3 * birthorder4to6_{is} + \beta_4 * female_{is} + \sum age_{ist}\pi + \varphi_t + \gamma_s + \varepsilon_{ist}$$

where y_{ist}, the outcome of child *i* in sibship *s* at time *t*, are our measures of children's current human capital stock and of investment into their continued human capital accumulation. age_{ist} is a full set of child age dummies, and φ_t is a survey round dummy. γ_s are sibship fixed effects, which captures differences in family size, and all other time constant differences across families.

In our main estimations we use linear sibship fixed effects regressions for all outcomes. For the binary outcomes, *enrollment*, *child labor* and *private school* we therefore estimate the linear probability model. We estimate alternative models as a robustness check (the conditional logit and the correlated random effects probit). Standard errors are always clustered at the sibship level.

Even if only within family variation is used for identification of birth order effects, all families will not contribute to the estimation of all birth order effects. In particular, only large families can contribute to the high birth order effects. If birth order effects differ with family size, this will affect the pattern of birth order effects that we estimate. To deal with this we follow Black et al. (2005) and estimate separate regressions for each sibship size (2, 3, 4. 5 and 6). Note, however, that fertility might not be completed in all families, making the division into family sizes somewhat blurry.[6]

[6] We have also run sibship-size-specific estimations only for sibships whose size is at least as large as the mother's expressed preferred number. This reduces the sample mostly for sibships of size 2, but to some degree also for sibships of size 3. The results of these estimations (not presented but available from the authors) are very similar to

5. Main results

Starting with the indicators of children's current human capital stock (Table 1), the results show clear negative birth order effects across the board. The higher the birth order, the fewer grades she has completed, the lower her scores on the reading-, writing- and math tests, and the shorter she is for her age. In the case of education investment indicators (Table 2) the pattern is mixed. For private schooling and school expenses - the indicators of pecuniary investment into school quality - the pattern is the same as for human capital stock indicators: there are clear negative birth order effects. Time investment indicators show a different pattern. While birth order effects on child labor are expected to have the opposite sign of those on education variables, our results show that birth order effects on child labor are strictly negative. Further, while the first-born child appears to be enrolled more often than the second born, the children of birth orders 4 to 6 have the highest enrollment, i.e. birth order effects appear to be non-monotonic. The number of hours spent on schooling shows a similar pattern, with second-born children again appearing to be the most disadvantaged. The difference in birth order effects on time investments compared to on pecuniary investments into school quality indicates that opportunity cost of child time is influential.

Table 1: The effect of birth order on indicators of current human capital stock – coefficients from linear sibship fixed effects estimations

	Completed grades	Reading	Writing	Math	HAZ
	0.076	-0.006	0.007	-0.030	-1.934
Second born	-0.204***	-0.142***	-0.126***	-0.157***	-0.346***
	(0.010)	(0.035)	(0.035)	(0.033)	(0.034)
Third born	-0.360***	-0.257***	-0.186***	-0.295***	-0.674***
	(0.019)	(0.063)	(0.061)	(0.057)	(0.062)
Fourth to sixth	-0.446***	-0.329***	-0.335***	-0.436***	-1.051***
	(0.029)	(0.098)	(0.091)	(0.088)	(0.095)
Female	0.008	-0.047**	-0.052**	-0.126***	-0.059***
	(0.007)	(0.023)	(0.024)	(0.023)	(0.021)
R^2	0.06	0.02	0.10	0.02	0.05
N	64,577	7,628	7,544	7,603	29,647
Sibships	20,829	3,610	3,570	3,598	10,898

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

the results of estimations including also sibships whose size is smaller than the mother's expressed preferred number of children.

Table 2: The effect of birth order on educational investment-coefficients from linear sibship fixed effects estimations

	Enrollment	Child labor	Total hours	Private school	School expenses
	0.921	0.082	39.351	0.300	3171.878
Second born	-0.015***	-0.005	-1.313***	-0.021***	-410.537***
	(0.003)	(0.003)	(0.194)	(0.004)	(61.272)
Third born	0.002	-0.028***	-0.961***	-0.034***	-584.039***
	(0.006)	(0.006)	(0.346)	(0.008)	(104.350)
Fourth to sixth born	0.042***	-0.064***	0.502	-0.050***	-702.911***
	(0.009)	(0.009)	(0.532)	(0.012)	(156.426)
Female	-0.015***	-0.020***	-0.826***	-0.056***	-551.148***
	(0.002)	(0.002)	(0.130)	(0.003)	(38.771)
R^2	0.15	0.11	0.08	0.02	0.15
N	60,523	64,647	54,326	52,436	47,571
Sibships	19,998	20,842	18,309	18,041	16,736

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Turning to gender differences, girls exhibit a human capital stock disadvantage in comparison to their brothers. They perform worse on the reading-, writing- and mathematics test and have lower HAZ. Nonetheless, there is one exception: girls are not disadvantaged in terms of the number of completed grades. Girls also receive less education investment than boys. They are less often enrolled, spend fewer hours on schooling, are less likely to attend a private school and have less money spent on their education. However, they are also less likely to participate in child labor. Unfortunately, however, we do not have information on domestic work, which is likely to be more common among girls. Since we use sibship fixed effects, the fact that educational investment are lower for girls than for boys clearly indicates that girls are treated differently than boys within the family. The difference in human capital stock between boys and girls is also likely to reflect past differences in investment depending on gender. Girls have, however, completed as many grades as boys, perhaps indicating that they have been better provided with some skill or ability which matters for academic success.

Heterogeneous results across family size

Tables 3 and 4 show family-size-specific birth order and gender effects. These estimations fulfil two purposes. First, heterogeneity related to family size is interesting in itself. Second, it can be seen as a robustness check, since all families do not contribute equally to all effects in the pooled sample.

Table 3: The effect of birth order on indicators of current human capital stock in families of different sizes – coefficients from linear sibship fixed effects estimations

	Completed grades	Reading	Writing	Math	HAZ
Panel I: 2-child families					
Mean	0.348	0.334	0.366	0.352	-1.751
Second born	-0.236***	-0.146	-0.205*	-0.250**	-0.389**
	(0.020)	(0.100)	(0.105)	(0.116)	(0.164)
Female	0.054***	0.094**	0.064	-0.048	-0.200**
	(0.012)	(0.046)	(0.051)	(0.050)	(0.089)
R^2	0.08	0.01	0.14	0.03	0.05
N	15,048	1,332	1,308	1,326	1,430
Sibships	6,509	665	653	662	714
Panel II: 3-child families					
Mean	0.184	0.136	0.106	0.074	-2.004
Second born	-0.204***	-0.188***	-0.100	-0.164**	-0.533***
	(0.018)	(0.062)	(0.071)	(0.066)	(0.137)
Third born	-0.435***	-0.307***	-0.066	-0.333***	-1.050***
	(0.033)	(0.113)	(0.128)	(0.116)	(0.258)
Female	0.043***	0.000	-0.033	-0.057	-0.191***
	(0.011)	(0.041)	(0.041)	(0.040)	(0.064)
R2	0.06	0.03	0.13	0.02	0.12
N	20,466	2,318	2,274	2,298	2,596
Sibships	6,789	1,122	1,100	1,112	1,249
Panel III: 4-child families					
Mean	-0.012	-0.030	-0.046	-0.059	-2.057
Second born	-0.167***	-0.235**	-0.307***	-0.225***	-0.476***
	(0.025)	(0.093)	(0.078)	(0.081)	(0.116)
Third born	-0.365***	-0.373**	-0.467***	-0.371***	-0.916***
	(0.042)	(0.169)	(0.123)	(0.137)	(0.184)
Fourth to sixth	-0.529***	-0.578**	-0.657***	-0.677***	-1.188***
born	(0.061)	(0.255)	(0.176)	(0.198)	(0.260)
Female	-0.017	-0.092**	-0.097*	-0.170***	-0.089
	(0.015)	(0.046)	(0.052)	(0.049)	(0.080)
R2	0.05	0.04	0.13	0.05	0.08
N	14,617	1,818	1,809	1,822	2,074
Sibships	4,206	866	863	869	972
Panel IV: 5-child families					
Mean	-0.237	-0.272	-0.219	-0.308	-2.167
Second born	-0.144***	-0.257**	-0.177*	-0.145	-0.215
	(0.033)	(0.100)	(0.100)	(0.099)	(0.185)
Third born	-0.282***	-0.504***	-0.259*	-0.387***	-0.670**
	(0.047)	(0.145)	(0.145)	(0.144)	(0.302)
Fourth to sixth	-0.474***	-0.530***	-0.329*	-0.444**	-1.136**
born	(0.067)	(0.199)	(0.194)	(0.206)	(0.460)
Female	-0.068***	-0.103	-0.074	-0.190***	-0.234*
	(0.022)	(0.065)	(0.063)	(0.064)	(0.123)
R2	0.07	0.03	0.11	0.03	0.05
N	8,979	1,271	1,264	1,266	1,538
Sibships	2,191	576	574	574	687
Panel V: 6-child families					
Mean	-0.326	-0.456	-0.350	0.972	-2.210
Second born	-0.071	-0.251	-0.307**	-0.131	0.010
	(0.049)	(0.155)	(0.139)	(0.127)	(0.214)
Third born	-0.113*	-0.285	-0.389**	-0.151	-0.260

	(0.061)	(0.179)	(0.163)	(0.140)	(0.275)
Fourth to sixth	-0.145*	-0.204	-0.441**	-0.196	-0.457
born	(0.083)	(0.227)	(0.197)	(0.175)	(0.377)
Female	-0.069**	-0.197**	-0.095	-0.240***	-0.217*
	(0.029)	(0.077)	(0.071)	(0.067)	(0.119)
R2	0.07	0.05	0.07	0.04	0.08
N	5,467	889	889	891	1,040
Sibships	1,134	381	380	381	430

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table 4: The effect of birth order on educational investment in families of different sizes - coefficients from linear sibship fixed effects estimations

	Enrollment	Child labor	Hours	Private	Expenses
Panel I: 2-child families					
Mean	0.972	0.038	43.903	0.404	5248.301
Second born	0.000	-0.016***	-0.953**	-0.026***	-427.580***
	(0.005)	(0.005)	(0.426)	(0.009)	(154.570)
Female	-0.002	-0.001	-0.160	-0.040***	-553.818***
	(0.003)	(0.003)	(0.221)	(0.006)	(108.939)
R^2	0.06	0.04	0.04	0.01	0.19
N	14,651	15,057	12,839	13,467	12,617
Sibships	6,353	6,513	5,647	5,890	5,554
Panel II: 3-child families					
Mean	0.934	0.074	40.380	0.304	3087.832
Second born	-0.008	-0.025***	-1.111***	-0.017**	-677.453***
	(0.005)	(0.005)	(0.346)	(0.008)	(137.975)
Third born	0.004	-0.048***	-1.251**	-0.024	-1,092.017***
	(0.010)	(0.009)	(0.632)	(0.015)	(250.760)
Female	-0.011***	-0.013***	-0.716***	-0.057***	-584.820***
	(0.004)	(0.004)	(0.215)	(0.005)	(62.792)
R2	0.12	0.08	0.06	0.02	0.15
N	19,549	20,485	17,628	17,157	15,690
Sibships	6,544	6,795	6,035	5,884	5,470
Panel III: 4-child families					
Mean	0.898	0.098	37.290	0.250	2096.006
Second born	0.009	-0.026***	-0.215	-0.026**	-359.531***
	(0.009)	(0.008)	(0.465)	(0.010)	(119.567)
Third born	0.023*	-0.043***	0.048	-0.032*	-704.372***
	(0.013)	(0.012)	(0.735)	(0.017)	(228.818)
Fourth to	0.025	-0.045***	-0.290	-0.044*	-690.623**
sixth born	(0.019)	(0.017)	(1.067)	(0.025)	(325.108)
Female	-0.026***	-0.027***	-1.337***	-0.061***	-495.777***
	(0.005)	(0.005)	(0.291)	(0.007)	(58.057)
R2	0.18	0.12	0.10	0.02	0.17
N	13,600	14,628	12,345	11,461	10,224
Sibships	3,991	4,207	3,720	3,539	3,237
Panel IV: 5-child families					
Mean	0.871	0.124	35.219	0.215	1686.569
Second born	0.002	-0.042***	-0.457	-0.034**	-247.985**
	(0.013)	(0.012)	(0.658)	(0.015)	(116.702)
Third born	0.006	-0.052***	-0.837	-0.061***	-522.110***
	(0.016)	(0.016)	(0.865)	(0.022)	(134.263)

Fourth to	0.026	-0.064***	-0.160	-0.065**	-687.323***
sixth born	(0.022)	(0.022)	(1.227)	(0.032)	(193.853)
Female	-0.023***	-0.035***	-1.104***	-0.059***	-550.448***
	(0.008)	(0.007)	(0.396)	(0.009)	(85.027)
R2	0.22	0.16	0.14	0.02	0.11
N	7,931	9,001	7,145	6,464	5,696
Sibships	2,040	2,193	1,891	1,781	1,611
Panel V: 6-child families					
Mean	0.860	0.125	34.410	0.212	1551.217
Second born	0.057**	-0.016	1.740*	-0.029	-119.108
	(0.022)	(0.019)	(1.054)	(0.022)	(116.581)
Third born	0.089***	-0.061***	2.877**	-0.036	-51.023
	(0.024)	(0.022)	(1.249)	(0.027)	(185.724)
Fourth to	0.103***	-0.059**	3.411**	-0.053	-145.063
sixth born	(0.028)	(0.027)	(1.546)	(0.033)	(270.653)
Female	-0.028***	-0.037***	-1.546***	-0.070***	-481.747***
	(0.010)	(0.010)	(0.514)	(0.013)	(107.969)
R2	0.20	0.16	0.11	0.03	0.08
N	4,792	5,476	4,369	3,887	3,344
Sibships	1,070	1,134	1,016	947	864

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Negative birth order effects on human capital stock indicators are found across all family sizes (Tables 3), though they are statistically weak for writing test scores in 2- and 3-child families and for all indicators in 6-child families. Turning to educational investment (Table 4), pecuniary investment into school quality also show a similar pattern. There are negative birth order effects across all family sizes. In contrast, the effects of birth order on time investment differ across family sizes. In large families there seems to be more of a tradeoff between child work and education, and birth order effects follow the pattern found in other developing countries. The negative birth order gradient on child labor is particularly strong in larger families, but is found for all family sizes. In small families there are no birth order effects on enrollment, but earlier born siblings spend more hours on their schooling than later-born. In large families there are positive birth order effects on enrollment. In 6-child families there are also positive birth order effects on hours spent on schooling. The birth order effects on hours are not statistically significant in the 4- and 5-child families.[7] While the effect of being second-born on enrollment was negative and statistically significant in the combined sample, there are no negative statistically significant birth order effects on enrollment for any given family size. There are

[7] The positive birth order effects on enrolment and the negative ones on hours conditional on being enrolled probably cancel in these families.

positive ones for larger families. Thus, the birth order effects on time investment into education is not non-monotonic within given families.

Girls are less disadvantaged in small families than in large families. In particular, girls in small families fare well in comparison to their brothers on the education related human capital stock indicators. In 2-child families girls have better reading scores and have completed more grades than their brothers. In 3-child families they have completed more grades than their brothers. The only indicator where girls appear to be disadvantaged in small families is the HAZ. In larger families, girls do worse than their brothers on all indicators. In terms of education investment (Table 4), girls are disadvantaged across all family sizes both with regard to pecuniary investment into school quality and with regard to time investment. Hence, even if girls' human capital stock appears to be at least as good as that of their brothers in small families, the families do not invest as much into the girls' education. Finally, girls work less often in families of all sizes, but as mentioned earlier we do not have information on domestic work, which girls probably participate in more often.

Further robustness checks

Table A1 in the appendix uses alternative samples for the estimations on some of the investments. The estimation of total school hours is conditional on any school hours, and the resulting birth order effects on conditional hours are clearly negative. The estimations of the private school choice and expenses are not conditional on enrollment. The birth order effects in these cases are similar to in the estimations on conditional samples, but some of them of a slightly smaller magnitude.

Tables A2 and A3 in the appendix estimate the binary outcomes using the conditional logit model and the correlated random effects model. The estimated birth order effects on enrollment differ substantially from the linear probability model ones. The conditional logit estimator can only be estimated on the subsample of sibhsips with variation in the outcome variable. Given the high rates of enrolment this is a minority of sibships, and for these sibships birth order effects are clearly positive. The estimated effects in the larger sample are heavily influenced by the zero effects in the sample of sibships without any variation in enrolment. Usually this would reduce the effect towards zero and we would estimate an effect which could reasonably be claimed to be

the average effect in the full sample. However, only large families contribute to the high birth order effects and these larger families more often have variation in enrollment. The fact that different families contribute unequally to the different birth order effects appears to lead to an estimated overall pattern which cannot be found within any given family.[8] Even though the correlated random effects model also uses the full sample, it appears to work better than the linear probability model for enrolment in this respect. The second birth order effect is not statistically significant and the higher birth order ones are positive. This only appears to be a significant issue with enrollment, however, and not any of the other outcomes.

6. Potential mechanisms

Further investigation of the impact of credit constraints

The positive birth order effects on education which are usually found in developing countries are typically explained by credit constraints and rising family income over time. The credit constraints model tends to be supported by the heterogeneity of birth order effects across socioeconomic groups within developing countries, with positive birth order effects for the poor and negative ones, as in a developed country, for the rich. In Tables 5 and 6 we test whether this pattern of more negative birth order effects in richer families also holds in India. The tables display results of fully interacted models, where household income per capita has been interacted with birth orders, the female dummy and the control variables (age fixed effects and survey year). To save space, Tables 5 and 6 only report the models estimated on the pooled sample of all sibship sizes. Sibship-size-specific estimations are presented in the appendix (Tables A4-A5).

Birth order effects are indeed more negative in higher income per capita households for enrollment, school hours, educational expenses, and completed years. They are more negative among the poor for child labor. Birth order effects do not differ significantly between poor and rich families for the probability to attend a private school, test scores, and HAZ. Hence we do find a difference between poor and rich families for the time investment indicators, for school expenses and for completed grades. However, larger effects on expenses among the rich than

[8] In particular, the differences in enrollment between higher birth orders are identified only from large families. The differences in enrollment between lower birth orders, are, however, heavily influenced by small families, who are likely not to have any variation in enrollment at all. The negative coefficient on second-born children mechanically makes the difference in enrolment between all birth order go together, but is not actually present in any type of family.

among the poor is a natural consequence of the fact that richer families afford to spend more.[9] And, among the human capital stock indicators, completed grades is the one which ought to be most connected to earlier time investment into education. Furthermore, the sibship-size-specific estimations in Table A4-A5 show that the pattern of negative interaction terms for time investments do not hold in general across different family sizes. There are few statistically strong interaction terms. Those that exist tend to suggest that birth order effects - whether they are positive or negative - are weaker in richer families. Smaller families are more often rich and larger ones more often poor. The differences between rich and poor families in the pooled sample estimations might be driven more by heterogeneous effects across family size and less by heterogeneity due to income per se.

Table 5: Heterogeneity of birth order effects on indicators of current human capital stock – coefficients from linear sibship fixed effects models fully interacted with income per capita

	Completed Grade	Reading	Writing	Math	HAZ
Mean	0.075	-0.005	0.007	-0.033	-1.934
Second born	-0.198***	-0.188***	-0.191***	-0.173***	-0.369***
	(0.012)	(0.043)	(0.044)	(0.041)	(0.043)
Third born	-0.351***	-0.281***	-0.251***	-0.301***	-0.712***
	(0.021)	(0.074)	(0.074)	(0.069)	(0.075)
Fourth to sixth born	-0.409***	-0.337***	-0.362***	-0.392***	-1.075***
	(0.032)	(0.113)	(0.107)	(0.102)	(0.112)
Female	-0.027***	-0.112***	-0.108***	-0.183***	-0.064**
	(0.009)	(0.030)	(0.030)	(0.030)	(0.029)
Second born #	-0.000	0.004	0.004	0.001	0.002
Income per capita	(0.000)	(0.002)	(0.003)	(0.002)	(0.002)
Third born # Income	-0.001*	0.001	0.004	0.000	0.003
per capita	(0.001)	(0.004)	(0.004)	(0.004)	(0.003)
Fourth to sixth born #	-0.006***	-0.002	-0.000	-0.005	0.002
Income per capita	(0.001)	(0.005)	(0.006)	(0.005)	(0.004)
Female # Income per	0.003***	0.006***	0.005***	0.005***	0.000
Capita	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.06	0.02	0.11	0.03	0.05
N	63,679	7,505	7,423	7,480	29,202
Sibships	20,624	3,571	3,532	3,559	10,782

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

[9] A regression using the share of school expenses out of total school expenses on the siblings have no statistically significant interaction effects (not reported but available from the authors).

Table 6: Heterogeneity of birth order effects on educational investment-coefficients from linear sibship fixed effects models fully interacted with income per capita

	Enrollment	Child labor	Hours	Private	Expenses
Mean	0.921	0.082	39.332	0.298	3118.533
Second born	-0.011***	-0.012***	-1.219***	-0.022***	-125.178
	(0.004)	(0.004)	(0.239)	(0.005)	(102.234)
Third born	0.010	-0.038***	-0.518	-0.034***	-218.218
	(0.007)	(0.007)	(0.414)	(0.010)	(169.366)
Fourth to sixth born	0.047***	-0.078***	0.802	-0.056***	-335.760
	(0.010)	(0.010)	(0.619)	(0.014)	(232.470)
Female	-0.022***	-0.015***	-0.984***	-0.055***	-369.923***
	(0.003)	(0.003)	(0.174)	(0.004)	(60.090)
Second born # Income per capita	-0.000**	0.001***	-0.007	0.000	-22.385***
	(0.000)	(0.000)	(0.010)	(0.000)	(7.553)
Third born # Income per capita	-0.001***	0.001***	-0.051***	0.000	-30.969**
	(0.000)	(0.000)	(0.019)	(0.000)	(12.297)
Fourth to sixth born # Income per capita	-0.001***	0.002***	-0.065**	0.001	-27.140*
	(0.000)	(0.000)	(0.026)	(0.001)	(14.609)
Female # Income per capita	0.000***	-0.000***	0.009	0.000	-12.634**
	(0.000)	(0.000)	(0.008)	(0.000)	(4.928)
R^2	0.16	0.11	0.09	0.02	0.20
N	59,673	63,749	53,572	51,686	46,883
Sibships	19,798	20,637	18,118	17,856	16,558

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.

* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Girls are less disadvantaged in richer than in poorer families on all education related indicators of human capital stock. They are as disadvantaged in rich families as in poor ones with regard to HAZ. For the investment variables there is a small difference in the effect of being female on enrollment and child labor in richer versus poorer families. Girls are as disadvantaged in rich as in poor families in terms of the hours they spend on schooling and their probability of attending a private school. There is a larger difference in expenses between boys and girls in rich families than in poor families, which is due to larger spending on average in rich families.[10]

Heterogeneity of birth order effects between rich and poor families did not hold in sibship-size-specific estimations. Moreover, the birth order gradient is mostly negative also in the poor families. This is clearly shown in tables 7 and 8, which restricts the estimation sample to poor households in rural areas. The birth order effects on human capital stock indicators are negative and at least as large among the rural poor as in the all India sample. The effects on test scores are

[10] Again, a regression using the share of school expenses out of total school expenses on the siblings have no statistically significant interaction effects (not reported but available from the authors).

statistically weaker, but this is probably due to the reduced sample size, since the test scores samples are already smaller than samples for other outcomes. The birth order effects on educational investments also resemble those in the full sample. There are stronger effects on child labor in the rural poor sample, and child labor is also more common in this sample.

Table 7: The effect of birth order on indicators of current human capital stock among the rural poor– coefficients from linear sibship fixed effects estimations

	Completed Grades	Reading	Writing	Math	HAZ
Mean	-0.204	-0.343	-0.232	-0.398	-2.224
Second born	-0.180***	-0.233**	-0.202**	-0.213***	-0.433***
	(0.028)	(0.095)	(0.088)	(0.082)	(0.073)
Third born	-0.338***	-0.318*	-0.227	-0.365***	-0.922***
	(0.049)	(0.168)	(0.151)	(0.134)	(0.125)
Fourth to	-0.465***	-0.482*	-0.425*	-0.718***	-1.444***
sixth born	(0.077)	(0.258)	(0.218)	(0.202)	(0.194)
Female	-0.071***	-0.136**	-0.079	-0.152***	0.009
	(0.018)	(0.055)	(0.060)	(0.053)	(0.054)
R^2	0.07	0.03	0.07	0.03	0.06
N	11,807	1,635	1,619	1,630	5,718
Sibships	4,107	880	871	877	2,344

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.

* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table 8: The effect of birth order on educational investment among the rural poor - coefficients from linear sibship fixed effects estimations

	Enrollment	Child labor	Hours	Private	Expenses
Mean	0.896	0.103	35.147	0.089	779.879
Second born	-0.005	-0.027***	-1.043**	-0.014*	-174.682***
	(0.009)	(0.009)	(0.461)	(0.008)	(36.893)
Third born	0.016	-0.039***	-0.941	-0.023*	-237.575***
	(0.015)	(0.015)	(0.778)	(0.013)	(68.466)
Fourth to sixth	0.040*	-0.070***	-1.027	-0.038**	-312.414***
born	(0.024)	(0.022)	(1.183)	(0.019)	(108.402)
Female	-0.025***	-0.017***	-0.879***	-0.030***	-99.986***
	(0.006)	(0.006)	(0.308)	(0.006)	(27.827)
R^2	0.25	0.19	0.15	0.01	0.17
N	10,358	11,828	9,347	8,785	7,836
Sibships	3,767	4,109	3,431	3,385	3,046

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.

* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Girls' disadvantage in comparison to their brothers is also similar to that found in the full sample. However, girls face a disadvantage in completed grades among the rural poor, which was not

found in the full sample. The disadvantage in HAZ, which was found in the full sample, is not found among the rural poor.

Evaluating the impact of (oldest) son preferences

We have already shown that girls are clearly disadvantaged within families in India. In this section we aim to investigate the interaction of birth order effects and son preferences. We also investigate whether oldest son preferences could be one reason behind the mostly negative birth order effects, as suggested by Jayachandran and Pande (2015) for early-life outcomes. Since earlier studies from developing countries have not been from countries that exhibit very strong son preferences this could be a reason why many birth order effects are negative in India, but generally not so in other developing countries. Oldest son preferences could create negative birth order effects through two mechanisms. The most straightforward one is that a lower birth order increases the probability that a child is the oldest son. Or, to put it differently, a higher birth order increases the probability that a child will have to compete over resources with an oldest son. The other mechanism works though gender-specific fertility stopping rules. If parents continue to have children until they have a certain number of boys, the birth of an additional girl increases the expected family size. Note that this last mechanism should primarily affect early life investments, which are done before the final family size is known for the lower birth order children. Early life investments are, however, likely to affect later life human capital outcomes, and thereby also the productivity of later life human capital investments.

First, to get a general overview of the interaction between gender and birth order we separate families where the first-born is a girl from families where the first-born is a boy.[11] The gender of the first-born should be exogenous in India despite sex-selective abortions since these are not common before the birth of the first child (Rosenblum, 2015; Pörtner, 2013). Hence there should be no other systematic difference between families where the first-born is a girl compared to where the first-born is a boy. If the oldest son is especially favored we should expect large negative birth order effects in comparison to him in families with a first-born boy. On the other hand we should expect stronger birth order effects in families with first-born girls if gender-specific stopping rules are an important explanation of negative birth order effects.

[11] To get an even more complete picture of how birth order interacts with gender, all birth orders are interacted with a girl dummy in Tables A6 to A9 in appendix. These results tell essentially the same story.

Tables 9 and 10 present the results for human capital stock indicators in families with first-born girls and first-born boys respectively (Tables A10-A11 in the appendix present separate results for each sibship size). To compare younger siblings with the first-born we need to take the female dummy into account. Doing this, a first-born girl still has a better human capital stock, given her age, than any of her younger siblings, whether sisters or brothers. Moreover, in families where the first-born is a girl, girls on average have completed more grades than boys given their age. Though the oldest sister performs better than younger brothers on test scores, the boys perform better than girls of the same birth order. These results are consistent with an impact of gender-specific stopping rules. If few families aim to have only one child the birth of the first-born girl is not likely to have increased expected family size much. However, the birth of additional girls, but not boys, increases expected family size, implying lower early life investments for later-born girls.

Similar to first-born girls, first-born boys also have better human capital stock indicators than their younger siblings, whether sisters or brothers, but for reading and writing scores the birth order effects are not statistically significant. Later-born boys and later-born girls appear to fare quite equally in families with first-born boys. The exception is the mathematics score, where boys have a statistically significant advantage. This is consistent with prior studies which have found that girls in India benefit from having an older brother rather than an older sister (Chamarbagwala, 2011), something which could be explained by gender -specific fertility stopping rules. However, since there are also negative birth order effects in families with first-born boys, gender-specific stopping rules is not the sole reason behind the negative birth order effects. Negative birth order effects in comparison to the first-born son could depend on favoritism towards him, but as shown in table A12 in the appendix, the magnitude of birth order effects increases with birth order. High birth order siblings do not only perform worse than the first-born son, but also worse than other siblings of a lower birth order than them.

Table 9: The effect of birth order on indicators of current human capital stock in families with a first-born girl – coefficients from linear sibship fixed effects estimations

	Completed Grades	Reading	Writing	Math	HAZ
Mean	0.130	0.017	0.032	-0.013	-1.955
Second born	-0.184***	-0.203***	-0.204***	-0.148***	-0.323***
	(0.017)	(0.055)	(0.056)	(0.052)	(0.055)
Third born	-0.376***	-0.337***	-0.255***	-0.335***	-0.688***
	(0.028)	(0.096)	(0.093)	(0.085)	(0.095)
Fourth to sixth born	-0.505***	-0.420***	-0.435***	-0.480***	-0.981***
	(0.043)	(0.150)	(0.138)	(0.130)	(0.145)
Female	0.022*	-0.064*	-0.091**	-0.128***	-0.049
	(0.013)	(0.037)	(0.039)	(0.038)	(0.035)
R^2	0.05	0.02	0.12	0.02	0.05
N	28,060	3,780	3,735	3,767	13,942
Sibships	8,627	1,777	1,754	1,770	4,952

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table 10: The effect of birth order on indicators of current human capital stock in families with a first-born boy – coefficients from linear sibship fixed effects estimations

	Completed Grades	Reading	Writing	Math	HAZ
Mean	0.078	0.006	0.014	-0.018	-1.919
Second born	-0.218***	-0.082	-0.093*	-0.179***	-0.446***
	(0.018)	(0.057)	(0.056)	(0.053)	(0.059)
Third born	-0.346***	-0.157	-0.169*	-0.247***	-0.796***
	(0.032)	(0.100)	(0.099)	(0.093)	(0.103)
Fourth to sixth born	-0.418***	-0.205	-0.282*	-0.322**	-1.327***
	(0.050)	(0.155)	(0.148)	(0.143)	(0.159)
Female	0.012	-0.068	-0.049	-0.096**	-0.063
	(0.013)	(0.043)	(0.044)	(0.041)	(0.041)
R^2	0.06	0.02	0.10	0.03	0.05
N	28,687	3,307	3,271	3,299	12,891
Sibships	9,559	1,578	1,562	1,575	4,888

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Turning to investment indicators in Tables 11 and 12 (Tables A13-A14 in the appendix present separate results for each sibship size), the birth order effects on enrollment are completely positive in families with a first-born girl. Birth order effects on school hours are statistically insignificant, while birth order effects remain negative on the probability of private schooling and on school expenses. While first-born daughters had a higher human capital stock than their younger siblings, the families do not invest more in their education. They are less enrolled than any of their younger siblings. They are more likely to work than all younger siblings except for a

second born brother (who is about as likely to work as she). They spend fewer hours on school than at least younger brothers. Conditional on being enrolled they are less likely to attend private school than younger brothers, but not sisters. The families spend less on their education than on that of younger brothers, but more than on that of younger sisters. If early life investments have persisting effects, the fact that first-born girls are favored in human capital stock indicators, but not in educational investment would be consistent with gender-specific stopping rules affecting early life investments, but parents not fully responding to the human capital advantage that oldest daughters possess when deciding on educational investments later in life. Parents still favor later-born boys.

In families with a first-born boy the pattern with regard to investment is very similar to that in the full sample. For time investments, first-born boys' higher opportunity cost of schooling imply that they are more likely to work than any of their younger siblings. The birth order effects on enrollment and on school hours again appear to be non-monotonic (but they are not so for specific sibship sizes, in appendix table A14). When it comes to pecuniary investment into school quality, first-born boys are favored in comparison to all of their younger siblings, and in particular in comparison to their younger sisters. Conditional on enrollment, they have the highest probability of attending a private school. Families spend more on their education than they do on that of younger siblings. Among younger siblings boys are favored over girls of the same birth order, even if they did not have better human capital stock indicator outcomes.

Table 11: The effect of birth order on educational investment in families with first-born girls - coefficients from linear sibship fixed effects estimations

	Enrollment	Child labor	Total hours	Private school	School expenses
Mean	0.939	0.062	40.162	0.309	3306.824
Second born	0.008	-0.015***	-0.340	-0.032***	-506.032***
	(0.005)	(0.005)	(0.327)	(0.007)	(97.930)
Third born	0.025***	-0.042***	0.196	-0.039***	-607.740***
	(0.009)	(0.008)	(0.559)	(0.013)	(151.421)
Fourth to sixth born	0.050***	-0.059***	1.194	-0.062***	-770.048***
	(0.013)	(0.013)	(0.855)	(0.019)	(235.582)
Female	-0.008**	-0.017***	-0.484**	-0.073***	-758.507***
	(0.004)	(0.004)	(0.219)	(0.005)	(65.750)
R^2	0.14	0.08	0.07	0.03	0.14
N	26,545	28,091	23,845	23,727	21,731
Sibships	8,349	8,632	7,683	7,813	7,322

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.

* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table 12: The effect of birth order on educational investment in families with first-born boys - coefficients from linear sibship fixed effects estimations

	Enrollment	Child labor	Total hours	Private school	School expenses
Mean	0.925	0.080	39.732	0.310	3238.92
Second born	-0.017***	-0.019***	-1.260***	-0.033***	-557.248***
	(0.005)	(0.005)	(0.308)	(0.007)	(108.346)
Third born	0.013	-0.051***	-0.400	-0.052***	-835.744***
	(0.009)	(0.009)	(0.537)	(0.012)	(194.253)
Fourth to sixth born	0.066***	-0.098***	1.689**	-0.063***	-1,000.624***
	(0.014)	(0.014)	(0.822)	(0.019)	(278.740)
Female	-0.005	-0.015***	-0.489**	-0.035***	-326.922***
	(0.004)	(0.004)	(0.231)	(0.005)	(60.908)
R^2	0.14	0.11	0.06	0.01	0.17
N	26,928	28,716	24,099	23,517	21,310
Sibships	9,198	9,565	8,370	8,358	7,739

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.

* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Next, to investigate the role of oldest son preferences we simply add an oldest son dummy (=1 for the oldest son independent of birth order) to our main regressions in Tables 13 and 14 (Tables A15-A16 in the appendix present separate results for each sibship size). By doing this we control for one of the two channels though which oldest son preferences could create negative birth order effects in all families, whether the first-born is a son or a daughter. The estimated birth order effects on human capital stock indicators remain the same. The possible advantage that oldest sons have is completely explained by their birth order and gender. The oldest son coefficient is both small and statistically insignificant. In spite of this, oldest sons appear to be favored in terms of investment, over and above what can be explained by birth order and gender. Their likelihood of working is, however, explained by their birth order and gender. Though the oldest son is favored in terms of investment, this does not drive the negative birth order effects. The pattern of birth order effects on educational investment is similar to in the main results, but these could still be explained by oldest son preferences and the impact that these have on gender-specific fertility stopping rules.

Table 13: The effect of birth order on indicators of current human capital stock in models with and oldest son dummy – coefficients from linear sibship fixed effects estimations

	Completed grades	Reading	Writing	Math	HAZ
Mean	0.076	-0.006	0.007	-0.030	-2.053
Second born	-0.200***	-0.144***	-0.130***	-0.147***	-0.176***
	(0.011)	(0.036)	(0.036)	(0.035)	(0.058)
Third born	-0.354***	-0.260***	-0.193***	-0.278***	-0.383***
	(0.019)	(0.064)	(0.063)	(0.059)	(0.103)
Fourth to sixth born	-0.439***	-0.333***	-0.343***	-0.417***	-0.659***
	(0.029)	(0.098)	(0.092)	(0.089)	(0.154)
Oldest son	0.019*	-0.053	-0.065*	-0.092***	0.007
	(0.011)	(0.034)	(0.034)	(0.032)	(0.053)
Female	0.016	-0.009	-0.018	0.047	-0.167***
	(0.010)	(0.032)	(0.033)	(0.032)	(0.052)
R^2	0.06	0.02	0.10	0.02	0.06
N	69,906	8,509	8,408	8,477	9,779
Sibships	21,750	3,975	3,929	3,960	4,491

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.

* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table 14: The effect of birth order on educational investment in models with an oldest son dummy - coefficients from linear sibship fixed effects estimations

	Enrollment	Child labor	Hours	Private	Expenses
	.91489	.08762	38.8296	.2934	3060.11
Second born	-0.023***	0.002	-1.636***	-0.018***	-313.478***
	(0.003)	(0.003)	(0.186)	(0.004)	(55.189)
Third born	-0.016***	-0.013**	-1.654***	-0.032***	-406.922***
	(0.006)	(0.006)	(0.323)	(0.008)	(87.528)
Fourth to sixth born	0.018**	-0.049***	-0.399	-0.050***	-476.660***
	(0.009)	(0.008)	(0.491)	(0.012)	(129.239)
Oldest son	0.010***	0.002	0.436**	0.018***	169.178***
	(0.003)	(0.003)	(0.177)	(0.004)	(51.567)
Female	-0.007**	-0.022***	-0.504***	-0.044***	-420.104***
	(0.003)	(0.003)	(0.181)	(0.004)	(43.315)
R^2	0.16	0.12	0.09	0.02	0.15
N	64,847	69,995	58,240	55,847	50,422
Sibships	20,852	21,765	19,117	18,820	17,438

Note: The estimations also include a constant, a full set of child age dummies, a year dummy, per capita income, and sibship fixed effects.

* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

As in Jayachandran and Pande (2015) we have run various regressions where we have interacted birth order indicators with indicators of belonging to groups that could be argued to possess

stronger or weaker son preferences. For example Hindu (tables A17-A18), Kerala (tables A19-A20), mothers' reported desire to have more sons than daughters (tables A21-A22), mothers' education (tables A23-A24), natural regional sex-ratios (tables A25-A26), and a high regional score on a 'standing of women and children' index (tables A27-A28). Similar to in tables 3 to 4, we used fully interacted models. Though some birth order interactions are significant, it is hard to find any general patterns. Birth order effects do not seem to be systematically different in places where we have reason to expect weaker or stronger son preferences. Being a girl is worse in places and families where we should expect stronger son preferences, though. Girls do better in comparison to their brothers in non-Hindu families, in Kerala, in families where the mothers do not report that they want more sons than daughters, in regions with natural sex ratios, and in regions scoring better on the 'standing of women and children' index.

7. Discussion and Conclusion

We have investigated the effects of children's birth order on their stock of and investments into human capital. Previous research into the effects of birth order on education human capital has revealed negative birth order effects in developed countries and mostly positive effects in developing countries. Our results show that birth order effects on human capital stocks are largely negative in India, which is in line with the results from developed countries. The results for investments into human capital are, however, more mixed. The results for enrollment and child labor indicate that later-born children experience an advantage in these measures, which is more in line with the results from developing countries. For our other measures of investment, birth order effects are again found to be negative. Overall, our results show that the effects of birth order on human capital are generally negative in India. They also demonstrate that the type of human capital measure examined is important.

To better understand our results, we have looked into two potential channels: credit constraints and son preference. Positive birth order effects in developing countries are typically explained by credit constraints. Our results suggest that opportunity cost of child time, which is closely linked to credit constraints, matters for time investments. Lower birth order children and boys have a higher probability of working. We do not observe household duties, but suspect these to be important especially for low birth order girls. The birth order effects on enrollment are non-monotonous in our main specification. However, this non-monotonicity seems to be the outcome

of heterogeneous effects across larger and smaller families rather than of middle born doing worse than others within specific families. In large families, where high birth order children are observed, the birth order effects on enrollment are positive. They are insignificant in smaller families. Large families also have higher child labor participation rates. This is consistent with credit constraints and higher opportunity costs of child time in large families.

Our results do not indicate that credit constraints are important in general and alone. Birth order effects are negative for pecuniary investment into school quality. These investments should also be affected by credit constraints, but not by opportunity cost of child time. The birth order gradients for pecuniary investments and for indicators of current human capital stock are consistently negative. This is true even among the rural poor, where we would expect credit constraints to be most important. Household income does not appear to influence the birth order effects on pecuniary investment and human capital stocks, except for completed grades, which is the human capital stock indicator most closely connected to earlier time investments. Further, income does not even appear to influence birth order effects on time investment when we condition on sibship size. Income is correlated with family size. Thus, differences in effects by family size rather than by income may be driving the differences in birth order effects across rich and poor families, in this as well as in other studies from developing countries.

The negative birth order effects on pecuniary investments could be interpreted as parents choosing to invest in the most able children. The return to further education investment is likely to be higher for children who already possess more human. Lower birth order children have better HAZ, test scores, and grade completion. This could be interpreted as greater accumulated human capital stock. However, these variables are clearly not only measures of the child human capital stock, i.e. of the child's abilities. They are also outcomes of previous human capital investments, and there is no reason to assume that abilities should be systematically correlated with birth order for natural reasons. Indeed, the developed country evidence suggests that the advantage of first-born is not due to biological reasons (Kristensen & Bjerkedal, 2007; Barclay, 2015b).

Another reason behind the observed negative birth order effects could be that parents invested more in the first-born children in their early life as suggested by Jayachandran and Pande (2015)**.** This in turn could be affected by oldest son preference. Oldest son preferences do seem to be able

to explain much of the within-household inequalities in human capital accumulation in our data. Boys are favored, earlier birth order children are favored, and oldest sons are especially favored. Boys and oldest sons appear to be even more favored than we should expect if it was only a rational response to existing differences in abilities. Oldest sons perform well on our human capital stock indicators, but not better than what we should expect given them being boys and of a low birth order. That is, the birth order and female dummies can fully explain oldest sons' advantage. Still, families invest in oldest sons' education even more than we should expect given their birth order and gender. Moreover, while first-born daughters possess a higher human capital stock than all of their younger siblings (as measured by our indicators), the family does not invest as much in their education as they do in the education of their younger brothers. This might well be due to differences in the perceived returns to parents, if they expect to rely on oldest sons for old-age support, rather than being an outcome of pure discrimination. Still, the girls are systematically disadvantaged within the families, and oldest sons are systematically favored.

Gender-specific fertility stopping rules also appear to influence within household inequalities. This is most clear in the estimations on subsamples of families where the first-born is a girl compared to a boy. In families with a first-born daughter, where the birth of an additional girl could increase expected family size if parents keep having children until they have a son, boys perform better than girls of the same birth order on human capital stock indicators. In families with a first-born son, however, boys and girls of the same birth order perform equally on human capital stock indicators. Gender-specific fertility stopping rules combined with a persisting effect of early life investments could also explain why first-born daughters perform better than all of their younger siblings on human capital stock indicators. In families that aim to have more than one child, their birth did not have to increase the expected family size. However, current educational investments do not appear to be much affected by gender-specific fertility stopping rules and the impact that they had on human capital stock indicators.

While (oldest) son preferences can explain much of the within household inequalities in human capital accumulation in India, they do not appear to be the sole reason behind negative birth order effects. We do not find any compelling evidence of stronger negative birth order effects in families where we should expect son preferences to be stronger, though boys are more favored in these families.

An outcome that deviates from the general pattern of son preference is completed grades, where all girls (not only first-born) do well in comparison to brothers. In most estimations the female dummy does not have a statistically significant coefficient. In families with first-born girls and in small families it is positive and statistically significant. We can only speculate as to the reasons, but one possibility is that girls are more motivated to perform well at school. They have more direct control over the amount of effort they exert, compared with other investments that are (mostly) controlled by parents. It could also be related to other non-cognitive skills which girls for some reason are better provided with; for example orderliness, time management, diligence, responsibility, etc.

To sum up, birth order effects on education in India broadly follow the same pattern as in developed countries. Child opportunity cost of time, however, appears to matter. As a result, birth order effects follow the typical developing country pattern for time investments. This is especially the case in large families. Oldest son preferences can explain much of the within-household inequalities which we observe. Policies aimed at changing such preferences could therefore reduce within-household inequalities. However, there appear to also be other factors creating negative birth order effects. These are probably the same ones which create negative birth order effects in developed countries. Pure dilution of parental resources might be one explanation. Another possibility is that the disease environment at home is negatively affected by more children.

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Appendix

Table A1: The effect of birth order and gender on educational investments with alternative samples - coefficients from linear sibship fixed effects estimations

	Hours (sample conditional on any hours)	Private school (unconditional sample)	Expenses (unconditional sample)
Mean	43.100	0.265	2755.987
Second born	-0.699***	-0.020***	-346.054***
	(0.116)	(0.004)	(47.714)
Third born	-1.228***	-0.031***	-397.253***
	(0.212)	(0.007)	(74.369)
Fourth to sixth born	-1.599***	-0.041***	-365.798***
	(0.325)	(0.010)	(110.820)
Female	-0.110	-0.055***	-515.878***
	(0.072)	(0.003)	(33.708)
R^2	0.09	0.03	0.11
N	51,279	62,292	56,707
Sibships	17,569	20,205	18,889

Table A2: The effect of birth order and gender on binary outcome investments – marginal effects from the conditional logit model

	Enrolment	Child labor	Private school
Second born	0.039***	-0.067***	-0.036***
	(0.012)	(0.013)	(0.010)
Third born	0.086***	-0.113***	-0.058***
	(0.019)	(0.022)	(0.017)
Fourth to sixth born	0.159***	-0.150***	-0.085***
	(0.029)	(0.031)	(0.026)
Female	-0.057***	-0.047***	-0.146***
	(0.008)	(0.008)	(0.009)
N	12,204	11,619	12,551

Table A3: The effect of birth order and gender on binary outcome investments – coefficients from the correlated random effects model

	Enrolment	Child labor	Private school
Second born	0.054	-0.240***	-0.081***
	(0.034)	(0.029)	(0.030)
Third born	0.276***	-0.483***	-0.107**
	(0.049)	(0.044)	(0.051)
Fourth to sixth born	0.560***	-0.749***	-0.116
	(0.072)	(0.065)	(0.077)
Female	-0.247***	-0.192***	-0.425***
	(0.029)	(0.025)	(0.023)
N	60,523	64,647	52,436

Table A4: The effect of birth order on indicators of current human capital stock in families of different sizes – coefficients from linear sibship fixed effects models fully interacted with income

	Completed grades	Reading	Writing	Math	HAZ
Panel I: 2-child families					
Mean	0.347	0.334	0.360	0.350	-1.760
Second born	-0.235***	-0.121	-0.158	-0.251	-0.519***
	(0.025)	(0.148)	(0.150)	(0.165)	(0.106)
Female	0.044***	0.045	-0.040	-0.126*	-0.055
	(0.017)	(0.063)	(0.067)	(0.067)	(0.058)
Second born	-0.000	-0.001	-0.002	0.001	0.002
# income	(0.001)	(0.005)	(0.004)	(0.005)	(0.003)
Female	0.000	0.002	0.004**	0.004*	0.000
# income					
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
R^2	0.09	0.03	0.16	0.04	0.05
N	14,793	1,313	1,289	1,307	6,644
Sibships	6,431	657	645	654	3,075
Panel II: 3-child families					
Mean	0.182	0.136	0.111	0.068	-1.915
Second born	-0.203***	-0.165**	-0.105	-0.165*	-0.630***
	(0.022)	(0.079)	(0.088)	(0.086)	(0.082)
Third born	-0.425***	-0.326**	-0.034	-0.336**	-1.159***
	(0.039)	(0.147)	(0.160)	(0.154)	(0.145)
Female	0.013	-0.067	-0.055	-0.105*	-0.046
	(0.015)	(0.059)	(0.056)	(0.057)	(0.052)
Second born	-0.000	-0.002	-0.000	0.000	0.008**
# income	(0.001)	(0.004)	(0.005)	(0.005)	(0.003)
Third born	-0.000	0.001	-0.003	0.001	0.014***
# income	(0.001)	(0.009)	(0.009)	(0.009)	(0.005)
Female	0.002***	0.006*	0.002	0.005	-0.001
# income	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
R2	0.07	0.04	0.14	0.03	0.06
N	20,167	2,273	2,232	2,253	9,153
Sibships	6,722	1,106	1,085	1,096	3,459
Panel III: 4-child families					
Mean	-0.011	-0.031	-0.050	-0.063	-1.991
Second born	-0.189***	-0.328***	-0.469***	-0.279***	-0.594***
	(0.031)	(0.114)	(0.101)	(0.098)	(0.100)
Third born	-0.408***	-0.378*	-0.691***	-0.347**	-0.997***
	(0.048)	(0.206)	(0.161)	(0.165)	(0.168)
Fourth to sixth born	-0.557***	-0.471	-0.866***	-0.464**	-1.321***
	(0.068)	(0.315)	(0.225)	(0.233)	(0.246)
Female	-0.062***	-0.203***	-0.164**	-0.258***	-0.072
	(0.021)	(0.063)	(0.065)	(0.063)	(0.056)
Second born	0.001	0.012	0.020***	0.005	0.013***
# income	(0.002)	(0.009)	(0.007)	(0.008)	(0.005)
Third born	0.002	0.004	0.026**	-0.004	0.015**
# income	(0.002)	(0.016)	(0.013)	(0.014)	(0.006)
Fourth to sixth born #	0.001	-0.006	0.025	-0.021	0.017**
income	(0.003)	(0.022)	(0.016)	(0.016)	(0.008)
Female	0.004***	0.011**	0.007	0.009**	0.000
# income	(0.001)	(0.005)	(0.004)	(0.004)	(0.003)
R2	0.06	0.06	0.15	0.07	0.05
N	14,466	1,792	1,783	1,797	6,628
Sibships	4,174	858	855	861	2,270

Panel IV: 5-child families					
Mean	-0.234	-0.270	-0.217	-0.310	-2.047
Second born	-0.180***	-0.264**	-0.155	-0.135	-0.126
	(0.038)	(0.126)	(0.121)	(0.119)	(0.127)
Third born	-0.297***	-0.470***	-0.278*	-0.386**	-0.491***
	(0.052)	(0.172)	(0.162)	(0.164)	(0.180)
Fourth to sixth born	-0.472***	-0.485**	-0.429*	-0.575**	-0.897***
	(0.076)	(0.232)	(0.227)	(0.231)	(0.263)
Female	-0.111***	-0.129	-0.140*	-0.207**	-0.174**
	(0.027)	(0.086)	(0.081)	(0.090)	(0.086)
Second born	0.004	0.001	-0.003	-0.001	-0.014*
# income	(0.003)	(0.010)	(0.009)	(0.009)	(0.008)
Third born	-0.001	-0.004	0.003	0.001	-0.010
# income	(0.003)	(0.012)	(0.010)	(0.010)	(0.011)
Fourth to sixth born #	-0.003	-0.008	0.010	0.015	-0.015
income	(0.004)	(0.018)	(0.015)	(0.018)	(0.015)
Female	0.005***	0.004	0.008	0.003	0.010**
# income	(0.002)	(0.007)	(0.007)	(0.008)	(0.005)
R2	0.09	0.04	0.12	0.04	0.05
N	8,858	1,254	1,247	1,249	4,178
Sibships	2,171	571	569	569	1,267
Panel V: 6-child families					
Mean	-0.329	-0.451	-0.346	-0.406	-2.116
Second born	-0.135**	-0.361*	-0.513***	-0.027	0.183
	(0.060)	(0.203)	(0.180)	(0.180)	(0.172)
Third born	-0.236***	-0.299	-0.383	0.147	-0.197
	(0.073)	(0.252)	(0.233)	(0.221)	(0.232)
Fourth to sixth born	-0.230**	-0.260	-0.527*	0.182	-0.166
	(0.098)	(0.311)	(0.287)	(0.277)	(0.288)
Female	-0.127***	-0.348***	-0.099	-0.239**	-0.127***
	(0.038)	(0.108)	(0.106)	(0.107)	(0.038)
Second born # income	0.008	0.018	0.039**	-0.021	-0.025*
	(0.006)	(0.019)	(0.019)	(0.019)	(0.013)
Third born # income	0.016**	-0.002	-0.004	-0.059**	-0.012
	(0.006)	(0.030)	(0.031)	(0.029)	(0.014)
Fourth to sixth born	0.008	0.001	0.010	-0.063*	-0.022
# income	(0.007)	(0.035)	(0.037)	(0.035)	(0.016)
Female # income	0.008***	0.021**	0.004	-0.003	0.003
	(0.003)	(0.010)	(0.010)	(0.010)	(0.005)
R2	0.08	0.06	0.09	0.05	0.06
N	5,395	873	872	874	2,599
Sibships	1,126	379	378	379	711

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.

* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table A5: The effect of birth order on educational investment in families of different sizes - coefficients from linear sibship fixed effects models fully interacted with income

	Enrollment	Child labor	Hours	Private	Expenses
Panel I: 2-child families					
Mean	0.972	0.038	43.903	0.404	5248.301
Second born	0.007	-0.020***	-0.943*	-0.027**	-79.385
	(0.006)	(0.007)	(0.555)	(0.012)	(267.799)
Female	-0.006	0.006	-0.312	-0.038***	-613.430***
	(0.005)	(0.005)	(0.335)	(0.008)	(163.160)
Second born # income	-0.000***	0.000	-0.004	0.000	-15.842
	(0.000)	(0.000)	(0.016)	(0.000)	(11.999)
Female # income	0.000*	-0.000***	0.008	-0.000	1.843
	(0.000)	(0.000)	(0.010)	(0.000)	(9.032)
R^2	0.08	0.05	0.06	0.02	0.24
N	14,397	14,802	12,614	13,227	12,391
Sibships	6,274	6,435	5,572	5,816	5,483
Panel II: 3-child families					
Mean	0.934	0.073	43.398	0.303	3054.367
Second born	-0.006	-0.030***	-1.196***	-0.022**	-214.882
	(0.007)	(0.007)	(0.445)	(0.010)	(247.163)
Third born	0.009	-0.056***	-1.257	-0.031	-606.626
	(0.012)	(0.012)	(0.802)	(0.019)	(384.176)
Female	-0.018***	-0.004	-0.879***	-0.052***	-230.425**
	(0.005)	(0.005)	(0.306)	(0.007)	(90.042)
Second born # income	-0.000	0.000	0.007	0.000	-32.452*
	(0.000)	(0.000)	(0.020)	(0.001)	(18.354)
Third born # income	-0.000	0.000	0.006	0.000	-31.924
	(0.000)	(0.000)	(0.035)	(0.001)	(24.293)
Female # income	0.000*	-0.001**	0.006	-0.000	-25.354***
	(0.000)	(0.000)	(0.016)	(0.000)	(7.301)
R2	0.13	0.09	0.07	0.02	0.20
N	19,261	20,186	17,373	16,902	15,453
Sibships	6,479	6,728	5,973	5,825	5,410
Panel III: 4-child families					
Mean	0.898	0.098	41.871	0.248	2087.585
Second born	0.005	-0.034***	-0.761	-0.044***	-610.295***
	(0.011)	(0.010)	(0.574)	(0.013)	(172.684)
Third born	0.019	-0.050***	-0.419	-0.062***	-803.396***
	(0.016)	(0.015)	(0.889)	(0.022)	(281.523)
Fourth to sixth born	0.012	-0.056***	-1.339	-0.080***	-1,162.247***
	(0.022)	(0.021)	(1.266)	(0.031)	(424.817)
Female	-0.038***	-0.019***	-1.794***	-0.062***	-303.637***
	(0.007)	(0.007)	(0.391)	(0.008)	(101.844)
Second born # income	0.000	0.001*	0.041	0.002**	28.557*
	(0.001)	(0.001)	(0.033)	(0.001)	(16.779)
Third born # income	-0.000	0.001	0.016	0.003**	14.579
	(0.001)	(0.001)	(0.047)	(0.001)	(19.912)
Fourth to sixth born # income	0.001	0.002	0.062	0.004**	39.487
	(0.001)	(0.001)	(0.059)	(0.001)	(25.649)
Female # income	0.001**	-0.001	0.043	0.000	-16.178
	(0.000)	(0.000)	(0.026)	(0.001)	(10.745)
R2	0.19	0.12	0.11	0.03	0.23
N	13,464	14,477	12,222	11,342	10,118

Sibships	3,963	4,175	3,696	3,513	3,214
Panel IV: 5-child families					
Mean	0.871	0.124	40.888	0.213	1691.459
Second born	0.003	-0.048***	-0.540	-0.005	-220.082*
	(0.016)	(0.015)	(0.776)	(0.017)	(125.040)
Third born	0.000	-0.057***	-1.112	-0.022	-555.431***
	(0.019)	(0.019)	(1.038)	(0.024)	(166.714)
Fourth to sixth born	0.021	-0.078***	-0.850	-0.032	-777.344***
	(0.026)	(0.026)	(1.446)	(0.035)	(279.210)
Female	-0.021**	-0.016*	-0.653	-0.054***	-357.320***
	(0.010)	(0.009)	(0.514)	(0.012)	(94.910)
Second born # income	-0.001	0.001	-0.004	-0.003**	-1.716
	(0.001)	(0.001)	(0.048)	(0.002)	(11.398)
Third born # income	0.000	0.001	0.018	-0.003*	4.274
	(0.001)	(0.001)	(0.064)	(0.002)	(15.714)
Fourth to sixth born	-0.000	0.002	0.042	-0.002	8.627
# income	(0.001)	(0.001)	(0.069)	(0.002)	(20.849)
Female # income	-0.000	-0.002***	-0.051	-0.001	-17.698*
	(0.001)	(0.001)	(0.038)	(0.001)	(9.421)
R2	0.22	0.16	0.14	0.03	0.15
N	7,827	8,880	7,049	6,379	5,618
Sibships	2,020	2,173	1,871	1,762	1,593
Panel V: 6-child families					
Mean	0.861	0.125	40.600	0.212	1561.477
Second born	0.062**	-0.013	1.552	-0.050*	-240.872
	(0.026)	(0.023)	(1.238)	(0.027)	(193.468)
Third born	0.103***	-0.069***	3.107**	-0.035	-315.087
	(0.028)	(0.027)	(1.444)	(0.031)	(250.530)
Fourth to sixth born	0.109***	-0.071**	2.506	-0.087**	-684.888**
	(0.033)	(0.033)	(1.855)	(0.040)	(344.046)
Female	-0.040***	-0.019	-1.491**	-0.065***	-42.412
	(0.013)	(0.012)	(0.644)	(0.017)	(153.355)
Second born	-0.002	0.001	0.023	0.004	19.033
# income	(0.002)	(0.002)	(0.093)	(0.003)	(30.379)
Third born	-0.003*	0.003	-0.028	0.001	39.081
# income	(0.002)	(0.002)	(0.103)	(0.002)	(33.376)
Fourth to sixth born #	-0.003	0.003	0.096	0.004	63.075
income	(0.002)	(0.002)	(0.142)	(0.003)	(43.056)
Female	0.001*	-0.002**	-0.002	-0.000	-47.131**
# income	(0.001)	(0.001)	(0.041)	(0.002)	(18.350)
R2	0.21	0.16	0.12	0.04	0.13
N	4,724	5,404	4,314	3,836	3,303
Sibships	1,070	1,134	1,016	947	864

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table A6: Birth order effects on human capital indicators in families with first-born girls – coefficients of linear sibship fixed effects models with birth order – gender interaction terms

	Completed grades	Reading	Writing	Math	HAZ
Mean	0.130	0.017	0.032	-0.013	-1.955
Second born	-0.201***	-0.143**	-0.104*	-0.028	-0.270***
	(0.017)	(0.056)	(0.059)	(0.056)	(0.054)
Third born	-0.397***	-0.244**	-0.168*	-0.199**	-0.647***
	(0.030)	(0.095)	(0.096)	(0.089)	(0.096)
Fourth to fifth born	-0.541***	-0.389**	-0.356**	-0.345**	-0.929***
	(0.045)	(0.151)	(0.142)	(0.136)	(0.145)
Second born # female	0.010	-0.056	-0.110*	-0.110**	-0.058
	(0.016)	(0.052)	(0.056)	(0.054)	(0.049)
Third born # female	0.020	-0.128*	-0.085	-0.144**	-0.032
	(0.022)	(0.067)	(0.072)	(0.068)	(0.062)
Fourth to sixth born	0.051	0.002	-0.065	-0.142*	-0.055
# female	(0.032)	(0.087)	(0.087)	(0.081)	(0.081)
R^2	0.05	0.02	0.12	0.02	0.05
N	28,060	3,780	3,735	3,767	13,942
Sibships	8,627	1,777	1,754	1,770	4,952

Table A7: Birth order effects on educational investment in families with first-born boys – coefficients of linear sibship fixed effects models with birth order – gender interaction terms

	Completed grades	Reading	Writing	Math	HAZ
Mean	0.078	0.006	0.014	-0.018	-1.919
Second born	-0.209***	-0.069	-0.081	-0.150***	-0.452***
	(0.019)	(0.059)	(0.059)	(0.057)	(0.060)
Third born	-0.355***	-0.179*	-0.171	-0.267***	-0.757***
	(0.034)	(0.104)	(0.105)	(0.100)	(0.106)
Fourth to fifth born	-0.428***	-0.205	-0.299*	-0.351**	-1.381***
	(0.053)	(0.165)	(0.158)	(0.147)	(0.171)
Second born # female	-0.006	-0.095	-0.070	-0.151***	-0.053
	(0.016)	(0.058)	(0.059)	(0.057)	(0.052)
Third born # female	0.030	-0.024	-0.040	-0.053	-0.145*
	(0.024)	(0.081)	(0.082)	(0.079)	(0.074)
Fourth to sixth born #	0.030	-0.067	-0.010	-0.028	0.037
female	(0.035)	(0.105)	(0.103)	(0.098)	(0.102)
R^2	0.06	0.02	0.10	0.03	0.05
N	28,687	3,307	3,271	3,299	12,891
Sibships	9,559	1,578	1,562	1,575	4,888

Table A8 Birth order effects on human capital indicators in families with first-born boys – coefficients of linear sibship fixed effects models with birth order – gender interaction terms

	Enrollment	Child labor	Total hours	Private school	School expenses
Mean	0.939	0.062	40.162	0.309	3306.824
Second born	0.017***	0.003	0.208	0.038***	284.697***
	(0.005)	(0.005)	(0.331)	(0.008)	(100.998)
Third born	0.028***	-0.023**	0.589	0.039***	138.522
	(0.009)	(0.009)	(0.568)	(0.013)	(150.040)
Fourth to fifth born	0.060***	-0.048***	1.668*	0.008	-85.881
	(0.014)	(0.014)	(0.862)	(0.020)	(233.973)
Second born # female	-0.011**	-0.018***	-0.624**	-0.067***	-832.471***
	(0.005)	(0.005)	(0.304)	(0.007)	(101.269)
Third born # female	0.002	-0.022***	-0.295	-0.085***	-745.783***
	(0.006)	(0.007)	(0.389)	(0.009)	(108.074)
Fourth to sixth	-0.013*	-0.005	-0.455	-0.066***	-605.388***
born # female	(0.008)	(0.009)	(0.517)	(0.012)	(140.925)
R^2	0.14	0.08	0.07	0.03	0.14
N	26,545	28,091	23,845	23,727	21,731
Sibships	8,349	8,632	7,683	7,813	7,322

Table A9: Birth order effects on educational investment in families with first-born boys – coefficients of linear sibship fixed effects models with birth order – gender interaction terms

	Enrollment	Child labor	Total hours	Private school	School expenses
Mean	.925	.080	39.732	.310	3238.92
Second born	-0.019***	-0.019***	-1.384***	-0.036***	-549.056***
	(0.005)	(0.006)	(0.320)	(0.007)	(108.944)
Third born	0.015	-0.051***	-0.328	-0.048***	-874.521***
	(0.010)	(0.010)	(0.568)	(0.013)	(206.218)
Fourth to sixth born	0.068***	-0.097***	1.979**	-0.059***	-945.944***
	(0.016)	(0.015)	(0.892)	(0.020)	(283.326)
Second born #female	-0.001	-0.014***	-0.224	-0.029***	-342.246***
	(0.005)	(0.005)	(0.310)	(0.007)	(87.543)
Third born #female	-0.010	-0.015*	-0.611	-0.043***	-242.857**
	(0.008)	(0.008)	(0.439)	(0.009)	(104.778)
Fourth to sixth	-0.008	-0.017	-1.067*	-0.042***	-431.639***
born #female	(0.011)	(0.010)	(0.614)	(0.014)	(120.368)
R^2	0.14	0.11	0.06	0.01	0.17
N	26,928	28,716	24,099	23,517	21,310
Sibships	9,198	9,565	8,370	8,358	7,739

Table A10: The effect of birth order on indicators of current human capital stock in families of different sizes with first-born girls– coefficients from linear sibship fixed effects estimations

	Completed grades	Reading	Writing	Math	HAZ
Panel I: 2-child families					
Mean	0.385	0.339	0.347	0.347	-1.818
Second born	-0.278***	-0.201	-0.254	-0.210	-0.308*
	(0.042)	(0.174)	(0.201)	(0.184)	(0.173)
Female	0.026	0.171	0.070	0.075	0.088
	(0.033)	(0.129)	(0.136)	(0.139)	(0.134)
R^2	0.10	0.04	0.12	0.07	0.05
N	5,994	504	492	500	2,638
Sibships	2,585	252	246	250	1,217
Panel II: 3 child families					
Mean	0.229	0.200	0.160	0.128	-1.922
Second born	-0.209***	-0.161	-0.276**	-0.255**	-0.531***
	(0.027)	(0.114)	(0.123)	(0.116)	(0.088)
Third born	-0.517***	-0.280	-0.364*	-0.594***	-0.965***
	(0.047)	(0.218)	(0.216)	(0.202)	(0.157)
Female	0.019	0.006	-0.080	-0.029	-0.093
	(0.019)	(0.065)	(0.068)	(0.067)	(0.061)
R2	0.07	0.03	0.15	0.04	0.05
N	9,230	1,125	1,101	1,115	4,534
Sibships	2,983	542	530	537	1,688
Panel III: 4-child families					
Mean	0.050	0.015	0.040	0.004	-1.963
Second born	-0.160***	-0.378***	-0.321***	-0.077	-0.354***
	(0.034)	(0.103)	(0.122)	(0.104)	(0.094)
Third born	-0.408***	-0.629***	-0.439**	-0.246	-0.718***
	(0.060)	(0.174)	(0.196)	(0.170)	(0.156)
Fourth to sixth born	-0.669***	-1.001***	-0.636**	-0.494**	-0.870***
	(0.087)	(0.262)	(0.288)	(0.248)	(0.244)
Female	-0.016	-0.097	-0.082	-0.118	-0.021
	(0.024)	(0.062)	(0.076)	(0.073)	(0.064)
R2	0.06	0.05	0.14	0.04	0.06
N	6,851	1,018	1,008	1,017	3,553
Sibships	1,838	484	479	484	1,174
Panel IV: 5-child families					
Mean	-0.165	-0.222	-0.168	-0.273	-2.137
Second born	-0.055	-0.230*	-0.138	-0.058	-0.148
	(0.045)	(0.129)	(0.134)	(0.123)	(0.122)
Third born	-0.217***	-0.499**	-0.186	-0.289	-0.705***
	(0.074)	(0.195)	(0.197)	(0.195)	(0.185)
Fourth to sixth born	-0.458***	-0.425	-0.333	-0.284	-1.086***
	(0.111)	(0.283)	(0.277)	(0.293)	(0.285)
Female	-0.055	-0.059	-0.032	-0.202**	-0.119
	(0.034)	(0.096)	(0.095)	(0.092)	(0.087)
R2	0.07	0.05	0.13	0.02	0.08
N	3,942	698	695	696	2,098
Sibships	864	316	315	315	599
Panel V: 6-child families					
Mean	-0.230	-0.445	-0.345	-0.405	-2.041
Second born	0.020	-0.245	-0.292	-0.041	-0.002
	(0.067)	(0.208)	(0.188)	(0.159)	(0.179)
Third born	-0.082	-0.321	-0.454**	-0.160	-0.094

	(0.084)	(0.251)	(0.218)	(0.176)	(0.294)
Fourth to sixth born	-0.197*	-0.194	-0.475*	-0.283	-0.214
	(0.116)	(0.331)	(0.267)	(0.247)	(0.414)
Female	-0.076	-0.242**	-0.152	-0.369***	-0.006
	(0.051)	(0.117)	(0.104)	(0.103)	(0.128)
R2	0.06	0.07	0.08	0.08	0.06
N	2,043	435	439	439	1,119
Sibships	357	183	184	184	274

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table A11: The effect of birth order on indicators of current human capital stock in families of different sizes with first-born boys– coefficients from linear sibship fixed effects estimations

	Completed grades	Reading	Writing	Math	HAZ
Panel I: 2-child families					
Mean	0.323	0.331	0.378	0.356	-1.700
Second born	-0.211***	-0.055	-0.171	-0.168	-0.486***
	(0.029)	(0.148)	(0.144)	(0.163)	(0.094)
Female	0.012	0.092	0.070	-0.011	-0.077
	(0.025)	(0.092)	(0.098)	(0.094)	(0.080)
R^2	0.08	0.01	0.15	0.03	0.05
N	8,930	817	805	815	4,092
Sibships	3,873	408	402	407	1,891
Panel II: 3-child families					
Mean	0.154	0.075	0.054	0.017	-1.918
Second born	-0.210***	-0.207**	0.011	-0.126	-0.542***
	(0.031)	(0.088)	(0.099)	(0.092)	(0.097)
Third born	-0.401***	-0.275**	0.130	-0.175	-0.961***
	(0.053)	(0.139)	(0.172)	(0.151)	(0.171)
Female	0.026	0.045	-0.040	-0.026	-0.066
	(0.020)	(0.073)	(0.070)	(0.070)	(0.064)
R2	0.06	0.03	0.12	0.02	0.07
N	9,956	1,136	1,118	1,128	4,332
Sibships	3,259	552	543	548	1,609
Panel III: 4-child families					
Mean	-0.097	-0.101	-0.178	-0.162	-2.107
Second born	-0.440***	-0.071	-0.191**	-0.305**	-0.515***
	(0.096)	(0.134)	(0.080)	(0.125)	(0.165)
Third born	-0.784***	0.039	-0.351***	-0.283	-0.951***
	(0.152)	(0.172)	(0.121)	(0.203)	(0.277)
Fourth to sixth born	-1.125***	0.125	-0.471***	-0.453	-1.461***
	(0.216)	(0.218)	(0.164)	(0.280)	(0.396)
Female	0.001	-0.101	-0.042	-0.157*	-0.242***
	(0.058)	(0.118)	(0.065)	(0.086)	(0.091)
R2	0.66	0.24	0.18	0.20	0.07
N	5,424	683	682	688	2,371
Sibships	1,502	325	326	328	802
Panel IV: 5-child families					
Mean	-0.334	-0.316	-.0237	-0.330	-2.080
Second born	-0.300***	-0.295	-0.200	-0.370**	-0.787***
	(0.063)	(0.195)	(0.177)	(0.182)	(0.212)
Third born	-0.405***	-0.486*	-0.206	-0.618**	-0.923***
	(0.088)	(0.283)	(0.253)	(0.261)	(0.273)

Fourth to sixth born	-0.640***	-0.809**	-0.191	-0.787**	-1.511***
	(0.126)	(0.371)	(0.339)	(0.365)	(0.418)
Female	-0.026	-0.273**	-0.098	-0.229**	0.214
	(0.041)	(0.114)	(0.116)	(0.109)	(0.132)
R2	0.08	0.06	0.12	0.07	0.04
N	2,792	410	407	407	1,287
Sibships	633	181	180	180	374
Panel V: 6-child families					
Mean	-0.445	-0.525	-0.387	-0.477	-2.233
Second born	-0.169**	-0.174	-0.513**	-0.316	-0.060
	(0.079)	(0.258)	(0.248)	(0.249)	(0.249)
Third born	-0.152	-0.179	-0.538	-0.283	-0.633**
	(0.113)	(0.312)	(0.344)	(0.298)	(0.302)
Fourth to sixth born	-0.134	0.028	-0.386	-0.110	-0.536
	(0.157)	(0.413)	(0.444)	(0.387)	(0.363)
Female	0.007	-0.264*	0.054	-0.080	-0.029
	(0.052)	(0.155)	(0.144)	(0.124)	(0.157)
R2	0.07	0.05	0.10	0.04	0.08
N	1,585	261	259	261	809
Sibships	292	112	111	112	212

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table A12: The effect of birth order between later-born siblings on human capital stock indicators and educational investment in families with first-born boys - comparison of coefficients in Tables 10 and 12

Panel A: Human capital stock indicators					
	Completed grades	Reading	Writing	Math	HAZ
Third born minus	-0.128***	-0.076	-0.075	-0.068	-0.423***
second born	(0.019)	(0.063)	(0.063)	(0.060)	(0.108)
Fourth to sixth born	-0.201***	-0.123	-0.189*	-0.143	-1.202***
minus second born	(0.038)	(0.118)	(0.114)	(0.110)	(0.208)
Panel B: Educational investment					
	Enrollment	Child labor	Hours	Private	Expenses
Third born minus	0.029***	-0.032***	0.822**	-0.019***	-291.576***
second born	(0.006)	(0.005)	(0.327)	(0.007)	(103.847)
Fourth to sixth born	0.082***	-0.076***	3.000***	-0.030**	-459.998**
minus second born	(0.011)	(0.011)	(0.625)	(0.014)	(190.424)

Table A13: The effect of birth order on educational investment in families of different sizes with first-born girls- coefficients from linear sibship fixed effects estimations

	Enrollment	Child labor	Hours	Private	Expenses
Panel I: 2-child families					
Mean	0.973	0.028	45.278	0.412	5519.259
Second born	-0.008	0.002	-2.002*	-0.038**	-636.782*
	(0.012)	(0.011)	(1.041)	(0.018)	(368.238)
Female	0.001	0.016**	-0.456	-0.067***	-1,031.280***
	(0.009)	(0.008)	(0.701)	(0.015)	(291.887)
R^2	0.06	0.03	0.04	0.02	0.17
N	5,835	5,996	5,129	5,371	5,090
Sibships	2,520	2,586	2,256	2,339	2,231
Panel II: 3-child families					
Mean	0.949	0.060	43.813	0.325	3438.653
Second born	-0.005	-0.010	-1.231**	-0.035***	-897.986***
	(0.009)	(0.008)	(0.543)	(0.014)	(208.621)
Third born	-0.002	-0.037***	-1.854*	-0.058**	-1,351.707***
	(0.015)	(0.014)	(0.986)	(0.024)	(333.093)
Female	-0.010*	-0.005	-0.972***	-0.079***	-935.277***
	(0.006)	(0.006)	(0.374)	(0.009)	(124.055)
R2	0.13	0.07	0.06	0.03	0.16
N	8,876	9,241	8,002	7,972	7,334
Sibships	2,888	2,987	2,671	2,692	2,512
Panel III: 4-child families					
Mean	0.926	0.070	41.858	0.266	2257.038
Second born	0.036***	-0.022**	1.071	-0.007	-418.786***
	(0.012)	(0.010)	(0.670)	(0.014)	(149.301)
Third born	0.037*	-0.033*	0.770	0.015	-619.161**
	(0.019)	(0.017)	(1.093)	(0.023)	(261.371)
Fourth to sixth born	0.036	-0.016	0.601	0.016	-539.489
	(0.029)	(0.026)	(1.629)	(0.033)	(371.485)
Female	-0.022***	-0.016**	-0.884**	-0.068***	-683.435***
	(0.007)	(0.007)	(0.400)	(0.010)	(91.571)
R2	0.17	0.09	0.10	0.03	0.21
N	6,429	6,856	5,799	5,700	5,144
Sibships	1,760	1,838	1,641	1,661	1,545
Panel IV: 5-child families					
Mean	0.903	0.088	40.806	0.226	1770.209
Second born	0.039**	-0.057***	1.359	-0.050**	-308.370*
	(0.016)	(0.016)	(0.865)	(0.020)	(165.151)
Third born	0.045**	-0.071***	1.648	-0.088***	-782.916***
	(0.020)	(0.022)	(1.192)	(0.033)	(189.455)
Fourth to sixth born	0.060**	-0.084**	2.298	-0.118**	-1,108.808***
	(0.028)	(0.033)	(1.749)	(0.051)	(288.530)
Female	-0.029***	-0.015	-1.535***	-0.079***	-588.131***
	(0.011)	(0.010)	(0.567)	(0.015)	(144.528)
R2	0.19	0.12	0.09	0.03	0.09
N	3,549	3,954	3,217	3,077	2,749
Sibships	827	864	777	779	719
Panel V: 6-child families					
Mean	0.893	0.095	39.760	0.204	1465.327
Second born	0.098***	-0.020	3.821**	-0.042	-208.427
	(0.029)	(0.025)	(1.490)	(0.026)	(214.284)
Third born	0.139***	-0.067**	5.674***	-0.044	-117.510
	(0.033)	(0.030)	(2.028)	(0.036)	(401.187)

Fourth to sixth born	0.113***	-0.050	4.476	-0.062	-352.354
	(0.039)	(0.037)	(2.805)	(0.046)	(605.080)
Female	-0.020	-0.031**	-0.699	-0.062***	-450.213***
	(0.015)	(0.014)	(0.856)	(0.019)	(169.514)
R2	0.25	0.16	0.13	0.04	0.10
N	1,856	2,044	1,698	1,607	1,414
Sibships	354	357	338	342	315

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table A14: The effect of birth order on educational investment in families of different sizes with first-born boys- coefficients from linear sibship fixed effects estimations

	Enrollment	Child labor	Hours	Private	Expenses
Panel I: 2-child families					
Mean	0.971	0.044	45.275	0.400	5052.324
Second born	0.005	-0.022***	-0.374	-0.039***	-562.128***
	(0.006)	(0.008)	(0.540)	(0.013)	(189.672)
Female	0.002	0.005	-0.328	-0.020*	-516.610***
	(0.006)	(0.007)	(0.426)	(0.011)	(171.627)
R^2	0.07	0.05	0.05	0.01	0.23
N	8,695	8,937	7,598	7,985	7,418
Sibships	3,782	3,876	3,343	3,504	3,277
Panel II: 3-child families					
Mean	0.928	0.079	43.029	0.288	2714.479
Second born	-0.013	-0.046***	-1.040*	-0.026**	-784.975***
	(0.009)	(0.009)	(0.539)	(0.012)	(232.587)
Third born	-0.000	-0.063***	-0.988	-0.019	-1,229.601***
	(0.015)	(0.015)	(0.936)	(0.022)	(420.099)
Female	-0.002	-0.003	-0.309	-0.030***	-280.939***
	(0.006)	(0.006)	(0.360)	(0.008)	(102.470)
R2	0.12	0.10	0.05	0.01	0.16
N	9,489	9,963	8,584	8,299	7,565
Sibships	3,142	3,261	2,904	2,811	2,612
Panel III: 4-child families					
Mean	0.890	0.105	41.607	0.244	1917.89
Second born	-0.010	-0.056***	-0.922	-0.061***	-686.265***
	(0.014)	(0.014)	(0.775)	(0.019)	(240.216)
Third born	0.026	-0.082***	0.448	-0.091***	-1,368.515***
	(0.020)	(0.019)	(1.157)	(0.029)	(481.070)
Fourth to sixth born	0.032	-0.088***	0.501	-0.112***	-1,533.597**
	(0.028)	(0.027)	(1.616)	(0.042)	(663.997)
Female	-0.017*	-0.017*	-1.187**	-0.044***	-207.731*
	(0.009)	(0.009)	(0.528)	(0.012)	(107.618)
R2	0.18	0.15	0.10	0.02	0.14
N	4,992	5,429	4,533	4,184	3,694
Sibships	1,415	1,503	1,316	1,267	1,147
Panel IV: 5-child families					
Mean	0.854	0.128	40.683	0.217	1540.845
Second born	-0.019	-0.049**	-1.731	-0.075***	-182.360
	(0.024)	(0.023)	(1.212)	(0.026)	(136.445)
Third born	0.014	-0.067**	-2.014	-0.098***	-246.116

	(0.031)	(0.030)	(1.587)	(0.035)	(196.377)
Fourth to sixth born	0.045	-0.066	-0.996	-0.104**	-245.699
	(0.043)	(0.040)	(2.219)	(0.050)	(301.610)
Female	-0.018	-0.021	-0.589	-0.024	-475.003***
	(0.014)	(0.013)	(0.745)	(0.015)	(113.229)
R2	0.24	0.20	0.16	0.03	0.19
N	2,412	2,797	2,161	1,937	1,699
Sibships	584	633	544	518	466
Panel V: 6-child families					
Mean	0.872	0.117	40.446	0.238	1397.874
Second born	0.004	-0.057*	-0.734	0.005	106.355
	(0.036)	(0.032)	(1.665)	(0.040)	(203.631)
Third born	0.076*	-0.108***	2.638	-0.017	45.898
	(0.040)	(0.039)	(1.957)	(0.048)	(264.656)
Fourth to sixth born	0.071	-0.096*	1.883	-0.023	186.412
	(0.052)	(0.049)	(2.562)	(0.058)	(403.862)
Female	-0.010	-0.047***	-0.595	-0.072***	-192.325**
	(0.017)	(0.017)	(0.860)	(0.025)	(97.501)
R2	0.18	0.16	0.08	0.02	0.25
N	1,340	1,590	1,223	1,112	934
Sibships	275	292	263	258	237

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table A15: The effect of birth order on indicators of current human capital stock in families of different sizes– coefficients from linear sibship fixed effects estimations with an oldest son dummy

	Completed grades	Reading	Writing	Math	HAZ
Panel I: 2-child families					
Mean	0.348	0.334	0.366	0.352	-1.751
Second born	-0.253***	-0.144	-0.203*	-0.230*	-0.393**
	(0.021)	(0.103)	(0.113)	(0.123)	(0.169)
Oldest son	0.005	0.099	0.068	0.007	-0.010
	(0.024)	(0.089)	(0.095)	(0.092)	(0.126)
Female	-0.048**	0.005	0.004	0.053	-0.210
	(0.021)	(0.075)	(0.080)	(0.076)	(0.150)
R^2	0.08	0.01	0.14	0.03	0.05
N	15,048	1,332	1,308	1,326	1,430
Sibships	6,509	665	653	662	714
Panel II: 3-child families					
Mean	0.184	0.136	0.106	0.074	-2.004
Second born	-0.385***	-0.223***	-0.078	-0.147**	-0.535***
	(0.037)	(0.085)	(0.048)	(0.066)	(0.137)
Third born	-0.837***	-0.357**	-0.064	-0.302***	-1.052***
	(0.067)	(0.157)	(0.088)	(0.116)	(0.260)
Oldest son	-0.053*	0.060	-0.045	0.065	-0.004
	(0.032)	(0.074)	(0.038)	(0.055)	(0.091)
Female	0.054*	0.044	-0.056	-0.005	-0.194**
	(0.032)	(0.082)	(0.040)	(0.057)	(0.097)
R2	0.80	0.24	0.22	0.22	0.12
N	20,466	2,318	2,274	2,298	2,596
Sibships	6,789	1,122	1,100	1,112	1,249
Panel III: 4-child families					

Mean	-0.012	-0.030	-0.046	-0.060	-2.057
Second born	-0.161***	-0.226**	-0.297***	-0.210**	-0.497***
	(0.025)	(0.094)	(0.082)	(0.082)	(0.119)
Third born	-0.356***	-0.357**	-0.451***	-0.345**	-0.951***
	(0.042)	(0.170)	(0.129)	(0.141)	(0.195)
Fourth to sixth born	-0.516***	-0.553**	-0.631***	-0.635***	-1.245***
	(0.061)	(0.257)	(0.183)	(0.204)	(0.276)
Oldest son	0.002	-0.067	-0.071	-0.126*	-0.094
	(0.021)	(0.065)	(0.074)	(0.068)	(0.124)
Female	0.030	0.038	0.041	0.068	-0.150
	(0.022)	(0.067)	(0.078)	(0.070)	(0.106)
R2	0.05	0.04	0.13	0.05	0.08
N	14,617	1,818	1,809	1,822	2,074
Sibships	4,206	866	863	869	972
Panel IV: 5-child families					
Mean	-0.237	-0.272	-0.219	-0.308	-2.167
Second born	-0.133***	-0.262***	-0.170*	-0.143	-0.205
	(0.033)	(0.100)	(0.099)	(0.099)	(0.183)
Third born	-0.268***	-0.509***	-0.250*	-0.384***	-0.657**
	(0.047)	(0.145)	(0.145)	(0.144)	(0.298)
Fourth to sixth born	-0.455***	-0.535***	-0.321	-0.441**	-1.122**
	(0.067)	(0.199)	(0.195)	(0.206)	(0.454)
Oldest son	-0.022	-0.130	-0.031	-0.174**	0.102
	(0.028)	(0.084)	(0.079)	(0.078)	(0.154)
Female	0.087***	-0.049	0.078	0.027	-0.179
	(0.032)	(0.092)	(0.084)	(0.090)	(0.155)
R2	0.07	0.03	0.11	0.03	0.05
N	8,979	1,271	1,264	1,266	1,538
Sibships	2,191	576	574	574	687
Panel V: 6-child families					
Mean	-0.326	-0.456	-0.350	-0.413	-2.211
Second born	-0.044	-0.232	-0.288**	-0.103	0.004
	(0.050)	(0.156)	(0.141)	(0.127)	(0.215)
Third born	-0.069	-0.253	-0.356**	-0.103	-0.269
	(0.063)	(0.180)	(0.164)	(0.140)	(0.278)
Fourth to sixth born	-0.102	-0.175	-0.411**	-0.151	-0.466
	(0.085)	(0.227)	(0.197)	(0.175)	(0.381)
Oldest son	0.006	-0.142	-0.036	-0.153*	-0.042
	(0.034)	(0.091)	(0.086)	(0.078)	(0.198)
Female	0.187***	0.142	0.147	0.221**	-0.234
	(0.046)	(0.119)	(0.110)	(0.107)	(0.159)
R2	0.07	0.05	0.07	0.04	0.08
N	5,467	889	889	891	1,040
Sibships	1,134	381	380	381	430

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table A16: The effect of birth order on educational investment in families of different sizes - coefficients from linear sibship fixed effects estimations with an oldest son dummy

	Enrollment	Child labor	Hours	Private	Expenses
Panel I: 2-child families					
Mean	0.972	0.038	43.903	0.404	5248.301
Second born	0.002	-0.013**	-1.046**	-0.023**	-448.988***
	(0.005)	(0.006)	(0.449)	(0.010)	(166.309)
Oldest son	0.004	0.010*	-0.265	0.010	-62.131
	(0.005)	(0.006)	(0.346)	(0.009)	(137.629)
Female	0.002	0.010	-0.430	-0.029***	-616.878***
	(0.006)	(0.006)	(0.421)	(0.011)	(168.914)
R^2	0.06	0.04	0.04	0.01	0.19
N	14,651	15,057	12,839	13,467	12,617
Sibships	6,353	6,513	5,647	5,890	5,554
Panel II: 3-child families					
Mean	0.935	0.074	40.379	0.304	3087.83
Second born	-0.006	-0.020***	-1.026***	-0.009	-604.595***
	(0.006)	(0.006)	(0.354)	(0.008)	(135.299)
Third born	0.007	-0.039***	-1.102*	-0.010	-962.532***
	(0.010)	(0.009)	(0.648)	(0.015)	(247.656)
Oldest son	0.008	0.019***	0.329	0.032***	290.116***
	(0.005)	(0.006)	(0.304)	(0.007)	(99.485)
Female	-0.005	0.000	-0.471	-0.034***	-367.193***
	(0.005)	(0.005)	(0.311)	(0.007)	(84.450)
R2	0.12	0.08	0.06	0.02	0.15
N	19,549	20,485	17,628	17,157	15,690
Sibships	6,544	6,795	6,035	5,884	5,470
Panel III: 4-child families					
Mean	0.900	0.098	37.289	0.250	2096.006
Second born	0.011	-0.025***	-0.123	-0.024**	-329.271***
	(0.009)	(0.008)	(0.474)	(0.010)	(120.462)
Third born	0.026*	-0.041***	0.191	-0.030*	-657.090***
	(0.013)	(0.012)	(0.750)	(0.018)	(230.125)
Fourth to sixth born	0.028	-0.042**	-0.071	-0.040	-616.597*
	(0.020)	(0.017)	(1.091)	(0.025)	(326.889)
Oldest son	0.008	0.008	0.501	0.009	181.117**
	(0.007)	(0.008)	(0.416)	(0.009)	(80.417)
Female	-0.020***	-0.022***	-1.016**	-0.056***	-377.882***
	(0.007)	(0.007)	(0.400)	(0.009)	(75.503)
R2	0.18	0.12	0.10	0.02	0.17
N	13,600	14,628	12,345	11,461	10,224
Sibships	3,991	4,207	3,720	3,539	3,237
Panel IV: 5-child families					
Mean	0.871	0.124	35.219	0.215	1686.569
Second born	0.003	-0.040***	-0.378	-0.029**	-228.422*
	(0.013)	(0.012)	(0.661)	(0.014)	(120.517)
Third born	0.008	-0.049***	-0.732	-0.053**	-494.588***
	(0.016)	(0.016)	(0.868)	(0.021)	(134.774)
Fourth to sixth born	0.028	-0.060***	-0.020	-0.055*	-648.762***
	(0.022)	(0.022)	(1.228)	(0.031)	(194.959)
Oldest son	0.012	0.019*	0.670	0.058***	241.660**
	(0.011)	(0.011)	(0.588)	(0.013)	(116.290)
Female	-0.017*	-0.025***	-0.746	-0.028***	-420.888***
	(0.010)	(0.009)	(0.511)	(0.011)	(89.281)
R2	0.22	0.16	0.14	0.03	0.11

N	7,931	9,001	7,145	6,464	5,696
Sibships	2,040	2,193	1,891	1,781	1,611
Panel V: 6-child families					
Mean	0.860	0.125	34.409	0.212	1551.217
Second born	0.061***	-0.013	1.981*	-0.028	-129.539
	(0.022)	(0.019)	(1.060)	(0.022)	(127.022)
Third born	0.097***	-0.057**	3.297***	-0.034	-69.918
	(0.024)	(0.023)	(1.263)	(0.027)	(212.445)
Fourth to sixth born	0.110***	-0.054**	3.828**	-0.052	-163.590
	(0.028)	(0.027)	(1.553)	(0.033)	(297.630)
Oldest son	0.032**	0.020	1.810**	0.007	-79.952
	(0.016)	(0.016)	(0.804)	(0.018)	(206.954)
Female	-0.015	-0.029**	-0.778	-0.067***	-515.221***
	(0.011)	(0.011)	(0.605)	(0.014)	(148.298)
R2	0.20	0.16	0.11	0.03	0.08
N	4,792	5,476	4,369	3,887	3,344
Sibships	1,070	1,134	1,016	947	864

Note: The estimations also include a constant, a full set of child age dummies, a year dummy and sibship fixed effects.
* p<0.1; ** p<0.05; *** p<0.01. Standard errors, clustered at the sibship level, within parenthesis.

Table A17: Birth order effects on current human capital indicators in Hindu versus other families - coefficients from linear sibship fixed effects models fully interacted with Hindu dummy

	Grades	Reading	Writing	Math	HAZ
	0.076	-0.006	0.007	-0.030	-1.934
Second born	-0.192***	-0.219***	-0.261***	-0.259***	-0.325***
	(0.022)	(0.072)	(0.080)	(0.065)	(0.076)
Third born	-0.324***	-0.307**	-0.302**	-0.372***	-0.717***
	(0.038)	(0.122)	(0.140)	(0.111)	(0.135)
Fourth to sixth born	-0.420***	-0.465**	-0.539**	-0.639***	-1.190***
	(0.058)	(0.186)	(0.211)	(0.177)	(0.214)
Female	0.053***	-0.024	-0.061	-0.069	-0.026
	(0.016)	(0.050)	(0.057)	(0.046)	(0.048)
Second born # Hindu	-0.017	0.098	0.168*	0.128*	-0.024
	(0.025)	(0.081)	(0.089)	(0.075)	(0.083)
Third born # Hindu	-0.050	0.074	0.140	0.099	0.054
	(0.042)	(0.140)	(0.155)	(0.129)	(0.148)
Fourth to sixth born # Hindu	-0.038	0.193	0.244	0.250	0.178
	(0.065)	(0.213)	(0.232)	(0.202)	(0.232)
Female # Hindu	-0.058***	-0.024	0.014	-0.067	-0.041
	(0.018)	(0.056)	(0.063)	(0.053)	(0.053)
R^2	0.06	0.02	0.11	0.03	0.05
N	64,577	7,628	7,544	7,603	29,647
Sibships	20,829	3,610	3,570	3,598	10,898

Table A18: Birth order effects on educational investment in Hindu versus other families - coefficients from linear sibship fixed effects models fully interacted with Hindu dummy

	Enrollment	Child labor	Hours	Private	Expenses
	0.921	0.082	39.351	0.300	3171.878
Second born	-0.012	-0.009	-1.099***	-0.018*	-316.829***
	(0.007)	(0.007)	(0.420)	(0.010)	(120.961)
Third born	0.004	-0.021*	-0.956	-0.035**	-497.895**
	(0.012)	(0.011)	(0.717)	(0.016)	(212.904)
Fourth to sixth born	0.060***	-0.048***	0.776	-0.042*	-711.895**
	(0.019)	(0.017)	(1.122)	(0.025)	(300.809)
Female	-0.007	-0.037***	-0.216	-0.042***	-497.629***
	(0.005)	(0.005)	(0.289)	(0.007)	(80.675)
Second born # Hindu	-0.004	0.005	-0.280	-0.002	-115.390
	(0.008)	(0.008)	(0.470)	(0.011)	(136.850)
Third born # Hindu	-0.002	-0.009	-0.036	0.003	-102.164
	(0.014)	(0.013)	(0.813)	(0.018)	(235.119)
Fourth to sixth born # Hindu	-0.025	-0.020	-0.425	-0.011	18.403
	(0.021)	(0.020)	(1.271)	(0.028)	(335.446)
Female # Hindu	-0.010*	0.021***	-0.764**	-0.018**	-66.287
	(0.006)	(0.006)	(0.325)	(0.008)	(91.961)
R^2	0.15	0.11	0.08	0.02	0.15
N	60,523	64,647	54,326	52,436	47,571
Sibships	19,998	20,842	18,309	18,041	16,736

Table A19: Birth order effects on current human capital indicators in Kerala versus the rest of India - coefficients from linear sibship fixed effects models fully interacted with Kerala dummy

	Grades	Reading	Writing	Math	HAZ
	0.076	-0.006	0.007	-0.030	-1.934
Second born	-0.205***	-0.142***	-0.128***	-0.154***	-0.342***
	(0.011)	(0.035)	(0.035)	(0.034)	(0.034)
Third born	-0.364***	-0.256***	-0.190***	-0.293***	-0.659***
	(0.019)	(0.063)	(0.062)	(0.058)	(0.061)
Fourth to sixth born	-0.457***	-0.326***	-0.343***	-0.431***	-1.026***
	(0.029)	(0.098)	(0.091)	(0.088)	(0.094)
Female	0.006	-0.051**	-0.056**	-0.131***	-0.059***
	(0.007)	(0.023)	(0.024)	(0.023)	(0.021)
Second born #Kerala	0.086	-0.067	0.172	-0.156	-0.200
	(0.071)	(0.228)	(0.295)	(0.324)	(0.291)
Third born # Kerala	0.041	-0.196	0.149	-0.110	-0.629
	(0.140)	(0.507)	(0.561)	(0.678)	(0.569)
Fourth to sixth born # Kerala	0.078	0.411	2.887***	-0.326	-1.070
	(0.226)	(0.554)	(0.765)	(0.776)	(0.881)
Female # Kerala	0.102**	0.269**	0.385**	0.348*	-0.010
	(0.043)	(0.127)	(0.177)	(0.190)	(0.110)
R^2	0.06	0.02	0.11	0.03	0.05
N	64,577	7,628	7,544	7,603	29,647
Sibships	20,829	3,610	3,570	3,598	10,898

Table A20: Birth order effects on educational investment in Kerala versus the rest of India - coefficients from linear sibship fixed effects models fully interacted with Kerala dummy

	Enrollment	Child labor	Hours	Private	Expenses
	0.921	0.082	39.351	0.300	3171.878
Second born	-0.015***	-0.006*	-1.286***	-0.020***	-408.652***
	(0.003)	(0.003)	(0.197)	(0.005)	(62.693)
Third born	0.002	-0.028***	-0.951***	-0.033***	-574.428***
	(0.006)	(0.006)	(0.351)	(0.008)	(106.657)
Fourth to sixth born	0.039***	-0.062***	0.433	-0.049***	-682.090***
	(0.009)	(0.009)	(0.539)	(0.012)	(160.236)
Female	-0.015***	-0.021***	-0.831***	-0.057***	-563.740***
	(0.002)	(0.002)	(0.132)	(0.003)	(39.614)
Second born #Kerala	0.022***	-0.002	0.355	-0.010	-228.928
	(0.008)	(0.006)	(0.765)	(0.029)	(234.283)
Third born # Kerala	0.002	0.022**	-2.127	-0.052	-488.848
	(0.013)	(0.010)	(1.510)	(0.053)	(444.188)
Fourth to sixth born # Kerala	-0.025**	0.059***	-2.908	-0.078	-1,121.236
	(0.013)	(0.013)	(2.108)	(0.088)	(728.649)
Female # Kerala	0.013*	0.028***	0.619	0.053***	479.822***
	(0.007)	(0.005)	(0.588)	(0.018)	(160.845)
R^2	0.15	0.11	0.08	0.02	0.15
N	60,523	64,647	54,326	52,436	47,571
Sibships	19,998	20,842	18,309	18,041	16,736

Table A21: Birth order effects on current human capital indicators in families where the mother does and does not express son preference - coefficients from linear sibship fixed effects models fully interacted with a son preference dummy[1]

	Grades	Reading	Writing	Math	HAZ
	0.092	0.027	0.042	0.005	-1.924
Second born	-0.191***	-0.164***	-0.062	-0.143***	-0.340***
	(0.014)	(0.047)	(0.049)	(0.047)	(0.046)
Third born	-0.336***	-0.243***	-0.101	-0.247***	-0.651***
	(0.025)	(0.085)	(0.087)	(0.082)	(0.087)
Fourth to sixth born	-0.401***	-0.406***	-0.240*	-0.431***	-1.023***
	(0.039)	(0.131)	(0.133)	(0.129)	(0.129)
Female	0.023**	0.019	0.027	-0.061*	-0.054**
	(0.009)	(0.030)	(0.032)	(0.032)	(0.027)
Second born # prefer sons	-0.032	0.071	-0.050	0.051	-0.051
	(0.028)	(0.092)	(0.091)	(0.084)	(0.091)
Third born # prefer sons	-0.095*	0.042	-0.068	0.081	-0.153
	(0.049)	(0.161)	(0.156)	(0.137)	(0.157)
Fourth to sixth born # prefer sons	-0.150*	0.289	-0.069	0.084	-0.151
	(0.079)	(0.251)	(0.226)	(0.208)	(0.240)
Female # prefer sons	-0.051***	-0.087	-0.173***	-0.137**	-0.055
	(0.019)	(0.064)	(0.062)	(0.059)	(0.057)
R^2	0.05	0.02	0.12	0.03	0.04
N	49,044	5,581	5,523	5,563	22,640
Sibships	16,428	2,666	2,637	2,657	8,532

[1] The son preference dummy is 1 if the mother states a higher number of desired boys than girls.

Table A22: Birth order effects on education investment in families where the mother does and does not express son preference - coefficients from linear sibship fixed effects models fully interacted with a son preference dummy[1]

	Enrollment	Child labor	Hours	Private	Expenses
	0.926	0.078	39.750	0.311	3328.355
Second born	-0.015***	-0.005	-1.324***	-0.019***	-354.370***
	(0.004)	(0.004)	(0.263)	(0.006)	(75.162)
Third born	0.002	-0.030***	-0.795	-0.025**	-444.966***
	(0.008)	(0.008)	(0.487)	(0.011)	(129.672)
Fourth to sixth born	0.044***	-0.062***	1.013	-0.028*	-470.800**
	(0.012)	(0.012)	(0.749)	(0.017)	(198.503)
Female	-0.008***	-0.016***	-0.386**	-0.055***	-571.126***
	(0.003)	(0.003)	(0.167)	(0.004)	(54.223)
Second born # prefer sons	0.006	-0.013	0.458	0.003	24.274
	(0.009)	(0.009)	(0.523)	(0.012)	(128.811)
Third born # prefer sons	-0.007	0.004	-0.485	-0.008	-124.931
	(0.016)	(0.016)	(0.900)	(0.021)	(222.575)
Fourth to sixth born # prefer sons	-0.032	-0.002	-1.788	-0.038	-111.996
	(0.024)	(0.024)	(1.398)	(0.032)	(328.769)
Female # prefer sons	-0.018***	-0.002	-1.056***	-0.001	-22.805
	(0.006)	(0.006)	(0.344)	(0.008)	(93.145)
R^2	0.15	0.11	0.08	0.02	0.16
N	46,025	49,089	41,250	40,058	36,517
Sibships	15,750	16,437	14,386	14,220	13,217

[1] The son preference dummy is 1 if the mother states a higher number of desired boys than girls.

Table A23: Heterogeneity of birth order effects on current human capital indicators depending on mothers' education - coefficients from linear sibship fixed effects models fully interacted with mothers' education in years

	Grades	Reading	Writing	Mathematics	HAZ
	0.0760	-0.006	0.007	-0.030	-1.933
Second born	-0.159***	-0.202***	-0.199***	-0.179***	-0.333***
	(0.014)	(0.047)	(0.047)	(0.045)	(0.044)
Third born	-0.311***	-0.298***	-0.219***	-0.285***	-0.662***
	(0.024)	(0.078)	(0.078)	(0.072)	(0.075)
Fourth to sixth born	-0.404***	-0.434***	-0.367***	-0.469***	-0.969***
	(0.037)	(0.117)	(0.114)	(0.109)	(0.116)
Female	-0.047***	-0.122***	-0.090***	-0.194***	-0.051*
	(0.010)	(0.032)	(0.032)	(0.030)	(0.028)
Second born #mothers' education	-0.004**	0.013*	0.010	0.003	-0.006
	(0.002)	(0.008)	(0.008)	(0.008)	(0.008)
Third born #mothers' education	-0.010***	0.011	-0.001	-0.004	-0.004
	(0.004)	(0.014)	(0.015)	(0.015)	(0.015)
Fourth to sixth born #mothers' education	-0.023***	0.038*	0.007	0.011	-0.027
	(0.006)	(0.022)	(0.022)	(0.022)	(0.024)
Female # mothers' education	0.013***	0.021***	0.011**	0.018***	-0.002
	(0.001)	(0.005)	(0.005)	(0.005)	(0.005)
R^2	0.07	0.03	0.11	0.03	0.05
N	64,447	7,613	7,529	7,588	29,620
Sibships	20,796	3,605	3,565	3,593	10,890

Table A24: Heterogeneity of birth order effects on educational investment depending on mothers' education - coefficients from linear sibship fixed effects models fully interacted with mothers' education in years

	Enrollment	Child labor	Hours	Private	Expenses
	0.921	0.082	39.349	0.300	3174.237
Second born	-0.007	-0.018***	-1.083***	-0.020***	-241.891***
	(0.005)	(0.005)	(0.272)	(0.006)	(66.376)
Third born	0.013	-0.038***	-0.579	-0.034***	-534.933***
	(0.008)	(0.008)	(0.450)	(0.010)	(114.796)
Fourth to sixth born	0.046***	-0.067***	0.460	-0.046***	-639.245***
	(0.012)	(0.011)	(0.674)	(0.016)	(177.945)
Female	-0.029***	-0.023***	-1.352***	-0.060***	-431.490***
	(0.004)	(0.003)	(0.187)	(0.004)	(43.064)
Second born	-0.000	0.001	0.030	-0.000	-33.951*
#mothers' education	(0.001)	(0.001)	(0.043)	(0.001)	(17.345)
Third born #	-0.002*	0.002	-0.073	0.000	-5.780
mothers' education	(0.001)	(0.001)	(0.078)	(0.002)	(30.301)
Fourth to sixth born	-0.004***	0.003*	-0.128	0.001	7.106
#mothers' education	(0.002)	(0.002)	(0.122)	(0.003)	(47.440)
Female # mothers'	0.003***	0.001***	0.112***	0.001**	-25.963**
education	(0.000)	(0.000)	(0.026)	(0.001)	(11.460)
R^2	0.18	0.12	0.10	0.02	0.18
N	60,394	64,512	54,208	52,320	47,487
Sibships	19,964	20,808	18,278	18,010	16,713

Table A25: Birth order effects on current human capital indicators in regions with natural versus unnatural sex ratios - coefficients from linear sibship fixed effects models fully interacted with a natural sex ratio dummy[1]

	Grades	Reading	Writing	Math	HAZ
	0.076	-0.006	0.007	-0.030	-1.934
Second born	-0.190***	-0.143***	-0.112**	-0.128***	-0.382***
	(0.013)	(0.042)	(0.044)	(0.042)	(0.037)
Third born	-0.359***	-0.272***	-0.209***	-0.306***	-0.759***
	(0.024)	(0.074)	(0.075)	(0.071)	(0.064)
Fourth to sixth born	-0.459***	-0.315***	-0.364***	-0.400***	-1.132***
	(0.037)	(0.117)	(0.112)	(0.109)	(0.099)
Female	-0.006	-0.060**	-0.084***	-0.128***	-0.068***
	(0.009)	(0.029)	(0.031)	(0.028)	(0.025)
Second born	-0.034	-0.001	-0.039	-0.089	0.103
#Natural sex ratio	(0.021)	(0.075)	(0.073)	(0.069)	(0.077)
Third born #natural	-0.003	0.039	0.073	0.021	0.244*
sex ratio	(0.038)	(0.138)	(0.130)	(0.121)	(0.145)
Fourth to sixth born	0.036	-0.065	0.087	-0.140	0.214
# natural sex ratio	(0.060)	(0.214)	(0.193)	(0.186)	(0.220)
Female # natural	0.030**	0.044	0.091*	0.006	0.024
sex ratio	(0.014)	(0.048)	(0.048)	(0.048)	(0.046)
R^2	0.06	0.02	0.11	0.03	0.05
N	64,577	7,628	7,544	7,603	29,647
Sibships	20,829	3,610	3,570	3,598	10,898

[1] The natural sex ratio dummy=1 if there on average were more than 925 girls age 0-6 per 1000 boys age 0-6 in the 2001 and 2011 population censuses

Table A26: Birth order effects on education investment in regions with natural versus unnatural sex ratios - coefficients from linear sibship fixed effects models fully interacted with a natural sex ratio dummy[1]

	Enrollment	Child labor	Hours	Private	Expenses
Second born	-0.009**	-0.009**	-0.728***	-0.023***	-470.980***
	(0.004)	(0.004)	(0.233)	(0.006)	(91.293)
Third born	0.007	-0.031***	-0.320	-0.034***	-668.014***
	(0.007)	(0.008)	(0.404)	(0.011)	(158.010)
Fourth to sixth born	0.052***	-0.066***	1.442**	-0.045***	-793.536***
	(0.011)	(0.012)	(0.617)	(0.017)	(239.113)
Female	-0.020***	-0.018***	-1.051***	-0.068***	-702.352***
	(0.003)	(0.003)	(0.159)	(0.004)	(56.544)
Second born	-0.014**	0.009	-1.449***	0.005	134.476
#natural sex ratio	(0.007)	(0.007)	(0.408)	(0.009)	(117.767)
Third born #natural	-0.009	0.007	-1.652**	-0.001	157.816
sex ratio	(0.012)	(0.012)	(0.737)	(0.016)	(198.732)
Fourth to sixth born	-0.018	0.012	-2.417**	-0.018	110.457
# natural sex ratio	(0.019)	(0.018)	(1.135)	(0.025)	(299.997)
Female # natural sex	0.013***	-0.007	0.576**	0.030***	360.211***
ratio	(0.005)	(0.005)	(0.272)	(0.006)	(75.016)
R^2	0.15	0.11	0.08	0.02	0.15
N	60,523	64,647	54,326	52,436	47,571
Sibships	19,998	20,842	18,309	18,041	16,736

[1] The natural sex ratio dummy=1 if there on average were more than 925 girls age 0-6 per 1000 boys age 0-6 in the 2001 and 2011 population censuses

Table A27: Birth order effects on current human capital indicators in regions that scores worse and better on gender equality index - coefficients from linear sibship fixed effects models fully interacted with a dummy for high score on gender equality index [1]

	Grades	Reading	Writing	Math	HAZ
Mean	0.074	-0.006	0.005	-0.031	-1.937
Second born	-0.200***	-0.194***	-0.152***	-0.190***	-0.309***
	(0.014)	(0.042)	(0.043)	(0.040)	(0.038)
Third born	-0.369***	-0.307***	-0.235***	-0.339***	-0.624***
	(0.024)	(0.073)	(0.073)	(0.067)	(0.066)
Fourth to sixth born	-0.471***	-0.377***	-0.394***	-0.430***	-0.963***
	(0.038)	(0.113)	(0.105)	(0.101)	(0.103)
Female	-0.015	-0.085***	-0.073**	-0.164***	-0.091***
	(0.010)	(0.029)	(0.030)	(0.028)	(0.025)
Second born	0.004	0.159**	0.069	0.069	-0.093
#gender equal	(0.021)	(0.078)	(0.076)	(0.074)	(0.083)
Third born # gender	0.038	0.174	0.155	0.099	-0.110
equal	(0.038)	(0.145)	(0.137)	(0.131)	(0.155)
Fourth to sixth born	0.082	0.171	0.223	-0.112	-0.221
# gender equal	(0.059)	(0.228)	(0.207)	(0.206)	(0.233)
Female # gender	0.058***	0.130***	0.075	0.121**	0.103**
equal	(0.014)	(0.048)	(0.049)	(0.048)	(0.047)
R^2	0.06	0.03	0.11	0.03	0.05
N	64,141	7,606	7,522	7,581	29,486
Sibships	20,648	3,599	3,559	3,587	10,826

[1] The index is the "Women and children index" by the Public Affairs Centre, http://pai.pacindia.org/. It runs from 0 to 1, with 1 representing the best possible score. A score above 0.55 is considered high.

Table A28: Birth order effects on current human capital indicators in regions that scores worse and better on gender equality index - coefficients from linear sibship fixed effects models fully interacted with a dummy for high score on gender equality index [1]

	Enrollment	Child labor	Hours	Private	Expenses
	0.921	0.083	39.341	0.300	3154.681
Second born	-0.008*	-0.006	-0.717***	-0.022***	-445.302***
	(0.004)	(0.004)	(0.237)	(0.006)	(86.230)
Third born	0.003	-0.022***	-0.476	-0.027***	-542.217***
	(0.007)	(0.007)	(0.407)	(0.010)	(146.315)
Fourth to sixth born	0.040***	-0.053***	1.026*	-0.040**	-660.120***
	(0.011)	(0.011)	(0.618)	(0.016)	(218.479)
Female	-0.020***	-0.023***	-1.076***	-0.072***	-704.126***
	(0.003)	(0.003)	(0.160)	(0.004)	(51.930)
Second born	-0.016**	-0.004	-1.304***	0.005	110.801
#gender equal	(0.007)	(0.007)	(0.421)	(0.009)	(117.398)
Third born # gender	0.000	-0.023*	-0.984	-0.019	-88.618
equal	(0.012)	(0.012)	(0.767)	(0.016)	(198.441)
Fourth to sixth born	0.006	-0.027	-1.107	-0.036	-134.856
# gender equal	(0.019)	(0.018)	(1.189)	(0.025)	(298.769)
Female # gender	0.012***	0.006	0.621**	0.043***	382.811***
equal	(0.005)	(0.005)	(0.275)	(0.006)	(77.329)
R^2	0.15	0.11	0.08	0.02	0.15
N	60,096	64,211	54,013	52,052	47,204
Sibships	19,820	20,661	18,181	17,878	16,581

[1] The index is the "Women and children index" by the Public Affairs Centre, http://pai.pacindia.org/. It runs from 0 to 1, with 1 representing the best possible score. A score above 0.55 is considered high.