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Maternal bargaining power, parental compensation and non-cognitive skills in rural China

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Maternal bargaining power, parental compensation and non-cognitive skills in rural China

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Abstract

The importance of non-cognitive skills in determining long-term human capital and labor market outcomes is widely acknowledged, but relatively little is known about how non-cognitive skills may shape educational investments by parents early in life. This paper evaluates the parental response to variation in non-cognitive skills among their children in rural Gansu province, China, employing a household fixed effects specification. The results suggest that on average, parents invest no more in terms of educational expenditure in children who have better non-cognitive skills relative to their siblings. However, there is significant heterogeneity with respect to maternal education; less educated mothers appear to reinforce differences in non-cognitive skills between their children, while more educated mothers compensate for these differences. The evidence is consistent with this pattern corresponding to greater bargaining power for more educated mothers and different preferences for compensation among more educated women. In addition, there is evidence that these compensatory investments lead to catch-up in non-cognitive skills over time for children of more educated mothers.

1 Introduction

In recent years, both research and policy debates have placed increasing emphasis on the importance of non-cognitive skills in determining long-term economic outcomes. Data primarily from industrialized countries has suggested that non-cognitive skills have a large impact on adult economic welfare, measured as earnings and labor productivity (Heckman and Rubinstein, 2001; Heckman,

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Stixrud and Urzua, 2006; Cunha, Heckman, Lochner and Masterov, 2006; Carneiro, Crawford and Goodman, 2007). There are many possible causal pathways through which stronger non-cognitive skills may lead to improved educational and economic outcomes: individuals with enhanced skills are more likely to be persistent in achieving strong academic outcomes or building professional expertise, may be more resilient in the face of setbacks, or may be better able to forge useful professional relationships. One particularly important channel, however, is the relationship forged much earlier in life between children and their parents.

Variation in non-cognitive skills among children may affect parental investments in several ways. First, variation in non-cognitive skills could alter the weight that a parent places on that child's welfare or future income in his/her utility function. Parents could favor a child with stronger non-cognitive skills with whom they forge a stronger relationship, or a child with weaker non-cognitive skills if s/he seems to require more nurturing. Second, even if the weight parents place on their children's welfare is unchanged, non-cognitive skills will affect children's future income, and may affect the returns to human capital investment in a given child.

Depending on whether parents emphasize efficiency or equality, they may then invest more or less in human capital development for children of varying levels of non-cognitive skills. Given that a number of evaluations have found that targeted early intervention can affect children's non-cognitive skills,[1] understanding whether these interventions crowd parental investment in or out may be a useful contribution to the ongoing policy debate about how best to develop non-cognitive skills.

The objective of this paper is to analyze whether non-cognitive skills measured in childhood and adolescence have a significant impact on the within-household allocation of educational expenditure among households in rural Gansu province, China. We employ a panel dataset that provides a particularly detailed set of outcome measures for a large cohort of children in one of the poorest provinces in China. Focusing on a sample of two-children families, our primary specification examines how parents respond to differences in non-cognitive skills between siblings conditional on household fixed effects, and whether this response varies based on the characteristics of the parents.

Our results suggest that while parents are not responsive to differences in non-cognitive skills on average—neither reinforcing nor compensating for these differences—there is significant heterogeneity with respect to characteristics of the parents, and particularly the mother. Households with more educated mothers show evidence of significantly more compensatory investment compared to households with less educated mothers. For a child who exhibits non-cognitive skills that are one standard deviation lower than his/her sibling, an increase in maternal education from the 25th to the 75th percentile, or from one to five years of maternal education, would result in an increase in discretionary educational expenditure (comprising all educational expenditure excluding tuition) directed to this child of nearly 30%. There is also an increase in tuition directed to this child of

[1]The results from the Perry preschool study as reported in Schweinhart et al. (2005) are among the best known in this respect.

around 5%, though this effect is noisily estimated.

These results are estimated conditional on household fixed effects, and thus control for common observed and unobserved characteristics within the household. There is very little evidence of comparable heterogeneity with respect to the education of the father.

This observed pattern of heterogeneous response—more compensation in households with a more educated mother—could be consistent with a number of possible channels. More educated mothers may simply be better able to recognize the non-cognitive deficits in their children and to compensate appropriately. Maternal education may simply be a proxy for income or other household characteristics, and higher-income households may have a preference for intrahousehold compensation. Alternatively, women may have a preference for compensatory investments while men do not, and more educated women may have greater bargaining power and the ability to impose this preference within the household. It is also possible that more educated women have a stronger preference for compensatory investment compared to less educated women.

Further exploration suggests that the first two channels are not particularly salient in this context: there is little evidence consistent with parental learning or higher income leading to a compensatory response by more educated mothers. However, it does seem that greater bargaining power by more educated mothers is a relevant channel. We also cannot rule out that more educated mothers have different preferences compared to less educated mothers.

In the final section of the paper, we analyze whether this variation in compensatory vis-a-vis reinforcing behavior results in catch-up in non-cognitive skills over time for children in households with more educated mothers—where struggling children receive greater investment—compared to children in households with less educated mothers. Analyzing longitudinal data observed for the first-born child over time, we find evidence of significantly greater catch-up in non-cognitive skills between ages 9-12 and ages 17-20 for children of more educated mothers. In other words, the correlation between maternal education and children's non-cognitive skills is increasing over time. If the economic returns to non-cognitive skills are significant, this is a channel through which inequality across households can widen over time.

Our paper contributes to several related literatures on intrahousehold allocation and human capital investment. First, there is an extensive literature that examines parental responses to differences in children's endowment; Almond and Mazumder (2013) provide a recent review. The evidence here has been mixed. Bharadwaj et al. (2013b), Royer (2009), and Currie and Almond (2011) find little or no evidence of either compensatory or reinforcing behavior. Akresh et al. (2012), Rosenzweig and Zhang (2009), Bharadwaj et al. (2013a), Almond et al. (n.d.), Adhvaryu and Nyshadham (2014) and Aizer and Cunha (2012) find parents exhibit reinforcing behavior in Burkina Faso, China, Chile, Sweden, Tanzania, and the United States, while Del Bono et al. (2012) find evidence of compensatory behavior in breast-feeding decisions and birth weight. Frijters et al. (2013) find evidence of reinforcing behavior with respect to variation in cognitive ability in the

U.S., employing left- or right-handedness as an instrument for cognitive development. Leight (2014) finds evidence of compensating behavior with respect to height-for-age using the same sample as this paper. This literature, however, focuses primarily on parental responses to children's health endowment and cognitive ability. Our paper is one of the first papers that examines whether parents respond to children's non-cognitive skills.[2]

Second, a more nascent literature has sought to analyze the role of parental investments in developing non-cognitive as well as cognitive skills; the most notable paper in this literature is Cunha et al. (2010). Here the primary emphasis has been on the timing of investments, and the complementarity between early and late investments. Given that these papers have focused primarily on industrialized countries where most families have fewer children and parents may be less resource-constrained, the question of within-household competition for parental investment has received less attention.

Finally, our paper contributes to a much larger and older literature nested within the literature on non-unitary models of the household that argues that greater decision-making power for mothers leads to greater investment in children on average (Lundberg et al., 1997). A number of papers have found empirical evidence that greater bargaining power of women in developing countries in particular leads to more investment in health and education for children (Bobonis, 2009; Duflo, 2003; Fafchamps and Quisumbing, 2002; Quisumbing and Maluccio, 2003). However, there is very little evidence of a relationship between maternal bargaining power and a preference for compensatory human capital investment within the household, rather than the overall level of human capital investment. One recent paper focused on the U.S. also finds evidence of educated women investing more time in children with lower birth weight, while less educated women show the opposite pattern (Hsin, 2012). Our paper joins this nascent literature and provides evidence for the first time of variation in compensatory behavior with respect to the education of both parents in a developing country.[3]

The remainder of the paper proceeds as follows. Section 2 describes the data. Section 3 describes the empirical strategy and the primary results, and Section 4 presents robustness checks and evidence about the relevant channels. Section 5 examines the longitudinal evidence about persistence of non-cognitive skills over time, and Section 6 concludes.

[2]The only other relevant paper is Gelber and Isen (2013). While it is not the focus of their work, they report in their appendix that parents respond positively to a child with greater observed non-cognitive abilities.

[3]There is also a related literature that has analyzed whether mothers have a preference for greater gender equity in the allocation of expenditure between children, where the evidence has been mixed. Quisumbing and Maluccio (2003) find in different contexts maternal bargaining power has different impacts on relative investments in boys and girls.

2 Data

The data set used in this paper is the Gansu Survey of Children and Families (GSCF), a panel study of rural children conducted in Gansu province, China. Gansu, located in northwest China, is one of the poorest and most rural provinces in China. The description of the data here draws substantially on the description in Leight (2014).

The first wave of the GSCF was conducted in 2000, and surveyed a representative sample of 2,000 children aged 9–12 in 20 rural counties, supplementing these surveys with additional surveys of their mothers, household heads, teachers, principals, and village leaders. These children are denoted the "index children." All but one of these 2,000 children have complete information in the first wave.

The second wave, implemented in 2004, re-surveyed the first sample of children at age 13–16 and also added a survey of their fathers. 1,872 children, or 93.6% of the original sample, were re-interviewed in the second wave. In addition, surveys were added of the eldest younger sibling of the index child. These additional children are denoted "younger siblings." Surveys are conducted directly with the younger siblings, as well as with their homeroom teachers; in addition, mothers and fathers report limited supplementary information about the younger siblings.

In early 2009, a third wave of surveying was conducted, re-interviewing the index children during Spring Festival, a period at which many of them had returned to their natal villages. In cases where the sampled individual was not available, parents were asked to provide information about their child's education and employment status. 1,437 individuals, or 72% of the original sample, were interviewed directly in this wave, and information was collected in parental interviews for an additional 426 sample children.

The household surveys in waves one (2000) and two (2004) included extensive questions about schooling outcomes, household expenditure on education, child time use, time investments in education by parents and teachers, and child and parental attitudes, as well as more standard socioeconomic variables. The index children also completed a number of achievement and cognitive tests. Younger siblings also completed these tests in wave two.

In addition, each wave of data collection included survey questions posed to the sample children that were designed to measure their non-cognitive skills. In the first and second waves, the survey measured both internalizing and externalizing behavioral challenges: the former refers to intra-personal problems (e.g., withdrawal and anxiety), and the latter to inter-personal problems (destructive behavior, aggression, and hyper-activity). Both measures of non-cognitive skills are constructed by recording the respondent's agreement or disagreement with a series of statements and then applying item response theory (IRT) to generate internalizing and externalizing scores. The measures are identical across waves one and two, and the scores are standardized to have a mean of zero and a standard deviation of one. In the third wave, a Rosenberg self-esteem index and a depressive index were measured. Further detail about the construction of the non-cognitive

skills measures can be found in Glewwe, Huang and Park (2013).

Non-cognitive skills of the younger siblings were measured only in wave two. For ease of interpretation, the primary non-cognitive skills measures employed here (the externalizing and internalizing indices) have been inverted; in the original index, a higher value indicates more challenges, but in our index a higher value indicates better non-cognitive skills.

In this paper, we will focus on a subsample of the families in the survey: those with two children in the household where both children have reported measurements for non-cognitive and cognitive skills in the second-wave survey. If the index children and the younger sibling are the only children in the household, then the surveys provide a complete overview of parental allocations and child endowment. Complete data is available for 388 families drawn from 90 localities in 20 counties, and these households constitute the relevant subsample. In our sample, only 6.5% of households have one child. The remaining households are excluded because the index child has two or more siblings, or has one older sibling for whom non-cognitive ability is not reported. In the robustness checks, we will also present results employing a slightly larger sample including households where these two children (the index child and the younger sibling) are part of a larger family.[4]

Figure 1 summarizes the structure of the sample, including the years in which data is collected, the children that are observed in each wave, and their age at the point of data collection. Note that household-level data is collected in waves one and two.

Panel A of Table 1 reports summary statistics for the subsample of two-children families and the overall sample for key demographic indicators of interest, as well as a t-test for equality between the two means; the covariates reported are measured in the second wave of the survey, the wave in primary use here. It is evident that there are no significant differences in income or parental education between the sample and the subsample. However, households in the subsample are slightly younger and have younger children. This primarily reflects the exclusion of larger families or families in which the index child is the younger child; these families are generally headed by older parents. Importantly, there are also no significant differences between the reported non-cognitive skills and cognitive skills in the second wave for the index children in the full sample and the subsample.

The dependent variable of interest is educational expenditure per child per semester, reported by the head of household in six categories: tuition, educational supplies, food consumed in school, transportation and housing, tutoring, and other fees.[5] Each household separately reports expenditure for each child in each of these categories. Discretionary expenditure is defined as the sum of all expenditures excluding tuition. Summary statistics for average expenditure per child for the

[4]While China's One-Child Policy was in effect during the period in which these children were born, many rural households could nonetheless have two children legally under various exemptions to the policy (Gu et al., 2007). It is not possible using this dataset to accurately identify for each household whether it was in technical compliance with the policy.

[5]In China, textbook fees are mandatory and levied as part of the overall tuition, and here they are likewise reported in the tuition category. Educational supplies is supplies other than textbooks.

subsample of families analyzed can be found in Panel B of Table 1. Total educational expenditure averages around 360 yuan per child per semester, or a total of 1,440 yuan for two children over a year. An average of 20% of household income is allocated to educational expenditure.

We focus on educational expenditure given that it is the primary form of child-specific expenditure reported in this dataset. The only other type of child-specific expenditure reported is medical expenditure over the past year; only 25% of households report any positive medical expenditure for either child over the past year, and unsurprisingly this expenditure is highly correlated with reported illness (i.e., it is reasonable to assume that very little of this expenditure corresponds to preventive care). Given that we are primarily interested in human capital investment with long-term returns, we do not focus on medical expenditure.

3 Empirical strategy and results

3.1 Empirical strategy

Our empirical strategy entails evaluating whether parental expenditure on education for children is correlated with measures of non-cognitive skills, conditional on household fixed effects. In other words, our primary specification identifies whether parents are more likely to invest in a child who has stronger non-cognitive skills relative to a sibling. The child's observed non-cognitive skills will be denoted $Ncog_{ihct}$, for child i in household h, living in county c and born in year t: the non-cognitive variables employed will include the externalizing and internalizing index, as well as a summary measure of non-cognitive skills that is the mean of the two indices.

All non-cognitive indices have been standardized to have means equal to zero and standard deviations equal to one. The original indices in this case are constructed such that a higher value is indicative of more severe challenges in the specified domain, and thus weaker non-cognitive skills. In order to facilitate interpretation, the indices here have been inverted such that a higher value is indicative of stronger non-cognitive skills.

The dependent variable, educational expenditure, is denoted Y_{ihct}. The specification includes household fixed effects η_h, year-of-birth fixed effects ν_t, and a vector of child-level covariates X_{ihct}, yielding the following equation. Child-level covariates include gender, the sibling's gender, birth parity (i.e., whether a child is first-born or second-born), height-for-age, reported grades in school, and scores on grade-specific achievement tests administered in math and Chinese. This specification is estimated with and without interactions with parental education S_{hct}.[6] Standard errors will be clustered at the county level in all specifications.[7]

$$Y_{ihct} = \beta_1 Ncog_{ihct} + \beta_2 Ncog_{ihct} \times S_{hct} + X_{ihct} + \nu_t + \eta_h + \epsilon_{ihct} \quad (1)$$

[6] The direct effect of varying parental education on non-cognitive skills is absorbed by the household fixed effects.

[7] We regard clustering at the county level as a conservative strategy for inference. Our subsample includes 20 counties and 90 villages; our results are also consistent if we cluster at the village level.

The identification assumption for this family of specifications requires that non-cognitive skills are uncorrelated with other unobservable variables that determine parental allocations. This assumption would be violated, for example, if parents invest more in a favored child, who is then observed to have stronger non-cognitive skills.

In order to present some preliminary evidence about the relationship between non-cognitive skills and child characteristics conditional on household fixed effects, the following specifications can be estimated, regressing the internalizing and externalizing indices on child covariates X_{ihct}, conditional on household fixed effects.

$$Ncog_{ihct} = \beta_1 X_{ihct} + \eta_h + \epsilon_{ihct} \tag{2}$$

The results can be found in Table 2: Panel A reports the correlations with sibling parity, age, gender, and grade level, and Panel B reports the correlations with various measures of the child's endowment. Interestingly, in Panel A there is no evidence of any significant correlation between the internalizing index and any child characteristic. However, for the externalizing index we observe that non-cognitive skills are weaker for second-born children, children who are younger on average, boys and children enrolled in lower grades in school. There is, of course, a high degree of correlation among these covariates: second-born children are on average younger, enrolled in lower grades, and more likely to be boys.[8] Columns (9) and (10) show the results of a multiple regression including all four covariates; there is some evidence here that the most robust correlations are between gender and grade level and the externalizing index.

Panel B shows that there is little evidence of significant correlations between non-cognitive skills and other measures of endowment: specifically, height-for-age, and various measures of cognitive skills. This includes the child's grades reported in the last academic year in math and Chinese, and their score on a grade-specific achievement test. The only exception is a significant correlation between the internalizing index and the achievement test score.

In light of these results, the primary specifications all include year-of-birth fixed effects as well as controls for gender, sibling's gender, sibling parity, height-for-age, and all three reported measures of cognitive skills as measured in the second wave, contemporaneously with non-cognitive skills. The inclusion of grade fixed effects is more complex; given that the primary dependent variable of interest is educational expenditure, grade level can plausibly be considered an outcome. However, the primary results will also be robust to the inclusion of grade fixed effects.

Given that the primary specifications are estimated conditional on household and year-of-birth fixed effects, it is also useful to examine how much variation in the child characteristics of interest is observed within a given household and within a given birth year. Table A1 in the Appendix

[8]The implications of gender selection for this analysis will be explored in greater detail in Section 4.2. Around 40% of children in the primary sample are girls; however, 49% of first-born children are girls, a ratio not significantly different from 0.5, while only 31% of second-born children are girls. This is consistent with other anthropological evidence indicating that sex selection in China occurs primarily after the first birth.

reports the R-squared in a simple regression including only the specified fixed effects as explanatory variables and the specified measure of non-cognitive or cognitive skills as the dependent variable. In general, between 50% and 60% of the variation in non-cognitive skills is explained by household fixed effects, suggesting there is still considerable within-household variation.

3.2 Primary results

Table 3 shows the results of estimating equation (1) without the interaction terms with parental education. The objective is to test whether parental allocations of educational expenditure are responsive, on average, to variation in non-cognitive skills between siblings; the measures of expenditure include total expenditure, discretionary expenditure (the sum of all expenditure excluding tuition), and six individual categories. Enrollment is universal among the subsample of interest, and thus school enrollment is not reported as an outcome. The results show coefficients that are small in magnitude, varying in sign, and generally insignificant, with the exception of one marginally significant coefficient in Panel B. In particular, there is no evidence of a significant effect for total or discretionary expenditure. This suggests that parents are neither systematically compensating children with weaker non-cognitive skills, nor systematically reinforcing these differences by directing more expenditure to the child with greater skills.[9]

In light of this pattern, we then examine whether parents who themselves have certain characteristics are more likely to respond to measured differences in the non-cognitive skills of their children. The most obvious relevant characteristic is education. There is limited variation in occupational structure among these households, who are all living in rural counties and primarily dependent on agriculture; there is also limited variation in ethnicity, religion, or cultural background. While the average level of education reported is relatively low—four years for mothers and seven years for fathers—there is considerable variation. Around 75% of mothers report completing at least one year of formal schooling, and 10% report completing junior high school. For fathers, around 90% report completing at least one year of formal schooling, and 10% report completing senior high school.

Figure 2 shows histograms of the distribution of both maternal and paternal education. The correlation between maternal and paternal education is positive, but low in magnitude (around .3). Unsurprisingly, education of both parents is also positively correlated with income and other measures of household wealth.

In addition, Figures 3a and 3b show the distribution of intrahousehold (between-sibling) differences in non-cognitive skills and in normalized expenditure residuals for households at different levels of maternal education. We can observe that the mean absolute difference in non-cognitive skills between siblings is around .75 standard deviations, and this is roughly constant across house-

[9] In regressions not shown, we explore the hypothesis that parents respond to differences in non-cognitive skills differently for children of varying age or gender, and find that interaction terms between non-cognitive skills and age and gender are uniformly insignificant. Tabulations available upon request.

holds of different levels of maternal education. Normalized expenditure residuals are calculated by regressing expenditure on child characteristics (gender, birth parity, cognitive skills, and height-for-age), generating the residuals and standardizing them to have mean zero and standard deviation one. The mean absolute difference is around .4 standard deviations, and this seems to be larger at higher levels of maternal education.

To identify whether parents who are more educated respond differentially to differences in non-cognitive skills, we then re-estimate equation (1) including interaction terms between non-cognitive skills and parental education. Again, the specification includes controls for a wide range of child characteristics including gender, sibling parity, and cognitive skills, and household and year-of-birth fixed effects. The results analyzing variation in parental response to children's non-cognitive skills with respect to parental education are reported in Table 4.

We observe a robust pattern in which households in which mothers have low levels of education (roughly speaking, fewer than three years of schooling) provide more expenditure to children with better non-cognitive skills, reinforcing the pre-existing differences, while households with more educated mothers seem to engage in compensatory behavior, providing more expenditure to children with worse skills. This is evident in the negative coefficients on the interaction term between non-cognitive indices and maternal education. This pattern is observed for both total educational expenditure and discretionary expenditure.[10]

The interaction terms for paternal education, on the other hand, are smaller in magnitude, heterogeneous in sign, and generally not statistically significant. Panels B and D report the p-values testing equality of coefficients on the interaction terms for maternal and paternal education for the internalizing and externalizing indices, respectively.[11] These coefficients are denoted β_2^m and β_2^f, where β_2^m refers to the coefficient on the interaction term for maternal education, and β_2^f refers to the analogous coefficient for paternal education. While the imprecision in the coefficients on the paternal education interaction term does not allow us to reject equality in all cases, we can reject the hypothesis that the coefficient on the maternal and the parental education interaction terms is equal in both specifications employing total and discretionary expenditure as the dependent variable, as well as in several additional specifications.

The magnitudes of the implied effects are also substantial. For example, consider a child who exhibits non-cognitive skills (as measured by the internalizing index) that are one standard deviation lower than his/her sibling. The coefficient on the interaction term suggests that an increase in maternal education from the 25th to the 75th percentile, or from one to five years of maternal education, would result in an increase in discretionary educational expenditure for this child compared to his/her sibling of 29%. The magnitudes are very similar for the coefficients estimated for

[10] Aizer and Cunha (2012) find that the degree of parental reinforcing behaviors increases with family size. Our finding cannot be explained by variation in family size since we restrict the sample to only those households with two children.

[11] This test is implemented by estimating the two specifications simultaneously in a seemingly unrelated regression framework, and then testing equality of the the coefficients on the two interaction terms.

the internalizing index in Panel C. The results are robust to the inclusion of grade fixed effects, and are also robust to re-formulating the non-cognitive variables as percentile rank variables. They are also consistent if estimated unconditional on cognitive skills and other endowment measures.[12]

We also re-estimate these results using two alternate samples. First, we employ the full sample of all households where the number of children is greater than or equal to two, rather than restricting to households in which the index child and his or her younger sibling are the only children in the family. (Less than 10% of the sample of interest are households with only one child.) This yields a sample of 566 households or 1,132 children, and the estimation results can be found in Table A2. The interaction terms on maternal education are again negative and and of roughly equal magnitude, suggesting that the observed pattern of compensation in households with more educated mothers is not limited to households of a particular size. (Households in which the index child has an older sibling and no younger siblings are still not observed in this sample due to the absence of data on the older sibling. However, the evidence presented in Table 1 suggests that there is no significant difference in household characteristics or the non-cognitive or cognitive skills of the index child when comparing index children observed in the subsample to the full sample.)

We also explore whether there is evidence of a correlation between birth spacing (between the first- and second-born child) and maternal education that could be an alternate channel for the detected pattern. There is no evidence of any correlation between birth spacing and maternal or paternal education, and no evidence that parents respond differentially to non-cognitive skills in households with different spacing between the two siblings.[13]

Second, it should be noted that gender cannot be considered to be exogenous in this sample; in fact, nearly 70% of second-born children are boys. However, consistent with existing anthropological evidence, there is little evidence of sex selection prior to the first birth (Gu et al., 2007). The gender ratio for first-born children is not significantly different from .5, and the gender ratio for second-born children who follow the birth of a son is also not significantly different from .5. Thus, sex selection is a phenomenon primarily observed after the birth of a first-born girl. Accordingly, if we restrict the sample to households reporting a first-born son, the distribution of gender among children in these households can plausibly be considered quasi-exogenous. Re-estimating the primary specification for this smaller sample generates the same observed pattern of results.[14]

To sum up, there seems to be robust evidence that parents do respond to non-cognitive skills in allocating investment, but this response is very different in households with differing levels of maternal education.[15]

[12]Tabulations are not reported for concision, but are available upon request.

[13]To be more specific, if we re-estimate equation (1) adding an interaction between birth spacing and non-cognitive skills, this interaction is consistently insignificant. The interaction between maternal education and education remains significant and of comparable magnitude.

[14]Tabulations are not reported for concision, but are available upon request.

[15]If we replace the non-cognitive skills interaction terms with interaction terms including cognitive skills and height-for-age in equation (1), the estimated coefficients β_1 and β_2 have the same sign as the results employing non-cognitive skills. However, one should be cautious in interpreting the results since using the same dataset, Leight (2014) presents

4 Robustness checks and channels

4.1 Robustness checks

Parental favoritism Parental favoritism may interact with non-cognitive skills in two ways. First, if a child with better non-cognitive skills is more likely to be the parental favorite and thus receives more parental investment, favoritism could be interpreted as a channel through which non-cognitive skills affect educational investment. Second, if parents choose a favorite child early in life, invest more in this favored child, and s/he is then observed to have better non-cognitive skills, this could be a source of bias in our primary specification. The direction of the bias in this case will be towards the detection of reinforcing behavior: i.e., this will generate upward bias on the estimated coefficient β_1. There will be downward bias in the estimation of β_2, the interaction term with parental education, if households with more educated mothers systematically exhibit less favoritism vis-a-vis households with less educated mothers.

We implement two tests to evaluate whether favoritism is relevant in this analysis. First, we exploit questions in the survey of mothers in which she reports the identity of the children who will provide more emotional and economic support in the future. We designate a child as a favorite if s/he is identified as the primary source of both emotional and economic support, and examine whether more educated mothers are more likely to provide more expenditure to their favorite children, conditional on non-cognitive skills and the full set of child characteristic controls already reported. Importantly, there is no significant correlation between non-cognitive skills and the identity of the favorite child, nor is there any heterogeneity in this correlation with respect to maternal education, suggesting that it is not the case that children with stronger non-cognitive skills are more likely to build relationships with parents and be identified as the favorite.

The specification of interest is as follows, where F_{ihct} denotes a dummy for favorite, equal to one if a given child is the reported favorite and zero otherwise.

$$Y_{ihct} = \beta_1 Ncog_{ihct} + \beta_2 Ncog_{ihct} \times S_{hct} + \beta_3 F_{ihct} + \beta_4 F_{hct} \times S_{hct} + \beta_5 X_{ihct} + \nu_t + \eta_h + \epsilon_{ihct} \quad (3)$$

The results are reported in Panel A of Table A3.[16] In general, there is no systematic preference in expenditure for the favored child; there is some evidence of greater preference for the favored child among more educated mothers, but the difference is not significant.[17] These results suggest that favoritism is unlikely to be a particularly important channel for the observed pattern of compensation. In assessing bias in the main specification, the fact that more educated mothers may exhibit slightly greater favoritism among their children would generate bias in the opposite

evidence that height-for-age is highly correlated with past parental investments.

[16] For concision, only the core sample of two-child households is employed in this analysis.

[17] It is also useful to note that the favorite child is significantly more likely to be a boy, though there is no significant variation in this relationship with respect to maternal education. Adding an interaction term between gender and maternal education to the primary specification also does not affect the results.

direction of the observed effect.

Serial correlation in investment However, given that our measure of parental favoritism is no doubt not fully informative, we also perform an additional test to evaluate the potential for bias in the primary specifications due to serial correlation in parental investment. We presume that there is limited scope for parental investment (via educational expenditure or other, correlated measures of investment) to affect non-cognitive skills prior to primary school. Accordingly, we construct a new variable $Ncog^{prim}_{ihct}$ that is defined as non-cognitive skills at primary school age, as observed in wave one for the older sibling or wave two for the younger sibling. We similarly define expenditure measures at primary school age Y^{prim}_{ihct}. We then estimate a specification prior to the specification of interest, though rather than using year-of-birth fixed effects, we employ fixed effects for the age of the child in the survey year, ν_{age}.

$$Y^{prim}_{ihct} = \beta_1 Ncog^{prim}_{ihct} + \beta_2 Ncog^{prim}_{ihct} \times S_{hct} + \beta_3 X_{ihct} + \nu_{age} + \eta_h + \epsilon_{ihct} \tag{4}$$

The results from estimating equation (4) are reported in Table A4.[18] We observe a similar pattern to the primary results: evidence of greater compensation in households with more educated mothers, and no systematic variation with respect to paternal education. While the coefficients are smaller in magnitude, the mean levels of expenditure are also lower when we examine only children at primary school age. The estimated coefficients suggest that a one standard deviation increase in maternal education leads to an increase in discretionary expenditure directed to a child with one standard deviation lower non-cognitive skills of around 22%, compared to an effect size of 29% using the original specification. This result is consistent with the hypothesis that the observed pattern does not solely reflect bias introduced by differential prior investment.

Alternate measures of non-cognitive skills Our primary measure of non-cognitive skills is based on children's self-reported status. This may raise questions about noise in the data, especially given that some children in the sample are relatively young. In particular, it is possible that children from some households are better able to understand and respond to the questions designed to elicit measures of their non-cognitive skills; this could result, for example, in a pattern in which there is greater measurement error in non-cognitive skills in households with less educated mothers. While in general this would result in attenuation of the coefficients on non-cognitive skills for children from households with less educated mothers, it is useful to verify that the observed results are robust to alternate measures.

The other measure of non-cognitive skills available in this data is drawn from surveys of the children's teachers, who are asked to report whether a child possesses a series of eight characteristics,

[18] The sample is slightly smaller than in the primary results (10 observations missing) due to the absence of detailed expenditure data in wave one for five households.

both positive and negative.[19] Given the limited variation in this teacher-reported measure, which has only eight unique values, we construct a dummy variable equal to one if the teacher's reports of the child's characteristics places him or her in the top half of all children, denoted $Tcog^D_{ihct}$. We then estimate a specification parallel to our primary specification of interest, employing this dummy variable as a measure of non-cognitive skills.

$$Y_{ihct} = \beta_1 Tcog^D_{ihct} + \beta_2 Tcog^D_{ihct} \times S_{hct} + \beta_3 X_{ihct} + \nu_t + \eta_h + \epsilon_{ihct} \quad (5)$$

The results are reported in Table A5 and show the same pattern of greater compensation in households with more educated mothers. The magnitude observed is similar to the magnitude in a parallel specification using a dummy variable constructed from the original self-reported non-cognitive skills measure.[20]

This evidence suggests that the observed pattern of differential compensation for adverse non-cognitive skills in households with more educated mothers is not an artifact of the non-cognitive self-reports. However, we preferentially use the measures of non-cognitive skills derived from self-reports given that these measures have greater variation, and only self-reported measures can be employed in the longitudinal analysis discussed in Section 5 examining persistence of non-cognitive skills into young adulthood. Teacher reports are, clearly, no longer available for the index children once they have completed secondary school.[21]

4.2 Channels

There are at least four channels that would be consistent with the observed pattern of compensation only in high maternal education households. First, more educated mothers may simply be better able to learn about variation in non-cognitive skills among their children, while less educated mothers do not acquire this information. (By contrast, more educated fathers are no better able to recognize differences in non-cognitive skills compared to less educated fathers.)

Second, maternal education may simply be a proxy for income or other household characteristics, and higher-income households may have a preference for compensatory investment.

Third, households where mothers are more educated may be households where mothers have greater bargaining power and a greater ability to impose their preferences around intrahousehold allocation, assuming on average mothers do in fact have a preference for compensatory investment.[22]

[19] This series includes whether the child is smart, conscientious, reasonable/well-mannered, clean, enjoys work, is lively/imaginative, gets along with others, likes to cry, or lacks confidence.

[20] If the same specification is re-estimated using the continuous teacher-reported measure, the reports are close to significant at conventional levels using the full sample, and significant if left-tail outliers are trimmed.

[21] The survey also reports maternal assessments of the child's non-cognitive skills but only for the index child, rendering an evaluation of the impact of non-cognitive skills on allocations within a household impossible. This data will be exploited in another robustness check reported in Section 4.2.

[22] This assumption is consistent with the finding that women are more inequality-averse in experimental literature

In households where mothers are less educated, the paternal preference may dominate, and this may entail a weaker preference for intrahousehold compensation. Fourth, it is also possible that more educated women have a greater preference for compensatory investment compared to less educated women. We will seek to present evidence about each potential channel in turn.

Parental learning about child characteristics The first postulated channel is that more educated mothers are better able to recognize deficits in non-cognitive skills among their children and respond appropriately, while less educated mothers do not recognize deficits in non-cognitive skills. It is also possible that more educated mothers acquire information about the returns to investing in children with weak non-cognitive skills that less educated mothers do not acquire. In either case, it is also necessary to assume there is no correlation between paternal education and the relevant information acquisition process.

If this channel is important, then ceteris paribus we would expect more compensation among parents who spend more time with their children, and thus have the opportunity to learn more about their child's characteristics and/or how these characteristics affect the returns to investment on that child. In this survey, parents report the time spent in a typical week either playing with or talking to children; about 65% of both mothers and fathers report that in a typical week they spend any time on either of these activities. (They do not report the division of this time between children.) There is a positive, albeit relatively weak, correlation between parental education and time spent with children.

In order to test whether the observed pattern in fact reflects a process in which educated mothers spend more time with their children and thus learn more about their characteristics, we estimate the following specification including the original interaction term between non-cognitive skills and parental education, and adding an interaction term between non-cognitive skills and average hours spent per week with children $Time_{hct}$ for both the mother and the father. (In order to enable comparison of the coefficients on the two variables, in each specification the time variable is re-scaled to have the same mean as the parental education variable.) The same control variables included in the primary specification are included, and standard errors are clustered at the county level.

$$\begin{aligned} Y_{ihct} &= \beta_1 Ncog_{ihct} + \beta_2 Noncog_{ihct} \times S_{hct} + \beta_3 Noncog_{ihct} \times Time_{hct} + \beta_4 X_{ihct} \\ &+ \nu_t + \eta_h + \epsilon_{ihct} \end{aligned} \tag{6}$$

The results can be found in Panels A and B of Table 5; Panel A reports the results employing maternal education and maternal time, while Panel B reports corresponding results for the father.

(Andreoni and Vesterlund, 2001; Dickinson and Tiefenthaler, 2002; Selten and Ockenfels, 1998; Dufwenberg and Muren, 2006). For example, Andreoni and Vesterlund (2001) find that women are more concerned about equalizing earnings during experiments, while men are more focused on maximizing efficiency.

We can observe that the coefficients β_2 remain highly significant and negative for the mother. While the estimated coefficients β_3 are negative, indicating there is some evidence that mothers who spend more time with their children do compensate more, they are small in magnitude and generally insignificant. For fathers, the evidence suggests that if anything, fathers who spend more time with their children compensate less.[23]

However, it is also important to note that if the most important information educated mothers acquire is information about variation in the returns to investment with respect to child characteristics, rather than variation in child characteristics, this learning process may be largely unrelated to time spent with the child. In that case, the test implemented here would have limited power.

In addition, in the survey of mothers, there is a set of questions related to a child's non-cognitive skills in which each mother reports whether she agrees or disagrees with a set of statements related to her child's shyness, emotional stability, interaction with friends, temper, self-esteem, stubbornness, etc. We can employ this data to create an index of the mother's perceptions of a child's non-cognitive skills. This data is only available for the index (elder) child, so we cannot use it in our main analysis to compare across siblings. However, we can evaluate whether more educated mothers can better predict their children's self-reported non-cognitive score; in fact, there is no evidence of any relationship between maternal education and the accuracy of their assessment.[24]

Maternal education as a proxy for income The second postulated channel that could be consistent with the observed pattern of differential compensation in high maternal education households is that maternal education is a proxy for household income, and higher-income parents prefer compensatory investment. This is a priori somewhat less plausible given that there are no parallel effects for paternal education, and in the sample of interest there is no evidence that maternal education is more closely correlated with household income when compared to paternal education. In fact, there is no significant difference between the magnitude of the cross-household correlation between maternal education and income, and the magnitude of the correlation between paternal education and income.

However, a simple test of this hypothesis can be estimated by adding an interaction term between household income and non-cognitive skills to the primary specifications. This yields the following estimating equations, where I_{hct} denotes household income; income and maternal education are re-scaled to have the same mean in order to allow for comparison of the coefficient magnitudes.

$$Y_{ihct} = \beta_1 Ncog_{ihct} + \beta_2 Ncog_{ihct} \times S_{hct} + \beta_3 In_{ihct} \times I_{hct} + \beta_4 X_{ihct} + \nu_t + \eta_h + \epsilon_{ihct} \qquad (7)$$

[23] If this specification is re-estimated including the triple interaction between parental education and time invested, the triple interaction terms are generally negative, though rarely significant. This also suggests that educated parents who spend more time with their children are not compensating weaker children more, compared to educated parents who spend less time with their children. If anything, they engage in less compensatory behavior. Tabulations are not reported, but are available on request.

[24] Tabulations are not reported for concision, but are available upon request.

The results of estimating equation (7) employing the education of the mother as the measure of parental education can be found in Table 6. It is evident that the coefficients β_3 on the income interaction terms are small in magnitude, inconsistent in sign, and generally insignificant.[25] The coefficients on the maternal education interaction terms, by contrast, remain consistently negative and significant. We also re-estimate this specification employing indices of productive assets and durable household goods owned by the household, rather than income. We observe some evidence of greater compensation among higher-asset households, though not among households reporting more ownership of durable goods; importantly, however, the coefficient β_2 remains negative, significant, and of consistent magnitude. This suggests it is unlikely the primary results reflect shifts in parental preferences in higher-income households.

Bargaining power and maternal education Finally, we seek to evaluate whether there is evidence consistent with the hypothesis that maternal education is a proxy for the mother's bargaining power. In our data, mothers are asked to report who within the household makes certain types of decisions, and we employ this data to construct two measures of household decision-making power. The first is a general decision-making index ranging from zero to seven. The maximum score, seven, indicates that the mother reports that she makes every one of the seven types of decisions referenced in the survey, whereas the minimum score, zero, indicates that the mother does not make any of the decisions.[26] Given that our main outcome is educational expenditure on children, we also construct a second measure capturing whether the mother makes decisions related to parenting and children's education. This measure ranges from zero to two, where zero indicates that the mother reports no control over parenting and educational decisions, and two indicates she reports sole control.

We then regress these decision-making measures on both the mother's education and the difference in education in two simple specifications, including household control variables (net income, per-capita income, and age of both parents) and county fixed effects. The decision-making variables are denoted Dec_{hct}.

$$Dec_{hct} = \beta_1 S^m_{hct} + \kappa_c + X_{hct} + \epsilon_{hct} \quad (8)$$

$$Dec_{hct} = \beta_1 S^{dif}_{hct} + \kappa_c + X_{hct} + \epsilon_{hct} \quad (9)$$

The results are reported in Panel A of Table 7, and suggest that there is generally a positive correlation between maternal education and the mother's reported decision-making power. We can also conduct a more indirect test, not reported, in which we evaluate whether total household expenditure in certain categories (children's education, and children's healthcare) is correlated with

[25] Again, this result is identical if the larger sample of households with two children observed is employed.

[26] These include decisions about children's schooling, purchase of durable goods, choice of crops, purchase of livestock, managing family finances, parenting methods, and household management.

the mother's education, conditional on household characteristics including household income. We find that total educational expenditure is higher in households with more educated mothers, and there is weak evidence of more expenditure on children's healthcare.[27] (Interestingly, there is no evidence of greater decision-making power for mothers of sons.)

The observed patterns of decision-making and expenditure seem to suggest that maternal education is in fact a plausible proxy for the mother's bargaining power within the household.[28] However, this evidence of greater bargaining power for more educated mothers is only useful in interpreting the primary results if mothers in fact do have a relatively greater preference for intrahousehold compensation vis-a-vis fathers. We do not have any direct evidence about the differences in preferences across parents, but we can test whether greater bargaining power is correlated with greater compensation by re-estimating the primary specification, adding an interaction term between the non-cognitive index and a dummy variable capturing the mother's reported decision-making power around parenting decisions; the dummy variable is defined equal to one if she reports any decision-making power around parenting decisions, and zero otherwise. The specification of interest can thus be written as follows, where Dec^D_{hct} denotes the decision-making dummy.

$$\begin{aligned} Y_{ihct} &= \beta_1 Noncog_{ihct} + \beta_2 Noncog_{ihct} \times S_{hct} + \beta_3 Noncog_{ihct} \times Dec^D_{hct} + \beta_4 X_{ihct} \\ &+ \nu_t + \eta_h + \epsilon_{ihct} \end{aligned} \tag{10}$$

The results are reported in Panel B of Table 7, and the estimated coefficient β_3 is significant and negative, consistent with households in which mothers have more decision-making power compensating children with worse non-cognitive skills more.[29] Again, mothers who are more educated and/or who have more bargaining power—characteristics that are closely correlated— appear to be able to exercise a preference for greater within-household compensation.

However, it is also important to note that the coefficients β_2 on maternal schooling also remain significant and large in magnitude. This may suggest that bargaining power is not the only channel through which maternal education affects compensatory behavior. More educated women may also have different preferences, opting for more compensatory investment. Though the evidence suggests greater bargaining power is important, we cannot rule out that more educated mothers also have different preferences compared to less educated mothers.

These results also raise the question of whether it is solely the level of maternal education that affects observed decisions about child investment, or the difference between maternal and paternal education. If we re-estimate the primary results restricting the sample to households where parents

[27] Tabulations are not reported for concision, but are available upon request.

[28] These results are similar, though less precise, if estimated for the larger sample of households with two children observed.

[29] These results are not significant when the continuous measure of decision-making power is employed, suggesting that there is some non-linearity in the relationship between maternal bargaining power and parental compensation.

are relatively close in education (i.e., excluding households falling in the top and bottom 25% of the distribution of the within-household educational gap), we observe that more educated women still report greater decision-making power, and households with more educated women still show evidence of greater compensation. In other words, high-education women married to high-education men exhibit more compensatory behavior than low-education women married to low-education men. This suggests that the level of education is important.

However, we can also re-estimate our primary specification by replacing the interaction of maternal education and non-cognitive skills with the interaction of the difference in education (maternal minus paternal) and non-cognitive skills, and we also observe greater compensation in households where the difference in education is more positive. In other words, low-education women married to low-education men show more compensatory behavior than low-education women married to high-education men. This evidence, in conjunction with the results presented in Panel A of Table 7, suggests that the difference in education is also relevant.[30]

Both the difference in education and the level of education seem important in determining parents' joint decision. This is consistent with higher education for mothers leading to both more bargaining power for women within the household and a greater preference for compensation.

5 Catch-up in non-cognitive skills over time

Given the evidence about compensatory investment in households with educated mothers, it is plausible to hypothesize that over time, children of educated mothers with worse non-cognitive skills should begin to catch up relative to their siblings (assuming, of course, that there are in fact positive returns to educational expenditure in that increased expenditure leads to enhanced non-cognitive skills). In other words, the persistence over time of non-cognitive challenges should be weaker for children of highly educated mothers.

In this data, the younger sibling is only observed once (in the second wave of the survey employed here), while the older sibling is observed in all three survey waves. Accordingly, to test whether catch-up in non-cognitive skills is more evident in more educated households, we examine whether the longitudinal correlation in child characteristics for the older child is weaker in households with a more educated mother.[31] More specifically, we regress various measures of non-cognitive skills

[30]The fact that the difference in education is also correlated with greater compensation also suggests that it is unlikely that greater compensation in higher maternal-education households reflects a pattern of assortative mating in which high-education women choose spouses whose preferences match their own. Even comparing across households where the woman is relatively uneducated, and thus presumably commands less power in the marriage market, we observe that a woman who is relatively more educated within her household is able to exert a preference for greater compensation.

[31]Another test that could be implemented is to examine whether the absolute difference in human capital characteristics between the first-born and second-born children is narrower in wave two in households with more educated mothers. This would be consistent with compensatory investment already successfully leading to "catch-up" by the weaker sibling. This test shows no significant differences in the absolute difference comparing across households with more or less educated mothers. Tabulations are not reported for concision, but are available upon request.

observed in 2009 and 2004 on earlier measures of non-cognitive skills for the same child. In 2009, the psychometric measures include a Rosenberg index of self-esteem, and an index of depression.[32] In 2004, internalizing and externalizing indices are reported as already noted; in 2000, the internalizing and externalizing indices are reported, as well as a self-esteem measure.

In the psychology literature, it is also common to use rank-order measures for personality traits (Shiner and Caspi, 2003; Roberts and DelVecchio, 2000). This is particularly relevant when employing longitudinal data in which subjects are observed at very different ages. Accordingly, for this analysis we convert all the non-cognitive measures into percentile measures ranking the child with respect to children of the same gender and the same age group; the child with the strongest non-cognitive skills is assigned the highest percentile.[33]

These measures of non-cognitive skills will be denoted $Psych_{ihct}$ for child i in household h in county c born in year t, and the superscript will indicate the year in which the data was observed. Thus the primary equations of interest can be written as follows, regressing non-cognitive outcomes on outcomes from the previous wave and the interaction of the previous outcome with a household-level input that can lead to catch up in non-cognitive skills, I_{hct}. I_{hct} can be a dummy variable for the mother or father having a high level of education (above the median), or reported discretionary educational expenditure on the child of interest in the previous wave. We also include an interaction term with household net income as measured in 2004. The specifications of interest are written as follows.

$$\begin{aligned} Ncog_{ihct}^{2009} &= \beta_1 Ncog_{ihct}^{2004} + \beta_2 Ncog_{ihct}^{2004} \times I_{hct} + \beta_3 Ncog_{ihct}^{2004} \times Inc_{hct} \quad (11) \\ &+ \beta_4 X_{hct} + \nu_t + \kappa_c + \epsilon_{ihct} \\ Ncog_{ihct}^{2004} &= \beta_1 Ncog_{ihct}^{2000} + \beta_2 Ncog_{ihct}^{2000} \times I_{hct} + \beta_3 Ncog_{ihct}^{2004} \times Inc_{hct} \quad (12) \\ &+ \beta_4 X_{hct} + \nu_t + \kappa_c + \epsilon_{ihct} \end{aligned}$$

X_{ihct} denotes a vector of child- and household-level controls, and standard errors are clustered at the county level. The control variables of interest are drawn from the same set of covariates employed in the earlier analysis: cognitive test scores as measured in 2000 and 2004, math and Chinese test scores as measured in 2004, height-for-age as measured in 2004, household net income, fixed capital and assets as measured in 2004, paternal and maternal education dummies, the number of siblings in the family, gender, gender of the younger sibling, sibling gender interacted with the number of siblings, and county and year-of-birth fixed effects. In the specifications including an interaction effect with expenditure, we also include linear and quadratic terms for total and discretionary educational expenditure, and a dummy for discretionary expenditure above the

[32] We invert the depression index, such that a higher depression index is indicative of subjects' being less depressed.
[33] The primary results are similar when estimated employing the original variables, though more noisily estimated.

median.

The results of estimating equations (11) and (12) for maternal and paternal education dummies and educational expenditure are reported in Table 8. Note a positive coefficient β_1 can be interpreted as evidence of persistence of non-cognitive skills over time, and a negative coefficient β_2 can be interpreted as catch-up in households with higher levels of parental education or more educational expenditure. The interaction terms with maternal and paternal education are included in the same specification.

First, it is useful to note that non-cognitive skills at ages 9–12 (as measured in 2000) do not seem to be particularly strongly correlated with non-cognitive skills at ages 13–16 (as measured in 2004); β_1 is positive, but not always statistically significant. There appears to be greater evidence of persistence between ages 13–16 and young adulthood, or between 2004 and 2009.

Second, and more importantly, there is also evidence of catch-up in non-cognitive skills for children of more educated mothers (as reported in Columns 1, 3, 5, and 7), and for children who receive more educational expenditure (as reported in Columns 2, 4, 6, and 8). This is observed both between 2000 and 2004 and between 2004 and 2009, and is consistent with compensatory investment by mothers facilitating catch-up by children with weaker non-cognitive skills. It is, however, important to be cautious in interpreting the evidence of catch-up as evidence of returns to the specific educational investments observed: more educated mothers may also make additional, unobserved investments targeting children with weaker non-cognitive skills that leads to catch-up.[34]

The interaction terms with paternal education, by contrast, are generally positive and insignificant. Given that there was little evidence that more educated fathers compensated children characterized by lower non-cognitive skills with additional investment, this is consistent with our prior results.

An alternate test that captures the same fundamental empirical pattern examines the cross-household correlation between non-cognitive skills and a dummy variable for the household being characterized by high maternal education, conditional on the same set of control variables. This correlation is increasing in magnitude in each wave: in the first wave, the observed cross-household correlation between a dummy for a mother of high maternal education and the percentile measures of non-cognitive skills is essentially zero. In the second wave, the correlation has increased in magnitude to .028, and by the third wave, .151. The difference between the first- and third-wave coefficients is statistically significant at the five percent level, respectively. There is no evidence of a comparable pattern for paternal education.

Given this pattern, it is also useful to briefly reconsider our primary results of heterogeneous response to variation in non-cognitive skills with respect to parental education. The longitudinal

[34]It may also be useful to analyze whether there is any heterogeneity in these patterns with respect to the initial level of reported non-cognitive skills of the child: i.e., are there greater observed returns to educational investment for a child who initially reports lower or higher non-cognitive skills? We test whether there is any heterogeneity in the coefficients estimated in equation (11) with respect to initial non-cognitive measures and find no evidence of such heterogeneity.

evidence suggests that in households with more educated mothers, compensatory investments may already have succeeded in generating some catch-up in non-cognitive skills among first-born children with weaker non-cognitive skills prior to wave two. However, we have already presented evidence in section 4.1 (Table A4) that the primary results are robust to employing the initial, wave-one measure of non-cognitive skills for the older child. In addition, any catch-up prior to wave two would lead to a narrowing of the gap in non-cognitive skills between children of an educated mother, and thus lead us to underestimate the compensatory behavior engaged in by these mothers. There is no obvious source of bias that would lead us to erroneously conclude that educated mothers are compensating when in fact they are reinforcing.

Considering the long-term effect of the observed patterns, if we again compare a child with a mother below the median level of education to a child with a mother above the median level of education for the former child, a one standard deviation decrease in the non-cognitive index in adolescence leads to a .228 decrease in the Rosenberg index in young adulthood (i.e., the child has lower self-esteem).[35] For the latter child, however, the same decrease in the non-cognitive index in adolescence does not lead to any statistically significant change in self-esteem in adulthood. If there are positive returns in the labor market to non-cognitive skills such as self-esteem, this pattern may have meaningful economic implications.

In addition, these results may raise the question of why parents appear to utilize educational expenditure as a tool to address deficits in non-cognitive skills as opposed to some other form of expenditure more explicitly targeted at developing these skills. We should note that we cannot rule out that parents are simultaneously making other, more targeted investments, in expenditure or in time, to develop non-cognitive skills, and that the observed pattern represents primarily returns to these unobserved investments. As previously highlighted, educational expenditure is the only type of child-specific investment reported in this survey other than medical care. However, given that these are relatively resource-constrained households, forms of expenditure that might be considered appropriate for developing non-cognitive skills in a developing country context (e.g., therapeutic interventions, additional attention from teachers, or intense supervision by parents) may be unavailable. In fact, both parents report spending only around four hours total per week with their children playing, talking, or assisting with homework, and this includes time spent with both children.

If we examine the evidence about categories of expenditure that respond to non-cognitive skills, referring back to Table 3, we observe the largest effects for food at school, transportation to school, and tutoring. Tutoring, presumably including one-on-one attention, may be a viable strategy to enhance non-cognitive skills. Expenditure on food at school and transportation to school may correspond to a decision to allow the child to spend more time at school or attend a school that is farther away from home, enhancing exposure to peers and teachers and potentially enhancing non-

[35] We assume the father is also above the median level of education, and thus the relevant coefficient is the sum of .110 and .118 as reported in Column (5) of Table 8.

cognitive skills. Needless to say, we also cannot rule out that these investments lead to simultaneous enhanced development of cognitive skills.

6 Conclusion

The decisions parents make about how to allocate educational investments among children have major implications for policies targeting human capital accumulation. As greater emphasis is placed on the development of non-cognitive skills as well as cognitive skills as a strategy for increasing long-term welfare, it is even more important to understand how parents may respond to observed differences in non-cognitive skills, and whether they seek to address any detectable deficits.

The evidence in this paper suggests that in a rural developing country context, households with more educated mothers may engage in more compensatory behavior, targeting expenditure to children with weak non-cognitive skills, when compared to households with less educated mothers. Over time, this leads to greater persistence in non-cognitive challenges in households with less educated mothers, while children in households with more educated mothers show evidence of catch-up. While the observed pattern would be consistent with many channels and we must be cautious in interpreting our findings, the evidence presented here suggests that both greater bargaining power for more educated mothers and a differential preference for compensation among more educated mothers are relevant.

Given that Gansu is one of the poorest regions of China—our sample is characterized by per capita income of only around $200—our results suggest that compensatory behavior by parents can be found even in resource-constrained settings. This pattern also may have implications for interventions targeted to strengthen non-cognitive skills. If more educated mothers respond to such interventions by redirecting expenditure away from the child whose skills have been strengthened, this may be a mechanism that decreases the long-term benefits for the targeted child. There may, however, be positive spillovers for other siblings.

It is important to note that our sample is relatively small and drawn from only one province in China, and we cannot conclude that the observed phenomenon is a general one. However, our results suggest that the question of whether differential household responses to child variation in non-cognitive skills widen cross-household inequality in human capital over time may merit further analysis.

7 Figures and Tables

Figure 1: Data structure

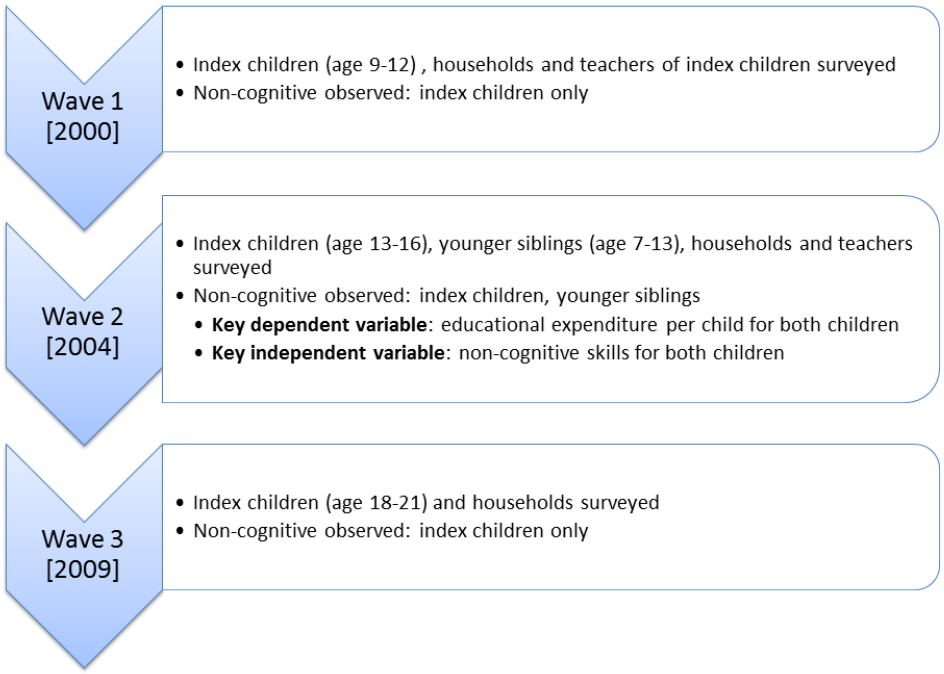
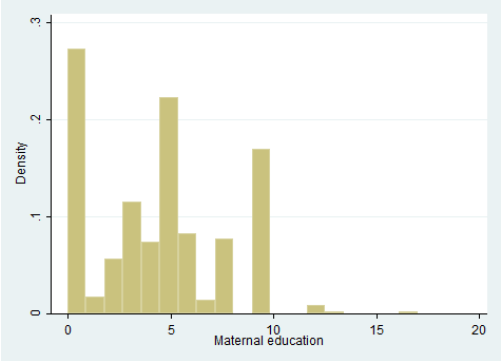


Figure 2: Parental education

(a) Maternal education



(b) Paternal education

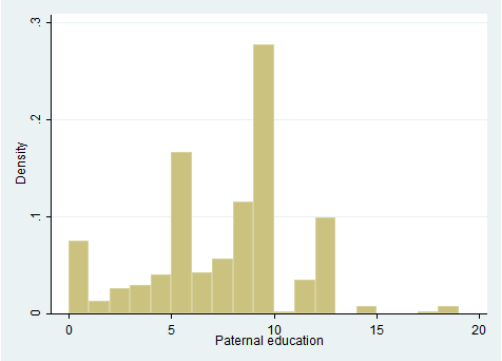
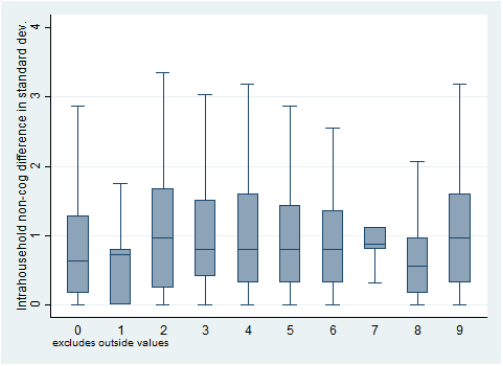
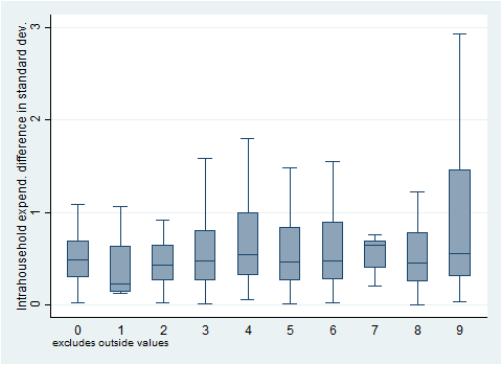


Figure 3: Intra-household differences in non-cognitive skills and expenditure, by Mother's Education

(a) Non-cognitive skills



(b) Expenditure



For each level of mother's education in years, the bottom bar corresponds to the minimum value of between-sibling absolute differences in non-cognitive skills (Figure 3a) or between-sibling absolute differences in normalized educational expenditure residuals (Figure 3b), while the top bar corresponds to the maximum value. The rectangle corresponds to the interquartile range, with the median value represented by the bold line bisecting the rectangle. Normalized expenditure residuals are calculated by regressing expenditure on child characteristics (gender, birth parity, cognitive skills, and height-for-age), generating the residuals and standardizing them to have mean zero and standard deviation one.

Table 1: Summary statistics

Panel A: Demographic data				**Panel B: Educational expenditure per child**			
	Sample	Subsample	p-value		Mean	Std. Dev.	Max.
Net income	6848.56	6728.28	.863	Total	361.52	343.1	2900
Income per capita	1717.76	1631.04	.581	Discretionary	149.03	215.65	1660
Mother education	4.31	4.35	.805	Tuition	212.49	185.47	2000
Father education	7.12	7.16	.837	Supplies	47.07	43.55	300
Mother age	39.19	36.97	.000	Transportation	19.67	50.99	500
Father age	42.57	38.89	.072	Food	59.12	139.08	1200
Index child age	15.09	14.96	.013	Tutoring	9.66	21.42	110
Internalizing index	-.01	.01	.634	Other fees	13.50	36.41	360
Externalizing index	.03	-.01	.280				
Achievement index	0	.06	.183				
Obs.	1918	388					

Notes: The sample encompasses the full sample of households that report income data; this is 1914 out of the full sample of 2000 households in the survey. The subsample is households with two-children families in which both children report data on non-cognitive skills as well as height-for-age. There are 388 households in the subsample of interest, and 776 children. Income is reported in yuan; educational expenditure is reported in yuan per semester. Internalizing, externalizing and achievement indices have been standardized to have means equal to zero and standard deviations equal to one. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. Column (3) reports the p-value for a test of equality of means across the sample and subsample.

Table 2: Non-cognitive skills and child characteristics

	Internal (1)	External (2)	Internal (3)	External (4)	Internal (5)	External (6)	Internal (7)	External (8)	Internal (9)	External (10)
Panel A: Child characteristics										
Sibling parity	.003	-.118**							.143	.131
	(.058)	(.059)							(.140)	(.119)
Age			.008	.039**					.007	-.076*
			(.017)	(.018)					(.051)	(.044)
Female					-.006	.315***			-.007	.289***
					(.077)	(.083)			(.080)	(.074)
Grade level							.015	.068***	.046	.159***
							(.019)	(.020)	(.045)	(.054)
Obs.	776	776	776	776	776	776	776	776	776	776
Panel B: Cognitive skills and health										
Height-for-age	.019	.052							.025	.056
	(.035)	(.046)							(.033)	(.045)
Math score			-.0007	.002					-.0005	-.0009
			(.003)	(.005)					(.005)	(.005)
Chinese score					.0009	.005			.004	.007
					(.005)	(.005)			(.007)	(.007)
Achievement score							-.006**	-.005	-.006**	-.005*
							(.003)	(.003)	(.003)	(.003)
Obs.	776	776	776	776	776	776	776	776	776	776

Notes: The dependent variables are the internalizing and externalizing indices. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. The independent variable is the specified child characteristic, all measured in the second wave; all specifications include household fixed effects and standard errors clustered at the county level. Asterisks indicate significant at the 10, 5 and 1 percent levels.

Table 3: Parental allocations and non-cognitive skills

	Total (1)	Discretionary (2)	Tuition (3)	Supplies (4)	Transportation (5)	Food (6)	Tutoring (7)	Other (8)
Panel A: Internalizing index								
Index	-4.390	-7.892	3.501	.806	-.291	-9.552	-.902	2.047
	(11.481)	(8.480)	(4.119)	(1.641)	(1.197)	(6.059)	(.758)	(1.503)
Obs.	776	776	776	776	776	776	776	776
Panel B: Externalizing index								
Index	4.533	-.370	4.903	2.592*	.668	-4.770	-.166	1.306
	(12.870)	(8.001)	(6.212)	(1.419)	(1.387)	(5.670)	(.726)	(1.016)
Obs.	776	776	776	776	776	776	776	776
Mean (dep. var.)	276.748	104.052	172.696	38.164	12.011	37.679	6.218	9.98
St. dev. (dep. var.)	286.515	174.218	161.381	38.785	40.065	109.107	17.357	28.532

Notes: The dependent variables are educational expenditure per semester per child in the specified category; total expenditure is the sum of all categories, and discretionary expenditure is the sum of all categories excluding tuition. The independent variable is the specified index of internalizing or externalizing behavior. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. All specifications include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills measured contemporaneously with non-cognitive skills, year-of-birth and household fixed effects, and standard errors clustered at the county level. Asterisks indicate significance at the 10, 5 and 1 percent levels.

Table 4: Heterogeneous effects with respect to parental education

	Total (1)	Discretionary (2)	Tuition (3)	Supplies (4)	Transportation (5)	Food (6)	Tutoring (7)	Other (8)
Panel A: Internalizing index and maternal education								
Index	37.205**	24.203*	13.002*	1.483	5.042*	11.819	1.253	4.607**
	(16.841)	(13.755)	(6.998)	(1.472)	(2.624)	(10.744)	(.792)	(2.329)
Index x mother educ.	-9.902**	-7.640**	-2.262	-.161	-1.270**	-5.087**	-.513**	-.609
	(4.163)	(3.533)	(1.631)	(.420)	(.569)	(2.523)	(.235)	(.451)
Obs.	776	776	776	776	776	776	776	776
Panel B: Internalizing index and paternal education								
Index	-4.099	-12.127	8.028	-2.470	5.641	-7.935	-2.217	-5.146**
	(24.006)	(18.434)	(8.936)	(1.679)	(3.459)	(14.997)	(1.589)	(2.286)
Index x father educ.	-.237	.529	-.767	.470*	-.832*	-.245	.162	.975**
	(2.612)	(1.789)	(1.452)	(.254)	(.425)	(1.463)	(.148)	(.445)
Test $\beta_2^m = \beta_2^f$	.042**	.019**	.439	.200	.392	.061*	.031**	.017**
Obs.	766	766	766	766	766	766	766	766
Panel C: Externalizing index and maternal education								
Index	41.322***	23.811**	17.511**	.702	5.817**	14.085*	1.421**	1.786
	(13.093)	(10.156)	(7.321)	(1.175)	(2.453)	(7.310)	(.716)	(1.527)
Index x mother educ.	-9.859**	-6.481*	-3.379	.507	-1.380**	-5.053**	-.425	-.129
	(4.805)	(3.389)	(2.597)	(.496)	(.636)	(2.261)	(.295)	(.352)
Obs.	776	776	776	776	776	776	776	776
Panel D: Externalizing index and paternal education								
Index	-22.736	-23.141	.406	-1.428	1.188	-19.168	-1.521	-2.211
	(31.726)	(18.981)	(17.179)	(2.378)	(3.198)	(15.260)	(1.454)	(2.066)
Index x father educ.	3.785	3.087	.698	.550*	-.084	1.957	.173	.492
	(3.276)	(1.972)	(1.891)	(.307)	(.402)	(1.553)	(.146)	(.364)
Test $\beta_2^m = \beta_2^f$	.037**	.023**	.309	.932	.066*	.026**	.088*	.314
Obs.	766	766	766	766	766	766	766	766
Mean (dep. var.)	276.748	104.052	172.696	38.164	12.011	37.679	6.218	9.98
St. dev. (dep. var.)	286.515	174.218	161.381	38.785	40.065	109.107	17.357	28.532

Notes: The dependent variables are educational expenditure per semester per child in the specified category; total expenditure is the sum of all categories, and discretionary expenditure is the sum of all categories excluding tuition. The independent variable is the specified index of internalizing or externalizing behavior, as well as the index interacted with the specified measure of parental education in years. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. Time invested by the mother (father) is re-scaled to have the same mean as education of the mother (father). All specifications include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills measured contemporaneously with non-cognitive skills, year-of-birth and household fixed effects, and standard errors clustered at the county level. Asterisks indicate significance at the 10, 5 and 1 percent levels.

Table 5: Non-cognitive skills and parental learning

	Total (1)	Discretionary (2)	Tuition (3)	Supplies (4)	Transp. (5)	Food (6)	Tutoring (7)	Other (8)
Panel A: Non-cognitive index and maternal time investment								
Index	64.611***	41.790***	22.821***	3.332**	6.898***	23.685**	2.613*	5.262**
	(17.031)	(13.562)	(8.696)	(1.607)	(2.619)	(10.398)	(1.349)	(2.674)
Index x mother educ.	-12.136**	-8.708**	-3.429	.227	-1.669**	-6.262**	-.579*	-.424
	(4.998)	(4.081)	(2.137)	(.532)	(.667)	(2.843)	(.301)	(.455)
Index x time	-3.613	-2.718	-.895	-.476	-.016	-1.683	-.214	-.328*
	(3.185)	(2.612)	(.919)	(.323)	(.284)	(2.254)	(.173)	(.187)
Obs.	776	776	776	776	776	776	776	776
Panel B: Non-cognitive index and paternal time investment								
Index	-22.058	-24.642	2.584	-1.484	2.593	-20.127	-2.550	-3.074*
	(35.023)	(23.014)	(16.578)	(3.306)	(2.862)	(18.908)	(2.082)	(1.692)
Index x father educ.	2.065	2.108	-.044	.590*	-.552	.987	.203	.880**
	(3.077)	(1.777)	(1.866)	(.313)	(.386)	(1.521)	(.171)	(.424)
Index x time	.745	.444	.301	-.085	.179	.472	.033	-.154
	(1.149)	(.643)	(.612)	(.255)	(.140)	(.424)	(.082)	(.115)
Obs.	766	766	766	766	766	766	766	766
Mean (dep. var.)	276.748	104.052	172.696	38.164	12.011	37.679	6.218	9.98
St. dev. (dep. var.)	286.515	174.218	161.381	38.785	40.065	109.107	17.357	28.532

Notes: The dependent variables in Panels A and B are educational expenditure per semester per child in the specified category; total expenditure is the sum of all categories, and discretionary expenditure is the sum of all categories excluding tuition. The independent variables are the specified index of internalizing or externalizing behavior, the index interacted with the specified measure of parental education in years, and the index interacted with the amount of time the parent reports spending with children playing, talking or assisting with homework in a typical week. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. All specifications include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills measured contemporaneously with non-cognitive skills, year-of-birth and household fixed effects, and standard errors clustered at the county level. Standard errors are clustered at the level of the county. Asterisks indicate significance at the 10, 5 and 1 percent levels.

Table 6: Heterogeneous effects with respect to maternal education and income

	Total (1)	Discretionary (2)	Tuition (3)	Supplies (4)	Transportation (5)	Food (6)	Tutoring (7)	Other (8)
Index	49.585***	31.957**	17.628**	1.460	7.045**	17.358*	1.956**	4.139*
	(16.426)	(13.209)	(7.642)	(1.290)	(2.992)	(10.136)	(.811)	(2.229)
Index x mother educ.	-12.456**	-8.359**	-4.097*	.228	-1.585***	-6.142**	-.504	-.356
	(5.102)	(4.078)	(2.329)	(.569)	(.609)	(2.885)	(.316)	(.482)
Index x income	-.079	-.875	.796	-.070	-.120	-.409	-.135	-.141
	(1.047)	(.745)	(.534)	(.111)	(.149)	(.488)	(.093)	(.106)
Obs.	776	776	776	776	776	776	776	776
Mean (dep. var.)	276.748	104.052	172.696	38.164	12.011	37.679	6.218	9.98
St. dev. (dep. var.)	286.515	174.218	161.381	38.785	40.065	109.107	17.357	28.532

Notes: The dependent variables are educational expenditure per semester per child in the specified category; total expenditure is the sum of all categories, and discretionary expenditure is the sum of all categories excluding tuition. The independent variable is the specified index of internalizing or externalizing behavior, the index interacted with the specified measure of parental education in years, and the index interacted with household net income. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. Net income is re-scaled to have the same mean as maternal education. All specifications include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills, year-of-birth and household fixed effects, and standard errors clustered at the county level. Asterisks indicate significance at the 10, 5 and 1 percent levels.

Table 7: Maternal education and bargaining power

Panel A: Reported household decision-making by mother

	All decisions		Parenting decisions	
	(1)	(2)	(3)	(4)
Dif educ.	.036*		.004	
	(.019)		(.006)	
Mother educ.		.051**		.017**
		(.025)		(.008)
Mean	2.952	2.952	.857	.857
Obs.	383	388	383	388

Panel B: Non-cognitive index and maternal decision-making

Index	83.329**	65.016***	18.313	1.520	15.704**	39.566**	6.022***	2.203
	(32.658)	(22.531)	(17.700)	(3.505)	(6.584)	(16.354)	(1.948)	(2.331)
Index x mother educ.	-12.341**	-8.816**	-3.526*	.178	-1.626**	-6.321**	-.580*	-.467
	(5.022)	(4.076)	(2.091)	(.530)	(.657)	(2.821)	(.313)	(.482)
Index x decision-making	-38.079	-38.922**	.844	-.209	-9.974	-25.786*	-4.843***	1.890
	(29.077)	(17.601)	(16.857)	(3.544)	(6.219)	(13.167)	(1.774)	(2.241)
Obs.	776	776	776	776	776	776	776	776
Mean (dep. var.)	276.748	104.052	172.696	38.164	12.011	37.679	6.218	9.98
St. dev. (dep. var.)	286.515	174.218	161.381	38.785	40.065	109.107	17.357	28.532

Notes: The dependent variable in Panel A, Columns (1) and (2) is an index indicating the numbers of decisions a mother makes, as reported by the mother (ranges from 0 to 7); the dependent variable in Columns (3) and (4) is an index indicating the number of parenting-related decisions a mother makes, as reported by the mother (ranges from 0 to2). The independent variables in Panel A are the difference between maternal education and paternal education in years or maternal education in years, as specified, and controls included are household net income, per-capita income, maternal and paternal age, and county fixed effects. In Panel B, the dependent variables are educational expenditure as defined in Table 3, and the independent variables are the non-cognitive index, the index interacted with a dummy variable equal to one if the mother reports any decision-making power around parenting, and the index interacted with maternal education. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. Specifications in Panel B include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills, year-of-birth and household fixed effects, and standard errors clustered at the county level. Asterisks indicate significance at the 10, 5 and 1 percent levels.

Table 8: Persistence of non-cognitive skills in percentile and parental education

	Internal 2004		External 2004		Rosenberg 2009		Depression 2009	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Psychometric index 2000	.001	.067	-.005	.046				
	(.093)	(.078)	(.059)	(.054)				
Mother educ. 2000 int.	-.143**		-.083					
	(.059)		(.070)					
Father educ. 2000 int.	.159		.127					
	(.121)		(.106)					
Exp. 2000 int.		-.002***		-.0009**				
		(.0005)		(.0004)				
Psychometric index 2004					.110	.093	.131**	.164***
					(.096)	(.070)	(.063)	(.048)
Mother educ. 2004 int.					-.181*		-.004	
					(.107)		(.099)	
Father educ. 2004 int.					.118		-.025	
					(.116)		(.106)	
Exp. 2004 int.						-.00002		-.0004**
						(.0003)		(.0002)
Obs.	550	550	550	550	408	408	410	410

Notes: The dependent variables are the specified measure of non-cognitive skills from waves two and three, calculated in percentile terms. A higher index in internalizing or externalizing behavior is indicative of higher non-cognitive skills. A higher percentile in the Rosenberg index is associated with higher self-esteem. The depression index is inverted, and thus a higher percentile in the depression index is indicative of a lower level of depression. The independent variables include the psychometric index, the mean of internalizing and externalizing indices from waves one and two, calculated in percentile terms. The psychometric index is also interacted with dummy variables for the mother's (father's) education being above the median, and discretionary educational expenditure. All specifications include controls for cognitive skills measured in waves one and two, grades in math and Chinese, height-for-age, the parental education dummy variables, net income, assets, and fixed capital in the household, the number of siblings, sibling gender, and sibling gender interacted with the number of siblings, and county and year-of-birth fixed effects; the specifications including an interaction effect with expenditure also include linear and quadratic terms for total and discretionary educational expenditure, and a dummy for discretionary expenditure above the median. Standard errors are clustered at the level of the county. Asterisks indicate significance at the 10, 5 and 1 percent levels.

Appendix

Table A1: Within-household and cross-household variation

	Internal		External		Height-for-age		Achievement score		Grades	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fixed effects	Household	Year	Household	Year	Household	Year	Household	Year	Household	Year
Obs.	776	776	776	776	776	776	776	776	776	776
R-squared	.586	.021	.592	.016	.638	.053	.539	.054	.64	.034

Notes: Each column reports the R-squared for the regression of the specified child characteristic on the specified set of fixed effects.

Table A2: Parental allocations and non-cognitive skills: Households with two or more children

	Total	Discretionary	Tuition	Supplies	Transportation	Food	Tutoring	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Index	29.733**	18.451*	11.282**	.786	4.462*	9.526	1.042	2.635**
	(12.185)	(9.588)	(5.406)	(.965)	(2.334)	(7.144)	(.965)	(1.119)
Index x mother educ.	-8.238**	-5.680**	-2.558	.269	-.864	-3.756*	-.999	-.330
	(3.554)	(2.896)	(1.576)	(.335)	(.540)	(1.973)	(.668)	(.275)
Obs.	1132	1132	1132	1132	1132	1132	1132	1132
Mean (dep. var.)	261.867	94.244	167.622	36.22	10.658	31.111	7.025	9.23
St. dev. (dep. var.)	273.416	168.236	148.407	37.226	37.467	102.985	33.987	30.367

Notes: The dependent variables are educational expenditure per semester per child in the specified category; total expenditure is the sum of all categories, and discretionary expenditure is the sum of all categories excluding tuition. The independent variable is a mean index of non-cognitive skills and the interaction of this index with maternal education. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. All specifications include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills, year-of-birth and household fixed effects, and standard errors clustered at the county level. Asterisks indicate significance at the 10, 5 and 1 percent levels.

Table A3: Heterogeneous effects with respect to maternal favorite

	Total	Discretionary	Tuition	Supplies	Transportation	Food	Tutoring	Other
Index	50.014***	30.990**	19.024**	1.462	6.861**	16.978	1.791**	3.897*
	(16.241)	(13.449)	(7.840)	(1.269)	(2.891)	(10.437)	(.864)	(2.221)
Index x mother educ.	-12.671**	-9.154**	-3.517*	.139	-1.679**	-6.530**	-.619*	-.465
	(5.034)	(4.124)	(2.117)	(.507)	(.654)	(2.872)	(.318)	(.478)
Favorite	-24.561	-20.333	-4.228	-8.111	-.534	-8.259	.707	-4.136*
	(32.892)	(25.428)	(13.583)	(7.634)	(4.785)	(18.374)	(2.519)	(2.431)
Favorite x mother educ.	8.817	8.500	.317	2.386	.366	4.422	.572	.754
	(9.016)	(6.463)	(3.523)	(2.025)	(1.225)	(4.520)	(.499)	(.534)
Obs.	776	776	776	776	776	776	776	776
Mean (dep. var.)	276.748	104.052	172.696	38.164	12.011	37.679	6.218	9.98
St. dev. (dep. var.)	286.515	174.218	161.381	38.785	40.065	109.107	17.357	28.532

Notes: The dependent variable is educational expenditure in the specified category, and the independent variables are the non-cognitive index and a dummy for the child being reported as the maternal favorite, and both variables interacted with maternal education. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. All specifications include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills measured contemporaneously with non-cognitive skills, year-of-birth and household fixed effects, and standard errors clustered at the county level. Standard errors are clustered at the level of the county.

Table A4: Heterogeneous effects: non-cognitive skills at primary school age

	Total	Discretionary	Tuition	Supplies	Transp. and food	Tutoring	Other fees
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Maternal education and non-cognitive index							
Index	10.211*	7.510*	2.701	1.626	2.700*	.285	-.174
	(6.130)	(4.533)	(3.351)	(2.106)	(1.459)	(.352)	(1.595)
Index x mother educ.	-3.214**	-2.464**	-.750	-.862*	-1.130*	-.087	.007
	(1.545)	(1.108)	(.859)	(.458)	(.608)	(.085)	(.470)
Obs.	766	766	766	766	766	766	766
Panel B: Paternal education and non-cognitive index							
Index	-11.089	5.524	-16.613	.944	-1.778	-.656*	4.419**
	(14.872)	(6.657)	(11.945)	(2.231)	(1.802)	(.386)	(2.144)
Index x father educ.	1.023	-1.201*	2.224	-.402	-.052	.077	-.647**
	(2.044)	(.640)	(1.738)	(.291)	(.256)	(.057)	(.292)
Obs.	756	756	756	756	756	756	756
Mean (dep. var.)	159.95	49.19	110.76	25.06	5.42	1.52	9.75
St. dev. (dep. var.)	133.65	78.21	89.91	24.35	32.7	7.9	25.11

Notes: The dependent variables are educational expenditure per semester per child in the specified category at primary school age (as observed in wave one for the first-born child and in wave two for the second-born child); total expenditure is the sum of all categories, and discretionary expenditure is the sum of all categories excluding tuition. The independent variable is a non-cognitive index as measured at primary school age, as well as the index interacted with the specified measure of parental education. A higher internalizing or externalizing index is indicative of higher non-cognitive skills. All specifications include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills measured contemporaneously with non-cognitive skills, age and household fixed effects, and standard errors clustered at the county level. Asterisks indicate significance at the 10, 5 and 1 percent levels.

Table A5: Alternate measures of non-cognitive skills: teacher reports

	Total (1)	Discretionary (2)	Tuition (3)	Supplies (4)	Transportation (5)	Food (6)	Tutoring (7)	Other (8)
Teacher index	30.546	26.496*	4.050	7.098	3.872	12.838	.441	2.247
	(27.486)	(15.541)	(15.045)	(4.485)	(5.291)	(8.329)	(2.177)	(1.943)
Index x mother educ.	-16.312***	-14.123***	-2.190	-1.705**	-2.783**	-9.074***	-.368	-.193
	(6.082)	(4.401)	(2.839)	(.712)	(1.208)	(2.725)	(.611)	(.326)
Obs.	774	774	774	774	774	774	774	774
Mean (dep. var.)	276.748	104.052	172.696	38.164	12.011	37.679	6.218	9.98
St. dev. (dep. var.)	286.515	174.218	161.381	38.785	40.065	109.107	17.357	28.532

Notes: The dependent variables are educational expenditure per semester per child in the specified category; total expenditure is the sum of all categories, and discretionary expenditure is the sum of all categories excluding tuition. The independent variables are a dummy variable equal to one if an index of non-cognitive skills based on teacher reports of the child's behavior is above the mean, and the interaction of this dummy variable with maternal education. All specifications include controls for sibling parity, gender, sibling gender, height-for-age and cognitive skills, year-of-birth and household fixed effects, and standard errors clustered at the county level. Asterisks indicate significance at the 10, 5 and 1 percent levels.

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