



Children's cognitive ability, schooling and work: Evidence from Ethiopia



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ABSTRACT

I investigate the relationship between children's cognitive ability and parental investment using a rich dataset on a cohort of children from Ethiopia. The data come from Young Lives, a long-term international study of childhood poverty in four countries. Ability is measured by scores on a cognitive test. A child's enrollment in school, participation in work and work hours are employed as measures of parental investment in human capital. The results provide strong evidence of reinforcing parental investment – higher ability children are more likely to be enrolled in school and less likely to work and, conditional on participation, also work fewer hours. These results are mostly robust to addressing potential feedback effects between schooling and test scores and household heterogeneities. On the policy front, the results suggest that the seeds of adulthood inequality in human capital and earnings capability may be sown quite early in childhood, and thereby underscore the importance of interventions that, among others, attempt to improve prenatal and early life health and nutrition, which are often cited as the sources of deficiencies in children's cognitive ability.

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1. Introduction

The pattern of allocation of resources by parents among offspring with varying endowments can be compensating or reinforcing. Compensating allocations provide more resources to the less endowed, to enable equitable opportunities and quality of life later in adulthood. Early models of household utility maximization with intergenerational provision of resources assumed that parents inherently possess such a preference for equity among their children, and hence for compensating allocations (Becker and Tomes, 1976). However, this assumption was challenged soon after, on theoretical grounds as well as with evidence that market signals, such as differential earning opportunities in adulthood, can shape and dominate household behavior, possibly leading to reinforcing allocations (Behrman et al., 1982; Rosenzweig and Schultz, 1982). Very likely, idiosyncratic preferences combine with market mechanisms to determine the final nature of investments, the dynamics of which are highly dependent on relevant household characteristics, society's general level of development, market imperfections, and the degree of social and economic inequality. Such nonlinearities render the

nature of intra-household allocation of resources largely empirical and contextual (Behrman, 1997).

Human capital investment often constitutes a core component of resources allocated to children by parents (the other takes the form of 'transfers'). Given preferences, testable implications consistent with compensating, reinforcing or neutral investments in human capital are derived from consensus models of the family (Behrman et al., 1982; Behrman, 1997 provides an extended review). Empirical tests, in turn, have mostly investigated differences in investment by a child's sex. This is mainly due to the fact that sex is the most directly observable genetic endowment.¹ Variations in children's health endowment and whether parents invest to compensate or reinforce such inequalities have also been emphasized (see Pitt et al., 1990 for a seminal contribution).

A child's cognitive or educational ability, despite the presumed central role it plays in the efficiency (returns and costs) of human capital investment broadly, and educational investments specifically, has been the subject of fewer studies. This is largely because [innate] cognitive ability is unobservable to the researcher. Although they are available, IQ or ability tests are usually difficult

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¹ Also, gender exhibits interesting interactions with parental preferences, production technology and culture which, in combination, often translate into differences in general labor market opportunities, giving it a special role in studies that examine the endowment–investment relationship (Rosenzweig and Schultz, 1982; Behrman and Deolalikar, 1995).

to administer alongside large-scale household surveys that also collect the requisite information on a wide array of control variables. In spite of this difficulty from the point of view of the researcher, it can be argued that parents can adequately assess their children's ability, in relative if not absolute terms, and will likely condition their investment allocations on such differences in perceived ability.

In theory at least, the prevalent pattern of educational investment allocation is expected to be of the reinforcing type. To the extent that marginal product of investment in human capital increases in child endowment, an "economic" allocation should favor more endowed children. There are factors that could attenuate and may even alter this, however, including inequality-averse parental preferences. Specific parametric assumptions about the human capital production and parental welfare functions are also crucial, as are total resources available for parents for allocation (Behrman, 1997).

In this study I examine the nature of the association between children's educational endowment and parental investment in schooling using a unique longitudinal survey from Ethiopia. The contributions to the literature derive from the following. First, it uses a direct measure of children's perceived endowment. In two rounds of the survey, the full sample of children completed a widely known standardized test of cognitive ability. Controlling for a rich array of child and household characteristics, the study therefore tests whether poor Ethiopian households condition educational investment decisions on their assessment of a child's ability and, if so, whether these decisions follow reinforcement or compensation. Only a handful of recent studies have used direct measures of ability in this context. Second, the educational investment decision is examined from two angles – child schooling and work. This is relevant because studies have shown that these two are not necessarily substitutes and drawing inferences about one (e.g. schooling status) based on the other (e.g. child work) can sometimes be fallacious.² More importantly, by examining child work as a separate parental decision variable, the study also contributes to the now-extensive child labor literature that has almost entirely been unable to evaluate or isolate the endowment effect on child work in poor developing economies. In doing so, the effect on both the extensive and intensive margins of child labor is analyzed.

Bacolod and Ranjan (2008) is the study closest to this one in adopting a direct measure of educational endowment to examine the impact on child schooling as well as work. Using data from the Cebu metropolitan area in the Philippines, they report that children with higher scores on an IQ test are more likely to be in school even in poor (low wealth) households. Conversely, households of even moderate wealth may be opting to let low-ability children stay idle rather than sending them to school or work. The study, however, does not consider the amount or intensity of child work. Two more studies, Ayalew (2005) and Akresh et al. (2012a), employ data from a village in Ethiopia and a province in Burkina Faso, respectively, to measure children's ability using test scores and examine the association with child schooling. Both report higher rates of school enrollment for higher ability children. Neither study considered child work.³

² Among other reasons, this could be due to the potential confounding effects of leisure (Ravallion and Wodon, 2000) and idleness (Biggeri et al., 2003), or possible complementarity between schooling and work (Admassie, 2003). Kim (2009) argues the suggested complementarity between schooling and work that is highlighted in some policy circles is often not grounded in evidence.

³ To the best of my knowledge, Ayalew (2005) is the first study to adopt a direct measure of endowment (i.e. score on an ability test) in the specific literature. Interestingly, he also reports that although households seem to reinforce educational endowment, investment in health is compensating – less endowed children receive more health-related resources.

Third, the data employed have attributes that are especially pertinent to a study of this type: (a) the cohort children are surveyed at two important junctures – ages 12 and 15 – when parents' say is still arguably the most important factor determining a child's status (e.g. in schooling and work), hence the latter's use to proxy parental human capital investment decisions; (b) the sample has extremely low attrition, which minimizes selection bias often associated with cohort data; (c) unlike most of the above-cited studies that were confined to a particular area/region, the sample in this study comes from about 20 sites in five major regions of Ethiopia, providing a balanced representation of the country's geographical, cultural and regional diversity, and enabling potentially broader inferences from the results; and (d) the surveys took place during a period in which Ethiopia recorded arguably the fastest growth in its economy as well as the largest expansion in schooling opportunities for children, especially at the primary level. The repeated cross-sectional analysis therefore is able to capture the impact, if any, the changing socio-economic conditions have had on the endowment–child schooling/work relationship.

Finally, it should be noted that estimation of the endowment effect using cognitive test score suffers from potential bias mainly because whether such a score measures pure ability is debatable. For instance, it is possible that test score at least partially reflects current and past schooling inputs and achievement, inducing reverse causation. More generally, unobserved household characteristics can also cause bias in cross-sectional estimations. The paper attempts to address these problems by using, respectively, a 'residual method' that utilizes the longitudinal nature of the data and estimation of a within-household model on sibling pairs.

The paper is organized as follows. The next section gives background of the study context by highlighting relevant statistics and determinants of child schooling and work in Ethiopia. Section 3 describes the data, variables of interest and some bivariate associations. Section 4 provides the empirical framework, followed by baseline results and sensitivity analyses in Section 5. Section 6 discusses the results in the context of existing findings. The last section concludes and offers some policy remarks. The results generally point to a pattern of reinforcing investment by Ethiopian households in children's education: (a) Higher ability, as measured by score on an ability test, is positively correlated with a child's enrollment in school; (b) The likelihood of participating in market work is negatively associated with perceived ability; (c) Conditional on participation, higher ability children work fewer hours; and (d) Although these associations are between concurrent test score and child status at each age, they are also present after accounting for potential sources of bias. For example, they also hold firm when ability is measured as a residual to account for potential reciprocal effect from schooling, and when an alternate specification is used to account for unobserved household characteristics.

2. Study context

Historically, Ethiopia had a poor record in various measures of children's schooling. At the turn of the Millennium, gross primary enrollment was about 62% and entry rate to primary school at the normal age (7 years) was 20%, both of which were significantly worse than the corresponding averages for Sub-Saharan Africa (SSA) (World Bank, 2005). Reform efforts that began in 1993 had gathered pace in the last decade, however, allowing the country to register impressive results on certain fronts. A central objective of the government's educational reform program was increasing access to schooling, particularly in rural areas and at the primary level. That objective is largely being achieved. As of 2011, for example, net primary enrollment reached 86%, compared to a SSA average of 75% (World Bank, 2013).

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