Family Background, Service Providers, and Early Childhood Development in the Philippines: Proxies and Interactions

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Human capital investments in the first few years of life have increasingly been emphasized to be important determinants of cognitive development, school performance, productivity, income, and health and nutritional status over the life course. Accumulated evidence supports strong associations between nutritional status and cognitive and psychosocial skills measured at young ages

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and schooling attainment, earnings, employment, and health and nutrition outcomes in later life.[1] Numerous studies indicate significant positive associations of family background with child development (see Strauss and Thomas [1995, 1998] for reviews). We direct this study toward important questions regarding the interpretation of the associations between family background and early childhood development (ECD) that have received limited attention in the empirical literature. The first two questions relate to whether correlates of ECD including family background are proxying for other variables in the usual estimates. The second two questions relate to whether there are interactions between family background and other variables or among the family background variables.

Our first main research question deals with whether the impacts of family background on ECD in part proxy health and other ECD-related programs and services. For example, program placement or quality may be purposively related to family background, either positively (e.g., due to political influence) or negatively (e.g., because of antipoverty considerations). If so, the failure to control for health and other ECD-related programs and services may lead to misleading estimates of the effect of family background on ECD. These biases may be negative or positive, depending on the nature of the political allocation rule (e.g., pro-poor versus pro–better off) for the governmental programs.

The second research question considers whether the associations between family background and child development represent various unobserved community characteristics that are related to the placement of health or ECD-related programs and services. Examples of these characteristics are inadequate drainage systems, poor sewage disposal, unreliable water supplies, and unusually heavy rainfalls, all of which contribute to the transmission of infectious diseases (e.g., intestinal worms, diarrhea, and malaria) that, in turn, are hypothesized to contribute to anemia, retardation of cognitive functioning, and malnutrition among children (e.g., Nokes et al. 1992; Carter, Mendis, and Roberts 2000; Crompton and Nesheim 2002). Health program placement and characteristics could be purposively related to unobserved community characteristics that are associated with family background. In such a case, the failure to control for unobserved community characteristics leads to misleading estimates of the effect of family background on ECD. Rosenzweig and Wolpin (1986) formally develop the implications of endogenous program placement in response to unobserved community factors for estimating program effects.

[1] See, e.g., Murnane, Willett, and Levy (1995), Neal and Johnson (1996), Karoly et al. (1998), and Currie and Thomas (1999) for the United States. See Myers (1995), Martorell et al. (1998), Deutsch (1999), Martorell (1999), Glewwe, Jacoby, and King (2001), Alderman, Hoddinott, and Kinsey (2003), and Behrman, Cheng, and Todd (2004) for developing countries.

A number of studies suggest that controlling for such factors can have substantial effects on the estimated program impacts (e.g., Pitt, Rosenzweig, and Gibbons 1993; Frankenberg 1995).

Our third aim is to ascertain whether there are important interactions between family background and health and other ECD-related programs in how they affect ECD. Are there gross complementarities (substitutions) indicating that better family background interacts positively (negatively) with health and other ECD-related services? Parents with more schooling, for instance, may have greater access to public health and ECD-related facilities because they have better connections, are favored by the providers of such services, or are informed in ways that permit them more effectively to exploit these facilities. But if these services primarily provide information that more educated parents can obtain relatively easily in the absence of such services, they may substitute for at least the parental schooling component of family background. A number of studies in the literature explore the presence of these interactions, with mixed results that generally favor the occurrence of substitution over complementarities (e.g., Rosenzweig and Schultz 1982; Barrera 1990; Strauss 1990; Thomas, Strauss, and Henriques 1991; Thomas and Strauss 1992; Dargent-Molina et al. 1994; Muhuri 1995; Sastry 1996). These studies do not control for unobserved community characteristics that may affect program allocations (Strauss [1990] is an exception).

In a similar vein, our final research question is whether there are important interactions between family wealth and parents' human assets in their association with ECD. Similar to family background and service provider interactions, there may be complementarities or substitutions between schooling and other parental characteristics (such as height) in their relationship with ECD. The effect of parents' schooling on beneficial outcomes for children may depend on their own health. Or the parents may be more efficient in using information to affect ECD at higher household wealth levels. These examples suggest complementarities between the economic status and human assets of parents in how they relate to ECD. Parental schooling and household wealth may also be substitutes for one another in their relation to child health (e.g., as found by Dargent-Molina et al. [1994]).

In this article, we examine the above questions using rich new data collected from the Philippines that includes indicators of (1) ECD for 3,556 Filipino preschool children ages 0–36 months (cognitive, social, and motor development; anthropometrics; hemoglobin measurements; occurrence of worms); (2) family background (schooling and anthropometrics both for mothers and fathers, as well as household expenditures, asset ownership, and housing quality); and (3) local health and ECD-related service providers (presence of various facilities). In the next section, we describe the survey data used in our analysis and follow with a detailed description of our measures of ECD, family background, and health services. We then present our estimates for (1) associations between ECD and observed family background characteristics in our simplest specification, (2) how the estimated associations of child development with family background change with the inclusion of health and other ECD-related services and community fixed effects, (3) the importance of interactions between family background and health and other ECD-related services for ECD, and (4) the presence of interactions between measures of family background in their relationship to ECD. We end with a summary of our results and conclusions.

I. Data

The Philippine Department of Social Welfare and Development (DSWD), with operational support from the Asian Development Bank and the World Bank, has initiated an ECD project to enable local government units to deliver more and improved services for pregnant mothers and their children under the age of 7. This ECD program is being implemented in three regions of the country, which include 13 provinces and 2.5 million households. These regions include Western Visayas (region 6), Central Visayas (region 7), and Central Mindanao (region 12). We, the authors of this article, are part of a collaborative project that has initiated the collection of longitudinal household survey data on ECD, family background, and program services that will be used to evaluate the impact of this new ECD project on a number of dimensions of ECD in regions 6 and 7. Baseline data on children ages 0–6 in these two regions and in a control region (region 8, Eastern Visayas) were collected in 2001 prior to the initiation of the new program. These baseline data are used for the analyses of this article since the follow-up rounds of data were not available at the time of the article's preparation.

In each of the two program regions (6 and 7), barangays (cities or villages located within a municipality) in each province were stratified into (1) pilot barangays that participated in a 1998 ECD pilot program, (2) program or target barangays targeted by the ECD program in the first phase of the intervention, and (3) nonprogram barangays or nontargeted barangays in the pilot and phase 1 municipalities/cities and other barangays in the region that are neither in the pilot nor phase 1 group. For each of the two ECD regions, five pilot and five nonprogram barangays were randomly chosen from the list, while the remaining barangays were drawn at random from the program barangays. In region 8 (control region), barangays were randomly chosen from

TABLE 1
NUMBER OF MUNICIPALITIES, BARANGAYS, HOUSEHOLDS, MOTHERS, AND CHILDREN BY REGION

	Program Area		Control Area	
Sample	Region 6	Region 7	Region 8	Total
Municipalities	24	14	57	95
Barangays	96	96	96	288
Households screened	3,870	3,995	4,340	12,205
Eligible households	1,724	2,382	2,425	6,531
All women (pregnant and not)	1,536	2,097	1,996	5,629
Pregnant women (subset of all women)	181	263	268	712
Eligible children ages 0–6 years	2,990	4,027	4,006	11,023
Eligible children ages 0–3 years	1,129	1,599	1,560	4,288
Available children ages 0–3 years	941	1,376	1,239	3,556

Sources. Office of Population Studies (2002, table 1, 28) and the 2001 Early Childhood Development Baseline Survey.

a list of barangays obtained from the 1995 Philippines census. The number of households screened ranged from 20 to 70 to obtain the desired number of eligible households, and on average 24 eligible households were randomly selected per barangay. An eligible household was defined as one that contained permanent residents who were pregnant women or children ages 0–6. Permanent residents were defined as adults (and the children born to them) who had stayed for at least 6 months in the household or who had no other reported residence if they had been living in the household for less than 6 months. All means shown in tables 2, 3, and 4 are weighted based on the probability of being selected to be interviewed for the survey.

Table 1 gives the number of municipalities, barangays, households screened, eligible households, and women and eligible children ages 0–6 and 0–3 years old in regions 6, 7, and 8. The study's overall response rate was high at 96%. The resulting total number of children of ages 0–6 was 11,023. In the current study, we restrict our attention to the 4,288 children who were ages 0–36 months, in particular, the subset of those ($N = 3{,}556$) for whom we have complete data for the indicators for ECD and family background that we consider. For hemoglobin, the available sample is smaller at 3,003; this is because blood samples to measure this quantity were not taken from children who were less than 6 months old (see n. 4 for explanation). In addition to the household surveys, information was collected at the municipality, barangay, and health and other ECD-related service provider levels. These sources provided information that is central to this analysis of whether family background is a proxy for health and other ECD-related services or whether family background interacts with health and other ECD-related service provision in its effect on ECD.

II. Measures

Our aims are to estimate the associations between (1) early child development and (2) family background and to discern whether and how these associations change with controls for (3) health and ECD-related service provision and (4) community characteristics. We also wish to investigate whether there are significant interactions involving family background. The empirical representations of each of the first three groups of variables are described here. The fourth construct, community characteristics, is measured with barangay fixed effects in some of the estimates.

A. Child Development Indicators

Cognitive, social, and motor development. The project collected information on a Revised ECD Checklist (REC) developed by a team of experts, including Lourdes Ledesma and Elizabeth Ventura, at the Department of Psychology of the University of the Philippines, Diliman. The REC was designed to measure child development in seven domains: gross and fine motor skills, receptive and expressive language, socioemotional skills, cognitive skills, and self-help skills. Each domain contains between nine and 22 items that are developmentally sequenced to increase in the degree of difficulty of tasks. The REC was applied to all children except those with serious health problems (e.g., poorly controlled seizures), debilitating anomalies (e.g., meningocoeles and cerebral palsy), or special needs (e.g., autism). We examine four domains of cognitive, social, and motor development that the developers of the REC items have designated as most relevant for understanding the psychosocial and physical development of children of ages 0–36 months: gross motor skills, fine motor skills, expressive language skills, and receptive language skills.[2] Within a domain, each item takes a value of one for presence of a skill and a value of zero for its absence. The sums of the raw scores are scaled within a series of age intervals to reflect a distribution with a mean of 10 and a standard deviation (SD) of 3 (see table 2).[3]

Hemoglobin. The study involved determining the hemoglobin levels from

[2] The gross motor domain includes 22 items on the ability of infants and children to lift their head, roll over, sit, stand, walk, and run. The fine motor domain includes 14 items on the child's ability to hold, grasp, and manipulate objects with his or her hands. Receptive language skills are measured with 15 items on whether a child responds to sounds or imitates and obeys specific commands or requests from others. The expressive language skills domain includes 22 items on the infant's or child's ability to emit sounds and vocalize to attract other's attention, imitate others, name objects, or engage in conversation.

[3] The age bands are 0–3, 4–6, 7–9, 10–12, 13–18, 19–24, 25–30, and 31–36 months.

TABLE 2
MEANS AND STANDARD DEVIATIONS FOR EARLY CHILDHOOD DEVELOPMENT VARIABLES

Variable/Components	Mean	SD
Cognitive, social, and motor development:		
Gross motor skills (22 items)	10.2	3.09
Fine motor skills (14 items)	10.1	2.88
Receptive language skills (15 items)	10.0	3.01
Expressive language skills (22 items)	10.0	3.08
Hemoglobin (grams per liter)	106.0	13.1
Worms (at time of survey or in past 6 months)	.142	.396
Anthropometrics:		
Height-for-age *Z*-score	−1.54	1.14
Weight-for-height *Z*-score	−.621	.997

Note. For cognitive, social, and motor development, sums of raw scores for each domain are scaled to range from 1 to 19, with a mean of 10 and a SD of 3. The number of items in parentheses refers to the total number of items in the raw scores.

blood samples taken from children ages 6 months or older.[4] A hemoglobin level below the cutoff of 110 grams per liter for children ages 6–59 months is considered to be indicative of anemia (World Health Organization 2001). Anemia is hypothesized to have deleterious consequences for children's cognitive and psychomotor functioning, as well as for their ability to resist and successfully recover from infections (e.g., Grantham-McGregor and Ani 2001; Oppenheimer 2001). About 64% of children between the ages of 6 and 36 months show readings below 110 grams per liter, and the mean level of hemoglobin for children in this sample was 106.

Worms. About 15% of the children in the sample had had worms in the past 6 months (table 2).[5] Although children with light helminth infections are often asymptomatic, more severe worm infections can lead to negative consequences such as iron deficiency anemia, protein energy malnutrition, stunting, wasting, listlessness, and abdominal pain. Schistosomiasis can have more severe clinical consequences, including hepatosplenomegaly (enlargement of the liver

[4] Children less than 6 months of age were generally not included in the blood sampling because, among full-term infants, the risk of iron deficiency in this age range is relatively low due to adequate iron provisions from the perinatal period (World Health Organization 2001). Hemoglobin levels were determined by diluting blood samples with a cyanmethemoglobin reagent in a spectrophotometer and using the proportional relationship of the absorbance of the reagent with the concentration of hemoglobin to determine the latter quantity. This method is one of two generally recommended as best for assessing hemoglobin levels in surveys (World Health Organization 2001).

[5] Worldwide, 1.3 billion people are estimated to be infected with hookworm (*Necator americanus, Ancylostoma duodenale*), 1.3 billion with roundworm (*Ascaris lumbricoides)*, 900 million with whipworm (*Trichuris trichura*), and 200 million with schistosomiasis (Bundy et al. 2001); Miguel and Kremer 2004). Most of those infected are school-age or preschool–age children in developing countries.

and spleen). In a recent study, Miguel and Kremer (2004) found that treatment for worms reduced primary school absenteeism by 25% in Kenya.

Anthropometric indicators of nutrition and health status. Malnutrition in early childhood has been found to have negative consequences on physical and mental development, which reduces schooling attainment and postschooling cognitive skills in poor populations (e.g., Martorell et al. 1998; Alderman, Hoddinott, and Kinsey 2003). The project collected anthropometric information in the form of weight and height for all children.[6] These measures were used to calculate Z-scores for height-for-age and weight-for-height that convey the number of SDs below or above widely used standards. The Z-scores were calculated using the Nutstat program, available within Epi Info, both obtained from the Centers for Disease Control. The Z-scores are based on the 2000 U.S. National Center for Health Statistics (NCHS) reference curves for age, sex, height, and weight.

In table 2, the mean Z-scores indicate significant deficits below the reference population means, about 1.5 SDs below for height-for-age and two-thirds of a SD below for weight-for-height. Individual Z-scores that were more than 2 SDs below the reference population mean for either height-for-age and weight-for-height were considered to be indicative of stunting and wasting, respectively. About 34% of the children in the sample fit the criteria for stunting, while 7% fit the criteria for wasting. However, particularly in the case of height-for-age, there are pervasive relative growth deficits among children in this sample that are not restricted only to those who fall below these conventional cutoffs.

B. Family Background Indicators

We measure family resources using physical assets and human assets.[7] We do not have a direct measure of physical wealth or prices that can be used to weight the available observations on various household assets. Therefore, we obtain estimated weights on the observed physical assets by regressing household food consumption (including both purchased and in-kind consumption) on these assets. We assume that household food consumption and the nature of physical assets are both related to longer-run household resources, though there is a stochastic difference due to transitory fluctuations and preference

[6] Weight was measured using Detecto scales (a standard scale with a platform and sliding balance weights). For children over 2 years of age, a microtoise (an L-shaped device with a pullout metal measuring tape) was used to measure standing height. For children under 2 years of age, recumbent length was measured using an infantometer (a flat device with a base, head, and movable footboard, as well as a tape measure imbedded on the base board). Three measurements for height and weight were taken, and these measurements are highly correlated with one another ($r = .99$ for weight and height).

[7] Other aspects of family background (e.g., social capital) also may play important roles, but the data do not permit empirical representation of them.

TABLE 3
MEANS AND STANDARD DEVIATIONS FOR FAMILY BACKGROUND VARIABLES

Variable/Components	Mean	SD
Physical assets:		
Ownership of:		
Land	.240	.466
Bicycles	.134	.371
Motorcycles	.063	.244
Car or jeep	.014	.132
Living room set	.254	.439
Dining room set	.350	.479
Bed with mattress	.114	.326
Bed without mattress	.320	.475
Electric iron	.175	.382
Electric fan	.314	.437
Refrigerator	.136	.329
Stove	.160	.353
Range	.098	.215
Telephone	.011	.085
Color television	.308	.416
VCR	.074	.255
Housing quality:		
Number of rooms	2.67	1.32
Household has electricity	.610	.499
Cement or iron roof	.657	.492
Cement or iron walls	.191	.417
Flush or water seal toilet	.594	.491
Expenditures (pesos)	729.2	484.4
Human assets of father:		
Height (cm)	163.6	7.39
Schooling	7.57	3.91
Human assets of mother:		
Height (cm)	150.0	5.28
Schooling	8.53	3.64

heterogeneity.[8] Thus, our procedure yields estimates of the relative, though not the absolute, weights for physical assets in overall household resources.[9]

Table 3 gives the means and standard deviations of the individual indicators

[8] We do not have data on all expenditure items that would permit considering total expenditure or data on income. Expenditure is likely to be preferable to income for representing long-run resources, given greater transitory fluctuations in income (Montgomery et al. 2000). We explored an alternative way of weighting assets using a principal components representation of assets, as in Filmer and Pritchett (2001). Although the estimated weights do not change substantially, a priori weights related to food consumption patterns seem preferable to those that come out of a statistical procedure that does not use other information on household behaviors related to expenditures on large components of consumption.

[9] See table A1 for the first-stage estimates for expenditures. Ownership of telephones, motor vehicles, a bed with a mattress, a refrigerator, a stove, a range, and a VCR have the largest estimated coefficients, though a number of other assets and housing related measures are highly significant. The consistency of the items with the variance in food-related consumption is 36%.

of household assets that we use. Regarding physical assets, about one-quarter to one-third of the children live in households that own furniture of some type (i.e., living room or dining room set or a bed without a mattress). A third of the children reside in households that own a television or an electric fan. Ownership of motor vehicles, ranges, VCRs, and telephones is relatively lower. The mean number of rooms in households is 2.7; about 60% of the children are from households that have a flush or water-seal toilet, and about two-thirds live in households with electricity or a roof in good condition.

We measure the human assets of the household by the parents' schooling and height. Schooling is widely recognized to represent a productive asset that captures both wealth and opportunity costs of time (e.g., Psacharopoulos 1994). We also include height because of evidence that health and nutritional status have important productive effects in poor populations, in some cases greater effects than schooling, again reflecting both wealth and opportunity cost components (e.g., Deolalikar 1988; Sahn and Alderman 1988; Behrman and Deolalikar 1989; Haddad and Bouis 1991; Foster and Rosenzweig 1993). As shown at the bottom of table 3, mothers average somewhat more schooling (8.5 grades) than fathers (7.6 grades), with substantial variation for both females and males. Human assets may reflect factors that relate to intrahousehold bargaining because they are identified with different family members. Studies show that the mother's characteristics, as measured by unearned income shares or assets owned, have larger positive associations with expenditures on human capital within the household than the father's characteristics (Thomas 1993; Quisumbing and Maluccio 1999). To allow for the possibility that the characteristics of fathers and mothers have different associations with the health and developmental outcomes of children, we consider the height and schooling of each parent separately.[10]

C. Health and Other ECD-Related Service Providers

We have 15 indicators of the availability of health and other ECD-related services at the municipality and barangay levels of geographical aggregation (table 4). In the analysis, we use sums of both the barangay and municipality health service items.[11] At the barangay level, on average, health centers, private medical clinics, and pharmacies are more numerous, while hospitals (either

[10] Physical assets in general also may have different effects depending on ownership, but physical assets are not identified by individual ownership in these data.

[11] Note that an alternative would be to summarize the health or ECD-related variables at both the barangay and municipality level using principal components. The estimates for family background and the overall results for the interactions do not change appreciably depending on whether we employ an additive summary or the principal components.

TABLE 4
MEANS AND STANDARD DEVIATIONS FOR HEALTH PROVIDER VARIABLES

Variable/Components	Mean	SD
Municipal services:		
No. of nurses	14.5	6.78
No. of doctors	4.93	1.95
No. of medical technicians	2.81	1.18
No. of sanitation inspectors	5.79	2.43
No. of midwives	13.2	8.45
No. of midwives in catchment area	14.9	6.90
No. of barangay health workers	215.7	98.0
No. of barangay nutrition scholars	29.9	24.8
No. of traditional birth attendants	37.9	24.3
No. of other volunteer health workers	.341	2.13
Sum of municipality services	340.2	137.3
Barangay services:		
No. of health centers	.587	.509
No. of private medical clinics	.584	1.27
No. of private hospitals	.090	.302
No. of public hospitals	.059	.233
No. of pharmacies	.567	1.14
Sum of barangay services	1.89	2.71

public or private) are less common. The mean numbers of total health service facilities and personnel available in a barangay and municipality are 1.9 and 340, respectively. There is considerable variation in health service availability across barangays and municipalities.

III. Estimation

We estimate models that take the *i*th indicator for early childhood development in the *j*th family in the *k*th community (ECD_{ijk}), in the most general case, as a second-order Taylor expansion of the reduced-form relation between ECD and family background. Specifically, ECD is a function of family physical assets (PA_{jk}), mother's and father's human assets (HA_{jk}), health and other ECD-related services in the *k*th community (HS_k), community characteristics that are relevant for the *i*th ECD indicator for the *k*th community (C_{ik}),[12] and a stochastic disturbance (u_{ijk}) due to chance events.[13]

$$\begin{aligned} ECD_{ijk} = {} & a_{0i} + a_{1i}PA_{jk} + a_{2i}PA^2_{jk} + a_{3i}HA_{jk} + a_{4i}HA^2_{jk} \\ & + a_{5i}HS_k + a_{6i}HS^2_k + a_{7i}C_{ik} + a_{8i}C^2_{ik} \\ & + (a_{9i}PA_{jk} \times HS_k) + (a_{10i}HA_{jk} \times HS_k) \qquad (1) \\ & + (a_{11i}PA_{jk} \times HA_{jk}) + u_{ijk}, \end{aligned}$$

[12] We are not able to estimate separately the first-order (a_{7i}) or second-order (a_{8i}) effects for C_{ik}

where HA_{jk} and HS_k in general are vectors and the a_{mi} are parameters to be estimated for each of the *i*th indicators of ECD (of which there are eight). The second-order Taylor expansion, in contrast to the first-order Taylor expansion, allows for interactions and varying (e.g., diminishing) marginal effects. Our interest is not in focusing on this full specification in relation (1), which may not be very informative because of the large number of parameters to be estimated and high multicollinearity. We wish to learn what happens to the estimates of family physical assets and family human assets as we start with a much simpler specification and then extend it by making changes consistent with the second-order Taylor series approximation in relation (1). We note that, as is customary with reduced-form relations, our interpretations of the underlying structural relations and intrahousehold bargaining processes are speculative. We also note that interpreting the estimates as causal using behavioral data always is conditional on a model. In this article, we are interested in examining how estimates of the impacts of right-side variables change as we estimate alternative specifications that are special cases of relation (1). For each comparison of estimates across models, our maintained hypothesis is that the relevant model is the more extended version of relation (1).

We consider two special cases of the general model shown in relation (1). In the simplest model (model 1), we include only the linear terms in the family physical assets PA_{jk} and the family human assets HA_{jk}, which represents a first-order Taylor series approximation with no quadratics and no interactions where the coefficients a_{2i}, a_{4i}, a_{6i}, and a_{8i}–a_{11i} are all constrained to be zero. We then expand the simplest specification by (1) including the linear effects of health and other ECD-related services in the *k*th community (a_{5i} is allowed to be nonzero; this is model 2) and (2) observed community characteristics that are relevant for the *i*th ECD indicator for the *k*th community (a_{7i} is allowed to be nonzero; this is model 3).

We then consider the results for the specification where we include the interactions between family background and health and ECD-related services (a_{9i} and a_{10i} are allowed to be nonzero) and quadratics in family background and health and ECD-related services (a_{2i}, a_{4i}, and a_{6i} are allowed to be nonzero) in what is approaching a second-order Taylor series representation of the observables. In an additional specification, we also include all community characteristics (or let a_{7i} and a_{8i} be nonzero) to verify the robustness of the estimated

because we do not observe what C_{ik} is measuring (i.e.., unobserved community effects); therefore, the coefficient of a_{7i} is controlling for the total effect of $a_{7i}C_{ik} + a_{8i}C_{ik}^2$. Likewise, we are not able to estimate coefficients of interactions that include C_{ik}, so we do not include such interactions in the expression below.

[13] In all specifications, we also adjust for child's age.

interaction effects. Finally, we present a specification with interactions among the family physical and human asset variables (a_{11i} is allowed to be nonzero) with quadratics in family background and tests of the robustness of interaction estimates to controls for unobserved community characteristics. Under the assumption that the true specification is given by relation (1), we investigate how excluding health and ECD-related services and community fixed effects affects the coefficients of the right-side variables. If omitted community characteristics that should be included are correlated with the right-side variables for ECD, then the coefficient estimates of the latter set of variables will be biased. We pay particular attention to how the estimated effects of family background on ECD change with controls for community characteristics.

IV. Results

A. Simplest Specification and Its Extensions

The simplest specification includes physical assets, mother's and father's human assets as measured by height and schooling, and controls for the child's age. Table 5 shows results from these estimates for the four domains of cognitive, social, and motor development (gross motor skills, fine motor skills, receptive language skills, and expressive language skills). The simplest model indicates that a SD increase in physical assets is associated with anywhere from a .02 to .05 SD increase in early childhood development, though the t-statistics exceed 2 for receptive language skills only. The addition of health and ECD-related services to the simplest model does not lead to appreciable changes in the magnitude of the coefficients for physical assets. For children's receptive language skills, there is a modest 7% increase in the coefficient when barangay fixed effects are included. The largest change is observed for fine motor skills, where the estimated coefficient for physical assets is about 2.2 times larger when fixed effects are included and becomes marginally significant in model 3 ($p < .10$).[14]

For the father's human assets in the form of height, the simplest model indicates that a SD increase is related to a .04 SD increase in gross motor, fine motor, and receptive language skills and a .03 SD increase in children's expressive language skills. All estimates are significant at the .05 level except those for expressive language skills. Inclusion of controls for health and ECD-related services leads to a decline in the estimated coefficients in model 2 for fine motor skills on the order of 10%. A similar decline is observed for receptive

[14] Here and elsewhere in tables 5 and 6, Chow tests on the equality of coefficients across models fail to reach significance at the .05 level despite fairly substantial changes in the estimates between model 1 and its extensions. This is likely due to imprecision in the estimates.

TABLE 5

RESULTS FOR COGNITIVE, SOCIAL, AND MOTOR DEVELOPMENT (STANDARDIZED OLS REGRESSION COEFFICIENTS)

	Early Childhood Development (ECD) Indicators											
	Gross Motor Skills			Fine Motor Skills			Receptive Language Skills			Expressive Language Skills		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Physical asset index	.016	.015	.015	.017	.018	.038	.046	.046	.049	.027	.031	.022
	(.83)	(.76)	(.73)	(.86)	(.92)	(1.82)	(2.28)	(2.30)	(2.51)	(1.43)	(1.58)	(1.11)
Human assets:												
Father's height	.040	.041	.049	.041	.037*	.020*	.037	.033*	.020	.026	.024	.025
	(2.37)	(2.39)	(2.90)	(2.30)	(2.06)	(1.17)	(1.99)	(1.79)	(1.25)	(1.45)	(1.34)	(1.45)
Father's schooling	.035	.036	.008	.051	.044*	.034	.034	.029	.018	.079	.077	.070
	(1.61)	(1.62)	(.41)	(2.19)	(1.92)	(1.55)	(1.47)	(1.24)	(.85)	(3.61)	(3.49)	(3.27)
Mother's height	.020	.019	.005	.013	.017	.021	−.004	−.001	.016	−.001	.001	−.001
	(1.16)	(1.10)	(.30)	(.73)	(.95)	(1.21)	(−.23)	(−.06)	(.97)	(−.07)	(.09)	(−.10)
Mother's schooling	.014	.014	.015	.034	.030	.047	.045	.042	.062	.038	.036	.057
	(.63)	(.65)	(.70)	(1.52)	(1.36)	(2.24)	(2.01)	(1.88)	(3.02)	(1.74)	(1.65)	(2.68)
Age (months):												
0–6	...	...	...	...	...	...	...	...	...	...	...	...
7–11	−.001	.005	−.005	−.054	−.055	−.068	−.041	−.041	−.053	−.022	−.022	−.038
	(−.08)	(−.09)	(−.25)	(−2.57)	(−2.62)	(−3.17)	(−2.03)	(−2.07)	(−2.70)	(−1.14)	(−1.14)	(−1.94)
12–18	.004	.015	.008	.005	.001	−.011	.031	.028	.003	.013	.011	−.004
	(.23)	(.26)	(.37)	(.27)	(.07)	(−.51)	(1.48)	(1.31)	(.15)	(.71)	(.59)	(−.24)
19–23	.015	.015	.008	.012	.012	−.002	.016	.016	.003	.015	.014	−.005
	(.72)	(.74)	(.43)	(.60)	(.62)	(−.12)	(.77)	(.79)	(.18)	(.77)	(.74)	(−.30)

24–30	.009	.01	.009	−.065	−.067	−.066	−.022	−.023	−.032	−.022	−.023	−.040
	(.44)	(.47)	(.43)	(−3.02)	(−3.14)	(−3.05)	(−1.00)	(−1.07)	(−1.44)	(−.97)	(−1.03)	(−1.76)
31–36	.004	.004	−.001	.008	.006	−.005	−.034	−.035	−.047	−.005	−.006	−.027
	(.19)	(.22)	(−.06)	(.40)	(.34)	(−.25)	(−1.60)	(−1.65)	(−2.21)	(−.25)	(−.32)	(−1.25)
Health and ECD-related services:												
Barangay		.011			.026			.027			−.015	
		(.76)			(2.14)			(2.18)			(−1.14)	
Municipality		−.016			.091			.074			.057	
		(−1.00)			(5.32)			(4.51)			(3.70)	
R^2	.007	.007	.19	.02	.03	.23	.02	.03	.27	.02	.02	.21
F-test (health and ECD services)		.73			18.0**			14.3**			7.2**	
F-test (fixed effects)			10.1**			15.9**			18.1**			10.9**

Note. $N = 3{,}556$. Model 1: family background, child's age. Model 2: family background, child's age, and health and ECD-related services. Model 3: family background, child's age, and barangay fixed effects. The *t*-statistics are shown in parentheses. Standard errors are corrected for clustering at the household level. All estimates are from an OLS regression.The statistical significance footnote symbols refer to a Chow test comparing the coefficient for family background in model 2 or model 3 with the counterpart estimate in model 1; they are shown when the estimate in the simplest model is significant at the .05 level or becomes significant at this level in the alternate model.

* $p < .05$.

** $p < .01$.

language skills, and for both of these domains of child development, the estimates are significantly different between models 1 and 2 ($p < .05$).

The addition of community fixed effects leads to a 45%–50% decline in the estimated effect of father's height on the fine motor and receptive language skills of children. For each of these two domains of ECD, the estimated t-statistics in model 1 fall from near 2 to about 1.2; in the case of fine motor skills, the estimates for father's height are significantly different at the .05 level between the simplest model and a model with barangay fixed effects. For gross motor skills, the addition of fixed effects leads to an increase of about 22% in the estimated effect of father's height. There are no significant differences in the effect of mother's and father's height or schooling on cognitive, social, and motor development except for the gross motor skills of children, where a significant difference is observed for height in model 3 ($p < .10$). Specifically, a SD increase in father's height is related to a .05 SD rise in gross motor skills ($t = 2.9$) compared to a coefficient for mother's height of .005 that is not significantly different from zero.

For father's schooling, in the simplest model (1), a SD increase is associated with .05 and .08 SD increases in fine motor and expressive language skills, respectively. When fixed effects are added to the simplest model, the coefficient for father's schooling in the case of fine motor skills is about a third smaller in magnitude and the associated t-statistic declines from 2.2 in model 1 to 1.6 in model 3. For fine motor skills, the addition of controls for health and ECD-related services is related to a 13% decrease in the estimated effect of father's schooling. A Chow test indicates that the coefficients for father's schooling in models 1 and 2 are significantly different at the .05 level for this domain of ECD.

For mother's human assets in the form of her height, a SD increase is associated with a .01–.02 SD increase for both fine motor skills and gross motor skills, and neither of these effects is significant at the .10 level. In the simplest models, the effects for mother's height are about one-third to one-half of the magnitude of those observed for father's height for gross motor and fine motor skills, though these differences are not statistically significant. Mother's schooling is relatively more important than mother's height for the language skills of children, where a SD rise in her schooling is associated with a .04–.05 SD increase in children's expressive and receptive language skills (model 1). The coefficient estimates in these two domains are very similar between the simplest model and one that includes health and ECD-related services. But the inclusion of barangay fixed effects leads to a 38%–50% increase in the coefficient estimates on maternal schooling in the simplest model for the fine motor domain and both measures of children's language performance. The accompanying t-statistics for mother's schooling increase from below 1.8 to above 2 in magnitude, and for receptive language skills, they increase from 2 to 3.

The bottom half of table 5 shows the estimated coefficients for child's age and health and ECD-related services. Age either has a weak association or one that displays no consistent patterns with the four cognitive, social, and motor development domains, because the measures are scaled within age bands to represent a normal distribution. Of the eight estimated coefficients for health and ECD-related services, five display significant relationships with ECD at the .05 level and the sign of these associations is positive. The test statistics shown at the bottom of the table indicate that the coefficients for the health and ECD-related services or the fixed effects are jointly significantly different from zero at the .01 level in all cases except for health and ECD services for the gross motor domain.

Table 6 shows the analogous results for the simplest model and its extensions for hemoglobin, worms, and anthropometrics. The estimates from model 1 in the top row of table 6 indicate that a SD increase in family physical assets is associated with .17, .12, and .09 SD increases, respectively, in hemoglobin, height-for-age *Z*-scores, and weight-for-height *Z*-scores. For worms, a SD increase in family physical assets is related to a .27 SD decline in the propensity for a child to have worms. The effects for family physical assets are significant at the .01 level for all ECD outcomes across the three model specifications. In the case of hemoglobin and weight-for-height, physical assets have estimated associations that are significantly larger than those for each of the measures of parents' human assets at the .05 level. The addition of health and ECD-related services (model 2) or community fixed effects (model 3) leads to relatively small shifts in the size of the estimated effects of physical assets on ECD. Two exceptions are for worms and weight-for-height, where the estimate for physical assets increases by about 33% in (absolute) magnitude and declines by about one-quarter, respectively, after the addition of fixed effects. In the case of weight-for-height, the coefficients in model 1 (simplest specification) and model 3 (simplest specification with fixed effects) are significantly different at the .10 level.

For father's height, a SD increase is related to a .10 SD increase in children's height-for-age that remains similar across all model specifications. Father's height displays no significant associations with any of the other ECD measures shown in table 6. Compared to father's height, the estimates for father's schooling (model 1) indicate larger and statistically significant effects on all ECD outcomes, except for height-for-age. A SD increase in father's schooling is related to .04, .05, and .07 SD increases, respectively, in weight-for-height, height-for-age, and hemoglobin. The propensity for a child to have worms is

TABLE 6

RESULTS FOR HEMOGLOBIN, WORMS, AND ANTHROPOMETRICS *Z*-SCORES (STANDARDIZED REGRESSION COEFFICIENTS)

	ECD-Related Outcomes											
	Hemoglobin			Worms			Height-for-Age			Weight-for-Height		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Physical asset index	.165	.164	.173	−.267	−.251^{+}	−.354	.118	.118	.116	.089	.087	.069^{+}
	(7.54)	(7.44)	(7.69)	[−2.75]	[−2.57]	[−2.96]	(6.41)	(6.41)	(5.81)	(4.17)	(4.04)	(3.14)
Human assets:												
Father's height	−.019	−.018	−.010	.008	.015	.040	.104	.105	.112	.003	.005	.016
	(−1.12)	(−1.06)	(−.57)	[.12]	[.21]	[.48]	(7.05)	(7.10)	(7.31)	(.23)	(.33)	(.99)
Father's schooling	.070	.071	.082	−.264	−.253	−.288	.046	.047	.049	.037	.039	.063*
	(3.06)	(3.09)	(3.59)	[−2.8]	[−2.67]	[−2.47]	(2.50)	(2.56)	(2.56)	(1.95)	(2.05)	(3.25)
Mother's height	.050	.048	.031^{+}	−.175	−.175	−.202	.252	.251	.243	.025	.023	.034
	(2.80)	(2.69)	(1.69)	[−2.36]	[−2.37]	[−2.27]	(15.7)	(15.6)	(14.9)	(1.56)	(1.42)	(2.07)
Mother's schooling	.022	.023	.036	−.071	−.060	−.238*	.054	.055	.048	.02	.024	.044^{+}
	(.98)	(1.01)	(1.57)	[−.79]	[−.66]	[−2.15]	(2.84)	(2.89)	(2.46)	(1.16)	(1.24)	(2.18)
Age (months):												
0–6	NA	NA	NA	…	…	…	…	…	…	…	…	…
7–11	…	…	…	.875	.884	1.04	−.206	−.206	−.197	−.285	−.285	−.269
				[2.91]	[2.94]	[2.86]	(−11.3)	(−11.3)	(−10.3)	(−13.6)	(−13.6)	(−12.6)
12–18	−.007	−.006	−.014	1.82	1.83	2.29	−.351	−.350	−.347	−.464	−.462	−.443
	(−.36)	(−.30)	(−.68)	[5.85]	[5.89]	[5.85]	(−19.8)	(−19.8)	(−18.5)	(−22.4)	(−22.2)	(−21.0)
19–23	.073	.073	.066	1.99	2.00	2.51	−.418	−.418	−.418	−.389	−.388	−.375
	(3.51)	(3.53)	(3.19)	[7.27]	[7.29]	[7.28]	(−23.5)	(−23.5)	(−22.8)	(−18.7)	(−18.6)	(−17.5)

24–30	.149	.150	.152	2.55	2.56	3.14	−.359	−.355	−.361	−.399	−.398	−.380
	(6.89)	(6.92)	(6.96)	[8.25]	[8.28]	[8.02]	(−19.5)	(−18.9)	(−18.5)	(−21.2)	(−21.2)	(−19.5)
31–36	.270	.271	.272	2.55	2.55	3.20	−.384	−.362	−.385	−.370	−.369	−.351
	(13.6)	(13.7)	(13.3)	[8.31]	[8.34]	[8.28]	(−21.4)	(−12.5)	(−20.5)	(−18.8)	(−18.7)	(−17.6)
Health and ECD-related services:												
Barangay		.010			−.461			−.003			.012	
		(.63)			[−2.96]			(−.99)			(.93)	
Municipality		−.027			−.023			−.016			−.042	
		(−1.59)			[−.34]			(−.25)			(−2.74)	
R^2	.12	.12	.21	.19	.19	.34	.29	.29	.36	.18	.18	.29
F-test or χ^2-test (health and ECD-related services)		1.4			8.7*			.73			4.1*	
F-test or χ^2-test (fixed effects)			5.3**			417.5**			4.2**			5.9**

Note. $N = 3{,}556$, except for hemoglobin, where $N = 3{,}003$. The *t*-statistics are shown in parentheses. All estimates are from an OLS regression except for worms, where estimates are from a probit regression; for those estimates, *Z*-statistics are in square brackets. Standard errors are corrected for clustering at the household level. Model 1: family background, child's age. Model 2: family background, child's age, and health and ECD-related services. Model 3: family background, child's age, and barangay fixed effects. NA: Hemoglobin measurements were not available for children ages 6 months and younger. The statistical significance footnote symbols refer to a Chow test comparing the coefficient for family background in model 2 or model 3 with the counterpart estimate in model 1; they are shown when the estimate in the simplest model is significant at the .05 level or becomes significant at this level in the alternate model.

$^{+}$ $p < .10$.

* $p < .05$.

** $p < .01$.

.26 SDs lower for every SD increase in the father's schooling, and this effect is very similar in magnitude to the estimate for physical assets. The estimates for father's schooling are relatively unchanged with the addition of measures of health and ECD-related services in model 2. But for weight-for-height, the addition of fixed effects produces a 70% increase in the estimate for father's schooling and the t-value rises from about 2 to 3.3. For this ECD outcome, a Chow test indicates that the estimate for father's schooling in model 3 is significantly different from that in model 1.

The estimates for mother's height indicate that a SD increase is related to anywhere from a .05 (hemoglobin) to a .25 (height-for-age) SD increase in ECD. A child's propensity to have worms is about .18 SDs lower for every SD increase in mother's height. With the exception of weight-for-height, all estimates for mother's height in the simplest model are significant at the .01 level. There is virtually no change in the magnitude of the coefficients across models 1 and 2. But the shifts in the estimates are relatively greater when comparing the simplest model with one that contains barangay fixed effects. For example, in the case of hemoglobin, the effect of mother's height declines by 38% and the t-statistic falls from 2.8 to 1.7. The two estimates for height in models 1 and 3 are significantly different at the .10 level. For weight-for-height, the effect of mother's height increases by about one-third, and the t-statistic increases from 1.6 to 2.1 between model 1 and model 3. And for mother's schooling, model 1 implies that a SD increase is related to a .02 SD increase in the weight-for-height Z-score with a t-value of 1.2. The addition of fixed effects doubles this estimate to .04 ($t = 2.2$), and the coefficients between models 1 and 3 are significantly different at the .10 level. For worms, model 1 shows that a SD increase in maternal schooling is associated with a −.07 decline in the propensity to have worms, with a t-value of −.80. With the addition of fixed effects, the effect of mother's schooling is about 3.4 times larger ($t = -2.2$) and implies a −.24 SD decline in the likelihood of a child having worms.

The results shown in the bottom panel of table 6 indicate that being at least 19 months old has a fairly linear and positive association with hemoglobin levels relative to the youngest age range. The propensity to have worms rises steadily for those between the ages of 7 months and 30 months relative to those less than 6 months old, and it levels off for children who are between 2 and 3 years of age. The health and ECD-related estimates are jointly significant (and generally negative) for worms and weight-for-height. The fixed effects are jointly significant at the .01 level for all ECD outcomes shown in table 6.

The tests for differences between the effect of father's and mother's human assets on each element of ECD shown in table 6 indicate that, in the simplest models for hemoglobin, height-for-age, and worms, the coefficients for father's and mother's height are significantly different at the .01 level for the first two outcomes and at the .10 level for worms. In the case of hemoglobin, the observed effect for father's height is negative and $-.02$ in magnitude ($t = -1.1$), while for the mother it is .05 ($t = 2.8$). The reverse is found for worms, where the mother's height has a significant negative association with this outcome and the estimate for father's height is .008. For height-for-age, a SD increase in the mother's height is related to a SD increase in height-for-age Z-scores that is about 2.5 times larger than the effect implied by the coefficient for father's height. But the estimates for both father's height and mother's height have large and significant positive effects on height-for-age. These findings do not change in alternate specifications that consider health and ECD-related services or community fixed effects, with the exception of hemoglobin, where the difference in the estimates for mother's and father's height is reduced in magnitude in a model with fixed effects and a test of the null hypothesis that they are equal cannot be rejected at the .05 level ($p = .12$).

B. Interactions between Family Background and Health and Other ECD-Related Services

There may be positive (complementary) or negative (substitution) interactions between family background and health and other ECD-related services. The results from models that consider family background and its interactions with health services for cognitive, social, and motor development of children are shown in table 7.[15] In table 8, we show the corresponding estimated interactions for hemoglobin, worms, and anthropometrics. As indicated by the F-statistics and chi-square statistics shown in the bottom rows of tables 7 and 8, the interaction terms taken as a group are not significantly different from zero in most cases (hemoglobin and worms are the main exceptions). For the occurrence of worms, a number of interactions are significant at the .10 level and generally reflect substitutions between health services and the mother's human assets. In the case of hemoglobin, the important interactions reflect complementarities between health and ECD-related services and family physical assets or father's height. Appendix tables A2 and A3 show the corresponding results for the interactions with the addition of community fixed effects. For all of the ECD outcomes, several previously significant interactions decline appreciably in magnitude, while others that were not previously important now have t-values exceeding 2. The joint tests on the estimated interaction effects are generally

[15] As discussed earlier, all models include quadratics for the five family background variables. In the interests of brevity of presentation, their estimates are omitted from tables 7, 8, and A2–A4, but these are available from us. As explained in the notes for the tables, the estimates for the first-order terms are the average derivative effects with respect to the first- and second-order terms.

TABLE 7

COGNITIVE, SOCIAL, AND MOTOR DEVELOPMENT RESULTS FOR FAMILY BACKGROUND–ECD SERVICE PROVIDER INTERACTIONS (STANDARDIZED OLS REGRESSION COEFFICIENTS)

	Early Childhood Development (ECD) Indicators			
	Gross Motor Skills	Fine Motor Skills	Expressive Language Skills	Receptive Language Skills
Physical asset index	.012 (.576)	−.0004 (.891)	−.0007 (.881)	−.002 (.773)
Human assets:				
Father's height	−3.81 (.568)	−.480 (.902)	−31.6 (.198)	24.4 (.338)
Father's schooling	.102 (.304)	.175 (.150)	.059 (.298)	.117 (.225)
Mother's height	53.1 (.261)	3.39 (.821)	−12.7 (.571)	−80.4 (.210)
Mother's schooling	−.290 (.137)	−.549 (.044)	−.456 (.062)	−.079 (.421)
Age (months):				
0–6	. . .	. . .	. . .	. . .
7–11	−.008 (−.39)	−.057 (−2.73)	−.023 (−1.20)	−.043 (−2.14)
12–18	.003 (.18)	.0001 (.01)	.009 (.46)	.026 (1.20)
19–23	.013 (.65)	.010 (.50)	.014 (.75)	.014 (.70)
24–30	.007 (.35)	−.069 (−3.20)	−.024 (−1.06)	−.025 (−1.14)
31–36	.002 (.13)	.004 (.24)	−.008 (−.38)	−.038 (−1.78)
ECD-related services:				
Barangay	.021 (.842)	.048 (.167)	−.027 (.707)	.077 (.402)
Municipality	−.005 (.598)	−.089 (.116)	−.111 (.068)	−.062 (.189)
Family background and ECD-services interactions:				
Barangay × expenditures	.097 [1.96]	.119 [2.92]	.019 [.45]	.050 [1.13]
Barangay × father's height	.358 [.72]	−.093 [−.22]	−.700 [−1.78]	−.753 [−2.11]
Barangay × father's schooling	.021 [.24]	−.058 [−.84]	−.148 [−1.96]	−.106 [−1.18]
Barangay × mother's height	−.447 [−.62]	−.715 [−1.38]	.946 [1.74]	.251 [.40]
Barangay × mother's schooling	−.061 [−.78]	−.125 [−2.16]	.099 [1.49]	−.013 [−.18]
Municipality × expenditures	−.116 [−1.84]	.041 [.72]	.009 [.18]	−.020 [−.33]
Municipality × father's height	.233 [.59]	−.252 [−.61]	−.348 [−.93]	.181 [.46]
Municipality × father's schooling	.094 [1.52]	.040 [.54]	.005 [.10]	−.027 [−.41]
Municipality × mother's height	.369 [.76]	.560 [1.08]	.055 [.13]	−.224 [−.48]
Municipality × mother's schooling	−.058 [−.86]	−.086 [−1.21]	−.071 [−1.19]	−.009 [−.13]
R^2	.01	.03	.02	.02
F (interactions)	1.1	1.4	1.4	.56

Note. $N = 3{,}542$. Standard errors are corrected for clustering at the household level. All models include quadratics for physical assets, human assets, and health and ECD-related services, and for these variables the coefficient estimates shown are the mean effect evaluated as the derivative with respect to the first- and second-order terms; the associated *p*-values for these estimates are in parentheses. For interaction terms, the items in square brackets are *t*-statistics.

not statistically significant at any conventional level. But the community fixed effects are jointly significant from zero in all of the models shown in tables A2 and A3.

The estimates for the interactions between physical assets and the four representations of parents' human assets are shown in table 9. For most of the ECD outcomes, we cannot reject the null hypothesis that the interactions are jointly different from zero at the .05 level. Table A4 shows the corresponding estimates for table 9 with additional controls for community fixed effects. In the case of fine motor and language skills, a number of interactions are significant at the 10% level, indicating substitutive relations among the measures of mother's and father's schooling or height. In the case of expressive language skills, there is evidence of substitutions between the family physical assets and the father's human assets. The results also indicate several important positive interactions between family physical assets and mother's height in terms of their effects on the fine motor and language skills of children.

V. Summary and Conclusions

This analysis of the relationship between family background and early childhood development in the Philippines indicates that family background has a number of important positive effects on early child development. Examples of such relationships include those between the family's physical assets and the hemoglobin levels, height-for-age, weight-for-height, and lower occurrence of worms among children. In terms of the mother's human assets, height has strong and positive relationships with children's height-for-age and the lower occurrence of worms. Father's schooling has significant positive associations with children's expressive language skills, hemoglobin levels, anthropometrics, and a lower propensity for children to have worms. In the case of worms, the importance of the father's schooling rivals the family's physical assets in magnitude. Father's height has significant positive effect on children's gross and fine motor skills, as well as on height-for-age.

Consistent with other studies, we find that while both mother's height and father's height have large and significant positive associations with children's height-for-age, the effect for the mother's height is significantly larger in magnitude (Thomas, Strauss, and Henriques 1990). The mother's height also has significantly larger negative effects on her children's propensity to have worms compared to the father's height. But in the case of children's gross motor skills, models that include controls for all community characteristics indicate that the association for father's height is significantly different from (and greater than) that observed for mother's height. Beyond the main effect of family background on ECD, we do not find evidence of widespread inter-

TABLE 8

HEMOGLOBIN, WORMS, AND ANTHROPOMETRICS RESULTS FOR FAMILY BACKGROUND–ECD SERVICE PROVIDER INTERACTIONS (STANDARDIZED REGRESSION COEFFICIENTS)

	ECD-Related Outcomes			
	Hemoglobin	Worms	Height-for-Age *Z*-Statistic	Weight-for-Age *Z*-Statistic
Physical asset index	−.027	.013	−.020	−.018
	(.190)	(.746)	(.273)	(.334)
Human assets:				
Father's height	2.35	.887	15.0	.110
	(.494)	(.851)	(.021)	(.868)
Father's schooling	.007	−.003	−.029	.013
	(.500)	(.691)	(.270)	(.437)
Mother's height	2.10	212.3	−1.18	−15.9
	(.760)	(.187)	(.839)	(.337)
Mother's schooling	.784	.083[a]	.121	1.59
	(.012)	(.753)	(.05)	(.362)
Age (months):				
0–6	NA	…	…	…
7–11		.881	−.204	−.286
	…	(2.34)	(−11.1)	(−13.5)
12–18	−.003	1.84	−.351	−.462
	(−.15)	(9.58)	(−19.8)	(−22.2)
19–23	.070	2.01	−.420	−.393
	(3.40)	(12.0)	(−23.5)	(−18.7)
24–30	.152	2.56	−.357	−.397
	(6.99)	(18.4)	(−19.2)	(−21.1)
31–36	.273	2.57	−.383	−.372
	(13.6)	(18.5)	(−21.3)	(−18.8)
ECD-related services:				
Barangay	−.054	1.73	.009	−.023
	(.209)	(.178)	(.157)	(.330)
Municipality	.126	−2.23	.007	.039
	(.027)	(.000)	(.407)	(.041)
Family background and ECD-services interactions:				
Barangay × expenditures	.087	−1.45	.026	.029
	[1.61]	{.14}	[.59]	[.59]
Barangay × father's height	.909	−1.13	−.175	−.190
	[2.66]	{.36}	[−.42]	[−.52]
Barangay × father's schooling	.011	.554	.038	−.130
	[.15]	{1.91}	(.46)	[−1.63]
Barangay × mother's height	.104	−5.77	−.822	.845
	[.14]	{−1.75}	[−1.23]	[1.45]
Barangay × mother's schooling	−.019	−.830	−.046	.049
	[−.25]	{−1.66}	[−.76]	[.74]
Municipality × expenditures	.081	.208	−.023	.036
	[1.41]	{.14}	[−.46]	[.58]
Municipality × father's height	.578	.052	−.053	.469
	[1.44]	{.05}	[−.16]	[1.16]
Municipality × father's schooling	.024	−.055	.082	.080
	[.41]	{−.09}	[1.56]	[1.55]
Municipality × mother's height	.343	3.68	.378	−.314
	[.74]	{1.29}	[.94]	[−.71]

TABLE 8 (*Continued*)

	ECD-Related Outcomes			
	Hemoglobin	Worms	Height-for-Age *Z*-Statistic	Weight-for-Age *Z*-Statistic
Municipality × mother's schooling	.024 [.36]	−.728 {−2.29}	−.119 [−2.09]	−.148 [−2.48]
R^2	.14	.20	.29	.19
F-test or χ^2 test (interactions)	1.9*	21.2*	.80	1.2

Note. $N = 3{,}542$ except for hemoglobin, where $N = 2{,}991$. Standard errors are corrected for clustering at the household level. All estimates are from an OLS regression, except that for worms, where estimates are from a probit regression. All models include quadratics for physical assets, human assets, and health and ECD-related services, and for these variables the coefficient estimates shown are the mean effect evaluated as the derivative with respect to the first- and second-order terms; the *p*-values for these estimates are in parentheses. For interaction terms, the associated *t*-statistics appear in square brackets; for the worms estimates, the associated *Z*-statistics appear in curly braces. NA for the hemoglobin measurements indicates that these were not available for children who were less than 6 months old.
[a] Value is multiplied by 1,000.
* $p < .05$.

actions between family background and health services for affecting ECD. A few exceptions are found in the case of occurrence of worms and hemoglobin levels among children, though the estimates are not robust to additional controls for community characteristics. For the fine motor and language skills of children, we find several important interactions between measures of family human and physical assets, indicating substitutions between mother's and father's human assets as well as between physical assets and father's human assets. There is also evidence of complementary effects between mother's height and family physical assets for these ECD outcomes.

The results show that failure to account for community characteristics can give misleading indications of the probable impact of family background on ECD. In cases such as the association between father's height and fine motor skills or receptive language skills of children, or the effect of mother's height on hemoglobin levels of children, omitting controls for community characteristics results in overestimates of the coefficients of family background. The magnitude of the upward bias ranges from about 40%–50% of the estimated coefficients. In other cases, such as the effect of each parent's schooling on weight-for-height, or the relation between maternal schooling and children's fine motor skills, language skills, and worms, omitting controls for community characteristics leads to underestimates of the relationship of family background to ECD. The size of the downward bias ranges from 40% to over three times the size of the estimated coefficients in the case of worms. These findings show that omitting controls for all observed or unobserved community characteristics leads to serious underestimation of the effect of maternal schooling on a number of ECD outcomes, including children's fine motor skills, occurrence of worms,

TABLE 9

REGRESSION RESULTS FOR INTERACTIONS BETWEEN FAMILY BACKGROUND ITEMS

	Early Childhood Development (ECD) Indicators				ECD-Related Outcomes			
	Gross Motor Skills	Fine Motor Skills	Expressive Language Skills	Receptive Language Skills	Hemoglobin	Worms	Height-for-Age *Z*- Statistic	Weight-for-Height *Z*-Statistic
Physical asset index	.075	−.020	.046	−.047	−.249	.174	−.107	−.049
	(.365)	(.593)	(.474)	(.449)	(.011)	(.351)	(.031)	(.142)
Human assets:								
Father's height	.069	−.0004	−29.0	26.7	1.00	.147	10.0	−.031
	(.943)	(.990)	(.169)	(.183)	(.693)	(.934)	(.120)	(.931)
Father's schooling	.886	.596	.257	.101	.008	.266	−.049	.040
	(.043)	(.016)	(.211)	(.339)	(.464)	(.354)	(.343)	(.381)
Mother's height	13.2	.002	−44.9	−146.4	.021	98.5	−7.05	−12.3
	(.641)	(.996)	(.387)	(.115)	(.978)	(.394)	(.507)	(.384)
Mother's schooling	−.042	.053	−.189	.053	.403	−.102	.122	.009
	(.415)	(.579)	(.622)	(.386)	(.346)	(.484)	(.083)	(.584)
Age (months):								
0–6	…	…	…	…	NA	…	…	…
7–11	−.0007	−.055	−.022	−.041	…	.878	−.204	−.801
	(−.03)	(−2.62)	(−1.12)	(−2.07)		(2.90)	(−11.2)	(−13.5)
12–18	.006	.006	.015	.031	−.006	1.82	−.350	−1.19
	(.28)	(.31)	(.79)	(1.44)	(−.30)	(5.83)	(−19.8)	(−22.2)
19–23	.013	.007	.011	.010	.071	2.00	−.418	−1.13
	(.61)	(.35)	(.59)	(.51)	(3.44)	(7.22)	(−23.6)	(−18.7)
24–30	.010	−.062	−.019	−.021	.150	2.56	−.357	−1.02
	(.50)	(−2.91)	(−.86)	(−.94)	(6.89)	(8.20)	(−19.4)	(−21.2)
31–36	.005	.009	−.005	−.033	.272	2.56	−.383	−.961
	(.24)	(.46)	(−.24)	(−1.57)	(13.6)	(8.28)	(−21.4)	(−18.7)

Family background and interactions:								
Expenditures × father's height	.290	−.461	−.855	−.507	.100	−.492	.078	−.246
	[.58]	[−.90]	[−1.87]	[−.93)	[.20]	{−2.08}	[.19]	[−.45]
Expenditures × father's schooling	−.034	.149	−.144	.242	.118	−2.08	−.002	−.040
	[−.26]	[.98]	[−1.12]	[1.68]	[.90]	{−.38}	[−.02]	[−.31]
Expenditures × mother's height	.398	1.75	1.57	.958	.731	.310	.013	.994
	[.64]	[2.67]	[2.76]	[1.61]	[1.07]	{1.06}	[.03]	[1.73]
Expenditures × mother's schooling	−.079	−.044	.013	−.076	.242	−.568	.277	.155
	[−.54]	[−.29]	[.09]	[−.50]	[1.59]	{−.10}	[2.15]	[1.04]
Father's height × father's schooling	−.382	−.605	.223	−.387	.115	2.20	.828	.299
	[−.74]	[−1.07]	[.43]	[−.72]	[.23]	{1.04}	[1.92]	[.64]
Mother's height × mother's	1.28	−.585	.152	−.092	.076	4.22	−.23	−.230
schooling	[1.79]	[−.78]	[.21]	[−.13]	[.11]	{−1.58}	[−.38]	[−.36]
Mother's height × father's height	−.360	.920	.515	.623	.588	−.375	1.13	.024
	[−.50]	[1.29]	[.77]	[.76]	[.82]	{−.15}	[2.01]	[.04]
Mother's schooling × father's	−.142	−.140	−.005	−.111	−.066	−.571	−.053	−.041
schooling	[−1.25]	[−1.09]	[−.05]	[−.85]	[−.58]	{−1.25}	[−.58]	[−.44]
Mother's height × father's	−.784	−1.31	−.914	−.392	−.821	−4.86	−.263	−.710
schooling	[−1.11]	[−1.81]	[−1.28]	[−.51]	[−1.12]	{−1.71}	[−.45]	[−1.19]
Father's height × mother's	−.574	−.487	−.559	−.673	.234	.671	−1.03	−.244
schooling	[−1.15]	[−.99]	[−1.08]	[−1.28]	[.45]	{.34}	[−2.34]	[−.51]
R^2	.01	.02	.02	.02	.13	.19	.29	.18
F-test or χ^2-test (interactions)	1.1	2.2*	1.6$^+$	1.4	.97	12.1	1.7$^+$	.62

Note. $N = 3{,}556$ except for hemoglobin where $N = 3{,}003$. Standard errors are corrected for clustering at the household level. All estimates are from an OLS regression except that for worms, where estimates are from a probit regression. All models include quadratics for physical assets and human assets, and for these variables the top panel shows the mean effect evaluated as the derivative with respect to the first- and second-order terms; brackets show the associated *p*-values for these estimates. For interactions terms, the associated *t*-statistics are in brackets; for the worms estimates, *Z*-statistics appear in the curly braces. NA for the hemoglobin measurements indicates that these were not available for children who were less than 6 months old.

$^+$ $p < .10$.

* $p < .05$.

and weight-for-height. Generally, the estimated associations of family background and ECD are less sensitive to inclusion of health or ECD-related services compared to all community characteristics. But there are instances where family background estimates change appreciably with inclusion of health services (e.g., the significant declines in the effect of father's human assets on fine motor skills of children). The foregoing discussion also indicates that the apparent biases in the estimates of the simplest model compared to those with controls for either ECD-related services or all community characteristics depend on what aspect of ECD we consider. There is nothing inherently contradictory in such results. They suggest that the different aspects of communities that are relevant for each dimension of ECD do not have uniform correlations with predictors of ECD including family background.

Appendix

TABLE A1

FIRST-STAGE RESULTS FOR PHYSICAL ASSET ESTIMATES

Physical Asset/Housing Quality Measures	Coefficient Estimate	*t*-Statistic
Land	21.9	1.91
Bicycles	38.6	2.73
Motorcycles	107.5	4.59
Car or jeep	330.7	7.36
Living room set	9.81	.66
Dining room set	36.7	2.93
Bed with mattress	130.1	6.81
Bed without mattress	49.3	4.13
Electric iron	61.4	3.33
Electric fan	47.4	2.71
Refrigerator	124.1	5.83
Stove	111.9	6.12
Range	183.7	6.61
Color television	75.5	4.29
VCR	111.3	4.76
Telephone	557.2	10.8
Number of rooms	14.2	3.06
Household has electricity	33.6	2.47
Flush or water sealed toilet	42.3	3.44
Cement or iron roof	4.58	39
Cement or iron walls	−25.0	−1.73
R^2	.36	
N	5,901	

Note. *N* = number of households.

TABLE A2

COGNITIVE, SOCIAL, AND MOTOR DEVELOPMENT RESULTS FOR FAMILY BACKGROUND–ECD SERVICE PROVIDER INTERACTIONS (WITH FIXED EFFECTS)

	Early Childhood Development (ECD) Indicators			
	Gross Motor Skills	Fine Motor Skills	Expressive Language Skills	Receptive Language Skills
Physical asset index	−.006	.0005	−.069	−.0002
	(.705)	(.908)	(.213)	(.941)
Human assets:				
Father's height	.022	4.41	−14.8	6.64
	(.968)	(.564)	(.315)	(.479)
Father's schooling	.089	.141	.066	.225
	(.333)	(.170)	(.266)	(.096)
Mother's height	−4.98	.152	−38.0	−149.6
	(.767)	(.956)	(.409)	(.085)
Mother's schooling	−.117	−.265	−.153	−.018
	(.321)	(.160)	(.257)	(.672)
Age (months):				
0–6	…	…	…	…
7–11	−.010	−.070	−.037	−.054
	(−.45)	(−3.26)	(−1.89)	(−2.75)

TABLE A2 (*Continued*)

	Early Childhood Development (ECD) Indicators			
	Gross Motor Skills	Fine Motor Skills	Expressive Language Skills	Receptive Language Skills
12–18	.006	−.011	−.004	.001
	(.29)	(−.53)	(−.23)	(.09)
19–23	.007	−.005	−.003	.002
	(.36)	(−.27)	(−.19)	(.13)
24–30	.007	−.067	−.039	−.032
	(.36)	(−3.07)	(−1.71)	(−1.46)
31–36	−.003	−.005	−.025	−.049
	(−.14)	(−.28)	(−1.16)	(−2.30)
Family background and ECD-services interactions:				
Barangay × expenditures	.083	.089	.060	.033
	[1.80]	[2.20]	[1.50]	[.75]
Barangay × father's height	.215	−.012	−.802	−.711
	[.50]	[−.03]	[−2.30]	[−2.26]
Barangay × father's schooling	−.013	−.068	−.227	−.172
	[−.15]	[−.97]	[−3.19]	[−1.88]
Barangay × mother's height	−.315	−.292	1.01	.760
	[−.49]	[−.58]	[2.18]	[1.31]
Barangay × mother's schooling	−.028	−.086	.089	.033
	[−.51]	[−1.58]	[1.51]	[.51]
Municipality × expenditures	−.123	.062	−.040	−.032
	[−1.90]	[.93]	[−.67]	[−.55]
Municipality × father's height	.090	−.068	−.078	.161
	[.23]	[−.16]	[−.21]	[.44]
Municipality × father's schooling	.111	.034	.028	−.015
	[1.67]	[.49]	[.50]	[−.25]
Municipality × mother's height	.362	.89	.501	−.020
	[.73]	[1.61]	[1.22]	[−.05]
Municipality × mother's schooling	−.029	−.103	−.017	.021
	[−.46]	[−1.48]	[−.28]	[.35]
R^2	.19	.23	.21	.27
F-test (interactions)	.86	1.2	2.6**	.98
F-test (fixed effects)	6.9*	10.8**	8.8**	13.4**

Note. $N = 3{,}542$. Standard errors are corrected for clustering at the household level. All models include quadratics for physical assets and human assets, and for these variables the coefficient estimates shown are the mean effect evaluated as the derivative with respect to the first- and second-order terms; associated *p*-values for these estimates are in parentheses. For interaction terms, associated *t*-statistics are in the square brackets.
** $p < .01$.

TABLE A3

HEMOGLOBIN, WORMS, AND ANTHROPOMETRICS RESULTS FOR FAMILY BACKGROUND-ECD SERVICE PROVIDER INTERACTIONS (WITH FIXED EFFECTS)

	Early Childhood Development (ECD)-Related Outcomes			
	Hemoglobin	Worms	Height-for-Age *Z*-Statistic	Weight-for-Age *Z*-Statistic
Physical asset index	−.028	.012	−.027	−.018
	(.228)	(.803)	(.150)	(.200)
Human assets:				
Father's height	2.34	−18.5	11.7	.110
	(.536)	(.467)	(.100)	(.867)

TABLE A3 (*Continued*)

	Early Childhood Development (ECD)-Related Outcomes			
	Hemoglobin	Worms	Height-for-Age *Z*-Statistic	Weight-for-Age *Z*-Statistic
Father's schooling	.007	−.011[a]	−.0004	.013
	(.514)	(.810)	(.799)	(.425)
Mother's height	2.11	230.1	−1.41	−15.9
	(.764)	(.248)	(.771)	(.296)
Mother's schooling	.807	−.010	.176	.014
	(.011)	(.869)	(.029)	(.330)
Age (months):				
0–6	NA	…	…	…
7–11	…	1.03	−.196	−.270
		(2.87)	(−10.1)	(−12.6)
12–18	−.012	2.27	−.349	−.444
	(−.58)	(5.85)	(−18.6)	(−20.9)
19–23	.063	2.50	−.420	−.377
	(3.06)	(7.27)	(−22.7)	(−17.4)
24–30	.150	3.14	−.361	−.381
	(6.92)	(8.04)	(−18.3)	(−19.4)
31–36	.273	3.19	−.385	−.353
	(13.4)	(8.30)	(−20.5)	(−17.6)
Family background and ECD-services interactions:				
Barangay × expenditures	.069	−1.45	.038	.071
	[1.24]	{−1.82}	[.81]	[1.44]
Barangay × father's height	.443	3.18	−.296	−.269
	[1.19]	{.60}	(−.70)	(−.71)
Barangay × father's schooling	−.076	.209	.033	−.078
	(−1.00)	{.28}	[.39]	[−.91]
Barangay × mother's height	−.082	−10.7	−1.01	.498
	[−.12]	{−1.75}	[−1.40]	[.77]
Barangay × mother's schooling	−.027	−.707	−.060	.011
	[−.40]	{−.97}	[−.94]	[.17]
Municipality × expenditures	.049	.313	−.007	−.049
	[.79]	{.74}	[−.14]	[−.76]
Municipality × father's height	.853	−.174	−.016	.401
	[2.04]	{−.09}	[−.05]	[.88]
Municipality × father's schooling	.032	−.034	.121	.058
	[.35]	{−.09}	[2.29]	[1.04]
Municipality × mother's height	.443	1.92	.219	−.210
	[.92]	{.73}	[.52]	[−.45]
Municipality × mother's schooling	.025	−.430	−.139	−.137
	[.36]	{−1.20}	[−2.21]	[−2.21]
R^2	.30	.34	.36	.29
F-test or χ^2-test (interactions)	1.4	13.2	1.1	1.1
F-test or χ^2-test (fixed effects)	4.7**	405.9**	3.2**	4.0**

Note. $N = 3{,}542$, except for hemoglobin, where $N = 2{,}991$. All estimates are from an OLS regression, except for worms, where estimates are from a probit regression. Standard errors are corrected for clustering at the household level. All models include quadratics for physical assets and human assets, and for these variables, the coefficient estimates shown are the mean effect evaluated as the derivative with respect to the first- and second-order terms; the associated *p*-values for these estimates are in parentheses. For interactions terms, the associated *t*-statistics are in square brackets; for the worms estimates, the associated *Z*-statistics are in curly braces. NA for hemoglobin measurements indicates that these are not available for children less than 6 months of age.

[a] Value is multiplied by 1,000.

** $p < .01$.

TABLE A4

RESULTS FOR INTERACTIONS BETWEEN FAMILY BACKGROUND ITEMS (WITH FIXED EFFECTS)

	Early Childhood Development (ECD) Indicators				ECD-Related Outcomes			
	Gross Motor Skills	Fine Motor Skills	Expressive Language Skills	Receptive Language Skills	Hemoglobin	Worms	Height-for-Age Z-Score	Weight-for-Height Z-Score
Physical asset index	−.001	−.042	−.0001	−.043	−.425	−.019	−.085	.003
	(.880)	(.436)	(.966)	(.449)	(.001)	(.799)	(.070)	(.727)
Human assets:								
Father's height	1.48	4.06	−21.6	8.69	2.66	−24.1	7.58	.020
	(.754)	(.590)	(.229)	(.427)	(.519)	(.419)	(.196)	(.948)
Father's schooling	.134	.234	.280	.190	.005	1.02	−.013	.004
	(.597)	(.065)	(.371)	(.398)	(.871)	(.091)	(.387)	(.522)
Mother's height	−39.2	−6.77	−111.7	−208.7	−14.4	178.0	−4.59	−3.93
	(.434)	(.726)	(.179)	(.054)	(.473)	(.311)	(.617)	(.640)
Mother's schooling	−.019	.067	.055	.052	.627	−.183	.229	.016
	(.759)	(.545)	(.588)	(.214)	(.223)	(.489)	(.023)	(.510)
Age (months):								
0–6	…	…	…	…	NA	…	…	…
7–11	−.006	−.070	−.038	−.054		1.06	−.197	−.270
	(−.27)	(−3.29)	(−1.94)	(−2.77)	…	(2.88)	(−10.2)	(−12.5)
12–18	.007	−.011	−.003	.002	−.014	2.31	−.347	−.443
	(.34)	(−.51)	(−.17)	(.11)	(−.68)	(5.84)	(−18.6)	(−20.9)
19–23	.006	−.008	−.008	−.001	.064	2.53	−.419	−.377
	(.31)	(−.42)	(−.41)	(−.09)	(3.08)	(7.24)	(−22.9)	(−17.5
24–30	.009	−.065	−.037	−.031	.151	3.16	−.359	−.380
	(.43)	(−3.01)	(−1.66)	(−1.40)	(6.98)	(7.96)	(−18.4)	(−19.4
31–36	−.001	−.004	−.027	−.047	.272	3.24	−.385	−.351
	(−.06)	(−.22)	(−1.23)	(−2.23)	(13.3)	(8.22)	(−20.6)	(−17.5)

Family background interactions:								
Expenditures × father's height	.156	−.280	−.843	−.381	.101	−.325	.061	−.329
	[.31]	[−.55]	[−1.91]	[−.81]	[.21]	{−1.08}	[.15]	[−.60]
Expenditures × father's schooling	.052	.176	−.252	.127	.072	.864	−.042	−.037
	[.40]	[1.24]	[−2.03]	[.96]	[.58]	{.13}	[−.35]	[−.29]
Expenditures × mother's height	.710	2.02	1.72	1.01	.608	.434	.061	.754
	[1.19]	[3.07]	[3.15]	[1.81]	[.96]	{1.13}	[.11]	[1.34]
Expenditures × mother's schooling	−.096	−.048	.097	.027	.175	4.34	.222	−.004
	[−.67]	[−.31]	[.73]	[.20]	[1.15]	{.58}	[1.76]	[−.03]
Father's height × father's schooling	.034	−.330	.456	−.090	.484	1.89	.954	.163
	[.07]	[−.60]	[.93]	[−.19]	[.94]	{.74}	[2.15]	[.32]
Mother's height × mother's schooling	.538	−.498	−.313	−.298	−.080	5.24	−.459	−.361
	[.82]	[−.74]	[−.48]	[−.48]	[−.11]	{1.61)	[−.75]	[−.56]
Mother's height × father's height	−.351	1.04	1.31	.753	.192	−.895	.942	.619
	[−.51]	[1.49]	[2.10]	[1.10]	[.27]	{−.27}	[1.59]	[.85]
Mother's schooling × father's schooling	−.078	−.027	−.024	−.061	−.079	−1.27	−.0008	.028
	[−.71]	[−.24]	[−.23]	[−.56]	[−.67]	{−2.28}	[−.01]	[.30]
Mother's height × father's schooling	−.082	−1.38	−.579	−.268	−.389	−8.07	−.165	−.691
	[−.12]	[−2.10]	[−.88]	[−.40]	[−.56]	{−2.34}	[−.27]	[−1.10]
Father's height × mother's schooling	−.234	−.734	−.773	−1.03	.021	.713	−1.26	−.124
	[−.50]	[−1.60]	[−1.59]	[−2.26]	[.04]	{.29}	[−2.83]	[−.24]
R^2	.19	.24	.21	.27	.30	.34	.37	.29
F-test or χ^2-test (interactions)	.52	2.4**	2.6**	1.9*	.66	13.8	1.7+	.38
F-test or χ^2-test (fixed effects)	6.2**	10.3**	8.3**	12.4**	4.5**	435.9**	3.1**	3.2**

Note. $N = 3{,}556$, except for hemoglobin, where $N = 3{,}003$. Standard errors corrected for clustering at household level. All estimates from an OLS regression except for worms where estimates are from a probit regression. All models include quadratics for physical assets and human assets, and for these variables, the coefficient estimates shown are the mean effect evaluated as the derivative with respect to the first- and second-order terms; the associated *p*-values for these estimates are in parentheses. For interactions terms, the associated *t*-statistics are in square brackets; for the worms estimates, the associated *Z*-statistics are in curly braces. NA for hemoglobin measurements indicates that these are not available for children less than 6 months of age.

+ $p < .10$.

* $p < .05$.

** $p < .01$.

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