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**CORRELATES AND DETERMINANTS OF CHILD
ANTHROPOMETRICS IN LATIN AMERICA:
BACKGROUND AND OVERVIEW OF THE SYMPOSIUM**

BY

JERE R. BEHRMAN*
EMMANUEL SKOUFIAS**

*UNIVERSITY OF PENNSYLVANIA
**WORLD BANK

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Inter-American Development Bank
1300 New York Avenue, N.W.
Washington, DC 20577

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Abstract*

This paper provides a summary of the work in seven papers of a Latin American Research Network project intended to identify the following information:

- The private and public determinants of child anthropometrics;
- The extent to which the private and public determinants interact and whether interactions suggest gross substitution or complementarities; and
- The extent to which the influence of the determinants of child anthropometrics vary by the age and gender of the child.

Countries for which results are reported included in the project are Argentina, Bolivia, Brazil, Colombia, Ecuador, Honduras, Mexico and Nicaragua.

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1. Introduction

Greater investments in the human capital of children are not only likely to improve their current welfare but also to enhance their opportunities over their life cycles. There are many studies on human capital investments in schooling that are interpreted to be consistent with this claim. But there is also evidence that for malnourished populations, such as those in many developing countries, the gains from investments in better nutrition may be substantial—perhaps even greater than the gains from investments in schooling. These effects can be diverse, including reduced mortality, reduced susceptibility to infectious diseases, better cognitive development, increased learning capacity, greater gains from education and greater labor productivity.¹ For such reasons it is valuable to understand better what are the correlates, and better yet, if possible, the determinants of child nutrition in such contexts. This was the main objective of the project and led to seven papers (in addition to this introduction and overview) being published in this symposium (Table 1).²

These seven papers are the outcomes of a research project supported by the Inter-American Development Bank (IDB) Research Department Latin American and Caribbean Research Network Project on “Child Health, Poverty and the Role of Social Policies” in 2003-04, of which we are the Co-Directors. The project began with a request for applications, which detailed the objectives and approaches for the studies in the Network and was distributed widely among research institutions throughout Latin America and the Caribbean. Twenty-seven applications were submitted by the deadline of 14 March 2003. The projects that yielded the

¹ Much of this literature is surveyed in Alderman (1993), Behrman (1993, 1996), Behrman and Deolalikar (1988), Behrman, Deolalikar and Wolfe (1988), Pollitt (1990), Behrman, Alderman and Hoddinott (2004), and Strauss and Thomas (1995, 1998). Some examples of studies that find important impact of nutrition on schooling, cognitive skills and productivities include Alderman et al. (2001), Alderman, Hoddinott and Kinsey (2002), Beaton et al. (1993), Behrman and Deolalikar (1989), Behrman, Foster and Rosenzweig (1997), Behrman et al. (2003), Behrman and Rosenzweig (2004), Bhutta et al. (1999), Bleichrodt and Born (1994), Deolalikar (1988), Galler (1984), Galler et al. (1983), Glewwe, Jacoby and King (2001), Glewwe and King (2001), Golden (1994), Grantham-McGregor (1995), Grantham-McGregor et al. (1997), Haddad and Bouis (1991), Haas et al. (1996), Johnston et al. (1987), Khan et al. (1995), Lozoff and Wachs (2000), Martorell (1997, 1999), Martorell and Habicht (1986), Martorell, Khan and Schroeder (1994), Martorell et al. (1993), Pelletier, Frongillo and Habicht (1993), Pelletier et al. (1995), Pollitt et al. (1993), Ramakrishna et al. (1999), Richardson, Birch and Ragbeer (1975), Rivera et al. (1995), Rose, Martorell and Rivera (1992), Sahn and Alderman (1988), Schultz (1993, 1997), Steckel (1995), Strauss (1986), Tanner (1994) and Wachs (1995).

² The project also included an additional paper (Larrea, Montavo and Ricaurte, 2004) that is not included in this symposium but is available at the IDB website at <http://www.iadb.org/res/laresnetwork/projects/pr208finaldraft.pdf>

papers included in this symposium were the ones judged most promising and were selected for inclusion in the Network by the Co-Directors in April 2003. In May 2003, videoconferences were held with the project Co-Directors and each of the Network teams in order to provide further feedback on the project applications and how the research strategies best should be pursued. The Network met twice—in October 2003 in Puebla, Mexico prior to the annual meetings of the Latin American and Caribbean Economic Association (LACEA) and in February 2003 at the Inter-American Development Bank Headquarters in Washington, DC. Prior to each of these meetings, all of the papers were circulated among members of the Network, and written evaluations and oral commentary at the meetings were provided by us as Project Co-Directors and by other Network members. Thus there was considerable feedback for and revisions of each of the papers under consideration for publication in this symposium.

Based on internationally comparable micro-based anthropometric measures, the prevalences among children under five years of age suffering from moderate and severe underweight (8 percent), wasting (2 percent) or stunting (16 percent) are relatively low in Latin America and the Caribbean in comparison with other developing country regions (Table 2). Nevertheless the fact that about one in six children under five years of age—or about 9 million children—in the region suffers from the longer-run undernourishment reflected in stunting suggests that undernourishment is a significant problem that needs to be better understood.³ The eight countries covered in the studies in this symposium represent more than three quarters of the population in the region (76 percent in 1997, about the midpoint of the range of years used for the anthropometric measures, according to World Bank 1999, Table 1). Therefore what is learned from the studies in the symposium is likely to have fairly broad implications for most of the Latin American and Caribbean region.

Underlying the regional average, of course, are substantial variances across countries and within countries. Table 3 gives the means across countries in Latin America and Caribbean, with those for the project countries in bold. In this table the countries are sorted in descending order of the prevalence of moderate and severe stunting because it is probably the most important of the indicators due to its long-run implications and, as noted with regard to Table 2, because it is

³ Based on the estimated population of 55.9 million children under five years of age in Latin America and the Caribbean in 2000 (United Nations Population Division, 2003, p. 131).

the most prevalent problem among the three included indicators. The prevalence of moderate and severe stunting across countries in Latin America and the Caribbean ranges from 2 percent in Chile to 46 percent in Guatemala. The project countries tend to have a relatively high prevalence of moderate and severe stunting among countries in Latin America and the Caribbean, with all project countries at the median or above in the distribution. Among the project countries, the prevalence ranges from 11 percent in Brazil to 39 percent in Honduras, with three countries (Argentina, Brazil, Colombia) below 15 percent; four at 25 percent or higher (Bolivia, Honduras, Nicaragua, Peru); and Mexico (18 percent) in between. The within-country variations, moreover, also are considerable as is reflected in the standard deviations of the Z scores for weight-for-age, weight-for-height (related to wasting) and height-for-age (related to stunting) for the samples used in the analysis in the papers in the symposium (Table 4).

The basic objective of the Network, thus, is to understand better the correlates and, subject to stronger assumptions, the determinants of child anthropometrics in the Latin America and Caribbean region. More specifically, the aims of the Network are to attempt to identify:

1. The private and public determinants of child anthropometrics;
2. The extent to which the private and public determinants interact and whether interactions suggest gross substitution or complementarities; and
3. The extent to which the influence of the determinants of child anthropometrics vary by the age and gender of the child.

Each of the papers in this symposium contributes to the attainment of the general objective in different ways because of special aspects of the context, data or analysis. To help provide further background and perspective, Section 2 of this overview paper presents a common general modeling approach and common estimation issues that underlie all of the studies. Section 3 briefly introduces each of the papers and their contributions. Section 4 concludes this background and overview with a summary of common themes.

2. Common Modeling and Estimation Issues for Symposium Papers

A standard common underlying framework is used in the symposium studies.⁴ Households are assumed to choose child health H , leisure L , consumption of goods and services C , as if they are maximizing a household welfare function subject to the health production function constraint and budget constraint. Preferences are assumed to be characterized by the utility function⁵

$$U = U(H, L, C; X_h) \quad (1)$$

where X_h is a vector of household characteristics including the schooling of the household head and the household head's spouse. Child health is generated by a production function

$$H = F(Y, X_i, X_h, X_c, \mu) \quad (2)$$

where Y is a vector of health inputs such as nutrient intake, health care practices (immunization), time spent by parents taking care of children, and disease incidence, X_i is a vector of child characteristics such as age and gender, X_c is a vector of environmental factors that may have a direct impact on child health and μ is a vector summarizing all unobservable characteristics of the child, parents, household, and the community that affect child health. In addition, the choices of households are assumed to be limited by their full income constraint

$$P_C C + WL + P_Y Y = FI. \quad (3)$$

where P_C, W, P_Y , are the price vectors of consumption goods, leisure and health inputs, respectively, and FI is full income including the value of the time endowment of the household

⁴ There are a number of previous studies in the literature that are consistent with this framework: Alderman and García (1994) for Pakistan; Barrera (1990) and Ghuman et al. (2004) for the Philippines; Behrman and Wolfe (1984, 1987, 1989) and Wolfe and Behrman (1983, 1984, 1987) for Nicaragua; Pitt and Rosenzweig (1985) and Pitt, Rosenzweig and Hassan (1990) for Bangladesh; Skoufias (1999, 2001) for Indonesia and Mexico; Strauss (1990) and Thomas, Lavy and Strauss (1996) for Cote d'Ivoire; Thomas, Strauss, and Henriques (1992) for Brazil; and Thomas (1994) for the United States. Survey articles with more exhaustive lists of references include Cochrane, Leslie and O'Hara (1982), Behrman and Deolalikar (1988) and Strauss and Thomas (1995, 1998).

⁵ For the sake of simplicity and consistency, we here consider a unified household preference function. If there is household bargaining between, for example, mothers and fathers, their individual utility functions, bargaining rules and individual assets need be incorporated (see, for example, Alderman et al., 1995; Behrman, 1997; Haddad, Hoddinott, and Alderman, 1996; Lundberg and Pollak, 1996; Lundberg, Pollak and Wales, 1997; and Thomas, 1994). In this symposium, the study on Mexico by Rubalcava and Teruel (2005), for example, appeals to such a framework.

and non-labor income. The reduced-form demand function for child health that results from the constrained maximization of household welfare is

$$H = \Phi(X_i, X_h, X_c, FI, P_C, W, P_y, \mu) \quad (4)$$

where the particular functional form of the function $\Phi(\cdot)$ depends on the underlying functions characterizing household preferences and the health production function (as well as other production functions if they are relevant).

The symposium studies provide estimates of variants of the reduced form (4) as approximated by a second-order Taylor series

$$\begin{aligned} H_i = & \alpha + \beta_1 X_i + \beta_2 X_i^2 + \beta_3 \hat{X}_h + \beta_4 \hat{X}_h^2 + \beta_5 \hat{X}_c + \beta_6 \hat{X}_c^2 \\ & + \gamma_1 (X_i * \hat{X}_h) + \gamma_2 (X_i * \hat{X}_c) + \gamma_3 (\hat{X}_h * \hat{X}_c) + \eta_i + \eta_h + \eta_c + \nu_i, \end{aligned} \quad (5)$$

where the subscript i indexes children;⁶ the subscript h indexes households; the subscript c indexes communities; the vector X_h is expanded to include household full income (i.e., $\hat{X}_h = \{X_h, FI_h\}$); the vector X_c is expanded to include prices and wages (i.e., $\hat{X}_c = \{X_c, P_C, W, P_y\}$); and the stochastic term includes unobserved child characteristics η_i , unobserved household characteristics η_h , unobserved community characteristics η_c and unobserved random shocks ν_i .

On a general level, the papers in the symposium estimate variants of relation (5) in order to address the specific aims noted in the introduction by attempting to identify:

1. The private and public determinants of child anthropometrics, which is tantamount to obtaining estimates of $\beta_3 - \beta_6$ in relation (5);
2. The extent to which the private and public determinants interact and whether interactions suggest gross substitution or complementarities, which is tantamount to obtaining estimates of γ_3 in relation (5) and determining whether the sign is negative or positive; and

⁶ Or, to be more specific, the i th child in the h th household in the c th community, but to lessen clutter we avoid multiple subscripts.

3. The extent to which the influence of the determinants of child anthropometrics vary by the age and gender of the child, which is tantamount to obtaining estimates of $\beta_1, \beta_2, \gamma_1, \gamma_2$ in relation (5).

The dependent variables for these estimates in the symposium papers generally are Z scores⁷ for anthropometric measures of child nutrition and health, such as height-for-age and weight-for-height (although the individual studies also in some cases consider other measures, such as leg length for Colombia in Attanasio et al., 2004) Height-for-age reflects the accumulation of past outcomes and thus is a long-run measure of nutritional and health status, while weight-for-height is thought to be a good shorter-run measure of nutritional and health status (Falkner and Tanner, 1986). The observed child-specific variables X_i generally include age and gender, the observed household-specific variables \hat{X}_h generally include parental characteristics such as age and schooling and measures of household resources (e.g., expenditures, perhaps instrumented as in Behrman and Knowles 1999, and principal components of physical assets as in Filmer and Pritchett, 2001), and the observed community-specific variables \hat{X}_c generally include characteristics of social services, markets and the environment. The details of exactly which observed variables are included, of course, vary with the information available in the samples used. Similarly, in part because the large numbers of observed variables in the full specification of relation (5) is likely to make interpretation difficult, the individual studies tend to present a range of specializations of this general specification.

The usual issues arise with the estimation of relation (5): basically right-side variables may be correlated with time-varying or fixed components of the compound disturbance term

⁷ Z scores are measured as standard deviation units from the reference mean and are often used by nutritionists as indicators of long-run and short-run nutritional status. The Z-scores can be constructed using the World Health Organization/National Center for Health Statistics/Center for Disease Control (WHO/NCHS/CDC) International Growth Reference as the standard for well-nourished children. For example, the height-for-age Z-score for a child i in age and gender group c can be constructed as $Z_{ic} = (H_{ic} - MedianH_c) / \sigma_c$, where H_{ic} is the measured height of the child, $MedianH_c$ and σ_c are the age- and gender-specific median heights and standard deviation of heights, respectively, of well-nourished children. The ANTHRO (1990) software program provided by Centers for Disease Control (CDC) generally is used in the symposium papers. The International Growth Reference used by ANTHRO is based on the WHO/NCHS/CDC Growth Curves, NCHS Series 11-165 (1977).

$\eta_i + \eta_h + \eta_c + \nu_i$. For instance, parents with unobserved greater endowments (e.g., innate capabilities and motivation) may tend to have more schooling, higher income and children with greater unobserved endowments.⁸ Or unobserved weather variations may directly affect short-run child health and nutritional status as well as household income. Or programs and social services may be determined by unobserved community characteristics that also directly affect child health such as the general health environment (e.g., Rosenzweig and Wolpin, 1986; and Pitt, Rosenzweig and Gibbons, 1993).

A factor integrating the symposium papers is their effort to illustrate how important some of these estimation problems may be by providing estimates with alternative specifications and estimation strategies such as fixed effects and instrumental variables (including a “natural experiment”). Even though the details of the approaches differ across the studies because of the differing strengths and weaknesses of the samples used, the combination of these sensitivity explorations across the studies provides insight into the limitations and probable biases in simpler specifications that assume away such possible problems.

3. Summaries of Symposium Papers

Each of the seven symposium papers listed after this one in Table 1 is now briefly summarized.

Argentina: “Effects of Land Titling on Child Health” (Galiani and Schargrodsky, 2004).

This paper analyzes the impact of land titling on child anthropometrics. The empirical evaluation of the effect of land property rights typically suffers from selection problems. The allocation of property rights across households is usually not random but is based on wealth, family characteristics, political clientelism, or other mechanisms built on differences between the groups that acquire property rights and the groups that do not—causing in the estimated impact of property rights because they are correlated with these unobserved factors in the disturbance term in relation (5). This paper addresses this selection concern by exploiting a “natural experiment” in the allocation of property rights. A group of squatters occupied several tracts of privately-owned land in a suburban area of Buenos Aires, Argentina. When the provincial

⁸ Behrman and Rosenzweig (2002) provide recent estimates of how the failure to control for unobserved parental endowments can cause considerable overestimates of the impact of parental schooling on investments in children’s human capital.

Congress passed an expropriation law transferring the land from the former owners to the squatters, some of the former owners surrendered the land (and received compensation), while others decided to sue in the slow Argentine courts. The different decisions by the former owners generated an allocation of property rights that is exogenous to the unobserved characteristics of the squatters (η_h in the disturbance terms in relation 5). Galiani and Schargrotsky take advantage of this natural experiment to evaluate the effect of the allocation of urban land property rights. They collected several rounds of data on the squatter households, including one in 2003 as part of the Network Project. Their data includes 339 households with 945 children and youths under 17 years of age. This sample tends to be stunted (mean Z score for height-for-age of -0.42), though not wasted (mean Z scores for weight-for-height of 0.16). Their results show that children in the titled parcels have better short-run (but not long-run) nutrition and lower teenage pregnancy rates than children in the untitled parcels.

Bolivia: “Undernutrition in Bolivia: Geography and Culture Matter” (Morales, Aguilar and Calzadilla, 2005). The prevalence of child stunting (26 percent) in Bolivia is fairly high in comparison to many other developing countries in Latin America and the Caribbean (second highest among the eight countries covered in this symposium, as shown in Table 3). This study analyzes the associations between child height and weight Z-scores on one hand, and on the other hand a set of other factors including culture, geography, mother’s height, mother’s schooling, private assets and access to public services. This study uses data on more than 3,000 children from a Demographic and Health Survey (DHS). The estimates point to geographical factors (namely the strong inverse association with altitude), cultural variables (a strong inverse association with mothers who speak only Quechua) and mothers’ anthropometrical characteristics as major correlates of child anthropometric outcomes.

Brazil: “Infant Mortality and Child Health in Brazil” (Alves and Belluzzo, Jr., 2005). Child health is a central issue in the public policy agenda of developing countries. Several policies aiming at the improvement of child health have been implemented over the years, with varying degrees of success. In Brazil, the impact of such policies includes a significant decline in infant mortality rates over the last 30 years and relatively good child anthropometric outcomes in comparison with other countries in the region (Table 3). Nevertheless, mortality rates are still high when compared to more developed nations and some other Latin American countries such as Chile. Moreover, there is considerable dispersion across Brazilian municipalities, which

suggests that policies should be reviewed and perhaps revised. This paper investigates the determinants of infant mortality at the municipal level and of child anthropometrics at the individual level. To analyze infant mortality rates, static and dynamic panel data models are estimated using four censuses covering the period from 1970 to 2000 that yield over 17,000 municipality-year observations. The demand for child anthropometrics, on the other hand, is addressed through a household decision model, estimated using data from the 1996 Standard of Living Survey on almost 4,000 children 0-12 years old. The results indicate that sanitation, education and per capita income contributed to the decline of infant mortality in Brazil, with stronger effects in the long run than in the short run. County fixed effects also contribute to the observed dispersion in infant mortality rates. The results from the micro household decision model are in line with the mortality model findings: education, sanitation and poverty are the most important factors explaining low child anthropometrics in Brazil.

Colombia: “Child Health in Rural Colombia: Determinants and Policy Interventions” (Attanasio et al., 2004). This paper studies the determinants of child anthropometrics within a sample of almost 8,000 poor Colombian children under seven years of age living in small municipalities. This sample tends to be stunted (with a mean height-for-age Z score of -1.23) though not wasted (with the mean weight-for-height Z score of 0.04). This study focuses on the influence of consumption, education and public infrastructure. The endogeneity of household consumption is explored using two different sets of instruments: household assets and municipality average wages. The results indicate that household consumption is an important determinant of child anthropometrics, but that ordinary least squares estimates suggest much less importance of household consumption than the instrumental variable estimates indicate. The presence of a public hospital in the municipality positively influences child health. The extent of the piped water network positively influences the health of children living in urban areas. However some of these results appear significant only if squared and interaction terms are included in the regression as in relation (5), not if a simpler first-order purely linear Taylor series expansion is used.

Honduras and Nicaragua: “Private and Public Determinants of Child Nutrition in Nicaragua and the Western Regions of Honduras” (David, Moncada and Ordoñez, 2004). Among the eight Latin America and the Caribbean countries covered in the symposium papers,

Honduras has the highest prevalence of stunting (33 percent) according to Table 3, and Nicaragua ties with Peru for third highest (25 percent) This study presents estimates of variants of relation (5) for these two countries. In each case multivariate regression models are presented, with child anthropometric indicators as dependent variables and child, household and community level variables as independent variables. The model includes interactions between schooling levels and overall level of community development, as well as estimates of community fixed effects. Two data sets are used, a 2001 nationwide survey of 4,676 households in Nicaragua and a 2002 survey of 5,600 households from the western regions of Honduras, as part of an evaluation process for a family entitlement program. The results show that maternal stature, age difference with an older sibling, household size and income are main determinants. Within the more homogeneous communities of Western Honduras, women's schooling is related to child nutritional status. Individual community variables are less relevant and the control for community fixed effects does not significantly alter the other parameters. However, overall community development (assessed through those community fixed effects) tends to have a small but significant and synergistic effect on the impact of child and household variables. The complex design of entitlement or distribution programs prevents an adequate evaluation of these poverty reduction strategies; while their impact does not appear to be currently significant in terms of child anthropometrics, longitudinal studies would be more appropriate to determine such an impact. The improvement of intra-community targeting seems to be a key issue for program redesign. The authors conclude that improved socio-economic situations, sound population and family policies, and timely preventive public health care are still proven, if long-term, investments towards improved child health and nutrition.

Mexico: "The Role of Maternal Cognitive Ability in Child Health." (Rubalcava and Teruel, 2005). The literature on child health determinants suggests that mothers play a central role in household and child-rearing activities. As a result, a mother's human capital has been commonly described as a key determinant of child health. However, little is known about how important a mother's cognitive ability is in affecting her children's health. This paper investigates the role of maternal cognitive ability in enhancing child health as measured by the child's height, using the 2002 Mexican Family Life Survey, which covers about 8,400 households with 13, 871 children under 18 years of age. This study relaxes the usual assumption

that maternal cognitive ability is a predetermined variable, and investigates the mechanism through which it improves child health. In particular, it analyzes how the effect of maternal cognitive ability reflects the mother's childhood background experience in the form of a) parental intra-generation transmission of knowledge and b) mother's childhood environmental factors such as community characteristics and school quality proxies. It also explores whether the mechanism through which maternal cognitive ability relates to child health operates through contemporaneous child health determinants such as maternal child-rearing experience and household economic resources. Finally, it tests whether returns to maternal reasoning ability on child's health are correlated with mother's unobserved characteristics other than childhood endowments by use of 2SLS methods. The results show that maternal cognitive ability is an important factor in improving children's height, even after controlling for child's age and gender, parental age, mother's and father's years of schooling and mother's height. This study finds that maternal cognitive ability estimates are robust to the inclusion of the mother's parents' years of schooling, whether she lived in an urban community during her primary-school years, and whether she attended an elementary public school, as opposed to a private institution. These results suggest that cognitive ability returns on child health are less likely to reflect mother's childhood background factors such as inter-generational transmission of knowledge between parents and their offspring, or local childhood community environment such as school quality factors. In another exploration, household total expenditure reduces the effect of maternal cognitive ability on child's health by 10 percent, suggesting the possibility that cognitive ability enhances child's health investment by improving maternal capability of providing wealth to the household, perhaps by means of labor productivity and/or savings decisions. Finally, mother's fixed effects estimates between firstborn and not-firstborn children suggest that high maternal reasoning ability plays a more important role in improving child health when mothers experience motherhood for the first time than when they have acquired experience with other children. These results hold only if there is control for mother's unobserved characteristics suggesting that OLS estimates of returns to mother's cognitive ability on child health are downward biased. 2SLS estimates that use mother's previous childhood endowment variables as identifying instruments for maternal years of schooling and cognitive ability corroborates this hypothesis.

Peru: "Poverty, Health Infrastructure and the Nutrition of Peruvian Children" (Valdivia, 2005). After the Peruvian economic crisis of the late 1980s, the 1990s witnessed a significant

pro-poor expansion in health infrastructure in Peru, which was instrumental for the expansion in public health expenditures that focused on preventive and primary health care. This paper reports empirical evidence on the effect of this expansion in health infrastructure upon child nutrition in Peru, as measured by the height-for-age Z-score. Using a pooled sample of more than 25,000 observations from the 1992, 1996 and 2000 rounds of the Peruvian Demographic Health Survey, Valdivia controls for biases in the allocation of public investments by using a district fixed effects model. The econometric analysis finds a positive, albeit small, effect of the health infrastructure expansion of the last decade. Desegregating by type of location reveals that the effect is significant only in urban areas. Within urban areas, the effect is found to be pro-poor since the estimate is larger for children of less schooled mothers. In this sense, this policy seems to have had a pro-poor bias within urban areas, while at the same time excluding the rural population, a traditionally marginalized population in Peru. These findings support that the reduction of distance and waiting time barriers may be necessary, but that more explicit inclusive policies are needed to improve the health of the rural poor, especially indigenous groups, to take them out of the poor nutrition-low productivity poverty trap.

4. Synthesis and Common Themes

Consideration of the details of the individual papers of the symposium leads to three major general themes.

First, the substantive findings imply the possibility of important roles for observed family background and community characteristics. The estimates suggest that family background variables, particularly those related to mother's education and overall household resources, are important correlates and probably determinants of child anthropometrics. They also suggest that public policies and other aspects of communities such as those that relate to water supplies and public health services also are important correlates and probably determinants of child anthropometrics. On the other hand, the estimates do not suggest pervasive and strong complementarities or substitution between family background and community characteristics and policies. To the contrary, most estimates of interaction terms are not significantly nonzero. In some important respects, nevertheless, policies may work through family background in addition to having direct effects. For instance, the Argentinean study illustrates how policies regarding property rights may affect child anthropometrics through strengthening household ownership of

resources. Additionally, in contrast to studies from Asia, there is *no* evidence of strong gender differentials favoring boys in the impact of family background and community characteristics and policies on child anthropometrics,⁹ though—as noted—there is some evidence of gender playing a role in the sense that mother’s characteristics apparently play a larger role than do father’s characteristics.

Second, context matters. Even if preferences and technologies were the same across samples from various parts of Latin America and the Caribbean, estimation of reduced-form demand functions such as relation (5) does not yield the underlying stable parameters, but combinations of them that in general vary as market and policy contexts differ. For that reason it is not surprising that estimates differ across samples.¹⁰ One striking example is the rural-urban difference in the estimated health infrastructure program impact in Peru. But there also are other illustrations in the differences, for example, in the estimated importance of parental schooling and resources across samples.

Third, the estimates in many cases are sensitive to the underlying assumptions and estimation strategies and suggest that there are important family background and community factors that are not observed in the data used. Most of the studies in the symposium have gone beyond using cross-sectional data with standard variables to attempt to obtain estimates of causal effects and to investigate whether the estimates are sensitive to alternative controls for endogenous right-side variables such as household income/expenditures or unobserved household or community characteristics. Examples include the land titling natural experiment in Argentina, controlling for maternal endowments using maternal anthropometric data in Bolivia, rich data on mother’s Raven test performance and early childhood background in Mexico, time series of cross-sections that permit control for unobserved community characteristics in Brazil

⁹ In cases in which additive terms for gender are significant, indeed the differentials tend to favor girls over boys (e.g., see the estimates for Brazil in Alves and Belluzzo, 2005; for Colombia in Attanasio et al. 2004; for Mexico in Rubalcava and Teruel, 2005; and for Peru in Valdivia, 2005).

¹⁰ For an illustration of a different human capital investment—children’s schooling—consider estimates of the impact of mother’s schooling on child schooling and how they vary depending on the market context after controlling for unobserved endowments that often confound such estimates. The estimated impact of mother’s school on child schooling was substantial and positive in rural India at a time in which there were not labor market returns to schooling for women (Behrman et al. 1999) but was insignificant or even negative in the U.S. at a time in which more schooling *ceteris paribus* increased the time women spent in the labor market and apparently reduced the time that they spent in raising children (Behrman and Rosenzweig, 2002).

and Peru, and instrumental variable estimates of household expenditures in Colombia. A number of the estimates suggest that such special data or estimation approaches make considerable differences in estimates of interest and that unobserved factors are quite important, at least in some contexts.

Thus, the papers in the symposium help to improve our understanding of the correlates and determinants of child anthropometrics in Latin America and the Caribbean, a region where there currently are millions of undernourished children. This improved understanding can help inform better predictions of likely developments over the life cycle of these children and of changes that might be expected for future generations with alterations in markets and policies. The papers also illustrate how some of the estimated effects are fairly sensitive to various assumptions underlying the specifications and estimates. At the same time, as with most good empirical studies, the papers raise questions about how future data and estimates can be improved so that our understanding of these important phenomena continues to expand.

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