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DOES GENDER AND BIRTH ORDER MATTER WHEN PARENTS SPECIALIZE IN CHILD'S NUTRITION? EVIDENCE FROM CHILE

Abstract

Using household survey data from Chile the current paper presents evidence of how the nutritional status of the child reflects differences in parental preferences and child rearing technology within an intra-household allocation approach that includes a health production function. From the household optimization problem we estimate the nutritional status of the child conditional on a set of child, family and community covariates that reflect parental preferences and parental child rearing technology. We test directly whether birth-order in the family and whether being a son or being a daughter reflect how parents allocate the resources, given that the Chilean family is often linked to a *machismo* sentiment in the division of household chores. Logit estimates of the nutritional status of the child, show gender specialization on child rearing: mothers give more resources to their daughters and fathers to their sons. This gender polarity is significant for non-oldest daughters and non-oldest sons, reflecting perhaps infant-order experience in child-care specialization. We also find that father's education less important than mother's education. Nevertheless, mothers with higher education levels than their spouse seem to assign less family resources to their children than those who are relatively less educated.

Resumen

Este artículo –basado en una encuesta chilena a nivel hogar– presenta evidencia sobre cómo el estado nutricional de los niños de familia refleja las preferencias y la tecnología en atención infantil por parte de los padres, bajo un modelo de reasignación de recursos dentro del hogar que incluye una función-producción de salud. Del problema de optimización del hogar, se estima el estado nutricional del niño en función de sus propias características, así como de características del hogar y de la comunidad que pudieran reflejar la tecnología y las preferencias paternas y maternas en la provisión de recursos dentro del hogar. En particular, se analiza si el genero del menor y su orden de nacimiento dentro de la familia refleja la forma en que los padres asignan los recursos dentro del hogar. Ello, dentro del contexto de las familias chilenas donde los quehaceres del hogar se asignan generalmente por especialización. Los resultados del modelo Logit sobre el estado nutricional del niño, sugieren la especialización en género de los padres en la atención de sus hijos: las madres tienden a asignar mayores recursos hacia sus hijas, y los padres hacia sus hijos varones. Esta polarización en género es particularmente significativa cuando el hijo o la hija no son los mayores en orden de nacimiento dentro del hogar. Lo anterior pudiera reflejar el efecto de la experiencia paterna y materna en el cuidado de los hijos. Asimismo, los resultados sugieren que la educación del padre es menos importante que la de la madre en la determinación del estado nutricional de niño. Sin embargo, aquellas madres con mayores niveles de educación con relación a su cónyuge, asignan menores recursos hacia sus hijos en comparación con aquellas madres cuyo nivel educativo es relativamente menor.

Introduction[*]

Parental decisions have a profound effect on a child's human capital development. Given the family's endowment, the way parents decide how to allocate household resources has a direct impact on the child's health and education. These decisions, in turn, may affect not only the productivity of the children once they have grown up, but also impact their life expectancy. It is in this context that the present paper emphasizes the impact of family resources and parental preferences on the provision of child health within the household.

We explore child nutritional status and parental resources within households in Chile. Unlike the traditional family literature that conceives the household as a single decision maker, we adopt an intrahousehold allocation approach, relax the unitary preferences assumption, and introduce a health production function to disentangle how parental preferences and differences in parental child-rearing technology affect the nutritional status of the child. In particular, we test whether there is any gender or birth-order differentiation by parents that could be captured through the nutritional status of the child, conditional on each parent's characteristics. The gender and birth-order analysis is based on the machismo sentiment in both sexes that is often encountered in the Chilean family (Raczynski and Serrano 1986). In addition, the birth-order hypothesis allows one to capture any parental apprenticeship in child-rearing or differences in predilection among children according to birth order. Parents may gain more experience in taking care of latter children. Likewise, older children in the household could be seen differently by their parents and consequently be treated dissimilarly relative to their younger siblings.

From the family maximization problem, we derive the household's demand for child health, conditional on a set of child, family and community covariates that reflect parental preferences and child-rearing technology in the allocation of health among children. We employ the Chilean Household Survey Casen 92. This national, cross-sectional survey was conducted by the Chilean National Ministry of Planning.

The Second section of the paper gives a brief overview of the intrahousehold model literature. Part III defines the theoretical model. Section IV describes the data. Part. V outlines the empirical strategy. Part VI presents the results. Conclusions are found at the end of the paper.

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Household Behavior Models

Traditionally, household decisions have been modeled on the assumption that the household is a single decision-maker unit that maximizes a sole utility function subject to a set of constraints dictated by the household budget and available technology (Becker 1964). These models assume either that all household members have common preferences, or that there is one household member, a dictator or representative agent, who determines the allocations of all household members in either and altruistic or selfish manner. Under this assumption the important factors for the family maximization problem are household aggregates rather than individual resources, where the optimal demands depend on aggregated household resources and not on each family member's income. This is *called the income pooling hypothesis*, and can be tested empirically.

While the common preferences approach has been shown to be a useful framework in many circumstances, taking the unitary representation of the household as a benchmark is sometimes questionable. From the theoretical point of view, individualism lies at the foundation of microeconomic theory. The fact that individualism requires one to allow that different individuals may have different preferences poses questions as to the way household behavior should be modeled. Should we rely on common preference analysis when characterizing family behavior when designing targeting public policy?[1] How far wrong can one go by simply presuming that intrahousehold inequality does not exist, when in fact it does? Are similar individuals treated differently in the allocation of resources within the family? If the family itself allows disparities among its members, should that be an issue of assessment when analyzing household demands and designing public policies? These and other questions challenge the common preference model, especially when this framework fails to explain intrahousehold allocation decisions in terms of differences in tastes and bargaining power among family members.

Several empirical analyses have highlighted these issues. Sen (1984) summarizes a number of studies which claim that girls are less favored than boys in terms of food division within the household for the case of India.[2] Haddad and Kanbur (1990) has analyzed the consequences of ignoring intrahousehold inequality within a targeted public policy framework. Thomas (1990);[3] Thomas (1994);[4]

[1] Sen (1984) claims that characterizing the family as a single decision-making unit could lead to misleading conclusions when evaluating standards of living on the basis of market data if disparities within the family are not taken into account. Market demands could well reflect the relative importance of different items as seen by the decision markers and not necessarily from each family member welfare.

[2] Undernutrition among children within the family is shown to be higher for females than males in West Bengal. Male to female calorie and protein intake ratios are marked by male predominance among young children in Bangladesh. In addition, female morbidity relative to male's is found to be greater within families of Greater Calcutta.

[3] The common preference model is shown to be inconsistent by way of the income pooling hypothesis in terms of nutrient intakes, fertility, child survival, and child weight for height. Maternal

Browning, Bourguignon, Chiappori and Lechene (1994) are among the authors who find evidence that is inconsistent with the common prefernce model.

Many theoretical frameworks have been proposed that characterize the intrahousehold allocation mechanism while relaxing the common preference assumption. Some models suggest that household allocation decisions may be characterized as the result of a *bargaining* process, where each member seeks to allocate family resources over which she or he has control in relation to her (his) preferences and bargaining power. Horney and McElroy (1981) have proposed a Nash equilibrium framework, in which each family member cooperates with each other in order to raise her (his) individual utility level above a certain threshold point. Bourguignon and Chiappori (1992); Bourguignon and Chiappori (1994);[5] and Browning, Bourguignon, Chiappori and Lechene (1994), have proposed a more general framework, where the common preference model may be tested. In this more general *collective model*, the only assumption made is the one of Pareto efficiency. The household behavior mechanism is viewed as an example of a repeated "game" where each person knows the preferences of the other people in the household. This symmetry of information and the fact that the game is repeated, supports the idea that agents find mechanism to allocate efficient outcomes. Within this setting, the household utility function is comprised of a weighted sum of family member's utility functions, which in turn are maximized subject to total household resources. The weighting scheme that leads to the Pareto efficient allocation is provided by a sharing rule or welfare weights, which are function of individual bargaining variables. Those individuals with more bargaining power within the family get bigger weights to their utility function, making the household welfare function to reflect more their tastes. The resulting household demand functions are sensitive to the welfare weights, and consequently to the variables that effect these weights and reflect the individuals' bargaining power within the family. In this framework, if individual incomes are taken as proxies for bargaining power measures, and members in the family do not share the same preferences, the optimal household demands are functions of household *individual* incomes and not simply total household pooled income as suggested by the common preference model. This is called the pooling alternative hypothesis and it can be tested empirically by

nonlabor income is found to have bigger impact on the family's health than father's income. Additionally, there is evidence for parental gender predilection.

[4] For the case of the United States, Brazil and Ghana, evidence suggests that mothers and fathers allocate differently the amounts of family resources with respect to the human capital of the children. Fathers channel more resources to their sons, and mothers to their daughters.

[5] Focusing on price-variation analysis, the authors show that under the collective household modeling, household demands need not satisfy the usual symmetry condition on the Slutsky matrix that the individual theory of demand (and common preference model) predicts. The Slutsky matrix is found to be equal to a symmetry matrix plus a rank-one matrix. The authors proceed to test this main result on single-head households and married-couple households. The Slutsky symmetry condition is not rejected for singles but it is for couples. Finally, the derived predictions of the collective setting are not rejected on couples data, which according to the authors, provides support for the collective model as a viable alternative to the unitary model.

examining the impact of individual incomes on household demands. If individual incomes have significantly different impacts on the analyzed household demand(s), this rejects the income pooling hypothesis and the common preference model.[6]

The Model

In this section we propose a general model within the intrahousehold allocation framework, that provides an empirical test of how the nutritional status of children may reflect differences in parental preferences and child rearing technology in the provision of health, conditional on parent's age, education and income, and on the characteristics of the child. In particular, we will focus our attention on whether there is parental differentiation in terms of child's birth-order and gender within households in Chile. It becomes important to incorporate gender and birth-order differentiation in the model for several reasons. Parents may rely on their oldest son to look after them when old, while daughters assist their husband's families. In such cases one might expect to see parents invest more in a son rather than in a daughter. The participation of girls and boys in different household tasks can be another reason for cost differentiation and human capital formation. Unlike their brothers, young girls may not go to school in order to provide child care support.[7] Likewise, child's human capital investments might differ by birth order, either because of biological factors or due to behavioral influences. Parents may learn from the experience of their older children and be more efficient at raising later ones. Finally, there might be differences in resource allocations simply because of tastes, which in turn may reflect social and cultural norms. These differences are relevant in the Chilean society, where the division of household tasks and probably child rearing itself, are influenced by a machismo sentiment in both sexes (Gissi J., 1984). Household chores are mainly described as a mother's issue (Raczynski and Serrano 1986, Aranda 1986).

Following Bourguignon and Chiappori (1992) we relax the common preference assumption and allow the household family welfare (W) to be weighted function of each parent (mother's and father's) utility. This permits us to capture the influence of bargaining factors within the family, that may reflect the negotiation process in the allocation of resources. From these factors, we focus our attention on mother's and father's individual income to test the common preference model via

[6] One must be careful when making this statement, since the reverse logic does not apply: If the income coefficients are not different from each other, one cannot conclude that the family behaves as a single decision unit. Other variables, unobservable to the econometrician may be the true bargaining factors. We will address this point in the paper by testing the common preference assumption focusing on *differences* in parental education attainment as bargaining factors. Conditional on education, age and individual current incomes, differences in education may modify the way each parent sees her (his) partner's long term income profile and consequently, reflect some bargaining power in the family.

[7] In agricultural communities, the argument can be reversed if sons provide help on the farm.

the pooling hypothesis. Conditional on parental age and education levels differences in parental education are also considered as bargaining variables in our model. The idea behind this is that differences in parental levels of education may reflect dissimilarities in the way individuals see their potential long-term incomes, and act as bargaining variables. Both variables, individual incomes and differences in parental education, enter in our model as bargaining factors through the welfare weight, Ω.

In addition, we specify each parent's preferences as dependent upon parental (observed and unobserved) characteristics, and on *all* household member's private and public consumption. This allows us not only to explain any altruistic behavior and externalities in consumption, but also to capture any other preference interactions that are essential in modeling why parents allocate resources in the provision of health to their children:

$$W = \left[\Omega; U^{m}\left(X, H, u_m, u_f, \varepsilon_m, \varepsilon_f\right), U^{f}\left(X, H, u_m, u_f, \varepsilon_m, \varepsilon_f\right)\right]$$

$$0 \le \Omega\left[Y_m, Y_f; (Diff.Edu.)\right] \le 1 \qquad (1)$$

X represents a vector of household market commodities, including leisure; H stands for all nonmarket goods produced at home, such as child's health investment in terms of parental rearing; u_m and u_f denote mother's and father's observed background characteristics such as age and education; and ε_m and ε_f correspond to vectors of parental unobservable characteristics, such as tastes reflecting child-gender and child birth-order predilection.

The household welfare function is maximized, subject to the family budget constraint;[8]

$$PX = Y_m + Y_f,$$

$$Y_i = E_j + ny_j \qquad \text{for} \qquad i = w, f; \qquad (2)$$

P is a vector of market prices excluding the price of leisure; and Y_m and Y_f stand for mother's and father's total income. We further assume parental total income be linear combination of parental earnings (E) and nonlabor income (ny_i). Earnings depend as usual, on individual's wage and on a time constraint. For exposition purposes, parental nonlabor income is assumed to be exogenous in our static model. Later in the estimation process, we consider the possibility of measurement error in income.

The health of the children in the family does not depend merely on the parents' preferences in the allocation of resources. Other variables such as child

[8] For simplicity, we assume parental incomes to be the only source of family monetary resources.

biological factors, community characteristics and each parent's specific technology in raising children become important elements in determining the health status of the child. Therefore, we introduce to the model a nonmarket commodity production function that enables us to capture any parental child-raring technology in the procurement of health:

$$H = H\left(X, X_n, \theta, \eta_p, \eta_c\right) \tag{3}$$

We allow the nonmarket commodity production function (H) to depend on any market purchased (X) and nonmarket (X_n) inputs that are related to the health status of the child, such as food intake, health services and breast-feeding respectively. We also incorporate a vector of child's characteristics (θ), such as age, gender and birth-order, that controls for biological factors influencing the child's health outcome. In addition, we introduce a vector of parental-specific characteristics (η_p), that reflect each parent child-rearing technology η_p can be thought as mother's and father's age and human capital; child rearing experience in terms of birth-order, and as any other parental child-rearing specific ability in terms of parent-son and parent-daughter gender matching. These characteristics may also account for the fact that parents learn from the experience of their older children, and be more efficient at raising later ones. Finally, the nonmarket commodity production function depends on regional and community characteristics (η_c), that capture characteristics related to the environment.

The maximization process leads to aggregate market and nonmarket household commodity demands for each element of X and H which includes child's health investment:

$$X^* = G_x\left(P, y_m, y_f; u_m, u_f, \varepsilon_m, \varepsilon_f; \theta, \eta_p, \eta_c\right)$$

$$H^* = G_z\left(P, X_n, y_m, y_f; u_m, u_f, \varepsilon_m, \varepsilon_f; \theta, \eta_p, \eta_c\right) \tag{4}$$

These optimal demands depend on a vector P of commodity prices, and on the set of observed and unobserved household characteristic and community characteristics that reflect parental preferences and child rearing technology in the allocation of resources within the household. Section III of the paper deals with the empirical strategy that estimates the child's health as a component of H^*.

We turn next to the description of the data.

The Data

The Chilean Household Survey CASEN92 (Encuesta de Caracterización Nacional 1992) was carried out by the Chilean National Ministry of Planning in collaboration with the University of Chile. The 1992 survey consists of a nationwide cross-sectional random sample of 143,459 individuals and 35,948 households. It encapsulates detailed socioeconomic and demographic information at an individual and household level, about labor and nonlabor income, dwelling characteristics, gender, age, levels of education and the nutritional status of the children, among other variables. This information becomes essential to the empirical implementation of our model. Having detailed demographic information at an individual level for parents living in the household facilitates the estimation of the health status of the child as an intrahousehold resource allocation outcome and child rearing technology. Similarly, information about each child's gender, age and consequently birth-order, permits one to analyze how child characteristics relate to parental demographics in determining the allocation of resources on child health investment.

The Survey provides data about child nutritional status in terms of biomedical risk for those children with five years or less of age. This biomedical hazard is defined under four ordered categorical variables (*normal or eutrofic, biomedical risk, moderate, and accentuated malnutrition*), which capture the overall healthiness of the child relative to Chilean national health standards. We should say that the entire Chilean population is entitled to basic public health services since a preventive health system was established. This means that for families to be eligible for governmental subsidies, each child has to be subject to medical controls on a periodical basis. The regular visits to medical clinics provide each child with health record that serves as source for the nutritional status information in this survey. This allows one to have a multidimensional health indicator for the child, while embracing an objective classification criteria for the empirical analysis.

For estimation purposes, we select a subsample of 11,702 observations for all children less than six years of age living in the household. For these children the nutritional biomedical hazard is defined, and at least one parent is present in the household either on married status or cohabiting. We aggregate the nutritional four-ordered categorical variable into a dichotomous variable.[9] Table 1.1. shows that under the new definition, 83 percent of the children were found to be well-nourished in our sample, while 17 percent lay under the malnourished category. The distribution of child's age (table1.2) is largely even across ages, with a mode at four years old. With respect to household composition we can see in table 1.3 that most of the families have either one or two children under six years old.

[9] The categories: "biomedical risk", "moderate" and "accentuated malnutrition" were redefined as malnourished , while "normal or eutrofic" and "over-weighted or obese" categories were collapse into the now called well-nourished category. The aggregation of categories was carried out, given that the nutritional-status distribution mode laid at the "normal or eutrofic" category (82.81%), and the other categories ("biomedical risk", "moderate" and "accentuated malnutrition") were evenly distributed (e.g., 6.03%, 4.84% and 6.32% respectively). We believe no valuable information is lost.

Mothers are, on average, slightly younger, presenting lower earnings and have lower nonlabor income compared to fathers (table 1.4).[10]

The great majority of the parents have at least some degree of education, displaying both similar distributions with modes at nine to twelve years of education (table 1.5). However, from a family perspective (table 1.6), only 15 percent of the mothers show higher levels of education than their spouse. This may represent differences in mother's and father's long-term earnings profiles, and consequently, reflect some bargaining power in the family. We take advantage of this fact to test the common preference assumption using differences in educational levels, as additional source of power.[11] Finally, the geographic household distribution (table 1.7) shows that 36 percent of the families are located in the South/Central part of the country, while only 28 percent of the households live in the Capital City. This feature contradicts the general population distribution, but coincides with the original survey design where people from the South/Central region of the country were oversampled. In addition, 65 percent of the families are located in urban areas.

Empirical Strategy

The empirical strategy focuses on the nutritional status of the child as an indicator of the household child-health demand represented in equation 4. According to our model, the core of our analysis is to regress the nutritional status of the child (h_{ij})[12] on parental characteristics such as individual nonlabor incomes, age and levels of education to test differences in parental preferences and child rearing technology. The hypothesis of gender differentiation is tested by allowing the core model be bully interacted with a child-gender dummy variable (GENDER), while the birth-order differentiation hypothesis is carried on by fully interacting the model whit a birth-order dummy variable (B/ORDER). In what follows we explain the core model (A), using the gender hypothesis specification:

<u>Gender hypothesis specification</u>

$$h_{ij} = 1\{A + A \times GENDER + \varepsilon_{ij} > 0\} \qquad \text{i = child, j = household} \qquad (5)$$

where

[10] 90 percent of the mothers report zero nonlabor income, yet only 0.4 percent of the fathers are found to have zero non-earned income.

[11] According to the pooling hypothesis, only aggregate resources determine household behavior, thus the effect of differences in educational levels on the child nourishment should be zero in order accept the common preference model.

[12] h_{ij} is an indicator that takes the value of one if well nourished, and zero otherwise.

$$A \equiv \alpha + \beta_m ny_m + \beta_f ny_f + Z_m\gamma_m + Z_f\gamma_f + \delta_{1c}C + \delta_G GENDER + \delta_B B/ORDER + D_r\ \varphi_r \quad (6)$$

In the core Model, mother's (Z_m) an father's (Z_f) characteristics such as parental age and education are include in the regression as important covariates in determining either child rearing technology or parental preferences in the provision of their children's health.[13] Both characteristics enter our model as variables a effecting the family welfare function and the nonmarket child-rearing production function. Consequently, any differences captured by parental age and education *levels* will reflect differences in child rearing technology and parental taste differentiation.

In terms of child rearing technology, one would like to think that the more educated the parent is, the more efficient he or she becomes in procuring his (her) children's health. Different age levels may also reflect differences in parental energy effort in terms of child rearing. To control for parental education, we use three categorical variables for each parent: education between 1-8 years, education between 9-12 years, and education between 13-18 years.[14] Additionally, mothers and fathers age enter in our regressions as a second order polynomial to capture age nonlinearities on rearing technology.[15] We also control for mother's (ny_m) and father's (ny_f) nonlabor income,[16] to test the common preference assumption in child health procurement, by examining the income pooling hypothesis.[17] In this framework, individual incomes are taken as bargaining power variables affecting the nutritional status of the child through the welfare weights. To find significantly different effects of mother's and father's nonlabor income on the nutritional status of the child, would contradict the common preference result which states that household optimal depend only on all members pooled income. This would suggest that mothers and fathers share different tastes in the procurement of their children's health. Additionally, we include the age of the child (C), [18] together with a gender (GENDER) and birth-order (B/ORDER) dummy to control for biological factors that influence the health development of the infant. GENDER takes the value of one if the child is a son and zero if she is a daughter. B/ORDER is equal to one if the infant is the oldest child living in the household at the time of the interview, and

[13] Despite fact the theoretical framework derives demand equations that depend on wages, we avoid the problem of predicting wages for non-workers (81 percent of women). This of course means that the coefficients on education will partly capture wage effects as mentioned in the discussion.

[14] 18 years of education is the highest level attained by either parent in our sample. Less than one year of education is the left-out category.

[15] $(age_m + age_f)^2$.

[16] Parental unearned income also enters the model as a second order polynomial, i.e., $(ny_m + ny_f)^2$

[17] Labor income reflects the decision on labor supply and is part of the household behavior, therefore, we exclude it in the logit estimation regressors. Logit specifications, were also tested using total labor income with a conditional logit (Chamberlain, 1980) However, small variability of the dependent variable within families prevented us to successfully identify the model.

[18] We also include a quadratic term with respect to child's age in the empirical estimation.

zero otherwise. Regional and rural-urban categorical variables (D_r) are employed to account for community heterogeneity, such as climate and economic conditions.[19] In order to test whether there is any gender differentiation in parental preferences or child rearing technology we allow the core model (A) to be fully interacted with the child GENDER dummy.

Results

Tale 1.8 presents logit estimates under the gender (son/daughter) hypothesis. The age of the mother has a greater impact on the nutritional status of the daughters rather than on the nutritional status of her sons. Likewise, in terms of parental age, fathers seem to direct more resources to the provision of their son's health than to their daughters'. The same pattern can be seen with respect to parental education. At higher levels of education (13 – 18 years), mothers have a stronger effect on daughters, while fathers show a greater effect on sons. The fact that this gender differentiation only takes place at higher levels of education may reflect the role of parental human capital in allowing both parents to specialize in the allocation of resources when procuring the health of their daughters and sons.

A general concern is the problem of measurement error in unearned income that is often encountered in household surveys. However, the fact that measurement error in paternal (or maternal) nonlabor income does not differ across siblings in the same household indicates that any bias transmitted to the estimates is common across siblings. Therefore, we exploit within-household variation in child gender (and birth-order) to test the income pooling hypothesis in a difference-in-difference framework that eliminates the measurement error bias. We test whether mother's and father's differential income effect with respect to gender (or birth/order) is equal.[20]

The p-value of [0.37] for the difference-in-difference effect of nonlabor income on child's nourishment based on gender predilection, does not allow one to reject the common preference model.

We now replace the GENDER dummy with the B/ORDER dummy and proceed to test differences in Birth-order in the same way:

Birth-order hypothesis specification

$$h_{ij} = \{A + A \times B/ORDER + \varepsilon_{ij} > 0\} \qquad (7)$$

[19] People may be concerned about the potential endogeneity of these variables due to migration issues, for instance. Nevertheless, in view of the omitted-variable bias that one could incur when neglecting them, we have resolved to include them. The survey does not provide migration information.

[20] The Appendix presents the intuition of the test.

According to the birth-order hypothesis (table1.9), we find larger effects of mother's age on oldest children. The characteristics of the father reflect no birth-order differentiation. However, neither can we reject common preference with respect to birth-order health status based on the income's difference-in-difference p-value [of 0.52].

Parental levels of education and preferences

The estimates presented in tables 1.8 and 1.9 do not allow us to differentiate in terms of education, those effects coming via preference from those coming via child rearing technology. In an effort to analyze the preference effect in child nutrition with respect to parental human capital, a new categorical variable (D_E) is introduced to the core model:

$$A_1 = A + \delta_E D_E \qquad (8)$$

Now extended core model (A_1) includes a dummy variable (D_E) equal to one for those families where the mother reports higher levels of education than her spouse. Thus, *conditional* on each parent level of education, age and income, the interaction of A_1 with GENDER and B/ORDER allows one to test the common preference model through the education bargaining power effect in terms of gender and birth-order predilection.

Gender hypothesis specification

$$h_{ij} = 1\left\{A_1 + A_1 \times GENDER + \varepsilon_{ij} > 0\right\} \qquad (9)$$

Table 1.10 shows that, after controlling for the parental education categorical variable (D_E), the effect of parental age on child nourishment is larger and is consistent with the same gender bias pattern observed in table 1.8. Mother's age is found to be larger for daughters, while fathers continue to direct more resources to their sons for high levels of education (13-18 years). The common preference model, through the education bargaining power dummy cannot be rejected in terms of gender differentiation, [p-value of 0.76]. However, negative and significant estimates of the education dummy variable on the child's nutritional status show that mothers with higher education attainment relative to their spouse channel less resources to their children than those mothers who are relatively less educated. This may reflect high child rearing opportunity costs in terms of mothers' household chore decisions.

We now proceed to test birth-order predilection with education as power factor:

Birth-order hypothesis specification

$$h_{ij} = 1\{A_1 + A_1 \times B/ORDER + \varepsilon_{ij} > 0\} \tag{10}$$

Logit estimates presented in table 1.11 show no evidence of child birth-order differentiation with respect to parental child rearing technology (e.g., levels of age and education), and with respect to parental predilection (e.g., differences in nonlabor income and human capital). This fact leads us to the next issue which is that child rearing technology and parental preferences may alternate in their effects and take different directions depending on the gender and birth-order of a child.

Gender-birth/order hypotheses specification

$$h_{ij} = 1\{A_1 + A_1[(GENDER) + (B/ORDER) + (GENDER \times B/ORDER)] + \varepsilon_{ij} > 0 \tag{11}$$

To analyze this possibility, we fully interact the core model (A1) with GENDER and B/ORDER simultaneously. Table 1.12 presents the results. We find gender differentiation with respect to parental age. Mothers continue to direct more resource to their daughters, while fathers to their sons. However, this gender polarity is significant only for latter-born daughters and latter-born sons, respectively (columns [(B) minus (D)]. These results provide evidence of how parenting experience may lead to specialization in child care. Additionally, education of the mother appears to be more important than father's education in providing nourishment of the child, (columns B and D). This issue seems plausible considering that Chilean mothers spend relatively more time with their children than fathers. We also obtain weak evidence of gender differentiation with respect to birth-order. If we focus on the birth-order hypothesis, contrary to the previous results, we find evidence of birth-order differentiation by gender. Looking at high levels of education (13-18 years), the mother assigns less resources to the oldest child if he is a son (columns [(A) minus (B)], but makes no differentiation in terms of birth-order among daughters, (columns [(c) minus (D)]).

Finally, the common preference hypothesis, with respect to gender and birth-order predilection, cannot be rejected using education differences and nonlabor income as bargaining factors. Nevertheless, the negative estimates of the education bargaining dummy variable indicate that mothers with more education than their spouse direct fewer resources to their latter children than those are relatively less educated. As mentioned before, this may reflect high child rearing opportunity costs in terms of the mother's out-of-home activities due to the high correlation between education and potential earnings.

Conclusions

Household decisions have been traditionally modeled by treating the household as the elementary decision unit. However, this approach provides no information about how family resources are allocated within the household. This is important because household behavior could well reflect the decision marker's welfare but not necessarily the other family members' well being. We believe more research has to be done in the interest of economic modeling to improve the understanding of intrahousehold allocation.

This paper examines the nutritional status of Chilean children, in a context of family resources, where mother and father characteristics reflect differences in child rearing technology and parental preferences. Mother and father incomes, and differences in education are taken as bargaining variables reflecting tastes. Levels of education and parental age enter out model as child rearing technology factors.

We find gender specialization in child rearing: mothers direct more family resources towards their daughters, while fathers channel more to their sons. This gender polarity is significant for parental age and high levels of education. Additionally, the education of the father becomes less important than mother's education in attending the nourishment of the children. This supports that household chores are essentially a woman's task in the majority of Chilean families.

The common preference assumption based on gender and birth-order predilection cannot be rejected. However, mothers with a higher education level than their spouse direct less resources to their children, than those who are relative less educated. This may reflect the increase in child rearing opportunity cost when mothers are better educated to perform out-of-home activities. If this is the correct interpretation, then the mother's decision to direct less resources to home activities, such as child-rearing, should not be viewed exclusively in terms of her individual opportunity cost, but also on the basis of her children's welfare.

Table 1.1

Child's Nutritional Status		
		Relative Frecuency
Mal-Nourished		17.19
Well-nourished		82.81
Sample size	11,702	100.00

Table 1.2

Child's Age Distribution		
Age (in years)		Relative Frequency
Zero		14.45
One		15.29
Two		17.21
Three		17.95
Four		18.20
Five		16.89
Sample size	11,702	100.00
	Mean	Standard Error
Child's age	2.61	(0.015)

Table 1.3

Children less than 6 Years old in the Household		
		Relative Frecuency
One Child		54.12
Two Children		37.09
Three Children		7.90
Four Children		0.85
Five Children		0.04
Sample Size	11,702	100.00

Table 1.4

Parental Age and Income		
	Mean	Standard Error
Mother's Age	29.807	(0.058)
Father's Age	33.424	(0.071)
Mother's Labor Income	19,909.870*	(719.241)
Father's Labor Income	125,333.300*	(2,139.365)
Mother's Nonlabor Income	1,427.040*	(0.001)
Father's Nonlabor Income.	11,103.200*	(0.003)

*1992 Chilean Pesos.

Table 1.5

Parental Education Distribucion		
	Mother	Father
None	247 (2.11%)	249 (2.13%)
1-8 years	5,196 (44.40%)	5,082 (43.43%)
9-12 years	5,026 (42.95%)	4,904 (41.91%)
13-18 years	1,233 (10.54%)	1,467 (12.54%)
Sample size	11,702 (100.00%)	11,702 (100.00%)

Table 1.6

Parental relative Education and Age Distribution			
Mothers	With lower education than their spouse	With higher education than their spouse	Total
Younger than their spouse	8,262 (70.60%)	1,398 (11.95%)	9,660 (82.55%)
Older than their spouse	1,707 (14.59%)	335 (2.86%)	2,042 (17.45%)
Total.	9,969 (85.19%)	1,733 (14.81%)	11,702 (100.00%)

Talbe 1.7

Household Geographical Distribution	Relative Frecuency
North	12.57
North/Central	9.81
Central	9.67
South/Central	35.95
South	3.52
Capital City	28.48
Sample size	100.00
Urban	65.35
Rural	34.65

Table 1.8

LOGIC PARENTAL EFFECT ON CHILD NOURISHMENT Gender Fully Interacted Model			
	Son	**Daughter**	**Difference**
Mother Age	-0.008 [0.443]	0.020 [0.056]	-0.028 [0.058]
Father Age	0.040 [0.000]	0.003 [0.744]	0.037 [0.005]
Mother Education (1-8 years)	0.162 [0.562]	0.293 [0.220]	-0.131 [0.722]
Mother Education (9-12 years)	0.253 [0.382]	0.634 [0.012]	-0.381 [0.322]
Mother Education (13-18 years)	0.385 [0.288]	1.292 [0.000]	-0.907 [0.070]
Father Education (1-8 years)	0.560 [0.021]	0.373 [0.123]	0.187 [0.585]
Father Education (9-12 years)	0.889 [0.001]	0.446 [0.079]	0.443 [.0220]
Father Education (13-18 years)	1.554 [0.000]	0.434 [0.173]	1.120 [0.016]
Mother Income	-1.355 [0.264]	0.256 [0.810]	-1.611 [0.317]
Father Income	0.654 [0.074]	0.719 [0.051]	-0.065 [0.901]
			Difference in Difference
Income Pooling (Diff.-Diff.)			-1.546 [0.367]
P-values in [parenthesis]			

Table 1.9

LOGIC PARENTAL EFFECT ON CHILD NOURISHMENT Gender Fully Interacted Model			
	Oldest	**Latter**	**Difference**
Mother	0.027	-0.007	0.034
Age	[0.042]	[0.432]	[0.034]
Father	0.009	0.025	-0.017
Age	[0.462]	[0.001]	[0.247]
Mother	0.221	0.232	-0.011
Education	[0.646]	[0.237]	[0.983]
(1-8 years)			
Mother	0.374	0.459	-0.085
Education	[0.445]	[0.028]	[0.873]
(9-12 years)			
Mother	0.243	1.261	-1.018
Education	[0.652]	[0.000]	[0.102]
(13-18 years)			
Father	0.541	0.417	0.124
Education	[0.161]	[0.029]	[0.774]
(1-8 years)			
Father	0.838	0.577	0.261
Education	[0.035]	[0.004]	[0.558]
(9-12 years)			
Father	1.148	0.887	0.261
Education	[0.013]	[0.001]	[0.627]
(13-18 years)			
Mother	-2.015	-0.340	-1.675
Income	[0.253]	[0.663]	[0.385]
Father	0.510	0.885	-0.345
Income	[0.335]	[0.007]	[0.575]
			Difference in Difference
Income			-1.330
Pooling			[0.524]
(Diff.-Diff.)			

P-values in [parenthesis]

Table 1.10

LOGIC PARENTAL EFFECT ON CHILD NOURISHMENT Gender Fully Interacted Model			
	Son	**Daughter**	**Difference**
Mother	-0.025	0.019	-0.043
Age	[0.069]	[0.165]	[0.023]
Father	0.054	0.004	0.050
Age	[0.000]	[0.731]	[0.003]
Mother	0.282	0.386	-0.104
Education	[0.316]	[0.108]	[0.778]
(1-8 years)			
Mother	0.572	0.935	-0.363
Education	[0.076]	[0.001]	[0.393]
(9-12 years)			
Mother	0.873	1.739	-0.866
Education	[0.039]	[0.000]	[0.131]
(13-18 years)			
Father	0.327	0.076	0.251
Education	[0.224]	[0.779]	[0.511]
(1-8 years)			
Father	0.499	-0.022	0.521
Education	[0.124]	[0.945]	[0.251]
(9-12 years)			
Father	1.035	-0.162	1.197
Education	[0.016]	[0.686]	[0.041]
(13-18 years)			
Education Difference	-0.363	-0.443	0.080
as bargaining	[0.045]	[0.015]	[0.755]
Mother	-1.348	0.226	-1.575
Income	[0.267]	[0.830]	[0.328]
Father	0.646	0.682	-0.036
Income	[0.077]	[0.063]	[0.945]
			Difference in Difference
Income			1.539
PoOling			[0.368]
(Diff.-Diff.)			
P-values in [parenthesis]			

Table 1.11

LOGIC PARENTAL EFFECT ON CHILD NOURISHMENT Birth-order Fully Interacted Model			
	Oldest	**Latter**	**Difference**
Mother	0.011	-0.011	0.022
Age	[0.516]	[0.336]	[0.278]
Father	0.022	0.029	-0.007
Age	[0.134]	[0.004]	[0.693]
Mother	0.345	0.328	0.017
Education	[0.472]	[0.097]	[0.974]
(1-8 years)			
Mother	0.708	0.756	-0.048
Education	[0.171]	[0.001]	[0.933]
(9-12 years)			
Mother	0.767	1.696	-0.929
Education	[0.207]	[0.000]	[0.184]
(13-18 years)			
Father	0.302	0.143	0.159
Education	[0.462]	[0.510]	[0.732]
(1-8 years)			
Father	0.421	0.144	0.277
Education	[0.371]	[0.581]	[0.607]
(9-12 years)			
Father	0.590	0.340	0.250
Education	[0.302]	[0.324]	[0.708]
(13-18 years)			
Education Difference	-0.376	-0.410	0.034
as bargaining	[0.098]	[0.009]	[0.902]
Mother	-2.106	-0.334	-1.772
Income	[0.232]	[0.668]	[0.358]
Father	0.467	0.829	-0.362
Income	[0.376]	[0.008]	[0.555]
			Difference in Difference
Income			1.410
Pooling			[0.499]
(Diff.-Diff.)			

P-values in [parenthesis]

Table 1.12

LOGIC PARENTAL EFFECT ON CHILD NOURISHMENT
Gender and Birth-order Fully Interacted Model

	Son		Daughter		Gender Diff.		Birth-order Diff.	
	Oldest (A)	**Latter** (B)	**Oldest** (C)	**Latter** (D)	**Oldest** (A) – (C)	**Latter** (B) – (D)	**Son** (A) – (B)	**Daughter** (C) - (D)
Mother Age	-0.010 [0.669]	-0.034 [0.04]	0.016 [0.491]	-0.012 [0.468]	-0.026 [0.433]	-0.046 [0.050]	0.024 [0.421]	0.004 [0.895]
Father Age	0.038 [0.076]	0.054 [0.000]	0.025 [0.275]	0.003 [0.827]	0.014 [0.656]	0.051 [0.014]	-0.015 [0.554]	0.021 [0.554]
Mother Education (1-8 years)	-0.370 [0.666]	0.407 [0.177]	0.565 [0.356]	0.312 [0.238]	-0.936 [0.375]	0.095 [0.813]	-0.778 [0.393]	0.253 [0.704]
Mother Education (9-12 years)	-0.225 [0.809]	0.718 [0.103]	1.068 [0.103]	0.843 [0.008]	-1.293 [0.255]	-0.124 [0.793]	-0.943 [0.342]	0.225 [0.757]
Mother Education (13-18 years)	-0.679 [0.530]	1.403 [0.004]	1.374 [0.074]	2.099 [0.000]	-2.053 [0.122]	-0696 [0.325]	-2.081 [0.080]	-0.724 [0.432]
Father Education (1-8 years)	0.675 [0.240]	0.265 [0.393]	0.288 [0.644]	0.075 [0.807]	0.387 [0.648]	0.190 [0.664]	0.410 [0.530]	0.213 [0.760]
Father Education (9-12 years)	0.974 [0.157]	0.420 [0.263]	0.296 [0.668]	-0.075 [0.840]	0.678 [0.487]	0.494 [0.347]	0.554 [0.479]	0.371 [0.636]
Father Education (13-18 years)	1.912 [0.035]	0.773 [0.118]	-0.036 [0.964]	-0.004 [0.993]	1.949 [0.107]	0.778 [0.262]	1.139 [0.270]	-0.032 [0.973]
Education as bargaining	-0.028 [0.543]	-0.389 [0.074]	-0.442 [0.163]	-0.402 [0.077]	0.235 [0.615]	0.013 [0.966]	0.181 [0.654]	-0.040 [0.919]
Mother Income	-1.027 [0.724]	-0.859 [0.546]	-0.875 [0.793]	1.661 [0.292]	-0.152 [0.973]	-2.519 [0.235]	-0.168 [0.959]	-2.536 [0.492]
Father Income	1.584 [0.143]	0.625 [0.128]	0.468 [0.519]	1.160 [0.018]	1.116 [0.392]	-0.535 [0.402]	0.959 [0.407]	-0.692 [0.429]
					Gender Diff-in-Diff		**Birth –Orer Diff-in-Diff**	
					Oldest	Latter	Son	Daughter
Income Pooling (Diff.-Diff.)					1.268 [0.786]	1.984 [0.373]	1.128 [0.749]	1.844 [0.626]

P-values in [parenthesis]

Appendix

The following is an informal approach to stimulate the intuition behind the difference-in-difference poolong hypothesis testing, contingent to measurement error in current unearned income. Without loss of generality, we will focus on the gender preference hypothesis:

Let the true fully-interacted model be represented by

$h_s = b_o + X\theta + b_1 y_m + b_2 y_f + \mu_s$ (m= mother; f= father)

$h_d = \gamma_o + X\theta + \gamma_1 Y_m + \gamma_2 Y_f + \mu_d$ (s= son: d= daughter)

1)

Let the bias on income coefficients (caused by the measurement error) be independent to the gender predilection of the mother and the father, but different across parents:

$plim\hat{b}_1 = b_1 + \Theta_m$ $plim\hat{\gamma}_1 = \gamma_2 + \Theta_m$

$plim\hat{b}_2 = b_2 + \Theta_f$ $plim\hat{\gamma}_2 = \gamma_2 + \Theta_f$

2)

Testing the gender common preference assumption implies:

H_0: $b_1 = b_2$ and $\gamma_1 = \gamma_2$

3)

Nevertheless, testing H_0 with 2) may cause to reject H_0 even when it is true. However, the common preference assumptions can consistently be tested using a difference-in-difference approach:

$H_0 : (b_1 - \gamma_2) - (b_2 - \gamma_2) = 0.$ Since

$plim[(\hat{b}_1 - \hat{\gamma}_1) - (\hat{b}_2 - \hat{\gamma}_2)] = (b_1 - \gamma_1) - (b_2 - \gamma_2)$

4)

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