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# EXTENDED FAMILIES AND CHILD WELL-BEING

Daniel LaFave
Duncan Thomas

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## ABSTRACT

Whereas studies have established the intra-household distribution of resources affects allocation decisions, little is known about how these decisions are affected by the distribution of resources among co-resident and non co-resident extended family members. Drawing on theoretical models of collective decision-making, we use extremely rich data from Indonesia to establish that child health- and education-related human capital outcomes are affected by resources of extended family members who co-reside with the child and those who are not co-resident. Extended family members are not completely altruistic but their allocation decisions are apparently co-ordinated in a way that is consistent with Pareto efficiency.

Daniel LaFave
5243 Mayflower Hill
Colby College
Waterville, ME 04901
drlafave@colby.edu

Duncan Thomas
Department of Economics
Duke University
Box 90097
Durham, NC 27708
and NBER
d.thomas@duke.edu

## 1. Introduction

Several studies have established that the distribution of resources among household members is predictive of spending and savings patterns, with females typically allocating more resources to investments in the future – including their children – relative to resources allocated by males. (Thomas, 1990; Lundberg, Pollak, and Wales, 1997; Duflo, 2003; Ashraf, 2009; Rubalcava, Teruel and Thomas, 2009, Bobonis, 2009). In contrast with studies of individuals who co-reside in a household, the relationship between the well-being of individual family members and the distribution of resources within an extended family, including members who are not co-resident, is not well understood. Given the central role that extended families play in many models of behavior, this is an important gap in the literature.

It is not straightforward to draw conclusions from evidence on household behavior about how variation in the distribution of resources among non co-resident family members affects spending and savings choices within the family. Yet, this is a question of substantial importance for both science and policy. To wit, a large literature has investigated inter-generational transfers from, for example, adults to their elderly non co-resident parents or from parents (and grand-parents) to young adults as they establish their own households. (See, for example, Lee (2003) for a recent review). Other research has examined the relationship between transfers from non-coresident fathers and the well-being of their children (Knox, 1996; Aizer and McLanahan, 2006) in studies of transfers between migrants – including international migrants – and those left behind (Antman, 2013). A challenge that is common to much of this work is that living arrangements of family members and, therefore, household composition potentially depends on the distribution of resources within that family. This substantially complicates inferences about family-wide behavior based on information about decision made by those members who choose to co-reside in a single household (Hamoudi and Thomas, 2014).

This research examines the impact of resources of both co-resident and non co-resident family members on child well-being by exploiting unusually rich longitudinal survey data that contains information on resources at the individual level of family members, irrespective of whether they co-reside with the child. We examine whether, and how, resources under the control of parents, grandparents, and other family members contribute to child human capital outcomes in Indonesia. The empirical model is motivated by a relatively general model of family behavior that has been a powerful resource in studies of household behavior and provides a natural framework to examine how human capital formation is influenced by intergenerational exchange and resource allocation.

There is a growing body of literature on the importance of the extended family in economic models of decision making. The evidence is, perhaps, especially salient in lower income settings, including developing countries, in which nuclear, two adult households are less common than in higher income settings (Cox, 2003; Bianchi et al., 2008). Living arrangements in lower income settings frequently consist of multi- or skip- generation households, and it has been argued that extended families often fill gaps created by the absence of formal social safety nets, access to financial markets and access to market-based insurance.[1] The importance of the question is apparent in the large body of evidence that has established the key role played by additional resources in early life on child development and human capital accumulation when resources are constrained (Heckman, 2006; Cunha, Heckman, and Schennach, 2010).

Using data from the Indonesia Family Life Survey (IFLS) we examine three markers of human capital of young children: first, height, conditional on age and gender, a measure of health and nutrition; second, performance on a non-verbal cognitive assessment and, third, age the child started school. The theoretical foundation for our empirical tests is provided by an extension of the collective model of household decision-making (Chiappori, 1988, 1992) to the context of decisions made by non co-resident family members. This model is ideally suited to the application: it makes no assumptions about co-residence choices, does not impose a specific structure for how family members bargain with one another, and yields empirical tests about the nature of resource sharing within the family. The key assumption in the model is that allocations within the extended family are Pareto efficient in the sense that no family member can be made better off without another family member being made worse off. In the context of a household, failure of efficiency may be difficult to rationalize since living arrangements are properly treated as endogenous. However, in the context of family decision-making, it is not obvious that Pareto efficiency will hold. It is, therefore, a substantively interesting test of family behavior that places plausible, testable restrictions on the behavior of individual family members who likely have heterogeneous preferences.

A special case of the collective model arises when families are completely altruistic and behave as if all members share the same preferences (or, one family member makes all decisions). The unitary or complete altruism model is tested and rejected by Altonji, Hayashi and Kotlikoff (1992) and Hayashi, Altonji and Kotlikoff (1996) using consumption data from the U.S. and by Witoelar (2013) using IFLS who examine whether household expenditures are affected by the expenditures of non co-resident family members. One important advantage of this research is that our investigation of the relationship between variation in the distribution of resources within the family and human capital outcomes of young children has direct welfare implications and speaks to investments in and the well-being of the next generation. In contrast, interpretation of variation in consumption behavior is more ambiguous. Second, we reach beyond a model of complete altruism of the family and test more general models of family decision-

[1] Evidence on extended family interaction in developing countries can be found in many settings. For example: Botswana (Lucas and Stark, 1985); India (Rosenzweig and Stark, 1989); South Africa (Duflo, 2003); and Indonesia (Thomas and Frankenberg, 2007) among many others.

making. See, also Dalton, Hotz and Thomas (2014) who examine spending on education in the U.S.

We show that child human capital outcomes are affected not only by the resources under control of their parents, but also resources of extended family members. We reject the unitary model of family behavior, but cannot rule out that family members co-ordinate actions in such as way as to allocate resources that affect child human capital outcomes in a manner that is consistent with Pareto efficiency.

The next section describes the theoretical and empirical model; we then describe the data and present our results. A conclusion summarizes our results.

## 2. Theoretical and Empirical Framework

Extending the model of household behavior of Chiappori (1988, 1992) and Chiappori and Browning (1994) with home production (Chiappori, 1997) to the family context, let the welfare of an extended family, $W$, depend on the utility of each of its $M$ members, where $m = 1, ..., M$. Each individual's sub-utility, $U_m$, is allowed to depend on their own consumption and that of all other extended family members as well as the output of home production by the family. The vector of goods and services is $\theta_{km}$, $k = 1,\ldots,K$, where $k$ indexes goods and services including home-produced goods such as health and education, and $\theta_{0m}$ which represents leisure of member $m$. We focus on the human capital of children which depends on time and goods inputs as well as endowments, with output, $\theta$, being constrained by the technology of the production function. Examining child human capital outcomes is of substantial interest in models of family behavior for two reasons. First, non co-resident family members have been shown to invest in the health and well-being of the next generation and, second, child human capital outcomes are readily observed. While the model does not specify the functional form of the sub-utility functions, it is necessary for each sub-utility function to be quasi-concave, non-decreasing, and strictly increasing in at least one argument.

Individual sub-utility is allowed to vary depending on individual, household, and family specific characteristics. Some of these characteristics, $\mu$, are observed and include age, household demographic structure, anthropometrics, and socioeconomic status. Characteristics that are not observed, $\varepsilon$, include, for example, attitudes toward human capital investments, altruism towards family members and human capital endowments. Each individual's sub-utility function is, therefore, $U_m(\theta, \mu, \varepsilon)$.

The extended family welfare function, $W$, is a weighted sum of individual sub-utilities with the weight associated with each individual, $\lambda_m$, depending on the characteristics of both that individual and all other family members. Some of these characteristics, $\pi$, are observed and include, for example, marriage market opportunities, prices (including the price of labor), age, education and the economic resources of each family member. Other characteristics, $\xi$, that are not observed might include, for example, time preferences and altruism.[2] Intuitively, the weighting function $\lambda_m(\pi, \xi)$ reflects the influence of member $m$ in the family decision-making process and can be interpreted as indicative of the bargaining power of that member. A key advantage of this model over many of the models in the literature is that there is no need to specify an equilibrium concept for the bargaining process.

Family welfare is maximized subject to the family-level budget constraint so that, in a static framework, expenditures of all family members is no more than total family income:

$$\max_{\theta} W[U_1(\theta,\mu,\varepsilon),\ \ldots,\ U_M(\theta,\mu,\varepsilon),\ \lambda(\pi,\xi)] \qquad [1]$$

$$\text{subject to } \ p_{\theta}\theta \leq \ \textstyle\sum_m [A_m + p_{0m}(T - \theta_{0m})] \ + A_0 \qquad [2]$$

where $A_m$ are assets controlled by family member $m$, and $A_0$ are assets jointly controlled by multiple family members. Individual labor income is the product of an individual's wage, $p_{0m}$, and labor hours, $T-\theta_{0m}$, where $T$ is the time endowment. Family expenditure is equal to spending on all goods and services including those that are used in the production of human capital, $p_{\theta}\theta$.

## 2.1 Unitary Model

In this context, family decisions will be unitary if all family members are completely altruistic, if all family members have the same preferences or if the preferences of only one family member (a dictator) determines resource allocations (Samuelson, 1956 and Becker, 1981). Under this assumption, conditional demand for $k$ by family member $m$ depends only on total family resources, $\sum_m y_m$, and not on its distribution within the family:

$$\theta_{km} = \theta_{km}(\textstyle\sum_m y_m,\ p,\ \mu,\ \varepsilon) \qquad [3]$$

where $y_m$ is resources of member $m$, $p$ is a vector of prices, and $\mu$ and $\varepsilon$ are observed and unobserved individual, household and family characteristics, respectively that affect demand. Since demand depends on pooled family resources, conditional on total family resources, the distribution of those resources within the family has no impact on resource allocations:

$$\left.\frac{\partial \theta_k}{\partial y_m}\right|_{\sum_{n=1}^{M} y_n} = 0 \quad \forall k,\ m \qquad [4]$$

for each family member, $m$. For example, conditional on total family resources, child human capital outcomes will not depend on the distribution of those resources between the child's parents, grandparents, aunts, uncles or other relatives.

While this model provides a useful starting place, it has been rejected in a large number of studies of household behavior at least since Horney and McElroy (1988), Schultz (1990) and Thomas (1990). It

[2] In principle, $\pi$ and $\xi$ may include factors that influence preferences through $\mu$ and $\varepsilon$.

is, therefore, unlikely to be a satisfactory model of decision-making that includes non co-resident family members. We turn, therefore, to the substantially more general collective model.

## 2.2 Collective Model

The collective model allows both total family resources and the distribution of resources within the family to affect resource allocations, but restricts allocations to be Pareto efficient. This is not an innocuous restriction, particularly in the context of decision-making by non co-resident family members. Rejection of this restriction provides important insights into understanding family behavior.

Chiappori (1988, 1992) and Browning and Chiappori (1998) establish that the collective model is formally equivalent to a model of family income sharing in which decisions are made in two stages. First, all resources are pooled and then shared among family decision-makers. Second, each decision-maker allocates his or her share of the pooled resources to maximize own sub-utility without reference to allocations by other family members.

Each decision-maker's share of pooled resources is determined by a sharing rule that depends on the utility weights that aggregate sub-utility functions, $\lambda$, and so is related to that member's influence over decisions. The rule, $\alpha(y_1,\ldots\ y_M,\ p, \pi,\ \xi)$, depends on resources of each family member, $y_m$, prices, $p$, along with observed, $\pi$, and unobserved, $\xi$, characteristics that affect the utility weights or, intuitively, affect bargaining power of that family member in allocation decisions. These might include, for example, marriage market opportunities or altruism. Letting pooled family resources be $Y=\sum_m y_m$, the share of pooled family resources that each decision-maker $m$ is allocated in the first stage, $Y_m$, is:

$$Y_m = \alpha(y_1,\ldots y_M,\ p, \pi,\ \xi)Y \qquad [5]$$

In the second stage, each family decision-maker, $m$, maximizes his or her own utility subject to a budget constraint that limits $m$'s spending to be no more than $m$'s share of resources $Y_m$. Conditional demand for $\theta_k$ by member $m$ is:

$$\theta_{km} = \theta_{km}(Y_m(y_1,\ldots y_M,\ p, \pi,\ \xi), p,\ \mu,\ \varepsilon) \qquad [6]$$

which can be rewritten as

$$\theta_{km} = \theta_{km}(y_1,\ldots y_M,\ p,\ \tilde{\mu}, \tilde{\varepsilon}) \qquad [7]$$

where $\tilde{\mu}$ includes all observed characteristics that affect demand directly, $\mu$, as well as those that affect demand through the sharing rule, $\pi$, many (but not all) of which are common. Similarly, $\tilde{\varepsilon}$ includes all unobserved characteristics that affect demand directly, $\varepsilon$, and those that affect the sharing rule, $\xi$.

Whereas in the unitary model, allocations depend only on total family resources, in the collective model, the resources of each decision-maker affects allocations and so the distribution of resources within the family matters. The weakly separable sharing rule function [6] plays a key role in deriving empirical tests of the collective model (Bourguignon et al., 1993, and Browning and Chiappori, 1998).

The marginal impact of income in the hands of family member *p*, $y_p$, on demand for $\theta_k$ is:

$$\frac{\partial \theta_k}{\partial y_p} = \frac{\partial \theta_k}{\partial Y_m} \frac{\partial Y_m}{\partial y_p} \qquad [8]$$

where the first term on the right hand side reflects the impact of *m*'s income share on demand which, because of weak separability in [6] is the same no matter what drives variation in *m*'s income share. The impact of $y_p$ on *m*'s income share is captured in the second term. The marginal impact of member q's income, $y_q$, on the same $\theta_k$ is:

$$\frac{\partial \theta_k}{\partial y_q} = \frac{\partial \theta_k}{\partial Y_m} \frac{\partial Y_m}{\partial y_q} \qquad [9]$$

where the first term is the same as in [8]. Thus, $y_p$ and $y_q$ affect the share of resources that each member, *m*, receives in the first stage but neither has a direct impact on demand for $\theta$. It is immediate that the ratio of these marginal effects is independent of $\theta_k$ for all outcomes *k*,

$$\frac{\dfrac{\partial \theta_k}{\partial y_p}}{\dfrac{\partial \theta_k}{\partial y_q}} = \frac{\dfrac{\partial \theta_k}{\partial Y_m}\dfrac{\partial Y_m}{\partial y_p}}{\dfrac{\partial \theta_k}{\partial Y_m}\dfrac{\partial Y_m}{\partial y_q}} = \frac{\dfrac{\partial Y_m}{\partial y_p}}{\dfrac{\partial Y_m}{\partial y_q}} \qquad \forall\ k,\ p \ and\ q, p \neq q \qquad [10]$$

for all pairs of family decision-makers, *p* and *q*. Put another way, the ratio of the marginal propensity to consume from each pair of family member's resources, $y_p$ and $y_q$, is constant across all goods, services and outcomes, $\theta$.

This is a powerful result for at least two reasons. First, there is no reason a priori to expect the ratio of marginal propensities to be the same across all goods for a pair of family members and, second, it is straightforward to test with survey data. The next sub-section describes the empirical implementation of the implications of the theoretical models described above.

### 2.3. Empirical Implementation

Taking a linear approximation of [7], the demand for $\theta^k_{ihf}$, the human capital outcome *k* of child *i* in household *h* and family *f*, depends on $y_m$, resources of each family member, *m*, some of whom are members of households *h* and some are not, in addition to a set of demographic controls for the index child, $X_{if}$, and all other family members, $X_{mf}$:

$$\theta^k_{ihf} = \alpha^k + y_{mf}\beta^k_m + X_{if}\gamma^k_i + X_{mf}\gamma^k_m + \varepsilon^k_{if} \qquad [11]$$

Exploiting the fact that IFLS collects information on resources at the individual level, we estimate [11] identifying individual family members, *m*, who are likely to be the most salient to the index child: the father, mother, grandfather, grandmother and other family members (which includes siblings, aunts and uncles). Allocations are collectively rational if the ratio of the marginal effect of resources of one family member, *m*, to the marginal effect of resources of another family member, *n*, is the same for all pairs of child outcomes, *j* and *k*:

$$\frac{\beta_m^k}{\beta_n^k} = \frac{\beta_m^j}{\beta_n^j} \quad \forall\, j \neq k \qquad [12]$$

In some cases, the value of a resource is well-known and assignment to an individual is straightforward; gold is a good example. In other cases, respondents may have difficulty valuing the resource and apportioning ownership among family members. This is likely to be most difficult within couples and possibly within households. In an effort to address these concerns, we put aside dynamics within households and compare the impact on child outcomes of resources of those family members who live in the same household, $h$, as and index child with resources of those who do not co-reside, $\bar{h}$, with the child:

$$\theta_{ihf}^k = \alpha^k + y_{hf}\beta_h^k + y_{\bar{h}f}\beta_{\bar{h}}^k + X_{if}\gamma_i^k + X_{mf}\gamma_m^k + \varepsilon_{if}^k \qquad [13]$$

In this special case of [11], allocations between co-resident and non co-resident family members will be collectively rational if the ratio of income effects are the same for each pair of child outcomes:

$$\frac{\beta_h^k}{\beta_{\bar{h}}^k} = \frac{\beta_h^j}{\beta_{\bar{h}}^j} \quad \forall\, j \neq k \qquad [14]$$

Moreover, families behave as if they are unitary if child outcomes are invariant to whether resources are in the hands of household members or in the hands of family members outside the household, implying that the income effects would then be equal, $\beta_h^k = \beta_{\bar{h}}^k$. A test that is robust to measurement error in total family resources replaces $y_{\bar{h}f}$ in [13] with a family-specific fixed effect, $\mu_f^k$

$$\theta_{ihf}^k = \alpha^k + y_{hf}\beta_h^k + X_{if}\gamma_i^k + X_{mf}\gamma_m^k + \mu_f^k + \varepsilon_{if}^k \qquad [15]$$

which effectively controls total family resources. In this case, household resources should have no additional impact on child outcomes and family behavior is unitary if $\beta_h^k$=0.

Since the test for collective rationality involves cross equation restrictions, the child outcome models are estimated jointly to construct nonlinear Wald test statistics. All variance-covariances are estimated allowing for intra-family correlation at the family level.[3] This is potentially important as we are comparing human capital outcomes of children in the same family who not only share genes but are

[3] Inferences do not change if they are based on bootstrapped estimates that are clustered at the family level.

likely to have shared environments.

## 3. Data

Data are drawn from IFLS, a large-scale, ongoing longitudinal survey that collects detailed information on individuals, households and families. The 1993 baseline enumerated about 22,000 members of 7,224 households in 306 rural or urban communities (*desa*) spread across 13 of the Indonesian provinces. Individuals were re-interviewed in IFLS2 in 1997 and in IFLS3 in 2000. We use data collected in IFLS4, conducted in late 2007 and early 2008, which interviewed over 43,500 individuals living in 13,500 households in 3,650 *desa*.[4] The fact that the number of communities in which respondents were interviewed increases by over 12-fold between baseline and IFLS4 follow-up 15 years later reflects a key strength of IFLS for this research: baseline respondents and their children born after baseline who move are tracked and interviewed in their new location. Specifically, as children age, strike out on their own and form new households, they, their spouses and their children are interviewed. In IFLS4, 90.6% of all surviving IFLS respondents were re-interviewed (Thomas et al., 2012). This far exceeds the recontact rates in any other large-scale population-based survey including, for example, the Panel Study of Income Dynamics in which attrition was around 50% after 15 years. Following Altonji et al. (1992), we construct extended families that include non co-residents by linking individuals in IFLS4 who have split off from their baseline households with all IFLS respondents that have been spawned by the baseline household.

An example is illustrated in Figure 1. Consider a baseline household with two parents and their two children. Four years later in IFLS2, the two children have grown and split-off to form their own households. These households are located and interviewed and we construct a family consisting of three households. In IFLS3, the baseline children have married, and their spouses become part of the IFLS sample. The spouses are administered the same individual interview as the original panel members. The light gray individuals indicate parents and siblings of joiners about whom information is collected from the joiner regarding vital status, age, gender education and transfers. As shown in Figure 1, by IFLS4, each of the original children now has two children. Our empirical models examine the outcomes of these four children and relate those outcomes to the resources of their parents, their grandparents and other non co-resident family members.

In a household-based survey, the full genealogical family tree is not observed; the implications for our analyses are discussed in detail below. The key point for this research is that, by design, IFLS enables the construction of families of related kin who are not co-resident. Appendix Table 1 reports the number of children, parents and grand-parents as well as households and families included in our sample.

[4] See Frankenberg and Karoly (1995), Frankenberg and Thomas (2000), Strauss et al. (2004), and Strauss et al. (2009) for descriptions of the waves of IFLS.

There are slightly over 15,00 age-eligible children (age 0-16 yrs) with about 1.7 per household and 2.9 per family.

*Child Outcomes* The analyses examine three indicators of child health and human capital that are related to well-being in later life: height-for-age, cognition, and participation in kindergarten. Height has been established as an informative indicator of nutritional status during early childhood (Waterlow et al., 1977; Martorell and Habicht, 1986) that reflects both the influence of genes and the environment – including parental time and financial resources – during early life (Silventoinen et al., 2000; Alderman et al., 2006; Hoddinott et al., 2013). Child height is a powerful predictor of attained height as an adult which is associated with reduced mortality and morbidity as well as greater economic prosperity (Fogel, 2004; Strauss and Thomas 1998). Height or length of each child is measured by a trained enumerator and standardized for age and gender using the 2000 Center for Diseases Control growth tables which are normed to a representative, well-nourished child in the United States. As shown in Table 1, the average child in our sample is between 1.2 and 1.5 standard deviations shorter than this norm.

The second child outcome is a measure of cognitive function. It comprises performance on a non-verbal cognitive battery, the Raven's Colored Progressive Matrices (CPM) pattern recognition assessment and answers to five simple arithmetic questions that involve addition, subtraction, multiplication and division. The CPM assessment has been interpreted as a measure of general intelligence and is thought to be a good measure of Spearman's general intelligence factor *g* (e.g. Raven, 2000 and Kaplan and Saccuzzo, 1997). Each child completed a booklet with 12 question from the CPM battery. We combine the CPM and arithmetic questions to increase precision and use the percentage of questions answered correctly for children age 7 through 16. Since older children are more likely to answer correctly than younger children, we flexibly control for age in the models. The average score is 69.6% with the average Ravens score being 74.6% and the average arithmetic score being 61.4%.

Whereas height and cognition are outputs of investments by family members, our third indicator is an input into the education process, whether or not the child participated in kindergarten. Only about half the sample children attended kindergarten although school readiness is thought to be an important contributor to learning in primary school. More generally, early education programs have been shown in rigorous studies to have a positive impact on socio-emotional development, cognition and school readiness and, in some studies, on school attainment and later life outcomes (Knudsen et al, 2006; Gertler et al., 2014). In our data, attending kindergarten is positively and significantly associated with subsequent school outcomes, even after controlling parental education and resources.

*Family Resources* The distribution of resources within the family plays a central role in the theory and empirical models. Child outcomes are invariant to this distribution in the unitary model, but are influenced by the distribution among family members through intra-family bargaining in the collective model. It is, however, a substantial challenge to translate the theory to an empirical specification of resources that reflects an individual's capacity to assert his or her own preferences over allocation decisions. Intuitively, one might think of resources as being indicative of an individual's bargaining power within a family say, for example, because the individual would retain control over those resources if all links with the family were severed.

Earnings are one potential candidate for individual-specific resources under the control of each family member. However, earnings reflect decisions about time allocation which is likely to be the outcome of a within-family bargaining process. Moreover, as a result of that process, income is typically shared with other household members and possibly also non co-resident family members through inter-household transfers.

Rather than rely on earnings, we assume that the distribution of assets within the family are the outcome of a less proximate bargaining process and, from the perspective of investments in young children, can be treated as pre-determined in the models. Exploiting an unusual feature of IFLS designed to test these models, we draw on information collected from each respondent age 15 or older about the value of assets the respondent owns in each of ten asset groups. Three of the asset groups are relatively illiquid – owner-occupied houses, other houses, and land – whereas the other seven are relatively liquid – livestock; vehicles; household appliances; financial assets; gold and jewelry; household furniture; and other assets. When assets are jointly owned with others inside or outside the family, the respondent estimates the value of the share of the asset that he or she owns.[5]

From the perspective of bargaining, it is not clear that more and less liquid assets will be treated the same. If a family member threatens to not co-operate, it may be difficult to withdraw his or her share of the value of the house from decision-making without evicting family members. Moreover, it is plausible that more and less liquid assets will have different impacts on child outcomes. Whether the value of more and less liquid assets should be combined is an empirical question that we will explore below using the value of assets owned by each respondent as the measure of resources, $y_m$, in the models.

While individual-specific assets have considerable appeal in these models since individuals are likely to take the assets they own with them if they sever ties with the family, the assumption that the distribution of assets within the family is unrelated to unobserved factors that affect child outcomes is not without controversy. An alternative strategy would be to use characteristics that affect marriage market

[5] Ninety-four percent of respondents provide their own estimate of the value of their assets. For the other 6%, the value reported by the spouse or household head is used.

outcomes. In fact, given that we focus on young children and, therefore, most of the parents are young, a substantial fraction of the assets are likely to have been provided at the time of marriage. Of course, one might argue that marriage outcomes are also potentially correlated with unobserved characteristics that affect child outcomes.

A step towards addressing this concern is to estimate [13] and compare the impact on child outcomes of assets of members of the child's household with assets of other non co-resident family members. To the extent that it is the distribution of assets within the household that is correlated with unobserved factors that affect child outcomes, these estimates should not be contaminated by unobserved heterogeneity. Moreover, household-level assets may be measured with less error and so there will be gains in precision relative to estimating model [11] with individual-specific resources.

This approach is more directly comparable with Altonji et al. (1992) and Hayashi et al. (1996) and others in this literature who have not examined the impact of individual-level family resources but, instead, examined the impact of household expenditures relative to the impact of expenditures of other family members who are not co-resident. This approach does not have a strong link to theory as the distribution of expenditure within the family is clearly endogenous in the model.

The distribution of assets within families is reported, along with other summary statistics in Table 1. Since the samples vary across outcomes (because age-eligibility varies), the statistics are reported for each sample. Overall, the average family has Rp206 million between illiquid and liquid assets (which is about $20,000) with the average household in which a target child lives accounting for about forty percent of the total. Wealth is split between liquid holdings, approximately twenty-two percent of total assets, and illiquid holdings. Within couples, husbands tend to report slightly higher levels of liquid assets than wives. Child characteristics, $X_i$, and characteristics of other family members, $X_m$, are reported in the rest of Table 1; those controls are included in the models.[6]

## 4. Empirical Results

Regression results of the effects of resources on child outcomes are reported in Table 2 for the models with resources measured at the household level using the logarithm of household and other family assets (in Rp10,000s).[7] Results for models with individual-specific resources are reported in Table 3.

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[6] Controls include gender and age of the child, using indicator variables for each age, and whether the child lives with their mother and father. At the household, and family level when appropriate, we include demographic controls including household size and composition, and age and education of the household and family head. Factors common at the province level are controlled for with province fixed effects, and we include an indicator for whether the household is located in an urban or rural region. In regressions examining child height, both mother's and father's height is included to capture the genetic component of height as well as additional factors not controlled for by parental education and age.

[7] The 0.8% of households that report no assets are assigned the sample mean and an indicator for zero assets is included in the models for these households.

To begin, columns 1 through 3 of Table 2 presents results of estimating [15], the model with a family fixed effect that measures assets at the household level for each of the three child outcomes. The fixed effect absorbs family-level characteristics that have a linear and additive impact on child outcomes. As this includes total family resources, an increase in household resources can be interpreted as an increase in the share of total family resources attributed to the household. If the unitary model of family decision-making is correct, the distribution of resources within the family should have no impact on child outcomes and so the resources of the household in which the child resides should not be significantly related to any of the child outcomes.

The empirical model distinguishes assets that are more liquid from those that are less liquid (or illiquid) and includes the logarithm of the value of household assets in each class. Liquid assets have a statistically significant positive impact on each of the child outcomes at a 5% size of test; in contrast, illiquid assets are not predictive of child outcomes. As shown in panel B1, taken together, liquid and illiquid assets are significantly associated with height for age and kindergarten attendance. If illiquid assets are not included in the model, then the estimated coefficients and standard errors for liquid assets are essentially the same. The evidence in these models is not consistent with the unitary model of the family.

A key advantage of the model with a family fixed effect is that it is not necessary to measure total family resources. Columns 4 through 6 of Table 2 present results from estimating model [13] which includes both the logarithm of household assets, $y_{hf}$ , and the logarithm of assets of family members who are not co-resident with the target child, $y_{\bar{h}f}$ , again distinguishing liquid from illiquid assets. Holding family resources constant, the logarithm of liquid household assets has a significant positive impact on each of the three child outcomes but illiquid household assets affect only kindergarten attendance. Taking household liquid and illiquid assets together, household resources are significant predictors of child outcomes (as shown in panel B1 of the table). In all cases, the impact of family resources is smaller and not significant in all but the case of illiquid assets which affect kindergarten attendance.

If family behavior is unitary, the effect on child outcomes of household resources and resources of non co-resident family members will be the same. Tests of equality of the estimated effects are shown in panel B2. Whereas there are no significant differences in the impacts of illiquid assets of households and the rest of the family for height-for-age and cognitive scores, for liquid assets, and also for all assets taken together, the unitary model is rejected at a 5% size of test for each of the child outcomes.

It is not obvious how family boundary should be delineated. As a practical matter, we have defined families as related biological kin of the parents of the target child. However, our empirical measure of family resources includes only the resources of the kin of one of those parents, the parent who was a member of the baseline household and whose parents and siblings have been interviewed. For all but a handful of children, the other parent is a new entrant into the IFLS sample and other members of that person's family are not interviewed. This is a function of the fact that the data are collected as part of a household-based rather than family-based survey. Measuring resources for only one side of the target child's family should not bias our results since whether resources are from the maternal or paternal side is essentially random. Moreover, including a control for whether we observe the maternal or paternal side of a child's family tree does not affect the results.

A related concern is that family resources are measured only for those kin who are members of households that are included in IFLS. One measure of the importance of this concern is provided by comparing the estimated difference between the impact of household assets in the models that control family assets (in columns 4 through 6) with the impact of household assets in the models that include a family fixed effect (in columns 1 through 3) and so are not contaminated by measurement in family assets. For child height for age, the difference between the impact of the logarithm of household and family liquid assets is 6.06 and the fixed effects estimate of this difference is 6.67; for illiquid assets the difference in the model that includes measures of family resources is 1.56 and in the fixed effects model it is 1.59. Neither of these differences is statistically significant nor economically meaningful. The estimates for the cognitive score and kindergarten attendance are also not statistically significant. We conclude that measurement error in family resources is not an empirically important issue in these models.

The impacts of household and family assets that are illiquid are small in magnitude relative to liquid assets and statistically significant in only one case indicating that, conditional on liquid assets, variation in illiquid assets is not an important determinant of child outcomes. Individuals and households who have more liquid assets tend to have more illiquid assets which likely affects the precision of the estimated effects of resources. The models are, therefore, re-estimated dropping illiquid assets. The results are reported in columns 7 through 9. The coefficient estimates are slightly larger and better determined than the models with illiquid assets. All of the estimated effects of household and family liquid assets are statistically significant and household assets have a significantly bigger effect on each child outcome than family assets indicating unambiguous rejection of the unitary model.

The ratios of the effects of own household resources to resources of non co-resident family members, [14], are presented in columns 7 through 9 of panel B3 of the table along with *p*-values of non-linear Wald tests of the equality of those ratios in panel C. The ratios for each child outcome are all very close and indicate that resources of those who co-reside with the child have about 2.6 times the impact relative to resources of non co-resident family members. Given the similarity of all three ratios, it is not surprising that none are different for any pair of outcomes or for all three taken together as shown by the test statistics in column 9 of panel C. Whereas the unitary model of the family has been rejected by these data, we cannot reject the collective model of family behavior: with respect to child investments, co-resident and non co-resident family members appear to co-ordinate resource allocations Pareto efficiently. The same conclusion is drawn for the models with liquid and illiquid assets although in those cases the ratios are not as well determined.

An advantage of a model of the family rather than the household to better understand resource allocations is that the family model does not need to take into account either potentially endogenous living arrangements or make strong assumptions about selection of household members. We turn, therefore, to the family-based model [11] and report estimates of the effects of resources of parents and grandparents on the three child outcomes in Table 3. Since the power of the Pareto efficiency tests is a function of the precision of the estimated resource effects, we include only liquid assets in these models.

Maternal resources have the largest impact on the child outcomes and the estimated effects are statistically significant in all three cases, a result that is consistent with a large literature (Thomas, 1990). The effects of paternal resources are also positive and while they are only significant in the case of kindergarten attendance, taken together maternal and paternal resources are significant predictors of each child outcome (with a $p$-value $< 0.01$ in each case). The effects of resources of grandparents are smaller in magnitude, none are statistically significant individually or taken together. The effects of grandparents resources are significantly different from maternal resources for all three child outcomes. The resources of other household members are significant predictors of each child outcome, the estimated effects are larger (albeit insignificantly) than paternal resources for child height but significantly smaller than the effects of maternal resources on cognition and kindergarten attendance. The same pattern is apparent in the final row of panel A of the table which reports the effects of resources of other, non co-resident family members. There are no substantively important or statistically significant differences between the effects of other family members who do or do not co-reside with the child.[8] These family members are aunts and uncles of the target child and, in some cases, older siblings.

The evidence in Table 3 demonstrates that, in terms of allocating resources for child human capital, the unitary model is rejected not only for the family but also for the household. While those are not novel conclusions, the results in Table 3 also demonstrate that the relationships between resources of different family members and child outcomes is extremely complex and not driven by living arrangements, and points to the likely value-added of designing studies that reach beyond parents and household members to more fully understand family dynamics, at least in a low income setting like

[8] In models that include both illiquid and liquid assets, we find that illiquid assets of the father and grandparents are significant predictors of kindergarten attendance but neither height nor cognition. This may reflect the fact that kindergarten attendance is readily observed and its timing is known at child birth.

Indonesia.

With six demographic groups, there are 15 resource effect ratios for each outcome. Given the centrality of maternal resources in the estimates reported in panel A of the table, we report the ratios relative to the effect of maternal assets for each child outcome as an illustration in panel B. As the impact of maternal resources is the largest for each outcome, all of the ratios are less than one. Following [11], if family decisions are Pareto efficient, these ratios will not be different from each other. Appendix Table 2 reports *p*-values for the equality of each pair of ratios and the *p*-values for the equality of all the ratios for each child outcome pair are repeated in panel C of Table 3. None of the ratios is significantly different from another in pairwise tests nor tested jointly.

Taken together, the evidence in Tables 2 and 3 indicates that it is not possible reject the hypothesis that family behavior is consistent with Pareto efficiency. Apparently, non co-resident family members successfully navigate information asymmetries, market imperfections and barriers to exchange so that, at least with regard to child human capital investments, resources are allocated efficiently. This is a remarkable result.

*Sensitivity analysis and robustness.* In order to ensure the validity of the results, numerous robustness checks were conducted to examine the failure to reject efficiency and rejection of the unitary model in a number of subsamples and alternative specifications to address various hypothesis concerning the sharing habits of extended families. Our conclusion that family behavior is consistent with the collective model when we allow nonlinearities in the impact of resources, consider other child outcomes or examine specific subsamples of children.

We have tested whether the effects of resources on child outcomes are non-linear by estimating models with splines and models with polynomials; the linearity assumption is not rejected. Moreover, our conclusion that families are co-operative is not changed in these non-linear models. The conclusions also extend to other child outcomes including weight for age, body mass index and school enrolment.

It is possible that some sub-populations do not behave efficiently. For example, families with more wealth may be able to afford to deviate from efficiency; co-ordination failures may be more likely in larger or more dispersed families. To explore whether Pareto efficiency describes the behavior of these population sub-groups, we stratified the sample based on total family wealth, on family size, the number of children within a family and whether families were geographically dispersed. In none of these sub-samples was Pareto efficiency rejected.

While the IFLS is an extremely rich resource for this research, it and every other household-based data collection effort is limited in that resources of all extended family members is not recorded. We established that our estimates in models that control family resources and models that treat family resources as an unobserved characteristics are very similar and not statistically significantly different. This gives us some comfort. We have also exploited the fact that, by design, there is variation in the branch of the family tree included in IFLS: for some children, the mother's family was selected for the baseline and so the resources of her family are measured; for other children, it is the paternal side of the family that has been interviewed. To assess whether it matters if the root household is on the maternal or paternal side of the family, we separately estimated models for families where the mother in a new household is an IFLS panel member compared with those where the father is an IFLS panel member. Again, we found no significant differences. In addition, IFLS collects demographic information about all parents and siblings of each respondent; we can control for whether the entire (paternal or maternal) family has been enumerated in IFLS and we can restrict our sample to those families in which the majority of family members have been interviewed. Our conclusions are not changed.

## 5. Conclusion

The family plays a central role in many models of behavior in economics and both implicit and explicit transfers between non co-resident family members have been shown to play an important role in many societies, particularly in lower income settings. Whereas understanding of household behavior has been substantially enriched by recent advances in the theoretical and empirical literatures on decision-making at the household level, relatively little is known about the behavior of extended family members who are not co-resident. Extending theoretical models of household decision-making to the family context, we draw on extremely rich survey data from Indonesia that was designed to collect individual-level measures of economic resources of extended family members in order to empirically discriminate among different models of family behavior.

We examine the relationship between the distribution of assets within a family and three child outcomes that are related to human capital: height for age, cognition and kindergarten attendance. Not only are parents likely to care about the human capital of their children but other family members are also likely to value higher levels of human capital among the next generation. Indeed, we find parental resources – particularly maternal resources – as well as resources of adults who co-reside with the target child have a positive impact on human capital outcomes. We also find these investments are greater if, conditional on household resources, non co-resident family members have more assets although these effects are significantly smaller in magnitude than the effects of parental and household assets. This behavior is not consistent with family members pooling all resources and behaving as a single unit. However, we cannot rule out that extended families behave cooperatively and that their allocation decisions are Pareto efficient, at least with respect to investments in children.

The results are important for two reasons. First, they establish that resources of the extended family play a role in early life human capital accumulation and underscore the centrality of the distribution of those resources among individuals within the family. Second, in a low income context where information asymmetries and liquidity constraints are likely to be important, geographically dispersed families behave as it resource allocations are coordinated (Pareto) efficiently. Taken together, these results suggest that there are likely to be substantial benefits to moving beyond surveys of households and develop studies that systematically collect data on family members in order to better understand the roles that families actually play in societies today.

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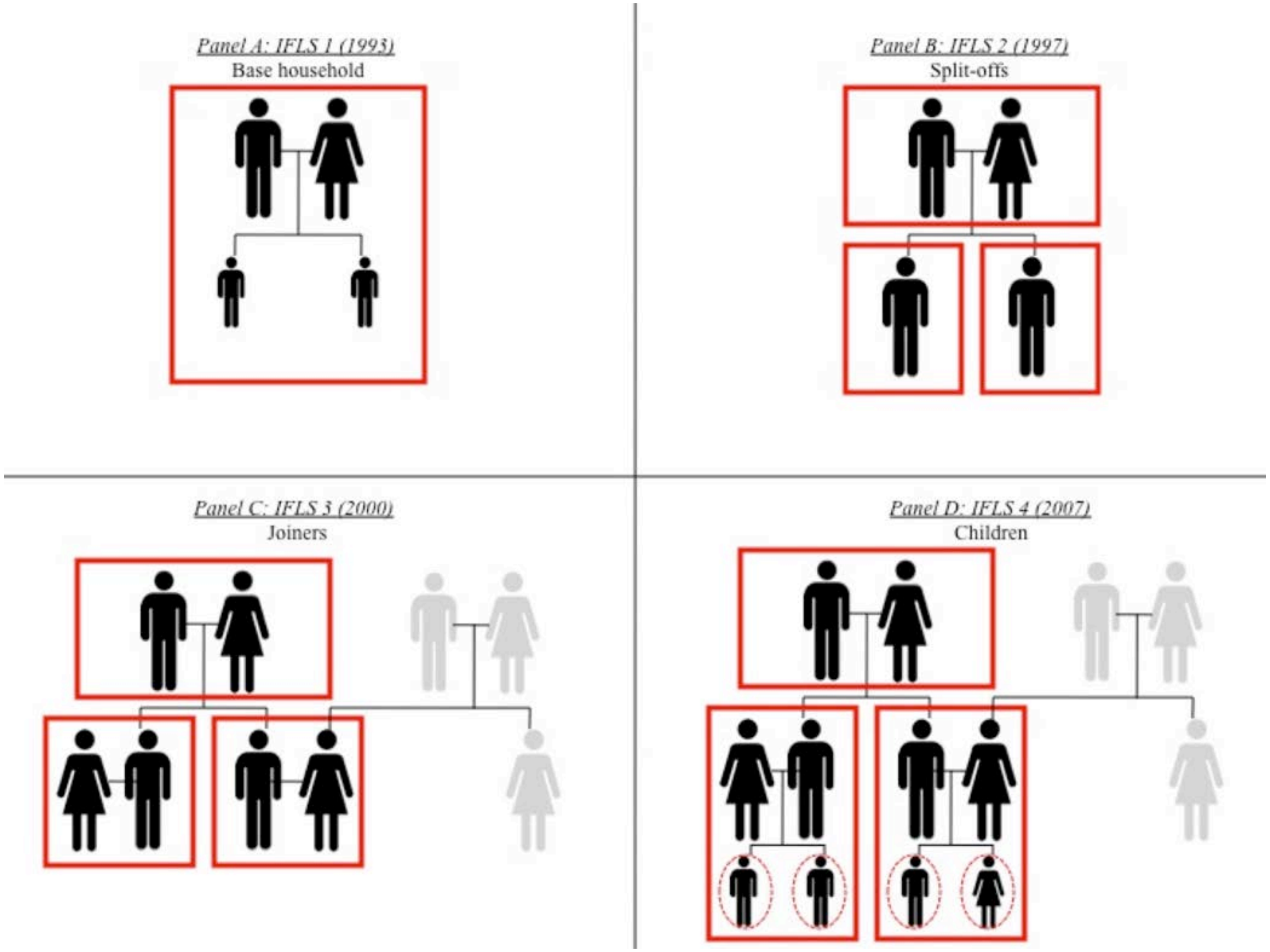
Figure 1: Constructing Extended Families in the Indonesia Family Life Survey




*Notes*: This figure depicts how extended families are identified in the IFLS. Each box represents an IFLS household. Starting from a baseline household in the first wave of IFLS in 1993, when children split-off and form their own households they are followed and become part of the IFLS sample, as shown in Panel B. When spouses join the newly formed households, as in Panel C, we obtain information on the spouses and their new non-IFLS relatives, but only the spouse is part of the IFLS sample. Our analytical sample consists of the young children shown in Panel D and their families in IFLS4.

## Table 1: Descriptive Statistics

| | *Sample* | | | |
|---|---|---|---|---|
| | All Children (Birth - 16 yrs) | Height-for-Age (Birth - 6 yrs) | Cognitive Score (7 - 16 yrs) | Attended Kindergarten (6 - 14 yrs) |
| *Outcomes* | | | | |
| Height-for-Age (z-score) | | -1.14 | | |
| | | (0.02) | | |
| Cognitive Score (%) | | | 69.6 | |
| | | | (0.21) | |
| Attended Kindergarten (%) | | | | 50.8 |
| | | | | (0.58) |
| *Illiquid Assets of […]** | | | | |
| Household | 6660.5 | 6376.0 | 6946.2 | 6801.4 |
| | (110.9) | (165.8) | (151.3) | (151.4) |
| Family | 9431.8 | 11312.4 | 7845.2 | 8774.0 |
| | (184.8) | (297.5) | (231.8) | (256.1) |
| *Liquid Assets of […]** | | | | |
| Household | 1928.8 | 1949.1 | 1902.7 | 1854.7 |
| | (38.9) | (60.3) | (51.5) | (49.7) |
| Family | 2579.5 | 3027.9 | 2148.9 | 2355.9 |
| | (47.3) | (74.6) | (59.5) | (64.7) |
| Mother | 762.8 | 680.6 | 831.3 | 822.4 |
| | (17.7) | (22.1) | (27.1) | (26.8) |
| Father | 872.2 | 821.5 | 904.2 | 907.9 |
| | (22.9) | (37.1) | (28.2) | (29.9) |
| Grandmother | 616.7 | 697.4 | 480.5 | 510.8 |
| | (19.9) | (29.4) | (23.7) | (22.7) |
| Grandfather | 799.8 | 885.6 | 657.9 | 658.3 |
| | (35.3) | (51.5) | (42.2) | (37.7) |
| *Additional Controls* | | | | |
| Age | 7.37 | 2.88 | 11.26 | 9.79 |
| | (0.04) | (0.02) | (0.03) | (0.03) |
| Female | 0.48 | 0.48 | 0.49 | 0.48 |
| | (0.00) | (0.01) | (0.01) | (0.01) |
| Co-reside with Mother | 0.90 | 0.96 | 0.85 | 0.87 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Co-reside with Father | 0.81 | 0.87 | 0.76 | 0.78 |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Household Size | 4.98 | 4.86 | 5.08 | 5.06 |
| | (0.02) | (0.02) | (0.02) | (0.02) |
| Family Size | 11.16 | 11.94 | 10.45 | 10.86 |
| | (0.05) | (0.08) | (0.07) | (0.07) |
| *Age of […]* | | | | |
| Mother | 34.1 | 29.8 | 37.9 | 36.4 |
| | (0.07) | (0.08) | (0.08) | (0.08) |
| Father | 38.7 | 34.4 | 42.5 | 41.0 |
| | (0.08) | (0.09) | (0.10) | (0.10) |
| Grandmother | 58.5 | 55.9 | 62.1 | 61.2 |
| | (0.11) | (0.14) | (0.17) | (0.16) |
| Grandfather | 62.0 | 59.9 | 65.5 | 64.7 |
| | (0.13) | (0.16) | (0.21) | (0.19) |
| *Years of Education of […]* | | | | |
| Mother | 8.03 | 8.96 | 7.26 | 7.56 |
| | (0.03) | (0.05) | (0.05) | (0.05) |
| Father | 8.52 | 9.15 | 7.96 | 8.22 |
| | (0.04) | (0.05) | (0.05) | (0.05) |
| Grandmother | 3.71 | 4.30 | 3.16 | 3.38 |
| | (0.03) | (0.04) | (0.04) | (0.04) |
| Grandfather | 4.89 | 5.47 | 4.33 | 4.54 |
| | (0.03) | (0.05) | (0.04) | (0.04) |
| Maternal Height *(cm)* | 162.0 | 162.6 | 161.6 | 162.0 |
| | (0.05) | (0.07) | (0.06) | (0.06) |
| Paternal Height *(cm)* | 151.1 | 151.5 | 150.9 | 151.0 |
| | (0.04) | (0.06) | (0.06) | (0.06) |
| Urban Household | 0.51 | 0.53 | 0.49 | 0.50 |
| | (0.00) | (0.01) | (0.01) | (0.01) |
| N. Observations | 14881 | 6567 | 7727 | 7493 |

** In Rp0,000 (~ 1 USD)*

## Table 2: Empirical Results

| **Panel A: Model Estimates** | *Family Fixed Effects* *Liquid and Illiquid Assets* | | | *Household and Family Resources* *Liquid and Illiquid Assets* | | | *Household and Family Resources* *Liquid Assets* | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | **Height-for-Age** | **Cognitive Score** | **Attended Kindergarten** | **Height-for-Age** | **Cognitive Score** | **Attended Kindergarten** | **Height-for-Age** | **Cognitive Score** | **Attended Kindergarten** |
| Liquid Household Assets | 6.67 | 0.90 | 3.87 | 8.35 | 1.12 | 4.24 | 9.07 | 1.17 | 5.02 |
| | (3.06) | (0.42) | (0.98) | (1.62) | (0.20) | (0.49) | (1.52) | (0.18) | (0.45) |
| Liquid Family Assets | | | | 2.29 | 0.36 | 1.45 | 3.43 | 0.45 | 1.93 |
| | | | | (1.74) | (0.23) | (0.57) | (1.62) | (0.22) | (0.52) |
| Illiquid Household Assets | 1.59 | -0.40 | 0.90 | 3.42 | 0.28 | 2.38 | | | |
| | (3.22) | (0.44) | (1.01) | (1.81) | (0.23) | (0.55) | | | |
| Illiquid Family Assets | | | | 1.86 | 0.27 | 0.56 | | | |
| | | | | (1.28) | (0.16) | (0.46) | | | |
| Family Fixed Effects | Y | Y | Y | N | N | N | N | N | N |
| N. Observations | 6567 | 7727 | 7493 | 6567 | 7727 | 7493 | 6567 | 7727 | 7493 |
| **Panel B** | | | | | | | | | |
| B1. Combined Effects | | | | | | | | | |
| Household liquid plus illiquid coefficient (std. error) | 8.25 | 0.49 | 4.77 | 11.77 | 1.40 | 6.63 | | | |
| | (3.62) | (0.55) | (1.26) | (1.98) | (0.25) | (0.59) | | | |
| B2. Equality of Asset Effects (*p*-values) | | | | | | | | | |
| Household liquid and illiquid | 0.32 | 0.05 | 0.05 | 0.08 | 0.02 | 0.03 | | | |
| Liquid Assets | | | | 0.02 | 0.02 | 0.00 | 0.02 | 0.02 | 0.00 |
| Illiquid Assets | | | | 0.51 | 0.97 | 0.01 | | | |
| All Liquid and Illiquid | | | | 0.01 | 0.01 | 0.00 | | | |
| B3. Coefficient Ratios: Household to family […] | | | | | | | | | |
| Liquid Assets | | | | 3.64 | 3.07 | 2.92 | 2.65 | 2.60 | 2.60 |
| | | | | (2.92) | (2.09) | (1.23) | (1.41) | (1.40) | (0.78) |
| Illiquid Assets | | | | 1.84 | 1.03 | 4.24 | | | |
| | | | | (1.68) | (1.06) | (3.64) | | | |

**Panel C: Collective Model Nonlinear Wald Tests (*p*-values)**

| Test of equality of ratios between […] | and […] | *p*-values Liquid Assets | *p*-values Illiquid Assets | *p*-values Liquid Assets |
|---|---|---|---|---|
| Height-for-Age | Cognitive Score | 0.86 | 0.66 | 0.98 |
| Height-for-Age | Attend Kindergarten | 0.79 | 0.50 | 0.97 |
| Cognitive Score | Attend Kindergarten | 0.96 | 0.26 | 0.99 |
| | All Ratios | 0.99 | 0.68 | 0.99 |

*Notes:* Panel A: All regressions include assets in log form, as well as controls for gender, age, household and family size and composition, parental education, age and gender of the household and family head and location as described in the text. Standard errors in parenthesis account for clustering at the family level. Panel B1 reports the sum of household liquid and illiquid assets effects and its standard error; panel B2 reports *p*-values for tests of the equality of asset effects in each row; panel B3 reports ratios and their standard errors calculated using the delta method. Panel C: The *p*-values correspond to results from nonlinear Wald tests where the null is Pareto efficiency. These tests compare the equivalence of the ratios shown in Panel B3 for the outcome pairs in each row.

## Table 3: Individual Level Results

| Panel A: Model Estimates | *Individual Resources - Liquid Assets* | | |
|---|---|---|---|
| | **(1)** | **(2)** | **(3)** |
| | **Height-for-Age** | **Cognitive Score** | **Attended Kindergarten** |
| Mother's Assets | 4.65 | 0.82 | 2.76 |
| | (1.82) | (0.21) | (0.58) |
| Father's Assets | 2.81 | 0.31 | 2.12 |
| | (1.80) | (0.21) | (0.57) |
| Grandmother's Assets | 2.18 | 0.10 | 1.10 |
| | (1.92) | (0.31) | (0.75) |
| Grandfather's Assets | 0.20 | 0.05 | -0.23 |
| | (2.01) | (0.34) | (0.87) |
| Rest of Household Assets | 3.28 | 0.29 | 0.99 |
| | (1.51) | (0.16) | (0.43) |
| Rest of Family Assets | 3.06 | 0.38 | 1.99 |
| | (1.71) | (0.21) | (0.51) |
| N. Observations | 6567 | 7727 | 7493 |
| **Panel B: Coefficient Ratios relative to Mothers** | | | |
| Mother | 1.00 | 1.00 | 1.00 |
| | - | - | - |
| Father | 0.60 | 0.38 | 0.77 |
| | (0.56) | (0.33) | (0.33) |
| Grandmother | 0.47 | 0.12 | 0.40 |
| | (0.46) | (0.38) | (0.28) |
| Grandfather | 0.04 | 0.06 | -0.08 |
| | (0.43) | (0.42) | (0.32) |
| Rest of Household | 0.71 | 0.36 | 0.36 |
| | (0.45) | (0.21) | (0.17) |
| Rest of Family | 0.66 | 0.47 | 0.72 |
| | (0.46) | (0.29) | (0.25) |

**Panel C: Collective Model Nonlinear Wald Tests (*p*-values)**

| Equality of all ratios between […] and […] | | *p*-value |
|---|---|---|
| Height-for-Age | Cognitive Score | 0.99 |
| Height-for-Age | Attend Kindergarten | 0.99 |
| Cognitive Score | Attend Kindergarten | 0.99 |
| | All Ratios | 0.96 |

*Notes:* Each regression includes log liquid assets at the individual level and controls for the age and gender of the child, household and family size and composition, age and education of parents and grandparents, and location as described in the text. Standard errors in parentheses account for clustering at the family level. Panel B reports coefficient ratios and their standard errors with the effect of mother's liquid assets serving as the denominator. Panel C reports *p*-values from nonlinear Wald tests across all ratio combinations of the outcome pairs in each row.

## Appendix Table 1
### Sample Description

| *Number of unique […]* | |
|---|---|
| Children *(birth - 16 yrs)* | 14881 |
| Households | 8480 |
| Families | 5283 |
| Mothers | 8438 |
| Fathers | 7809 |
| Grandmothers | 5448 |
| Grandfathers | 4386 |

## Appendix Table 2: Individual Level Tests of the Collective Model (*p*-values)

| | *Outcome Pair* | | | | |
|---|---|---|---|---|---|
| | **Height-for-Age and Cognitive Score** | | | | |
| | Father | Grandmother | Grandfather | Rest of HH | Rest of Fam |
| Mother | 0.81 | 0.89 | 0.81 | 0.41 | 0.91 |
| Father | | 0.77 | 0.83 | 0.33 | 0.87 |
| Grandmother | | | 0.80 | 0.70 | 0.85 |
| Grandfather | | | | 0.76 | 0.82 |
| Rest of Household | | | | | 0.38 |
| Equality among parents and grandparents (6 ratios) | | | 0.99 | | |
| Equality among all ratios (15 ratios) | | | | | 0.99 |
| | **Height-for-Age and Attended Kindergarten** | | | | |
| | Father | Grandmother | Grandfather | Rest of HH | Rest of Fam |
| Mother | 0.72 | 0.56 | 0.97 | 0.45 | 0.71 |
| Father | | 0.74 | 0.95 | 0.86 | 0.93 |
| Grandmother | | | 0.91 | 0.80 | 0.70 |
| Grandfather | | | | 0.93 | 0.95 |
| Rest of Household | | | | | 0.76 |
| Equality among parents and grandparents (6 ratios) | | | 0.99 | | |
| Equality among all ratios (15 ratios) | | | | | 0.99 |
| | **Cognitive Score and Attended Kindergarten** | | | | |
| | Father | Grandmother | Grandfather | Rest of HH | Rest of Fam |
| Mother | 0.41 | 0.55 | 0.76 | 0.99 | 0.51 |
| Father | | 0.86 | 0.81 | 0.49 | 0.78 |
| Grandmother | | | 0.82 | 0.57 | 0.76 |
| Grandfather | | | | 0.77 | 0.79 |
| Rest of Household | | | | | 0.63 |
| Equality among parents and grandparents (6 ratios) | | | 0.97 | | |
| Equality among all ratios (15 ratios) | | | | | 0.99 |
| *Overarching Test* | | | | | |
| Equality across all ratios, all outcomes (45 ratios) | | | | | 0.96 |

*Notes:* Table reports *p*-values from nonlinear Wald tests of Pareto efficiency. Each cell is the *p*-value comparing the ratio of marginal effects for assets owned by the individual listed in the row with the individual in the column. For example, 0.81 is the *p*-value for the test of equivalence between the ratio of effects of assets controlled by a child's mother to their father for height-for-age and cognitive scores. Also included in each panel are tests of equivalence of ratios for parents and grandparents, and the test of equality of all fifteen ratios in the panel. Rest of HH and Rest of Fam stand for Rest of Household and Family. The overarching test at the bottom of the table is for equality of all ratios across all outcomes (45 total ratios). Tests are conducted allowing for clustering at the family level.