Distribution of Power Within the Household and Child Health

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1. INTRODUCTION

In recent years, the "black box" of the household has come under increased scrutiny which has led to several important theoretical and empirical contributions building on the foundations laid by Becker (1981). The most common model of the household in the social sciences assumes that all household members have identical preferences or that the preferences of one member determine resource allocations. This *unitary* model of household behavior has played a key role in improving our understanding of a wide array of behavioral choices involving individuals, households and families. For a recent review, see Bergstrom (1997).

There are, however, several issues that are difficult to address in this framework because it essentially treats the household as a single unit rather than a group of individuals, each of whom may be characterized by their own preferences and resources. More general models of household decision-making take the individual as the basic element and treats household decisions as the outcomes of interactions among the members either as the solution to a bargaining game (see McElroy and Horney, 1980; Manser and Brown, 1980, for early explications of these ideas) or as the outcome of negotiations that achieve some form of efficiency (Chiappori, 1988, 1992; Browning and Chiappori, 1999). In these *collective* models, the relative "power" of household members plays a central role in shaping household decisions, (see Pollak, 1994, for a thoughtful discussion).

While the notion of "power" has a clear place in the theory underlying these models, measuring power has, perhaps, proven to be the Achilles heel of empirical work on household decision-making. Household members derive power from multiple sources, many of which reflect the options a person would have outside the household. Prominent among these sources is control over economic resources. Many studies operationalize this notion by treating the incomes of husbands and wives as measures of their relative power. While this has a good deal of intuitive appeal, in a model of the allocation of goods and time of household members, individual labor supply (and therefore income) might be thought of as an *outcome* of a bargaining process between husbands and wives. To circumvent this concern, some studies have relied on non-labor income, or the value of assets, as measures of power. However, in a model of decision-making over the life course, non-labor income is the outcome of past labor supply and consumption decisions and so it is also properly treated as an *outcome* of the inter-temporal household allocation process.

The key problem is that although control over income is surely related to power, it is hard to argue that, within households, the distribution of income is exogenous to household demand for goods and services. A small number of clever "natural experiment"-type studies exploit variation in resource control that is well outside the domain of the household. For example, Lundberg, Pollak and Wales (1997) examine the effects of changes in the payment of welfare benefits from men to women in the United Kingdom. (See, also, Carlin, 1988, Behrman and Rosenzweig, 1998, Thomas and Rubalcava, 1998.)

In this paper we focus on a different source of economic power not previously exploited in work on this topic: the value of resources that husbands and wives bring to the marriage. We argue that relative asset positions at the time of marriage are an indicator of economic independence within marriage and are thus an important source of power. In many societies assets that are accumulated prior to marriage are retained as individual property during the marriage and are excluded from settlements in the event of a dissolution. If control over economic resources is an important source of power in negotiating household decisions, relative asset positions at the time of marriage should affect the balance of power during the marriage. (See Quisumbing, 19995, for a related approach; she uses inheritances to examine bequest, transfers and investments in children.)

The concept of individual ownership of premarital assets is particularly germane to Indonesia, our study site. Among Javanese families, at least, it is an important and long-standing tradition that resources brought to the marriage by an individual are retained under her (or his) control. On Java, and in parts of Sumatra, brides often bring more to the table than do grooms. We expect -- and the models discussed below predict -- that women with relatively more assets at marriage are more able to influence the allocation of resources within the household. The goal of this paper is to test that prediction. In so doing, we explore the meaning of assets brought to marriage in the context of these model and link these measures to other indicators of power in household decision-making.

Controlling total household income, we compare the effect on child health of a husband's assets at marriage with the effect of his wife's assets at marriage. Under the assumptions of the unitary model, the value of assets at marriage (which we argue are indicators of the power an individual wields in the household), should have no effect on child health. We begin by testing that prediction. Where it is rejected, we proceed to a second model of the household -- one which assumes that allocations are Pareto efficient in the sense that if any household member can be made better off, someone else in the household must be worse off. The model can be interpreted in terms of household decision-making being made in

two stages. In the first stage, resources are shared among members, presumably according to their power, and, in the second stage, each individuals allocates resources optimally from his or her own point of view. Power can, therefore, only have an "income" effect on demands -- and this effect must be common to all allocations which implies that the ratio of the influence of husband's power to wife's power must be constant. We test that prediction.

The tests are implemented using data from the Indonesian Family Life Survey (IFLS). In addition to the advantages that Indonesia provides as a culturally interesting context in which to examine the influence of resources at marriage on household decision-making, the IFLS data are well-suited for our analyses for four reasons. First, the data contain explicit measures of resources brought to the marriage, which is unusual in household surveys. Second, the survey contains a series of indicators of "power" within the household which provide an opportunity to assess the usefulness of resources brought to marriage in these models. Third, the empirical tests of household decision-making require stringent controls for income. The IFLS contains detailed information on labor and non-labor income of family members, provided by multiple household respondents. Fourth, because we have multiple indicators of child health, we are able to implement tests of Pareto efficiency, which rely on comparing the ratio of coefficients across pairs of outcomes.

The next section presents the theory underlying our tests and is followed by a description of the data. The empirical results are discussed in section 4. Assets at marriage appear to be related to the extent of income-pooling in households and also to spheres of influence in household decision-making. In Java and Sumatra, we find assets at marriage do affect allocations and the data reject the predictions of the unitary model; the data are, however, consistent with the prediction of the model of efficient allocations. In the rest of Indonesia, treating the household as a single unit does little violence to the data.

2. THEORY

The theoretical model underlying our empirical test of household decision-making is outlined in this section. The data and empirical model are described in the following section.

General model of household decision-making

Consider a fairly standard model of household behavior in which household welfare in any period, W, depends on the utility of each member, m = 1, ..., M. In turn, each individual's utility function, U_m,

depends on the commodity consumption of all household members, X_{gm} , g=1, ..., G, where g indexes goods, and consumption of leisure by each individual, ℓ_1 , ... ℓ_M .

In a study of intra-household resource allocations, it would be useful to observe individual consumption. To this end, labor supply (or leisure demand) is a natural outcome of interest. It is, however, not straightforward to model which significantly complicates empirical tests of household decision-making based on time allocation. Measures of human capital outcomes, such as health status, provide an alternative set of individual-specific outcomes that are potentially very useful in sorting out intra-household allocations. In the context of the model, assume that each individual cares not only about commodity and leisure consumption of household members, but also an array of indicators of their own and other family members' well-being: θ_1, ... θ_M. In this paper, we will focus on child morbidity indicators. For notational ease, the full set of outcomes, consumption, X, leisure, ℓ, and child human capital, θ, are collected in the vector ϕ.

To complete the specification of preferences, individual and household specific characteristics may affect tastes and therefore utility. Let μ denote those that are observable and let ε represent all unobservable characteristics, such as the extent to which parents care about their children. Then each individual's sub-utility function is given by $U_m(\phi; \mu , \varepsilon)$ which is assumed to be quasi-concave, non-decreasing and strictly increasing in at least one argument. The household welfare function aggregates these individual sub-utility functions:

$$W = W[U_1(\phi; \mu , \varepsilon), ... U_M(\phi; \mu , \varepsilon)] \qquad [1]$$

This is a natural extension of the commonly adopted model that treats the household as a homogeneous unit. In this more general framework, [1], household members may both have different preferences with respect to their own consumption, leisure and human capital and also differentially value the well-being and consumption of other members in the same household. Specific alternative models are discussed below. For the present, treat the household as if it chooses to maximize the welfare function, W, subject to the household budget constraint:

$$p X = \sum_m [w_m(T-\ell_m) + y_m] + y_0 \qquad [2]$$

where the vector p is the set of prices of all goods in the vector X. All household members are assumed to face parametric commodity prices. The price of time for each individual is the wage, w_m, so that individual's total income is given by the value of earned income $w_m(T-\ell_m)$ together with non-labor income, y_m. Income that is held jointly by household members is denoted y_0.

The elements of the vector θ are not purchased in the market, but are assumed to be "produced" by combining inputs in the manner implied by a series of production functions. For each outcome, θ_{ki}, of θ, where k indexes the outcome and i the household member, the production function can be modelled as a relation between that outcome and a set of input choices, M_{ki}, as well as an endowment, η_{ki} , which contains both individual and household components. The shape of the production function will depend on the underlying technology and it might also be affected by household and community characteristics, μ, such as parental education or the availability of infrastructure in the community. The production function is:

$$\theta_{ki} = H_k (M_{ki} , \mu_h , \eta_{ki}) \qquad [3]$$

Solving this model yields a series of reduced form demand functions for the three classes of outcomes: commodity demand, labor supply and human capital. In the empirical work below, we will estimate a series of demand functions for child health. In general, these demand functions depend on incomes or, more generally, resources of *individual* household members, y_m, the characteristics of all family members along with community characteristics, μ, and prices, p:

$$\phi_{ki} = \phi_{ki} (y_0, y_1, ...y_M , \mu , p , \upsilon_{ki}) \qquad [4]$$

All unobservable individual and household characteristics are included in the stochastic term, υ_{ki}, which captures more than taste variation since it incorporates the role of heterogeneity in the production function and in the child's endowment, η_{ki}. Notice also that part of this heterogeneity is common within families while part is idiosyncratic to the individual child. The model is quite general and encompasses several that have been discussed in the social science literature. An important issue worth highlighting is that the analysis here is based on the assumption there is a well-defined household or family unit.

Clearly household composition is a choice and so all the analysis needs to be interpreted as conditional on that composition. Simultaneously taking into account preference heterogeneity, living arrangement and fertility decisions is a substantially more complicated problem which we put to the side here in order to focus on testing different models of household decision-making. See Foster (1995) for a discussion of this important, more general, issue.

Unitary model of the household

The simplest (and most common) economic model of the household implicitly assumes that all household members have exactly the same preferences, so the sub-utility functions, U in [1], are identical. An alternative assumption that has been invoked is that there is one member, a *dictator*, who makes all

allocation decisions. Under this assumption, the aggregator function W(.) in [1] assigns a zero weight to all but that member's utility function. For our purposes, the two assumptions are observationally equivalent as they both imply that the household may be treated as if it were a single unit. That is, rearranging the distribution of income within the household has no impact on demand (as long as the dictator does not change). In terms of empirical implications, if the *unitary* model of the household is correct, then the demand functions [4] depend not on individual resources, y_0, y_1, ... y_M, but rather on household resources taken together, $\sum_{m=0}^{M} y_m$:

$$\phi_{ki} = \phi_{ki} (\sum_{m=0}^{M} y_m , \mu , p, , \upsilon_{ki}) \qquad [4A]$$

It is conceptually straightforward to test this hypothesis since, conditional on total household income, measures of individual "power" (or resources) should have no impact on child health outcomes. We turn next to discuss two sets of models which explicitly take into account the notion that relative power of parents may affect the extent to which they assert their own preferences in the household allocation game.

Bargaining models of the household

A simple model of household bargaining might be one in which each individual spends the income over which he or she has control without reference to other members and then looks at the equilibrium (if any exists); a slightly more sophisticated approach might be to repeat this process until achieving an equilibrium. In this vein, one class of models suggests that household allocation decisions are the outcome of a bargaining process in which members seek to allocate resources towards goods they especially care about. While the exact nature of the bargaining process and ultimate equilibrium may take a number of forms, the intuition underlying these models is relatively simple.

Each household member has some fall-back position (level of utility) and will quit the household if his (her) welfare falls below this "threat point" level. If the sum of utilities associated with these fall-back positions is less than total household welfare, then the household will dissolve. Any utility over and above the sum of the individuals' threat points is shared among household members presumably in accordance with their bargaining strength. To fix ideas, following McElroy and Horney assume a co-operative Nash equilibrium. The M household members involved in decision-making choose allocations of resources to maximize the product of the differences between the utility each achieves, U, and the threat point or reservation utility level, V, which is the utility the individual would achieve outside the household:

$$\Pi_{m=1}^{M} U (x, \ell, \theta; \mu, \varepsilon) - V_m (p; \tilde{\mu})$$

Reservation utility depends on prices and those characteristics, $\tilde{\mu}$, which affect one's ability to assert one's preferences in the bargaining game. McElroy (1990) suggests that these would reflect, for example, the environment an individual would face upon withdrawing from the household and might include re-marriage market opportunities, social and family support as well as the resources that the individual would take away from the household. In the United States, how household resources are split when families dissolve will depend, to some extent, on divorce settlement laws.[1] These laws typically treat assets brought to the marriage as separate, to be retained by the individual in the event of household dissolution. Thus, it seems reasonable to suppose that, controlling for husband's assets at marriage, a wife who brings more of her own assets to the marriage would have more "power" which would translate in this model to having greater scope for asserting her preferences in decision-making. The argument takes on particular relevance in the context of our study site, Indonesia, where the practice of retaining control over resources brought to the marriage is a long-standing tradition embedded in several of the cultures. In Indonesia, one's position within a marriage and one's options in the event of marital dissolution are likely to be related to one's family status and background. Focus groups that we conducted in Indonesia prior to the collection of the second wave of the IFLS indicated that if a partner came from a higher status family then that partner was likely to wield more power within the household. One might think of the family status of a husband relative to that of his wife as being elements of $\tilde{\mu}$ in the context of the model.

"Power" is likely to evolve over the course of the marriage and, as discussed above, is likely to be related to an individual's labor (and possibly non-labor) income. However, since the accumulation of income is itself part of the bargaining game that husbands and wives play, it is not entirely obvious how to take this evolution into account in a static framework presented here. If the influence of assets at marriage on an individual's power diminishes as the marriage proceeds, then our indicator of power will be measured with error and estimates of its effect will be downward biased. While we will attempt to take this into account in the empirical model below, note that the implication of the measurement error is that we will fail to reject the unitary model when it is inappropriate.

Solving the optimization problem along with the budget constraint, [2], and production function, [3], generates demands

[1]See Carlin (1992) for example, who exploits the "natural experiment" arising from changes in divorce laws at different times in different states in the United States.

$$\phi_{ki} = \phi_{ki} (\Sigma^{M}_{m=0} \; y_m, \tilde{\mu}(y_1, \ldots , y_M; A_1, \ldots , A_M; \Gamma), \; p, \xi_{ki}) \qquad [4B']$$

where bargaining power, $\tilde{\mu}$, depends explicitly on the distribution of resources within the household, (y_1, ... , y_M), along with assets brought to the marriage, (A_1, ... , A_M) and other individual, family and environmental characteristics, Γ. Because assets at the time of marriage of the husband, A_1, and wife, A_2, play a central role in our empirical models, we write the demand function:

$$\phi_{ki} = \phi_{ki} (\; \Sigma^{M}_{m=0} , A_1, A_2 , \tilde{\mu}^* , p, \xi_{ki}) \qquad [4B]$$

According to this model, after controlling for household resources, demand for child health depends on *individual* assets brought to the marriage as well as household characteristics (including those that enter through their impact on reservation utility) and community characteristics, $\tilde{\mu}^*$, prices, p, and an unobservable component, ξ, reflecting heterogeneity in tastes and technology.

A comparison of [4A] and [4B] indicates that the key implication of this bargaining model which differentiates it from the unitary model is that demands are affected by the distribution of power within the household and not just total household income. Specifically, in this example, holding total income constant, changes in the distribution of assets brought to the marriage will affect demand; the unitary model predicts demand is invariant to that transfer.[2] Under the maintained assumption that income has been fully controlled, the only reason why assets that were brought to the marriage would affect household allocations is because those assets are indicative of bargaining power within the family. Of course, if household income is not fully controlled, or if it is measured with error, and assets at marriage are correlated with unmeasured components of income, then the test will have little power. We will address this concern in the empirical specification below.

Putting aside measurement error in income, rejection of this implication of the unitary model does not imply acceptance of a particular bargaining model of household behavior as there are other

[2]The same implication holds for any elements of $\tilde{\mu}^*$ which are not elements of μ and, may include, for example, changes in the distribution of control over income within the household and the relative status of the husband's and wife's family backgrounds. (This is explored in Frankenberg, Sikoki and Thomas, 1999.) It is worth noting that the distinction between the unitary and bargaining does not rely on the assumption of a Nash co-operative equilibrium but is fairly general; see, for example, Roth and Sotomayar (1990) and Binmore (1987). Exploiting the specific implications of the Nash assumption does generates a set of additional restrictions on compensated and uncompensated price effects. Of special interest is the Nash generalization of the substitution matrix which depends on individual income effects and the effects of price and income changes that operate through their impact on changing threat point utility. Intuitively, a shift in the bargaining strength of one member will affect his or her threat point and thus the fraction of the "gains from marriage" he or she is able to extract. (For details, see McElroy and Horney, 1981). While the substitution matrix can only be identified up to a scalar multiple, the model does yield a set of testable restrictions on the matrix, although implementation of these tests is not trivial.

models that are also consistent with [4B]. Thus, rejection of [4A] can say very little about what may constitute an appropriate model of household decision-making. This point has been made forcefully by Chiappori (1988) and has been an impetus for the development of a rich theoretical literature on alternative models of household choices. We next discuss one of these models and describe how it may be empirically distinguished from the general framework [4].

Pareto efficient models of the household

Chiappori (1988, 1992, 1993) has proposed a different *individualistic* model of the household in which members allocate resources in such a way that no allocation could result in one member being better off without some other member being worse off: that is resource allocations are *Pareto efficient*. It turns out that even under fairly general conditions, this condition imposes testable restrictions on data.

Assume there are M decision-makers in a household, each of whom chooses to consume ϕ^m so that total demand, ϕ, is $\Sigma_m^M \phi^m$, which includes commodity consumption, labor supply and child human capital. Given the usual regularity conditions regarding quasi-concavity and differentiability of utility functions, then *for all* Pareto-efficient allocations, there exists some λ so that the household optimization program is

$$\text{Max } \Sigma_m^M \lambda^m U^m(\phi^1, ..., \phi^M; \mu, \varepsilon) \qquad [5]$$

subject to the budget constraint [2] and production functions [3] (Chiappori, 1992). Thus, if allocations are Pareto-efficient, the household may be thought of as if it were a single unit maximizing a weighted sum of all individual felicity functions, U^m, where the weights, λ, sum to unity. This imposes structure over the general form of the household welfare function [1] since demands depend on household income, $\Sigma_m^M y_m$, household and community characteristics, μ, prices, p, and the vector of weights, λ:

$$\phi_{ki} = \phi_{ki} (\Sigma_0^M y_m , \mu_h , p , \lambda , \varphi_{ki})$$

φ represents unobserved heterogeneity due to preferences or technology. Apart from the weighting factors, λ, the demand functions are identical to those under the assumptions of the *unitary* model.

This *collective* model can also be given an interpretation in the context of a model of income pooling which helps sharpen intuition (Chiappori, 1992). If allocations are Pareto efficient, then the optimization program can be rewritten as a two stage process. In the first stage, the household may be treated as if all members pool their income and then re-allocate it among themselves according to some sharing rule. Thereupon, in the second stage, each household member maximizes his (her) own utility given their income share. The income sharing rule is clearly related to the weights, λ. The rule also has

a very nice intuitive interpretation as an indicator of relative bargaining power of household members: the more powerful the individual, the bigger that person's share of the pie in the first stage. In fact, since co-operative bargaining outcomes (without asymmetric information) are also Pareto efficient, those models are a special case of this more general framework.

The weights, λ, play a key role in this model and they are a function of all characteristics that affect the relative importance of any member's utility in the optimization program; they also determine the share of income that each members spends. The weights are likely, therefore, to depend on individual incomes and prices, as well as those individual, family and community characteristics that are associated with asserting one's preferences. Drawing on the intuition of the bargaining models, the weights will depend on anything that affects bargaining strength including assets brought to the marriage; the remaining factors that may enter the weighting functions are denoted $\tilde{\mu}$. Rewriting the demand function:

$$\phi_{ki} = \phi_{ki} (\Sigma_0^M y_m , \mu, p , \lambda(A_1, ... , A_M , \tilde{\mu}, p) , \varphi_{ki}) \qquad [4C']$$

and substituting for the weights yields:

$$\phi_{ki} = \phi_{ki} (\Sigma_0^M y_m A_1, A_2 , \tilde{\mu}^* , p , \varphi_{ki}) \qquad [4C]$$

which is similar in form to the bargaining model [4B] where $\tilde{\mu}^*$ denotes all individual, household and community characteristics that affect demands other than income and assets at marriage. Thus, $\tilde{\mu}^*$ includes all those factors that operate through the weights, λ. It is now transparent that rejection of the unitary model [4A] does not imply that a bargaining model of the household is the appropriate structure. Can the general model [4] and Pareto efficient or *collective* model [4C] be empirically distinguished? To answer this, consider what happens to demand if bargaining power in a household is transferred from one member to another. Differentiating [4C] with respect to assets brought to marriage by the husband, A_1, while holding household income constant yields:

$$\frac{\partial \phi_{ki}}{\partial A_1} = \frac{\partial \phi_{ki}}{\partial \lambda} * \frac{\partial \lambda}{\partial A_1}$$

Taking the ratio of the effects of the husband's assets to his wife's assets, A_2:

$$\Pi_{12_i} = \frac{\frac{\partial \phi_{ki}}{\partial A_1}}{\frac{\partial \phi_{ki}}{\partial A_2}} = \frac{\frac{\partial \phi_{ki}}{\partial \lambda} * \frac{\partial \lambda}{\partial A_1}}{\frac{\partial \phi_{ki}}{\partial \lambda} * \frac{\partial \lambda}{\partial A_2}} = \frac{\frac{\partial \lambda}{\partial A_1}}{\frac{\partial \lambda}{\partial A_2}} = \Pi_{12}$$

the outcome specific terms cancel and the ratio of asset effects, Π_{12}, is *independent* of the outcome, ϕ_{ki} and is, therefore, *constant* for *any* pairs of outcomes. This says, for example, that the ratio of the impact of a husband's assets at marriage to his wife's assets at marriage on the probability their child suffers from fevers is the same as the ratio of asset effects on the probability the child has respiratory problems.

The intuition behind the result is quite simple. Recall, that incomes are pooled, shared out in the first stage and then spent by each individual in the second stage. As long as allocations are Pareto efficient, the only role that assets at marriage can play is in the determination of the sharing rule in the first stage. In the second stage, therefore, individual bargaining power has no direct effect on allocations but can only have an "income" effect through that sharing rule. This result is closely related, in spirit, to the notion of demographic separability, introduced by Deaton, Ruiz-Castillo and Thomas (1986).

It is important to recognize that the prediction the asset effects are proportional is derived from the general *collective* model which assumes only that allocations are efficient and places no restrictions on the nature of preferences (Browning and Chiappori, 1994). From a theoretical point of view, this is a very powerful result since, *a priori*, there is no obvious reason to expect the proportionality restriction to hold. It is important because it is also an empirically testable restriction. Before presenting our tests of the unitary and Pareto efficient models, we provide an explanation of the empirical strategy we follow and a description of the data in the next section.

3. DATA

Data are drawn from the first two waves of the IFLS, conducted by RAND in collaboration with UCLA and Lembaga Demografi, University of Indonesia. The first wave, in 1993, included a random sample of about 7,200 households in thirteen provinces in the country (representing 83% of the population).[3] The first follow-up, IFLS2, was conducted four years later in 1997 and re-interviewed 94% of the original households as well as some 800 split offs yielding a sample of about 7,500 households.

[3]Remote areas were excluded from the sampling frame for cost reasons.

(See Frankenberg and Thomas, 1999, for a description of the surveys and Thomas, Frankenberg and Smith, 1999, for a discussion of attrition between the waves.) The IFLS is extremely rich and contains a wide array of information on the well-being of individuals, families and communities. Three aspects are key for this study.

Child morbidity

First, the IFLS contains an array of information on child health status. In this study, we focus on the determinants of child morbidity and rely on data from IFLS1. In particular, for two randomly chosen children living in each household in 1993, the mother (or primary care-giver) reports whether or not the child had experienced one of several morbidities during the four weeks prior to the survey. We consider three of these morbidities -- whether the child had a cough, fever or diarrhea (or nausea). They, along with a residual category capturing all other morbidities,[4] are the dependent variables, ϕ. Attention is restricted to children under the age of 10. Of the approximately 5,000 children in this age range in IFLS1. 29% were reported to have experienced a fever in the preceding four weeks, whereas 13% had had diarrhea. Over one-third (37.8%) were reported to have experienced a cough and a similar proportion experienced some other type of symptom.

Table 1 presents regressions of the four child morbidities on socioeconomic and demographic characteristics of the child and his or her family. For the present, we will focus on the first model for each outcome which includes controls for maternal age and education as well as the age, sex, and residence of the child. The coefficients are multiplied by 100 and so can be interpreted as percentage effects. For example, a nine year old child is about 20% less likely to have a cough than an infant who has not had his first birthday.

The patterns across age groups are sensible: the incidence of coughs, fevers and diarrhea decline sharply with age.[5] Similarly, respiratory problems are more common in urban areas where air quality tends to be poorer. Maternal education is negatively associated with reports that the child has experienced a fever, diarrhea, or some other morbidity suggesting that children of better educated mothers are in better health, an intuitively sensible result. However, better educated mothers are *more* likely to report that their children had a cough. It seems unlikely that these children are sicker (and just happen to suffer from

[4]The other morbidities are eye infections, earaches, skin disorders, toothaches, headaches, worms and measles.

[5]Older children are more likely to experience an "other" symptom. This is because the most prevalent symptoms in this (pooled) category are headaches and toothaches, which are far more common among older children.

respiratory problems). An alternative interpretation is that respiratory problems -- which are often not readily detected, at least relative to diarrhea or fever -- are more likely to be *reported* by better educated mothers, given a level of "true" respiratory problems in a particular child. If this interpretation is correct, the correlation between maternal education and coughing is (seriously) contaminated by reporting error.

There are at least two reasons why reporting error may be correlated with maternal education. First, better educated mothers may be more aware of their children's health, perhaps because they are more knowledgeable about diseases or perhaps because they have had more contact with the health care system. Second, better educated mothers may have a different perception of what "suffering from coughing" means and thus have a lower threshold for reporting the incidence of coughing than a less well-educated mother. For both reasons, it is plausible that reporting error will be correlated not only with maternal education but also with other measures of household resources in which case estimates of the relationship between morbidities and resources within the household may be biased.[6]

Reasons to worry that maternal (or self) reports of health status or morbidities contain systematic measurement error correlated with socio-economic status have emerged in other studies as well. For example, Sindelar and Thomas (1992) show that maternal education is positively correlated with the reporting of respiratory illnesses in children, but it is negatively correlated with more obvious symptoms such as diarrhea. For adults, there is evidence that as income rises, so does the probability that an individual reports himself to be in poor health, underscoring the subjective nature of the meaning of "poor health" or, in our case, a particular morbidity (Strauss et al, 1994; Dow et al, 1997).

The main point for our purposes is that the possibility that morbidities are reported with error which is correlated with household resources complicates our tests of models of household decision-making. The fact that the morbidities are reported by the same informant (virtually always the mother), suggests exploiting within-family variation in morbidities and sweeping out the effects of reporting error by including a family fixed effect in the empirical models. The relative merits of this strategy are discussed in more detail below.

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[6]Notice also that although there is a negative correlation between maternal education and the incidence of fever and diarrhea, it is not obvious that there is no systematic reporting error in those morbidities. It may be that the correlation between the "true" morbidities and maternal education (and household resources) are even more negative than observed.

Parental assets brought to the marriage

The second aspect of the IFLS that is central for this study are special modules that collect information about resources at the individiual level. Specifically, each married head and spouse provides information about their own labor income, non labor income and assets at the time of the survey as well as detailed information on the value of assets brought to the household at the time of marriage, including the value of any dowry. It is this information on individual resources brought to the marriage that lies at the heart of the tests of household decision-making presented below since, controlling household income, those resources play no role in the unitary model of the household.

As discussed above, it is critical that the regression models contain good controls for household income so that assets brought to the marriage do not capture unmeasured components of income. With this concern in mind, we have exploited another unusual feature of the IFLS. Incomes are reported both by the household head for each income earner in the household, and, by other adult respondents who report their own as well as their spouse's income. There is scope, therefore, to calculate several different measures of household income with these data. We have experimented with three: first, using only the head's responses; second, using each respondent's own report along with the head's report when an adult respondent was not interviewed in the household; and, third, averaging the head's report and respondent's own report when both are recorded. Our tests of models of household decision-making are robust to all of these specifications (which have little perceptible effect on the test statistics) and so, for simplicity, we report estimates using household income as recorded by the head.

Before presenting tests of the household model, it is important to evaluate the information contained in reported values of assets brought to the marriage. In addition to describing the data in IFLS1, we exploit a third unique feature of the IFLS. IFLS2 contains a special module that was administered to all husbands and wives and sought to elicit information on decision-making within the household; in addition, information was collected at the community level from a local *adat* expert -- an expert on local customs and traditions.[7]

[7]*Adat* can be translated as customary law, or as the body of tradition that sets out how individuals relate to each other with respect to matters of marriage, divorce, inheritance, land, and property rights. The predominant structure of any *adat* system is determined by the nature of individuals' ties to kin and to a particular area of land (Ter Haar, 1948; Hooker, 1978). The *adat* module was administered in communities in which one ethnic group accounted for at least 50% of the community residents, and in a handful of communities where there was no clear majority; the modules were administered in 85% of the 321 IFLS communities. The module contains questions about practices related to marriage, divorce, inheritance and property rights. These data provide a valuable complement to the

Table 2 summarizes information in IFLS1 on assets that husbands and wives bring to the marriage using all the couples in the survey. The data are presented for two regions. Respondents from Java and Sumatra are included in one region, while respondents from Bali, Lombok, Sumbawa, Kalimantan, and Sulawesi are included in the other region. Differences in patterns of family organization broadly follow this division. On Java, it is traditional for men and women to retain control over the resources that they (and their families) bring to the marriage, including any inheritances that they receive after the marriage. This tradition is confirmed in our *adat* module which indicates that in over 75% of the communities in Central Java that are in the IFLS, it is the norm for husbands and wives to retain separate ownership over assets brought to the marriage. Numerous anthropological studies have documented the central role that Javanese women play in the management the household economy (Williams, 1990). Our own focus group studies indicate that the practice of women being in control of the lion's share of the household budget is widespread, even today, and is not restricted to any particular socio-economic group. In-depth interviews, however, indicate that there is substantial heterogeneity in the process underlying the negotiations that ultimately yield family decisions both across Indonesia and even within cultures.

The matrilineal organization of the Minangkabau of West Sumatra has been well-documented by anthropologists. Women there are not only more likely to have access to resources than their husbands but studies suggest that women wield considerable power in the home and in the community (Geertz, 1961; Sullivan, 1994). According to the *adat* experts, in 80% of the communities included in the IFLS, married women are free to spend their earnings as they choose.

These two groups make up the majority of Region 1 respondents. The household organization of these groups stand in contrast to the more patriarchal structure of Buginese and Balinese families (Warren, 1995; Koentjaraningrat, 1967), the Dayaks, Sasaks and Makassarese, all of whom reside on the islands contained in Region 2. For example, according to the *adat* experts on Bali, assets brought to the marriage are typically kept separate in only 43% of the communities and married women are free to spend their earnings as they choose in only 8% of the communities.

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ethnographic literature since we are able to compare customs across the communities covered by IFLS rather than rely only on a small number of case studies that do not cover our respondents. All of this information, in combination with insights from focus groups we conducted in Indonesia, has influenced the empirical specifications and inferences drawn from them. For a fuller description of the *adat* module, see Frankenberg, Sikoki and Thomas (1999).

As shown in Table 1, almost 90% of Javanese and Sumatran brides enter the marriage owning some assets. In contrast, only about 70% of brides from other islands report owning assets at marriage. On Java and Sumatra it is more common for the bride to enter the marriage with assets than for the groom. This is not true on other islands. Another difference between the two regions is how assets at marriage are distributed between husbands and wives. In about one-third of the marriages on Java and Sumatra, the woman enters the marriage with more assets than her husband. In another one-third of the marriages both husbands and wives bring assets to the marriage, and these are valued at similar levels. In only 4% of marriages do both the husband and the wife own nothing. The situation where both partners enter the marriage with nothing is far more common off Java and Sumatra, where it characterizes 15% of marriages. It is also more common outside of Java and Sumatra for the husband's assets at marriage to be worth more than the wife's assets: for every two women who marry men with fewer assets, there are three men who own more assets than their wives when they marry.

Respondents were instructed to report the nominal value of assets at the time of their marriage (and they also reported their marriage date). These nominal values of assets are presented in the second panel of the table. The third panel reports values in thousands of 1993 Rupiah (excluding those who report getting married prior to 1967 since price data are not readily available that far back). Off Java and Sumatra, on average, the husband's assets at marriage is more than twice that of his wife's assets (in real or nominal terms) whereas among Javanese and Sumatran couples, in real terms, husbands and wives bring about the same amount to the table at marriage (which is also about the same amount that other men bring to their marriages). These household- and community-level data, in conjunction with the anthropological evidence on the differences in the mechanics of the household economy in the two regions provide the motivation for our stratification of Indonesia into these groups.[8]

Income pooling and assets at marriage

Are assets brought to marriage related to household decision-making? It is possible that the tests of model of the household that are presented below are contaminated by unobserved heterogeneity which is correlated with assets brought to the marriage. In an attempt to provide some direct evidence on the links between assets at marriage and household behavior, we experimented in IFLS2 with asking the respondents specific questions about the management of the household economy. Each married

[8]Ideally, in view of the diversity of cultures within these regions, we would like to stratify further. As will become apparent below, we are already pushing the limits of the sample.

respondent, who was earning an income, was asked "apart from money you use for household expenses, is there any part of your income that you set aside which you can spend without consulting your spouse?" The idea was to probe the extent to which there is income-pooling. About one-third of households report they do not pool income. In Panel A of Table 3, we examine whether this is related to assets brought to the marriage.

Probit estimates of the probability the respondent reports keeping part of his or her income for him or herself are reported separately for husbands and wives. In all areas of Indonesia, the probability a woman retains some of her income for herself increases as the share of assets she brought to the marriage increases. Whether the husband keeps part of his income is not related to assets at marriage. It is, however, related to his education: controlling his wife's education, the better educated he is, the more likely he is to not fully pool his income. A similar pattern emerges for women in Java and Sumatra.

The results are suggestive that assets brought to marriage by a woman are related to her autonomy in decision-making later in life. The results are, however, only suggestive. They do not speak to the question of whether a household behaves as a single unit; a respondent may report the household does not pool income but, if there are transfers between husbands and wives, the household may behave as if it does pool income.[9]

Spheres of influence and assets at marriage

It is natural for a husband and wife to specialize and take primary responsibility for particular spheres of a household's life (Becker, 1963; Lundberg and Pollak, 1993). If assets at marriage are related to power, then they are likely to affect the division of those spheres of influence. IFLS2 contained direct questions in this regard. In separate interviews, each husband and wife was asked who made decisions about a series of domains including expenditures, time allocation and investments. (See Frankenberg, Sikoki and Thomas, 1999, for a full description.)

Panel B of Table 3 reports the relationship between the share of assets brought to the marriage by the wife and the decision-makers in four domains: male, female and child clothing (which have been shown to be responsive to changes in power in the household by Lundberg, Pollak and Wales, 1997) and savings. Decisions are categorized as being made by the husband alone, wife alone or jointly (which

[9]Our focus groups indicate that this is not the norm and that attempts to probe more deeply into the management of the household economy would be very time-consuming in a survey setting as it would entail an extensive explanation of the concept of income-pooling in conjunction with within-household transfers.

includes joint with other household members). Multinomial logit estimates of the effect of the wife's share of assets at marriage are reported in the panel. The first column reports the probability the husband is the decision-maker, relative to the decision being made jointly; the second column provides the probability the wife is the decision-maker, relative to joint decision-making; the difference is reported in the third column and is the probability the wife is the decision-maker relative to the husband.[10]

Among Javanese and Sumatran families, wives are more likely to make decisions about expenditures on their own clothing, their children's clothing and about savings if they brought a greater share of assets to the marriage. Assets brought to marriage affect only decisions about child clothing in the rest of Indonesia. The results suggest that spheres of influence are systematically related to power as indicated by assets at marriage.

Correlations among different indicators of power

As a final step in evaluating the information contained in assets at marriage, we examine their correlation with other potential indicators of power collected in IFLS2. Each husband and wife was asked to rank their own family background and status relative to that of their spouse along seven dimensions of background. These include parental occupation and education, assets and parental stature in the community at the time of marriage. A spouse from a higher status family is likely to have better outside options, $\tilde{\mu}$, and therefore more power within the household. These subjective indicators have the advantage that they are reported by all couples, whether or not they had any assets at the time of marriage. We expect the relative background indicators to be correlated with assets brought to the marriage if the latter is also indicative of power. Table 4 reports the correlation between the indicators and the square root of assets. The first set of F statistics at the foot of the table indicate that own characteristics are significant predictors of assets for husbands and wives throughout Indonesia and provide supporting evidence for the interpretation of assets as indicative of power.[11]

[10]Wherever possible the spouses were interviewed separately. The regressions include controls for presence of the spouse and other household members at the interview as well as ethnicity, residential location and the square root of the total value of assets brought to the marriage. Results are based on the wife's responses; results using the husband's responses are similar.

[11]Direct evidence that the characteristics $\tilde{\mu}$ affect household decision-making is presented in Frankenberg, Sikoki and Thomas (1999).

Interpretation of assets at marriage

Assets brought to marriage is likely the outcome of a process that occurs in the marriage market and may signal as much about the person's spouse as they do about the respondent him or herself. This raises an important concern about marital selection and interpretation of the results below. Specifically, tests of household models will be biased if a person's assets at marriage reflect the power of their spouse to elicit more assets at the time of marriage and, presumably, assert their own preferences thereafter. An implication of this interpretation is that indicators of a spouse's power, $\tilde{\mu}$, as indicated by relative family background and status should affect the value of assets one brings to the marriage. This implication is tested in Table 4 which includes own and spouse's characteristics. The significance of spousal background and status is summarized in the second set of F statistics in the table ; the hypothesis that assets at marriage are driven by the power of a spouse is not supported in any of the four regressions.

Measurement of assets at marriage

It is well known that accurate information on assets is very difficult to collect in a household survey setting and reported values are likely to be contaminated by measurement error. Problems are bound to be exacerbated when the value of assets is collected retrospectively as they are for assets at the time of marriage in the IFLS and this raises legitimate questions about the quality of these data.

To explore this issue, we have regressed the reported (nominal) value of each respondent's assets at marriage on the date of marriage, current residence, the characteristics of the respondent and (in a second specification) the characteristics of the respondent's spouse are also included. The regressions are presented in Table 5.

On Java and Sumatra, a man's age and education are positively and significantly associated with the value of assets he brings to the marriage, while his wife's characteristics are irrelevant (they are not statistically significant, nor does their inclusion change the coefficients on the man's characteristics). In Java and Sumatra, a woman's age and education are positively and significantly associated with the value of assets she brings to the marriage. Her husband's education has a very similar effect. Furthermore, when the characteristics of a woman's husband are included in the model, the effect of her own characteristics on the value of her assets diminishes. The results suggest that, controlling for their age and education, men who bring more assets to their weddings are not marrying better educated women but higher asset women are able to attract better educated and older husbands. The pattern with regard to education is even stronger in the rest of Indonesia where each partner's education is positively correlated

with their own assets but, after controlling for the education of her husband, a woman's education is not related to the assets she brings to the marriage. There is clearly selection on observables in the marriage market -- better educated women tend to marry better educated women -- but, given the results in Table 4, we conclude that this selection does not appear to be related to characteristics associated with each spouse's outside options and, therefore, their power in household decision-making.

The date of marriage is entered as a linear spline. The effects on the reported value of assets are positive, and statistically significant, regardless of gender or region: the more recent the marriage, the higher the reported value of the assets. This is consistent with the interpretation that respondents are reporting nominal values of assets. It is also consistent with rising values of assets at marriage and dowries over time. Since rates of growth of reported values of assets differ between men and women (primarily in Java and Sumatra), the evidence suggests that the relative positions of men and women at marriage have changed (unless men and women have systematically different reporting errors). There is other evidence suggesting the relative positions of men and women has changed over time. First, over the last several decades, age at marriage has risen faster for women than for men, leading to a reduction in the age gap between husbands and wives (Xenos and Gultiano, 1992; Jones, 1994, p. 103). Older ages at marriage give women the opportunity to work (and save) prior to marriage. Second, anthropological research on female factory workers on Java reveals that many unmarried women use their incomes to buy gold jewelry, along with other possessions, which they take with them to marriage and continue to retain control over those assets during the marriage (Wolf, 1991, p. 141).

While the results in Tables 3 through 5 provide some comfort that reported asset values have some content, the survey design literature suggests that it may be difficult to recall nominal values from years ago and that respondents are inclined to inflate values to closer to what they would be worth today and thus understate the rate of growth of assets brought to the marriage. In Indonesia, time since marriage is correlated with fertility so that parents who have been married longer are likely to have more children. Our analytical sample is restricted to children under 10 in the home (who were included in the random sample) and so older parents will presumably have more experience with child-rearing (and dealing with child illness). Any correlation between measurement error in assets and time since marriage may, therefore, be transmitted to a correlation with reported child morbidities.

One approach to address this concern would be to control year of marriage (non-parametrically) when asset values are included as covariates in a regression; this would provide consistent estimates of

the impact of assets under the assumption that all people married in the same year will have the same propensity to "telescope". A more appealing strategy would allow "telescoping" or, more generally, measurement error in reported asset values to differ by individual. In the context of regressions of child morbidities, measurement error in paternal (or maternal) assets will obviously not differ across children in the same household and so any bias that would be imparted to the estimates would be common across siblings. This suggests exploiting within-household variation in child outcomes to test models of household decision-making and, thus, estimating models that include a household fixed effect in the regressions. We turn now to a discussion of those regressions.

4. RESULTS

Our exploration of the morbidity and asset data in the IFLS has suggested two outstanding concerns. First, reporting error in morbidities is likely to be correlated with parental characteristics. Second, assets at marriage are likely to be measured with error but the error is common across siblings. There are, therefore, two motivations for including household fixed effects in the child morbidity regressions. That is, although the valuation of the resources does not vary within the household, the effects of the resources may vary across children within the household and it is this variation between siblings that we will harness to test the models of household decision-making. There are three obvious sources of variation among siblings that might be exploited: sex, age, and birth order. We rule out drawing comparisons between older and younger siblings since, even within a family, the accuracy of a mother's reports of morbidity may vary by the age and birth order of her children because of experience, for example. In that case reporting error in morbidities would be correlated with age (and birth order) and the tests would be inconsistent. Instead, we assume that there is no systematic difference in (usually) maternal reports of morbidities for sons relative to daughters and exploit gender differences in the empirical tests.

By focussing on within-household variation, we have developed tests of the household model that are slightly more subtle than those discussed in Section 2. To put these in context, rewrite the theoretical model [4C] in linearised form:

$$\phi = A_1\alpha_1 + A_2\alpha_2 + f(Y) + X\beta + u \qquad [4E]$$

where ϕ are child morbidities, A_1 are assets brought to marriage by the father, A_2 are assets brought by the mother, Y is household income (and the function f denotes the form of the relationship between

income and child morbidity) and X are child and household level observable characteristics such as age, gender, education of parents, their age and location.

If there are no correlations between measurement error in assets or reported morbidities and the unobservables, u, then α will be consistent. Those estimates are reported in the second column of each pair in Table 1 which includes controls for parental age and education as well as the square root of household income and its square (which is obviously just household income). The regressions also include the (square root of the) value of the assets the father brought to the marriage, and the (square root of the) assets the mother brought to the marriage. (We use the square root transformation because it roughly approximates a logarithm transformation and does a good job of symmetrizing the distribution of assets and income. We prefer it to logs because assets are zero for some parents.)

Under the assumptions of the unitary model, after conditioning on income, assets brought to the marriage should have no affect on allocations and so $\alpha_1=\alpha_2=0$. If the distribution of those assets does matter, then we can proceed to determine whether allocations are Pareto efficient, in which case the ratio α_1/α_2 should be constant across all ϕ. The empirical evidence indicates that the unitary model does a reasonably good job of describing these data: assets at marriage are significant predictors of morbidity in only one case (paternal assets affect other morbidities).

Tests of the unitary model

Tables 2 and 5 suggest that because assets are likely to be measured with error, we should be cautious about taking these results at face value. Consequently, we probe the unitary model further. Estimates of the effects of parental assets at the time of marriage on the probability that a child is reported as having one of the four groups of morbidities are presented in Table 6a for Java and Sumatra and in Table 6b for the rest of Indonesia. The samples are restricted to include families in which both a brother and a sister are present. We report the OLS estimates for sons in the first column, for daughters in the second column, and difference (sons - daughters) in the third column. If the unitary model holds, then in the absence of parental measurement error, parental assets at marriage should not be significant in the regressions.

In the final column of each table, estimates of the effects of assets on sons, relative to daughters, from models that include household fixed effects are presented. For the reasons discussed in detail above,

we view these as our most robust estimates to test models of the household .[12] It is important to notice, however, that in this case we are not testing whether parents' assets at marriage affect child health but, instead, whether there is a differential effect on sons, relative to daughters.

Conditional on household resources, the sons of Javanese and Sumatran fathers who wield more power are more likely to be reported as having respiratory problems. But as their mother's power rises, it is their sisters who are more likely to be reported with respiratory problems. The difference in the effect of maternal assets on sons versus daughters is significant (column 4). Since any errors in reporting of maternal assets will be the same on sons and daughters, this result cannot be attributed to measurement error in assets.

It is possible that we are not capturing household income sufficiently well and so maternal assets are picking up unmeasured elements in income. This seems an unlikely explanation for three reasons. First, the household fixed effect sweeps out the main effects of income, so we only need to pick up *differences* in the effects of income on sons relative to daughters; a quadratic in log income should do an adequate job. Second, if the asset measure does reflect the impact of income, we would expect a similar effect of assets on sons and on daughters. But maternal assets have a positive effect on sons and a negative effect on daughters. Third, because paternal assets are positively correlated with maternal assets, they should be correlated with these unmeasured components of income as well. Under these circumstances the effect of paternal assets should match the effect of maternal assets and have a negative effect on the probability that a son has respiratory problems relative to a daughter. However, the effect of paternal assets on sons relative to daughters is positive.

In fact, a test of the difference between the effect of maternal assets on morbidity of sons, relative to daughters and the effect of paternal assets on morbidity of sons relative to daughters provides a test of the unitary model that is robust to measurement error and to some forms of specification error. The test statistic is reported in the fourth row of each fixed effects panel. For coughs, the statistic is significantly different from zero and so provides evidence that the unitary model does not characterize these families. The unitary model is less than satisfactory with respect to the results for fever as well. As with respiratory difficulties, sons of more powerful women are significantly less likely to have fevers than their sisters.

[12]All regressions include controls for child age and gender along with household income and its square root, maternal and paternal education and age, year of marriage, location dummies (or household characteristics interacted with an indicator variable for sons in the fixed effects regression). Robust variance-covariance matrices are calculated by the method of the infinitesimal jackknife. All models are estimated with the method of least squares.

These results suggest that mothers who are more powerful are allocating resources towards goods and services that they value differently from their husbands and that is reflected in their sons having fewer episodes of illness than their daughters. While the results for diarrhea and other morbidities indicate there is no evidence against the unitary model in Java and Sumatra, on the basis of the evidence for coughs and fevers, we conclude that mothers and fathers do not share the same preferences. In the rest of Indonesia, the unitary model performs rather well. Only one of the asset effects is significant and none is significant when the model includes household fixed effects.

It is worth emphasizing that the tests we are relying on are quite subtle and based on within-family variation of the impact of resources that were brought to the marriage on allocation of resources to and this the health of sons, relative to daughters. The magnitudes of the estimated effects are, therefore, small and do not constitute substantial differences in the prevalence of morbidities among brothers and sisters. For example, a standard deviation increase in the assets brought to the marriage by a woman would be associated with widening the gap between the incidence of respiratory diseases between a brother and sister by less than ½%. The key issue in the context of testing models of decision-making is their significance.

Tests of the Pareto efficient model

We turn, finally, to testing the Pareto efficient model. This is only relevant for Java and Sumatra since in the rest of Indonesia, the unitary model is not rejected. The test involves cross-equation restrictions and amounts to checking that α_{1m}/α_{2m} is constant across all morbidities, m=1,..4, and is straightforward to test with a non-linear Wald statistic:

$$W = h'[HVH']^{-1}h \quad \sim \quad \chi^2$$

where H is the derivative of the restriction vector, h, with respect to the coefficients on assets at marriage in [4E]. V is the estimated variance-covariance matrix. In addition to simultaneously testing all ratios are equal, we present non-linear Wald tests for each pair of morbidities in order to determine whether there are departures from Pareto efficiency for any pairs. Apart from identifying those cases for which Pareto efficiency is rejected, one advantage of this strategy is that test results do not rely on the choice of morbidity groups or number of morbidities included in the system of regressions.[13]

[13]Since the critical value of the Wald test statistic is a function of the number of goods, it is possible to mask rejection of Pareto efficiency by simply including a large enough set of goods in the system.

As a practical matter, the ratio α_{1m}/α_{2m} approaches infinity as α_{2m} goes to zero and so tests based on ratios tend to lack power (Gregory and Veall, 1985; see also Phillips and Park, 1988). We have, therefore, transformed the test as $\alpha_{1m}*\alpha_{2n}-\alpha_{2m}*\alpha_{1n}=0$, $m\neq n$. The test statistics, along with the ratio of asset effects, are presented in Table 7.

The ratios of asset effects are fairly close for all except diarrhea. They are, however, not estimated precisely and so in all cases the Wald tests are not significant (in pairs or taken all together). The test statistics indicate that the assumptions of the Pareto efficient model of household allocations are not rejected by the data. Thus, we conclude that while couples on Java and Sumatra appear to have different preferences but it does not appear to be possible to reallocate resources within households so that one person would be better off without at least one other person feeling worse off. It is probably worth being somewhat cautious in interpreting this result in view of the imprecision of the estimates of the ratios.

5. CONCLUSIONS

A principle goal of this paper is to test two models of household decision-making. First, the unitary model assumes the household may be treated as a single unit and predicts that measures of "power" within the household will have no impact on resource allocation. The second is a collective model which explicitly recognizes that households are made up of individuals and assumes that allocations are Pareto efficient.

The models are tested using the Indonesian Family Life Survey, which provides detailed measures of household income and individual assets, as well as multiple indicators of individual well-being. After controlling for household income, we examine the effects of maternal and paternal assets at marriage on whether children experience coughs, fevers, diarrhea, or other symptoms in the month prior to the interview. We argue that conditional on income, the assets that husbands and wives bring to the marriage are measures of the power each partner wields within the marriage. If the unitary model holds, husbands' and wives' power within the marriage should have no impact on the outcomes of their children.

Exploration of the morbidity data in the IFLS suggests that reporting error in morbidities may be correlated with parental characteristics. Exploration of the data on assets at marriage suggest that reported values are also likely to be measured with error. We address these issues by including household fixed effects in our preferred specification. In the empirical tests of the household model, we estimate the effect on child morbidity of maternal assets on sons relative to daughters and the effect of paternal assets on sons

relative to daughters. We test whether the estimates are significantly different from zero and significantly different from one another.

These results indicate that mothers who are more powerful allocate resources towards goods and services that they value differently from their husbands and that is reflected in their sons having fewer episodes of illness (of cough and fewer) than their daughters. Mothers and fathers on Java and Sumatra, it appears, do not share the same preferences. For the rest of Indonesia, we cannot reject the unitary model.

Since the unitary model does not appear to adequately characterize Javanese and Sumatran families, we examined the implications of the assumption that allocations are Pareto efficient. The model predicts that the ratio of the effect of paternal assets to the effect of maternal assets will be constant across morbidities. That prediction is not rejected by the data. We conclude, therefore, that although couples in these are do not agree about resource allocations, they cannot reallocate resources in such a way that one household member is made better-off without making at least one household member worse-off.

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Table 1: Correlates of reported child morbidities (*100)

	Cough		Fever		Diarrhea		Other	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother's characteristics								
Years of education	0.721	0.791	-0.451	-0.330	-0.471	-0.530	-0.742	-0.391
	[3.94]	[3.36]	[2.64]	[1.47]	[3.99]	[3.28]	[4.09]	[1.62]
Age	-0.241	-0.156	-0.021	0.161	-0.104	-0.116	-0.164	0.137
	[2.49]	[1.11]	[0.23]	[1.21]	[1.54]	[1.17]	[1.61]	[0.95]
(1) in household	3.011	2.276	1.922	-0.689	-4.526	-4.669	8.132	5.360
	[0.45]	[0.33]	[0.31]	[0.11]	[0.83]	[0.84]	[1.15]	[0.76]
Father's characteristics								
Years of education	.	-0.120	.	-0.343	.	0.108	.	-0.563
		[0.55]		[1.64]		[0.71]		[2.52]
Age	.	-0.104	.	-0.250	.	0.003	.	-0.357
		[0.88]		[2.29]		[0.04]		[3.01]
(1) in household	.	-3.639	.	-8.172	.	-3.307	.	-7.705
		[1.14]		[2.60]		[1.36]		[2.32]
Household resources								
Household income	.	-4.206	.	-0.681	.	-1.048	.	-0.036
(square root)		[1.13]		[0.19]		[0.40]		[0.01]
Household income	.	0.256	.	0.072	.	0.064	.	-0.065
		[0.92]		[0.28]		[0.34]		[0.24]
√(Father's assets	.	0.033	.	-0.005	.	0.009	.	0.019
at marriage)		[1.14]		[0.18]		[0.42]		[0.71]
√(Mother's assets	.	0.025	.	0.043	.	-0.004	.	0.077
at marriage)		[0.83]		[1.18]		[0.18]		[2.40]
Child characteristics								
(1) if child age is								
1 year	4.199	4.266	-0.909	-1.033	-2.191	-2.180	7.567	7.519
	[1.44]	[1.46]	[0.32]	[0.36]	[0.89]	[0.88]	[2.70]	[2.70]
2	-5.122	-4.986	-4.547	-4.536	-12.435	-12.499	7.709	8.024
	[1.77]	[1.72]	[1.60]	[1.59]	[5.77]	[5.79]	[2.77]	[2.89]
3	-6.322	-6.194	-9.574	-9.646	-11.143	-11.141	11.269	11.402
	[2.18]	[2.14]	[3.41]	[3.44]	[5.01]	[5.00]	[3.96]	[4.01]
4	-10.061	-9.785	-15.562	-15.478	-12.597	-12.534	7.567	7.906
	[3.42]	[3.32]	[5.62]	[5.61]	[5.70]	[5.67]	[2.62]	[2.75]
5	-16.983	-16.844	-16.310	-16.363	-15.200	-15.230	6.716	6.893
	[5.86]	[5.80]	[5.93]	[5.94]	[7.26]	[7.25]	[2.33]	[2.39]
6	-20.461	-20.200	-17.885	-17.779	-16.159	-16.108	9.460	9.846
	[7.31]	[7.20]	[6.64]	[6.60]	[7.87]	[7.82]	[3.28]	[3.41]
7	-21.318	-20.933	-18.777	-18.507	-15.769	-15.732	4.190	4.920
	[7.67]	[7.51]	[6.98]	[6.85]	[7.61]	[7.55]	[1.48]	[1.74]
8	-20.787	-20.413	-20.593	-20.465	-16.541	-16.509	5.172	5.729
	[7.53]	[7.37]	[7.81]	[7.74]	[8.19]	[8.14]	[1.84]	[2.04]
9	-19.538	-19.210	-22.060	-21.904	-18.398	-18.367	6.790	7.373
	[7.14]	[6.99]	[8.59]	[8.50]	[9.63]	[9.54]	[2.44]	[2.65]
(1) if male	-1.352	-1.342	-1.410	-1.435	1.679	1.698	1.257	1.214
	[1.02]	[1.02]	[1.12]	[1.14]	[1.80]	[1.82]	[0.93]	[0.90]
Location								
(1) if urban	5.193	5.909	2.601	2.958	-0.059	0.016	2.272	3.778
	[3.63]	[3.86]	[1.90]	[2.03]	[0.06]	[0.02]	[1.54]	[2.41]
(1) if Sumatra	-4.458	-4.577	-1.738	-2.039	0.647	0.557	-1.797	-2.114
	[1.75]	[1.80]	[0.72]	[0.84]	[0.36]	[0.31]	[0.69]	[0.81]
(1) if Java	-6.224	-6.177	-2.689	-2.858	-1.121	-1.252	-9.713	-9.566
	[2.65]	[2.62]	[1.20]	[1.28]	[0.68]	[0.75]	[4.04]	[3.97]
(1) if Bali	-13.739	-13.494	-4.326	-4.245	2.182	2.058	-6.466	-5.826
	[4.95]	[4.85]	[1.61]	[1.58]	[1.04]	[0.98]	[2.21]	[1.98]
Intercept	54.601	75.790	44.228	60.400	34.356	41.662	37.137	54.308
	[7.04]	[4.99]	[6.06]	[4.20]	[5.59]	[3.78]	[4.58]	[3.52]
F(all covariates)	20.230	14.630	10.210	8.090	10.980	7.980	4.390	4.590
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.061	0.063	0.034	0.037	0.042	0.043	0.014	0.020
Percentage report morbidity	37.8		29.0		13.2		37.4	

Notes. Sample size: 5,082 children. Linear probability model standard errors below coefficient estimates; p-values below test statistics. Variance-covariance matrices computed by method of infinitesimal jackknife.

Table 2: Assets brought to marriage

	JAVA and SUMATRA (1)	REST OF INDONESIA (2)
Assets brought to marriage		
Percentage of		
Husbands with assets > 0	77.8	68.0
Wives with assets > 0	88.9	69.6
Husband's assets = Wife's assets	36.7	34.3
Husband's assets = Wife's assets (excluding zeroes)	32.7	19.8
Husband's assets > Wife's assets	29.6	37.8
Husband's assets < Wife's assets	33.7	27.9
Nominal value of assets brought to marriage (Rp 000s)		
Husband		
Mean	745	589
Standard error	[126]	[156]
Wife		
Mean	542	228
Standard error	[143]	[48]
Real value of assets brought to marriage (1993 Rp 000s)		
Husband		
Mean	1917	1900
Standard error	[263]	[387]
Wife		
Mean	1897	839
Standard error	[385]	[143]

Notes. Sample size: 3,949 couples (Java and Sumatra); 1,133 couples (rest of Indonesia).

Table 3: Distribution of assets brought to marriage and operation of household economy

A. Income pooling: Probability respondent reports keeping some of income for own needs
(Probit estimates)

	Java and Sumatra		Rest of Indonesia	
	Wife	Husband	Wife	Husband
	(1)	(2)	(3)	(4)
√Total assets brought to marriage	2.875	0.059	0.707	3.826
	[2.20]	[0.09]	[0.29]	[2.46]
Wife's share of assets to marriage	8.622	-0.619	12.390	-2.096
	[2.55]	[0.30]	[2.58]	[0.68]
Husband's characteristics				
Age	-0.468	-0.184	-0.113	-0.099
	[2.45]	[1.53]	[0.37]	[0.47]
Years of education	0.411	0.985	0.660	0.933
	[0.97]	[3.91]	[1.15]	[2.40]
Wife's characteristics				
Age	0.599	0.087	-0.093	-0.052
	[2.78]	[0.67]	[0.29]	[0.24]
Years of education	1.208	0.162	-0.036	-0.219
	[2.68]	[0.58]	[0.06]	[0.53]

Notes: Regressions include controls for presence of spouse and other people at interview of husband and wife, residential location of household, ethnicity of household. Sample in each column includes only those who earned income during survey month.

B. Spheres of influence: Probability decisions are made jointly, by husband or by wife
Effect of wife's share of assets to marriage on decision-making
(Multinomial logit estimates)

	Java and Sumatra Decision maker is			Rest of Indonesia Decision maker is		
Decisions about:	Husband rel to Joint	Wife rel to Joint	Wife rel to Husband	Husband rel to Joint	Wife rel to Joint	Wife rel to Husband
	(1)	(2)	(3)	(4)	(5)	(6)
Expenditures on male clothing	0.102	0.230	0.128	-0.072	0.244	0.316
	[0.70]	[1.70]	[0.80]	[0.40]	[1.36]	[1.63]
Expenditures on female clothing	0.075	0.247	0.171	0.162	0.110	-0.052
	[0.36]	[1.96]	[0.87]	[0.63]	[0.67]	[0.21]
Expenditures on child clothing	0.079	0.327	0.248	0.260	0.352	0.091
	[0.34]	[2.63]	[1.05]	[0.86]	[2.11]	[0.29]
Savings	0.347	0.367	0.020	-0.421	0.224	0.645
	[1.30]	[1.91]	[0.07]	[1.08]	[0.77]	[1.47]

Notes: Regressions include controls for total assets at marriage, presence of spouse and other people at interview of husband and wife, for residential location of household, ethnicity of household.

Table 4: Correlations between assets brought to marriage and measures of family background

	Java and Sumatra		Rest of Indonesia	
	Husband (1)	Wife (2)	Husband (3)	Wife (4)
Husband's report of own background relative to wife's				
Father higher status job	-0.166	0.006	-0.054	-0.032
	[1.71]	[0.23]	[0.62]	[0.79]
Father better educated	0.380	-0.004	-0.100	0.005
	[3.67]	[0.16]	[1.15]	[0.13]
Mother better educated	-0.114	-0.014	0.026	0.045
	[1.13]	[0.52]	[0.30]	[1.13]
Family higher stature in community	0.229	-0.025	0.112	-0.015
	[2.64]	[1.08]	[1.44]	[0.40]
Lived in better house	0.109	-0.029	0.018	-0.056
	[1.26]	[1.29]	[0.21]	[1.41]
Higher income family	0.059	0.041	0.022	0.082
	[0.69]	[1.84]	[0.28]	[2.22]
Higher level of assets	0.140	0.023	0.137	0.050
	[1.60]	[1.02]	[1.57]	[1.22]
Wife's report of own background relative to husband's				
Father higher status job	-0.029	-0.023	0.210	-0.018
	[0.27]	[0.81]	[2.13]	[0.40]
Father better educated	-0.004	-0.006	0.071	0.100
	[0.04]	[0.21]	[0.71]	[2.12]
Mother better educated	-0.097	0.023	0.012	0.041
	[1.05]	[0.96]	[0.13]	[0.98]
Family higher stature in community	0.104	-0.034	0.123	0.043
	[1.14]	[1.43]	[1.43]	[1.09]
Lived in better house	0.038	0.002	0.056	0.004
	[0.44]	[0.09]	[0.70]	[0.09]
High income family	0.075	0.017	-0.046	0.073
	[0.84]	[0.74]	[0.55]	[1.87]
High level of assets	0.090	0.035	-0.092	0.077
	[0.99]	[1.47]	[1.00]	[1.79]
(1) Urban	0.021	0.025	0.033	0.031
	[0.46]	[2.03]	[0.79]	[1.59]
(1) Sumatra	0.075	0.012	.	.
	[1.18]	[0.73]		
(1) Bali	.	.	0.128	0.05
			[2.41]	[2.02]
Intercept	0.007	0.097	0.089	0.043
	[0.07]	[3.85]	[0.97]	[1.02]
1. F(Own characteristics)	8.13	2.07	2.05	4.41
	[0.00]	[0.04]	[0.05]	[0.00]
2. F(Spouse's characteristics)	0.82	1.12	1.44	1.80
	[0.57]	[0.35]	[0.19]	[0.08]
F(All covariates)	3.89	1.71	1.95	3.20
	[0.00]	[0.04]	[0.01]	[0.00]
R^2	0.025	0.011	0.024	0.039

Table 5: Correletes of value of assets brought to marriage
By husband and wife

Dependent variable: √(assets)

	JAVA AND SUMATRA				REST OF INDONESIA			
	Husband's assets at marriage		Wife's assets at marriage		Husband's assets at marriage		Wife's assets at marriage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Date of marriage (spline)								
Before 1970	0.196	0.173	-0.009	0.030	0.304	0.197	0.223	0.227
	[2.30]	[2.00]	[0.12]	[0.36]	[1.52]	[0.95]	[1.55]	[1.57]
1970-1979	0.400	0.358	0.275	0.342	0.292	0.202	0.276	0.277
	[3.49]	[3.05]	[1.99]	[2.58]	[1.73]	[1.16]	[2.31]	[2.28]
1980 and later	1.301	1.257	0.436	0.460	0.677	0.615	0.360	0.342
	[5.99]	[5.29]	[3.36]	[3.64]	[2.77]	[2.54]	[2.09]	[2.05]
Husband's characteristics								
Age	0.337	0.370	.	0.186	0.069	0.156	.	-0.018
	[3.83]	[3.81]		[2.33]	[0.77]	[1.74]		[0.33]
Years of education	0.924	0.912	.	0.328	0.592	0.569	.	0.263
	[7.23]	[4.35]		[2.20]	[4.52]	[3.53]		[2.73]
Wife's characteristics								
Age	.	-0.083	0.131	-0.002	.	-0.195	0.058	0.072
		[0.95]	[1.80]	[0.02]		[1.94]	[0.89]	[1.06]
Years of education	.	0.038	0.607	0.419	.	0.057	0.326	0.136
		[0.14]	[4.68]	[4.22]		[0.28]	[2.40]	[0.85]
Location								
(1) if urban	0.494	0.516	0.747	0.253	2.522	2.566	0.879	0.744
	[0.83]	[0.79]	[1.22]	[0.37]	[1.68]	[1.59]	[0.82]	[0.69]
(1) if Sumatra	0.525	0.577	1.141	1.299	.	.	.	.
	[0.69]	[0.76]	[1.46]	[1.72]				
(1) if Bali	.	.	.	.	-4.617	-4.534	-1.936	-2.114
					[3.55]	[3.33]	[2.67]	[2.91]
Intercept	-30.193	-26.834	-3.071	-9.978	-18.963	-7.778	-13.644	-14.203
	[3.34]	[2.85]	[0.44]	[1.39]	[1.25]	[0.47]	[1.26]	[1.31]
F(all covariates)	16.150	12.850	26.850	23.880	9.010	8.120	11.700	9.490
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.064	0.065	0.026	0.030	0.066	0.067	0.055	0.060

Notes. Sample size: 3,949 couples (Java and Sumatra); 1,133 couples (rest of Indonesia). Standard errors below coefficient estimates; p-values below test statistics. Variance-covariance matrices computed by method of infinitesimal jackknife.

Table 6A: Impact of parental assets at marriage on child morbidity:
OLS and Fixed Effects estimates (*100)
JAVA AND SUMATRA

	SONS	DAUGHTERS	DIFFERENCE	
			OLS	Fixed Effects
COUGH				
Paternal assets at marriage	0.135 [2.60]	0.011 [0.14]	0.124 [1.30]	0.119 [1.37]
Maternal assets at marriage	-0.093 [1.09]	0.143 [1.53]	-0.237 [1.86]	-0.236 [2.78]
χ^2(asset effects=0)	3.90 [0.02]	1.21 [0.30]	2.42 [0.09]	4.73 [0.01]
χ^2(asset effects equal)	5.08 [0.02]	1.04 [0.31]	4.82 [0.03]	8.36 [0.00]
F (all covariates)	10.46 [0.00]	2.60 [0.00]	7.10 [0.00]	2.78 [0.00]
R^2	0.096	0.085	0.091	0.686
FEVER				
Paternal assets at marriage	0.068 [0.74]	0.075 [0.90]	-0.007 [0.05]	-0.026 [0.25]
Maternal assets at marriage	0.029 [0.33]	0.224 [2.44]	-0.195 [1.53]	-0.186 [2.48]
χ^2(asset effects=0)	0.36 [0.70]	3.67 [0.03]	1.20 [0.30]	3.21 [0.04]
χ^2(asset effects equal)	0.09 [0.77]	1.29 [0.26]	1.01 [0.32]	1.46 [0.23]
F (all covariates)	5.50 [0.00]	3.01 [0.00]	4.50 [0.00]	2.53 [0.00]
R^2	0.080	0.083	0.082	0.655
DIARRHEA				
Paternal assets at marriage	-0.002 [0.03]	0.072 [0.85]	-0.074 [0.69]	-0.079 [1.39]
Maternal assets at marriage	-0.042 [1.13]	-0.018 [0.45]	-0.024 [0.43]	-0.017 [0.42]
χ^2(asset effects=0)	0.64 [0.53]	0.45 [0.64]	0.320 [0.73]	0.980 [0.38]
χ^2(asset effects equal)	0.29 [0.59]	0.89 [0.35]	0.170 [0.68]	0.970 [0.33]
F (all covariates)	2.59 [0.00]	1.87 [0.01]	2.180 [0.00]	2.030 [0.00]
R^2	0.071	0.062	0.067	0.682
OTHER				
Paternal assets at marriage	0.066 [1.05]	0.096 [1.19]	-0.030 [0.30]	-0.063 [0.61]
Maternal assets at marriage	0.066 [1.24]	-0.023 [0.31]	0.089 [0.97]	0.110 [1.57]
χ^2(asset effects=0)	1.31 [0.27]	0.73 [0.48]	0.500 [0.61]	1.340 [0.26]
χ^2(asset effects equal)	0.00 [1.00]	1.08 [0.30]	0.720 [0.40]	1.750 [0.19]
F (all covariates)	6.80 [0.00]	2.52 [0.00]	4.570 [0.00]	1.910 [0.00]
R^2	0.081	0.044	0.064	0.684

Notes. Sample size: 601 sibling pairs Standard errors below coefficient estimates; p-values below test statistics. Variance-covariances matrices computed by method of infinitesimal jackknife.

Table 6B: Impact of parental assets at marriage on child morbidity:
OLS and Fixed Effects estimates (*100)
REST OF INDONESIA

	SONS	DAUGHTERS	DIFFERENCE	
			OLS	Fixed Effects
COUGH				
Paternal assets at marriage	0.076 [0.94]	0.225 [2.50]	-0.149 [1.23]	-0.167 [1.24]
Maternal assets at marriage	0.535 [1.14]	0.050 [0.11]	0.485 [0.74]	0.554 [1.00]
χ^2(asset effects=0)	1.62 [0.20]	3.46 [0.03]	0.83 [0.44]	1.07 [0.34]
χ^2(asset effects equal)	0.83 [0.36]	0.13 [0.72]	0.82 [0.37]	1.48 [0.23]
F (all covariates)	3.06 [0.00]	2.29 [0.00]	2.62 [0.00]	1.05 [0.41]
R^2	0.179	0.174	0.178	0.754
FEVER				
Paternal assets at marriage	0.026 [0.25]	-0.146 [1.77]	0.172 [1.28]	0.069 [0.46]
Maternal assets at marriage	0.569 [1.22]	-0.183 [0.48]	0.751 [1.25]	0.688 [1.23]
χ^2(asset effects=0)	0.89 [0.41]	2.12 [0.12]	2.15 [0.12]	0.95 [0.39]
χ^2(asset effects equal)	1.18 [0.28]	0.01 [0.93]	0.80 [0.37]	1.07 [0.30]
F (all covariates)	3.95 [0.00]	3.31 [0.00]	3.72 [0.00]	1.55 [0.05]
R^2	0.200	0.224	0.212	0.707
DAIRRHEA				
Paternal assets at marriage	0.032 [0.37]	-0.071 [0.86]	0.103 [0.86]	0.096 [0.84]
Maternal assets at marriage	0.347 [0.94]	-0.508 [1.92]	0.856 [1.89]	0.646 [1.32]
χ^2(asset effects=0)	0.65 [0.52]	2.64 [0.08]	2.68 [0.07]	1.64 [0.20]
χ^2(asset effects equal)	0.62 [0.43]	2.22 [0.14]	2.30 [0.13]	1.07 [0.30]
F (all covariates)	1.73 [0.03]	1.10 [0.36]	1.40 [0.06]	1.70 [0.02]
R^2	0.157	0.152	0.155	0.607
OTHER				
Paternal assets at marriage	0.001 [0.01]	-0.035 [0.19]	0.035 [0.17]	-0.049 [0.22]
Maternal assets at marriage	-0.159 [0.33]	0.233 [0.50]	-0.392 [0.58]	-0.389 [0.53]
χ^2(asset effects=0)	0.05 [0.95]	0.13 [0.88]	0.17 [0.84]	0.18 [0.84]
χ^2(asset effects equal)	0.10 [0.76]	0.25 [0.62]	0.33 [0.57]	0.19 [0.67]
F (all covariates)	0.80 [0.72]	2.12 [0.01]	1.46 [0.04]	1.02 [0.45]
R^2	0.084	0.164	0.125	0.666

Notes. Sample size: 159 sibling pairs Standard errors below coefficient estimates; p-values below test statistics. Variance-covariances matrices computed by method of infinitesimal jackknife.

TABLE 7: Tests for Pareto efficiency in household allocations
JAVA AND SUMATRA
Ratio of effects of paternal to maternal assets at marriage and
Non linear wald tests for equality of ratios

Ratios of asset effects: α_1/α_2	
Cough	-0.50
Fever	0.14
Diarrhea	4.65
Other	-0.57

Pair-wise tests for equality of ratios χ^2_1

	Fever	Diarrhea	Other
Cough	0.90 [0.14]	1.44 [0.23]	0.00 [0.96]
Fever		1.43 [0.23]	0.41 [0.52]
Diarrhea			1.10 [0.29]

Joint test for equality of all 4 ratios: χ^2_5	
	2.52 [0.77]

Notes: Coefficient estimates from Table 6A, Column 4. P-values below test statistics. Variance-covariances matrices computed by method of infinitesimal jackknife.