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Intrahousehold Allocations: A Review of Theories, Empirical Evidence and Policy Issues

by

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1. INTRODUCTION

Interest in issues of intrahousehold distribution in developing countries has been increasing by both economists and other social scientists.[1] The interest in this difficult topic derives from a concern with poverty, and inequality, and a recognition that differential resource allocations within households may seriously reduce the welfare of some members. The early policy-oriented literature on this topic focused on the risks to health and nutrition of women and children, or to differential access to schooling.

As a good example, consider the issuance of food stamps in the United Kingdom and Sri Lanka. In both countries food stamps are given to the head female of the household because of policy-maker concern that the head male may squander the transfer on other items (for instance by selling the stamps and using cash to purchase alcohol). The question here is whether the specific identity of the recipient of the stamps matters to resource allocation decisions. As another example, policy concern with household-level food security centers around mechanisms for consumption smoothing in the event of negative income shocks. For very poor households it may be that women and children suffer most from such shocks, because workers, who may be mostly adult men, get the first food allocations in order to maintain their labor productivity. If so, women may have particular reasons to be conservative in their behavior; in particular, they may demand more income smoothing than do men. If their wishes are not satisfied, women may resort to behavior that will attempt to satisfy their wants, but which may help or hurt overall household food security.

These two examples involve potential conflicts within the household. Not all intrahousehold distributional issues are of a conflicting nature. For instance, excess female infant and child mortality in south Asia or greater completed schooling by boys in many African and Asian countries may well result from the *joint* decisions of fathers and mothers. These decisions may be made in response to greater market opportunities for men, or possibly to girls being more costly to raise, or from pure preferences for males.

Decisions that bear on differential outcomes within the household are the subject of this review. We begin with the issue of how to model household behavior to account for differential outcomes within the household. The household production model of Becker (1965, 1974, 1981) can be used to do this, but it may be that some of the underlying assumptions are violated, necessitating a broader approach. We review one such approach, the collective household model, which encompasses some game-theoretic approaches as well. We then discuss empirical evidence on a variety of issues related to human resource outcomes and investments, using both the household production model and the collective model. We

[1] See, for instance the recent reviews by Behrman (1992, 1993b) and Haddad, Hoddinott, and Alderman (1994). Strauss and Thomas (1995) also review this literature in their more general survey of empirical research on human resources, while Alderman et al. (1995) review the evidence from a policy perspective. Blumberg (1988) examine the sociological evidence, while Dwyer and Bruce (1988) comprise an older set of papers, written mostly by non-economists. For an early set of papers on these topics, see the volume by Rogers and Schlossman (1990).

next turn to evidence of how production relations are affected by intrahousehold distributional issues and finally we examine broader policy issues that arise from this discussion.

2. THEORETICAL ISSUES

Economic models of intrahousehold decisions attempt to understand the internal rules that motivate and guide patterns of resource allocations among members within a household. While households are dynamic units with respect to size and composition, most analyses of intrahousehold allocation avoid these complexities by assuming a static, more narrow framework. Analysis of intrahousehold allocations typically assigns decision–making over all resource allocations to the same household unit, while it may be that the appropriate unit of analysis should depend on the resource or investment. For example, investments in agricultural production may be made at the household level, while child schooling investments may be made at a wider, family level. These models may thus neglect issues involving the formation, partitioning, and dissolution of households, not to mention the role of allocations and transfers between households or spatially separated families (see the discussion below). Even with their shortcomings, these models reveal much about the role of preferences, gender, age, endowments, household–level resources, prices and labor market opportunities in the distribution of resources among household members.

The interpretation of the strategies employed by households in allocating resources depends on how we choose to model decision–making. Even when the reduced form determinants underlying household allocations are revealed, the process of decision-making is not necessarily exposed. One set of empirical results can yield several interpretations of the decision–making process in the household. For example, Rosenzweig and Schultz (1982) showed that survival probabilities for female infants in India are higher in areas where opportunities for female employment are greater. The authors, modeling in a joint family utility function, conclude that households invest more in (i.e., allocate more resources towards) male infants compared to female infants in anticipation of a higher return to these investments (i.e., males have higher earning potential). Folbre (1984b) proposes an alternative interpretation, viewing household resource allocations as outcomes of a bargaining process among members. When adult females have higher earning capabilities, they can have greater bargaining leverage with which to allocate more resources towards female infants. The reduced form equations estimated by Rosenzweig and Schultz do not clearly distinguish between these possibilities.

2.1. Unitary Models

Most economic models of intrahousehold allocation of resources, and, in particular, the household production model of Becker (1965), are based on the constrained maximization of a single household welfare function. Individual preferences are aggregated with fixed weights into a common objective function (the household level welfare or utility function).[2] This welfare function is, in turn, maximized subject to various household level constraints: on time use,

[2] These models can be justified in several ways (Becker 1974; Pollak 1985). They have been referred to using several terms in the literature, for example: unitary models (Haddad, Hoddinott, and Alderman 1994), unified preference models (Behrman 1993b), common-preference models (Thomas 1990), and neo-classical models (McElroy and Horney 1981).

household technology and resources; to derive the optimal allocations of resources and investments. These models yield reduced–form equations for household demands over both market and non-market goods, where observed allocations are functions of exogenous variables, such as prices and exogenous resources. In these models, all household resources are pooled so that while the source of incomes for individuals does matter (e.g., labor earnings vs. nonlabor income), the distribution of income among household members is irrelevant. Rogers and Schlossman (1990) note that the unified approach "does not address the interpersonal dynamics by which the household preference function emerges." Little is said about the process of aggregating preferences. It could be that preferences among all members over all goods are homogeneous, or that some consensus is reached among household members, or that a dictator (malevolent or benevolent) exists in the household. In this sense, decision–making in the household is treated as a black–box under unitary models.

The income-maximization (or investment) model of household decision–making is nested in the constrained utility-maximization problem. In this approach, the common objective of the household is to allocate resources so as to maximize the sum of earnings across all members within the household (i.e., the household budget), subject to household technology. If so, households will make larger allocations to those members for whom the marginal economic returns on these allocations is greater, providing that the price or cost of these allocations do not differ across members. Where allocations yield the greatest return will depend on the household technology involved (the process of transmitting allocations into outcomes, which is income in this case). For example, in the context of food distribution, food is an input in an earnings or income function.[3] Those household members for whom food yields the greatest returns in their income-earning activities will be allocated more food if the household allocates resources according to the income model. Bias or inequality across household members would reflect the inequality in income–earning opportunities for household members. This approach also suggests that if individual endowments (also referred to as heterogeneity, and typically unobserved) are included in the earnings function, insofar as these endowments augment labor-market returns and provided greater food allocation enhances the marginal impact of endowments, allocations will *reinforce* endowment differences, rather than compensate for these differences. Higher–endowed individuals should receive greater allocations of resources. On the other hand, if greater food consumption raises earnings more for persons with lower endowments, then optimal food allocations will *compensate* for endowment differences; lower-endowed persons will be fed more. Food will be allocated equally to all members *only* if endowments are the same across members and the returns to food are equal in each member's income-earning activities.

The income-maximization model draws some concrete conclusions regarding household strategies of allocations based on fairly restrictive assumptions. This approach does not allow decision–making to be motivated by preferences regarding allocations towards household members. Discrimination or bias in allocations among members can only be a function of market returns given individual endowments.

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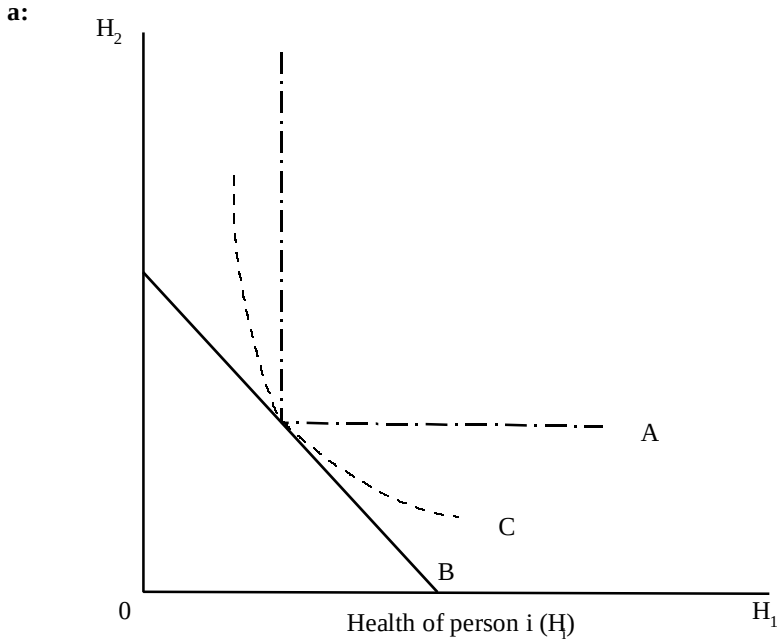
[3] Several empirical studies have estimated the labor productivity–enhancing effect of nutrition or calorie consumption in low-income countries (see Behrman 1993a; and Strauss and Thomas 1995 for summaries).

Behrman, Pollak, and Taubman (1982) [hereafter referred to as BPT] develop a model of utility maximization in which both preferences *and* market opportunities operate to affect allocations. The BPT model has been used typically in a framework that analyzes the investment dimension of resource allocations from parents to children under unified parental preferences. It has also been used to distinguish between the causes of systematic gender differences in human capital investments. For example, applications have examined why intrahousehold allocations of nutrients (or schooling) may favor boys over girls in some societies. Are parents responding to the greater labor-market opportunities for boys, as suggested by Rosenzweig and Schultz earlier? Or, do parents have a pro–male bias?

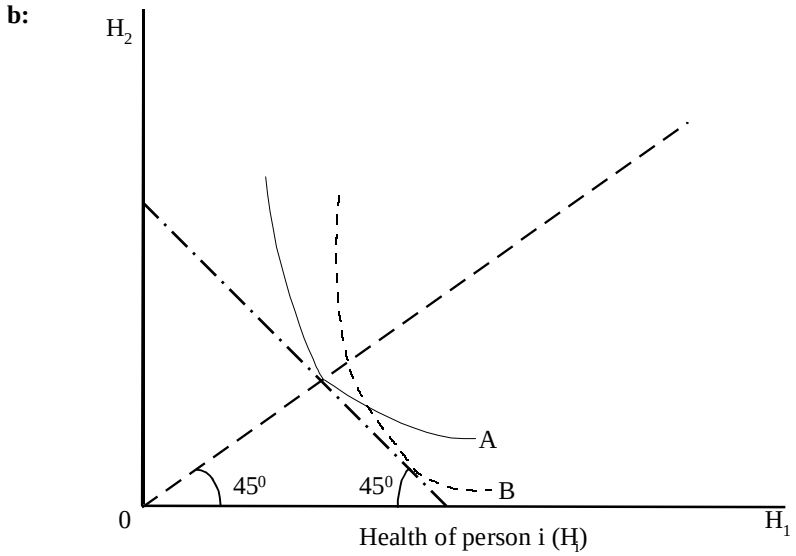
The BPT approach attempts to disentangle the nature of preferences that underlie the distribution of resources in the household. Household preferences for various outcomes (e.g., health status or earnings of members) are comprised of two components: the degree of inequality aversion and the welfare weights attached to individuals. The degree of inequality aversion describes the degree of concern regarding disparities in the distribution of outcomes across members. Graphed in the space of outcomes over two members of the household, inequality aversion is characterized by the slope of the indifference curve that describes preferences in the welfare (utility) function (see Figure 1a). As one extreme, households have no inequality aversion and equity in outcomes does not matter. In this case the indifference curve is linear (line B in Figure 1a), and it is only market opportunities that matter, as in the income model. As in that model, parents (more generally, households) invest more in children (or any individual member) for whom the return is greatest; a pure investment strategy. In the other extreme case, households may be perfectly averse to inequality in that they care only about the outcome of the worst–off member(s). In this case preferences are L-shaped (dashed line A), a so-called Rawlsian strategy. Preferences between the two extremes are captured in an indifference curve (C) that is convex to the origin.

Inequality aversion has no bearing on preferences regarding who should get the short end of the stick. Yet different individuals or groups may receive different weights in household preferences. For example, there may exist different preferences towards outcomes depending on the gender or birth order of children. Equal concern implies that equal outcomes across individuals or groups are not weighted differently in the household's utility function. At points of equal outcomes, indifference curves are symmetric around the 45^0 line for any two members for whom the household has equal concern (see Figure 1b, curve A). Where there is unequal concern, indifference curves will be asymmetric, or slanted towards outcomes for a particular member or group (curve B in Figure 1b).

Figure 1. Indifference Curves in Behrman, Pollak, and Taubman Model



A: Extreme inequality aversion, B: No inequality aversion, C: Intermediate inequality aversion



A: Equal concern for persons 1 and 2, B: unequal concern for 1

In the BPT model, the optimal allocations of resources that a household chooses will depend on preferences (both inequality aversion and (un)equal concern) and also on the feasible set of outcomes. The feasible set of outcomes is determined by the household's production function(s),

and these outcomes need not be the same for all individuals or groups. Endowments differ across household members and the costs (prices) attached to these outcomes may also vary. Therefore, the production possibilities frontier (describing the feasible set) for outcomes across two individuals may not be symmetric around the 45^0 line. Households maximize utility when they obtain the highest indifference curve given the production possibilities frontier (tangency of the two curves). Thus, preferences exhibiting equal concern and some inequality aversion do not necessarily imply equal outcomes across individuals if the production possibilities frontier is asymmetric. This is demonstrated in Figure 2 for two hypothetical households, A and B. In household A, person 2 is relatively better endowed with health, while person 1 is in household B. Both households have identical preferences that display equal concern and the equilibria are shown as points A^* and B^*, neither of which embodies equal outcomes. Likewise, equal endowments and a symmetric production possibilities frontier do not ensure equal input allocations, and thus equal outcomes, if preferences display unequal concern.

To quantify the preference parameters regarding equal concern and inequality aversion, or the trade-offs arising from the production technology, specific functional forms for utility and household production must be explicitly assumed. In the context of food allocations and health outcomes, we follow Behrman (1988 a,b) and assume that the household level utility function has a separable, sub-utility function defined over the health outcomes of all household members. Further, the particular functional form of this sub-utility function must be stipulated, in this case it is the constant-elasticity-of-substitution:

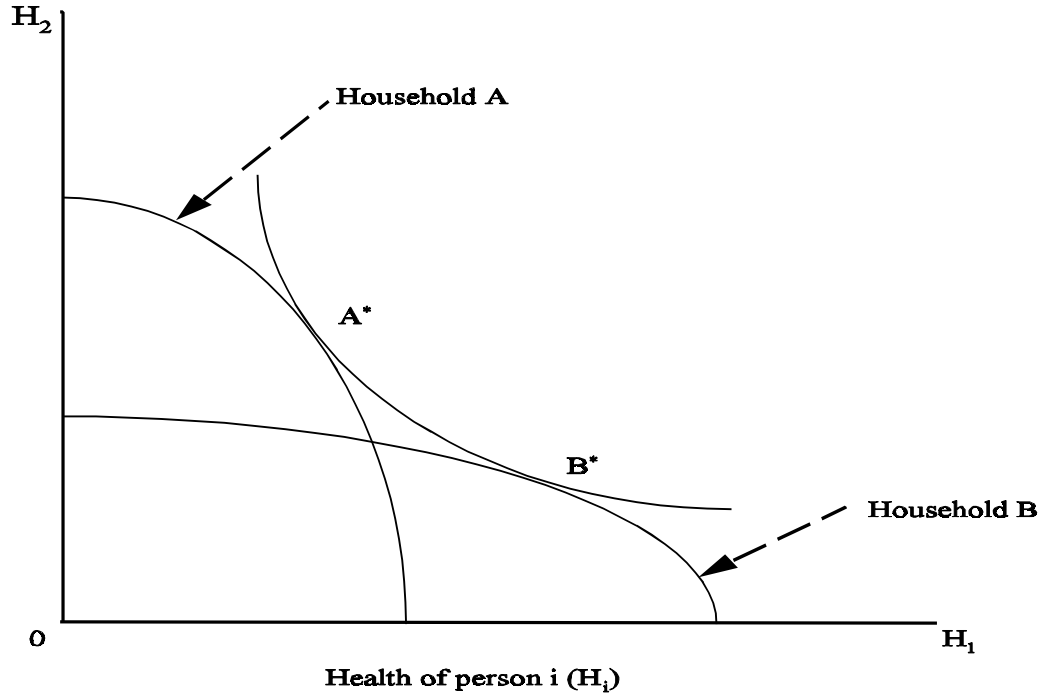
$$[1] \qquad U(H_1, H_2) = (\alpha_1 H_1^{\rho} + \alpha_2 H_2^{\rho})^{1/\rho}$$

The α's represent the equal concern parameters; if the health status, H, of persons 1 and 2 are equal and $\alpha_1 = \alpha_2$, then the marginal rate of substitution between the health of persons 1 and 2 is unity. ρ, which ranges from $-\infty$ to 1, represents inequality aversion: a value of $-\infty$ represents Rawlsian preferences and a value of 1 represents a linear indifference curve and thus no inequality aversion (a pure investment strategy). Next the technology of the health production function is assumed to be Cobb-Douglas, with inputs of food, other purchased inputs and individual endowments:

$$[2] \qquad H_i = N_i^{\beta} X_i^{\gamma} E_i^{\lambda}$$

where N denotes nutrient intake (it can be a vector), X denotes other purchased inputs and E denotes individual endowments. Note that food alone does not determine the health outcome.

Figure 2. Optimal Intrahousehold Allocations of Health Investments: Unequal Relative Endowments



The first-order conditions for a household with two members (or groups) can be derived from maximizing the household's utility subject to the production function and budget constraints. With these assumptions the first-order condition is:

[3] $$N_1/N_2 = (\alpha_1/\alpha_2)(H_1/H_2)^{\rho}$$

Solving for the reduced forms of N_1/N_2 and H_1/H_2, one obtains:

[4] $$(N_1/N_2) = (\alpha_1/\alpha_2)^{1/(1-\delta\rho)}(E_1/E_2)^{\lambda\rho/(1-\delta\rho)}$$

$$(H_1/H_2) = (\alpha_1/\alpha_2)^{\delta/(1-\delta\rho)}\ (E_1/E_2)^{\lambda/(1-\delta\rho)}$$

where $\delta = \beta + \gamma$. It is apparent that the relative health of person 1 is improved if his/her relative health endowment (E_1/E_2) is greater. If $\rho > 0$, more nutrients will be given to 1 as well, thus reinforcing his or her endowment.[4]

[4] Note that this results from the Cobb-Douglas health technology, which implies that increases in relative health endowments raise the relative marginal products of nutrient intakes.

While one would like to directly estimate equation [4], it is in general not possible, because health endowments are unobserved. If instead, both nutrients and health status are observed, the first order condition, equation [3], can be estimated (though see below for a discussion of the difficulties in interpretation due to statistical problems). Behrman has applied this approach to examine preferences underlying the allocations of schooling and nutrients in producing earnings outcomes in the United States (1982) and health outcomes in rural India (1988 a,b), respectively.

The model can be extended in several dimensions. One such direction is to allow flexibility in the structure of preferences across seasons. Allocations in "lean" seasons may be less averse to inequality, and more responsive to the relative productivity of allocations. For example, households may prefer to allocate food to members who receive the greatest returns to food in the labor market, resulting in unequal allocations in lean seasons. In "surplus" seasons, households may be in a position to allow less inequality in their allocation of nutrients, and to be less concerned with productivity. We may also see different degrees of inequality aversion and unequal concern across socioeconomic class lines.

Pitt, Rosenzweig, and Hassan (1990) develop and empirically test a model which also highlights the roles of endowments, labor markets, and preferences. They examine the linkages between food consumption, health endowments, health outcomes and labor market productivity with respect to the optimal allocation of food and labor market effort. Households determine the optimal amount of food and work effort for each member in order to maximize household-level utility, subject to household technology in producing health, income and a budget constraint. Resources allocated among household members are themselves valued, net of their effect on earnings (i.e., food and effort are in the utility function). In this case, households care about each member's food consumption and work effort beyond their anticipated effects on earnings. Food raises health, which raises labor-market productivity and utility, while labor effort lowers health (through energy expenditure) and utility, but raises labor-market productivity.

The authors show that in this framework allocations (food in this case) may reinforce endowment disparities, which is not inconsistent with inequality aversion in household preferences. Households may display *net* compensating or reinforcing behaviors, which can be measured by examining the return in health status to endowments. If the elasticity of health status with respect to endowments is less than unity, higher-endowed individuals have their health outcomes "taxed" in a sense, as a way to compensate lesser-endowed individuals. Although higher-endowed individuals receive greater allocations of food, they may participate in more energy-intensive labor-market activities, thus exerting more effort. So their health status does not necessarily increase proportionally with their endowments.

The Pitt, Rosenzweig, Hassan model suggests that allocations of calories are more likely to reinforce disparities in health endowments for individuals in groups which have low incomes and engage in energy-intensive, labor-market activities. In such groups the extra calories allocated to better health-endowed workers will aid them in engaging in strenuous activities. As the overall

available calories to the household increases, such differential allocations may be reduced, provided there is a decline in the marginal effect of calories on one's ability to do hard work.

As these two examples plus the Rosenzweig and Schultz paper show, much can be learned regarding intrahousehold allocations, with straightforward extensions to the neoclassical household production model with unified preferences. Despite this, some analysts argue that such unified preference models are flawed on both methodological and empirical grounds. The unified approach models the behavior of a group of individuals (households) as if they were a unique individual. In theory, these models rely on the aggregation of the utility (preferences) of individuals into a fixed household-level welfare function, which may violate micro-economic theory. While to some degree household preferences may be similar (due, for example, to assertive mating), the assumption that individual preferences are homogenous across all goods is probably too strong. On the other hand, the existence of one member dictating *and* enforcing allocations (possibly Becker's benevolent altruist) is likewise a strong assumption. While household members may have similar preferences or be altruistic towards each other, *a priori*, this is not grounds to dismiss conflict or differences in preferences over outcomes.

2.2. The Collective Approach

Challenging the unified approach have been a group of models that explicitly recognize the "collective" decision processes that occur within households. Households are modeled in a *collective framework* that recognizes the individualistic elements in households. Collective models make one major assumption: Pareto efficiency in intrahousehold allocations. Little else is assumed, however. Individualistic behavior can thus be cooperative or non-cooperative and no particular solution concept is imposed.[5] Chiappori and others have developed a model of collective decision-making that has a minimal description of household income-sharing rules, stipulating only that outcomes in households are Pareto efficient without specifying the solution concept. This approach encompasses the subclass of models within the framework of cooperative behavior (e.g., cooperative game theoretic models, such as Nash-bargaining models with symmetric information, and unitary models) without adopting highly restrictive assumptions that accompany specific collective models. Moreover, this general efficiency approach yields a set of testable restrictions which can be potentially falsified empirically and under further restrictions and, subject to data constraints, allows the estimation of certain structural components, such as the impacts of covariates on income-sharing rules.

Browning and Chiappori (1994) show that if behavior in the household is Pareto efficient, then the household's objective function can be written as a weighted utilitarian maximand. Simply put, if behavior is efficient, households maximize the weighted sum of each member's utility, subject to the budget constraint. For a two-person household:

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[5] While cooperative behaviors lead to Pareto efficient outcomes, non-cooperative behaviors need not (Chiappori 1992).

$$max \quad \mu\, U^A(x^A, x^B) + (1-\mu)\, U^B(x^A, x^B)$$

[5]

$$subject\ to\ p(x^A + x^B) = Y$$

where U^i represents member *i*'s utility, and x^i represents private consumption for *i*.[6] Total household income is Y, and p represents a vector of prices for x.[7] The variable μ can be thought of as representing the welfare weight of members (member A in this case) in household allocations, where μ lies between 0 and 1. The key point concerning μ is that it is not a constant, but a function of prices, total household income and possibly other variables (such as the distribution of income).[8] This model of efficient behavior collapses into the unified model if U_A and U_B are identical, *or* if μ is either 1 or 0 (i.e., members' preferences across all goods are identical, or there is a dictator in the household). Notice that each individual can be altruistic, as well as egoistic. That is, A's utility can depend in part on B's consumption, or not.

Given this maximand, one can write conditional demand functions, conditional on μ, as:

[6] $$x^j = f(p,\ Y,\ \mu(p,\ Y))$$

where the demand for x^i depends on prices, income *and* the individual's weight in the utility function. Conditional on μ, these demands obey all the usual restrictions of the individualistic demand theory. The reduced form demands can be derived by substituting μ out of the conditional demands:

[7] $$x^j = g(p,\ Y)$$

Browning and Chiappori show that empirically testable restrictions can be derived from $g(\cdot)$, which are analogous to, and a generalization of, restrictions on the matrix of income-compensated responses in the unitary model.

With reduced form commodity demands as in [7], the reduced form relationships would be unchanged for individual-level outcomes such as child health. It is only by imposing additional structure on [5] that testable restrictions can be derived. Once we generalize the maximand, [5],

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[6] Public goods can be added to the model; see Chiappori (1992).

[7] It is straightforward to allow for leisure-labor choice. Then Y will refer to full income: the value of potential time plus non-labor income; X will include leisure and p will include individual wage rates.

[8] This can be seen since μ can be written as a function of the LaGrange multipliers on individual's utility when the maximand is formulated as maximizing one person's utility subject to the budget constraint and to the reservation levels of utility of other members (Browning and Chiappori 1994). The LaGrangian in that case is:

$$U^A + \gamma(U^B - V^B) + \lambda(Y - p(x^A + x^B))$$

where V^B is member B's reservation utility. Dividing everything by $1+\gamma$ gives us the maximand in [5]. Note that the LaGrange multiplier γ (and hence μ) will in general be a function of prices and total household income, as well as any parameters affecting a person's reservation utility, such as individual earnings.

and its associated conditional demands, [6], to include factors that affect the distribution parameter, μ, but *not* preferences, then the reduced forms, [7], can differ. In particular, consider a set of factors, Z, which might include income or assets controlled by *individuals or groups* within the household (controlling for total household resources). If such factors alter the implicit welfare weights, μ, then they belong in the reduced form commodity demands, [7], unlike the unitary model.

This example leads to one testable implication of the unitary approach, that income is pooled across household members. Then the share of income controlled by particular members will not impact the structure of consumption or allocations of resources within the household, conditional on total household income. Testing for income pooling in the household is one approach to examine the validity of unitary models. However, rejection of unitary models does not imply support for any particular alternative approach (Bourguignon and Chiappori 1992).

To derive tests of the collective approach it is useful to reinterpret the model as consisting of a two-stage decision process with an *income-sharing rule*. For this interpretation to hold it must be the case that preferences obey certain functional form assumptions; in particular that if any member cares about another, what he or she cares about is the utility of that other person and not the amount of specific goods they consume. Thus the utility function is weakly separable in the private goods consumption of different members, such as in the following example in which A cares about B's welfare:

[8] $$W^A(U^A(x^A),\ U^B(x^B))$$

This is in contrast to the more general formulation of the collective model in which the preferences of A can be written as:

[9] $$W^A(x^A,\ x^B)$$

Note that egoistic preferences, in which one cares only about one's own consumption, is nested within both formulations. Kapteyn and Kooreman (1992) note that the assumption of weak separability of individual consumption can be strong. For example, meals eaten together may not be equivalent to meals taken separately, yet under separability no difference would be permitted.

Under the assumption of caring about the other's welfare (or under egoistic preferences), efficient behavior can be characterized by an income-sharing rule procedure (Chiappori 1992; Bourguignon et al. 1993). This situation is analogous to a two-stage budgeting procedure, by which households act as if they first pool and allocate income to each individual according to some household sharing-rule and then each person maximizes their individual sub-utility subject to the income allocated to them. If we let θ be the amount of income given to member *A*, in a two-person household the second person's share would be $(Y - \theta)$. In the second stage then, each

member of the household maximizes his/her own (sub-)utility subject to the share of income received:[9]

[10] $$\begin{aligned} &max\ U^A(x^A) \\ &subject\ to\ px^A = \theta \end{aligned}$$

The sharing rule, described by $\theta(\cdot)$, depicts the outcome of the resource allocation within the household. In the most general formulation, no structure (and hence no restrictions) is put on this sharing rule other than it is a function of exogenous constraints: prices, total income and perhaps other *distributional* factors. Thus, all cooperative bargaining models, as well as some non-cooperative models, are special cases, as is the unitary model in which θ is fixed.

The shares of income that are given to household members must not exceed the household budget constraint. Conditional demands for x^A can be written so that they will be a function of prices and $\theta(\cdot)$:

[11] $$x^A = x^A(p,\ \theta)$$

or alternatively in the form of equation [6].[10] For the case in which the sharing rule depends on relative incomes or assets that are held by different individuals, Y^A and Y^B, there exist particular testable restrictions of the collective approach. Since individual incomes only affect demands through the welfare weights, μ, or the income share, θ, it must be that the ratio of the marginal propensities to consume a good with respect to any two individual incomes (holding household income constant) should be the same across all pairs of goods (Bourguignon et al. 1993):

[12] $$\frac{\partial x_i/\partial Y^A}{\partial x_i/\partial Y^B} = \frac{\partial x_j/\partial Y^A}{\partial x_j/\partial Y^B} = \frac{\partial \theta/\partial Y^A}{\partial \theta/\partial Y^B} \quad or \quad = \frac{\partial \mu/\partial Y^A}{\partial \mu/\partial Y^B}$$

Note that in the unitary model this constant is unity.

In the collective model, the welfare weights or income-sharing rule measures the extent of an individual's command over the household's resources (income). The collective approach does not reveal how these weights and rules emerge in the household, but does imply that the reduced form sharing rule can be recovered from data. Of pivotal concern is what variables affect/determine each individual's weight in the maximand, or their share of income: what factors influence $\mu(\cdot)$, or $\theta(\cdot)$ and what are their effects? The weights or shares are functions of prices

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[9] The model is more complicated when public goods, household savings or durables are introduced. In the first stage, expenditures on public goods are determined. Then total household income minus expenditure on public goods is divided based on the income-sharing rule. In the second stage, utility is maximized subject to the quantity of income received and the quantity of the public good.

[10] The income sharing rule interpretation is not necessary for this particular derivation, although it is convenient for exposition.

and total household income. Any factors that shift tastes will also affect μ and θ. In addition, other variables may exist that affect only resource sharing, but not preferences directly. These could include individual incomes or assets, or what McElroy (1990a) calls Extra-Environmental Parameters (EEP's), such as divorce laws or other factors affecting the market for marriage, or certain cultural factors or constraints. Thus, the reduced form demand for goods may depend not only on prices and total income, but also on individual incomes (that is the *distribution* of income), and possibly other factors. The demand for goods is thus related to the power or command over income of individuals in the household. This is a strong distinguishing feature of the collective approach, contrasted with unified models in which *only* prices, total income and exogenous taste factors affect demand. However, the empirical importance of this will depend on the ability to identify variables that are related to bargaining power and their effects; that is, the parameters of the θ function.

In order to identify parameters of θ, more data and/or assumptions are required than we have made thus far (although, note that we can identify the ratios of individual income effects on θ, as in equation [12]). Browning, Bourgignon, Chiappori and Lechene (1994) show that if data are available on goods that are "assignable" (we can observe the separate consumption of individuals within the household) or "exclusive" (they can only be consumed by separate people or groups) and if there exist variables such as separate incomes or assets that affect income sharing, but not demands directly, then the effects of these variables on the income-sharing rule can be estimated. Intuitively, if we can estimate the ratios of the effects of individual incomes, Y^A and Y^B on individual consumption of a good, x^A and x^B, then we have two equations with two unknowns, which can then be solved (see Deaton, 1994).

[13]
$$\frac{\partial x^A/\partial Y^A}{\partial x^A/\partial Y^B} = \frac{\partial \theta/\partial Y^A}{\partial \theta/\partial Y^B}$$
$$\frac{\partial x^B/\partial Y^A}{\partial x^B/\partial Y^B} = \frac{\partial \theta/\partial Y^A}{\partial \theta/\partial Y^B}$$

We can then solve for $\partial\theta/\partial Y^A$ and $\partial\theta/\partial Y^B$, not just their ratio, as in equation [12]. Maintaining that a good is assignable or exclusive is often highly restrictive. For instance, women's clothing may be worn by only women, however, if men care about how their wives look, their wife's clothing would enter into their sub-utility function and so not be exclusive. A, perhaps, more plausible example of an assignable good is individual leisure. In this case the model needs to be generalized as in Chiappori (1988; 1992) to account for endogenous labor supply, but this is straightforward; for instance income will refer to nonlabor incomes.

The collective models are fairly general (though certainly not completely). For instance, they subsume cooperative bargaining models, although only a subset of non-cooperative models. Household members may bargain over allocations given some *threat point* or fall-back position. Threat points are characterized as some level of utility obtained if no agreement can be reached

(they are analogous to the reservation utilities in the collective approach). Any cooperative agreement must offer every individual some level of utility at least as large as that individual's fall-back position. "Surplus" utility, the amount of utility above the threat point, is then divided among individuals. Two questions need, then, to be addressed. First, what cooperative, bargained equilibrium describes the process of dividing the surplus? Second, how are we to define or specify threat points?

One particular framework designates a symmetric Nash-bargained solution. In a two-person household, members agree to maximize $[U^A - V^A]*[U^B - V^B]$ where U^i represents utility under the agreement and V^i represents the maximal level of utility that can be reached outside of an agreement. The Nash solution is not be the only possible one, which poses a difficulty for this framework. In addition, the Nash solution suffers from being sensitive to general monotonic transformations of the utility function, as in cardinal demand theory (Chiappori 1988b).[11] A further potential difficulty arises when the threat point corresponds to divorce, as in McElroy and Horney (1981). In this case, the marriage and divorce utilities may not be comparable if utility depends directly on marriage, as seems reasonable (Chiappori 1988b, 1991).

On the other hand, threat points may correspond to non-cooperative behavior within the household (Ulph 1988), such as in the separate spheres bargaining model (Lundberg and Pollak 1993). This would seem a more likely set of choices, given the extreme assumption under a divorce threat point: that individuals threaten divorce over daily, short-term decisions. A difficulty of game theoretic approaches is that results will, in general, be sensitive to such differences in specification.

As an example of the sensitivity to assumptions, taken from Lundberg and Pollak, consider the following two child support schemes: in the first a payment is made to the father and in the second, it is made to the mother. Under divorce the payment is always made to the mother, assuming that the child lives with her. Under the unitary model with an altruist as the family head, it does not matter who receives the income. In a cooperative Nash-bargaining model with threat points corresponding to divorce, who gets the resources also doesn't matter because the threat points, corresponding to the wife's and husband's incomes under divorce, are the same no matter who gets the income within the marriage, and family income remains unchanged if the marriage remains intact. However, if the threat point corresponds to noncooperation within a marriage, then the threat points *are* affected by who receives the income (and so the solution will be as well), so long as no binding, cost less prenuptual agreements exist that involve transfer of resources contingent on the state of nature, i.e., an income payment to one partner.

To date, the unitary model development has been static. Static extensions to include endogenous labor supply have been made (Chiappori, 1988, 1992) as have extensions to household production (Chiappori, 1994; Apps and Rees, 1996). In household production models, the ability to recover sharing rule parameters depends on separability of production from consumption decisions (see

[11] The solution is invariant to affine transformations, akin to expected utility theory.

Strauss, 1986 for a discussion of separation in unitary models).[12] This would occur if the household produced good is marketable and perfect markets exist. If the household good is nonmarketed, as in the case of child quantity or quality, then less is possible; the only derivations have been for the special case of constant returns to scale and no joint production (Chiappori, 1994).

In dynamic models a number of potentially difficult issues can arise. For example, it may be that the preferences of partners converge over time, as the partners become more alike, in which case the unitary models would be the limiting outcome. Modeling such taste formation will be difficult. Another issue is the stability of the household itself. Once one allows for dissolution, one has to also consider formation. As Lundberg and Pollak (1993) point out, the marriage market may involve explicit or implicit contracts which specify contingencies that can undo actions taken by one or another party, analogous to transfers across generations in models of Ricardian equivalence. For instance, a government transfer payment to the wife may be undone by reduced implicit payments by the husband. In general, an efficient marriage market will reduce the gains to marriage, eliminating the rents which can be bargained over. With positive assertive mating this would mean that couples are alike in preferences, making the unified approach reasonable.

While key implications of unitary models, such as income pooling, may be violated, can a general collective model or a specific bargaining model tell us more about intrahousehold allocations? The reduced forms from collective models are not necessarily distinct from those used under the unified model, particularly to the extent that use of additional variables suggested by the collective models may be limited due to data availability (Behrman 1992, 1993b). In other cases, the collective models may not change the formation of reduced forms, but they may alter the interpretation of coefficients. For example, in Rosenzweig and Schultz's (1982) estimates one could interpret the impact of female employment rates on relative boy-girl mortality as signaling greater bargaining strength for adult females, rather than, or in addition to, representing the effects of large market returns to investments in girls (see the beginning of this section and Folbre 1984b, 1986).

More broadly, empirically refutable implications of collective models need to be tested. As discussed below, only a handful of tests have been conducted, with not many being done on data from developing countries. The few tests that have appeared so far provide evidence against unitary models, but are mixed regarding collective models. Those testing demand-side implications seem to be consistent with collective models; however, tests of production efficiencies sometimes fail, which calls into question the key Pareto-efficiency assumption.

[12] Otherwise there exist effects through shadow prices that erase the validity of such restrictions as proportionality ones.

3. EMPIRICAL ISSUES

We begin with a discussion of general interactions amongst household members, in part because of the difficulties in modeling them, the subject serves as a good vehicle to discuss empirical issues. Some concepts, such as a person's health endowment, are inherently difficult to observe. Unobserved variables will often be correlated with included ones, leading to omitted variables bias. Some variables, such as an individual's earned income may be simultaneously determined and must be modeled as such. In some cases the observations used may be highly non-representative.

We discuss the evidence, first in terms of the unitary models, since there is much that approach has to offer, at least as a starting point. We go on to discuss the hypothesized greater propensity of women to allocate resources towards their children. It is here that the unitary models potentially break down and we discuss the associated evidence.

3.1. Interactions Among Household Members

Implicit in many of these studies is the notion that there might be trade-offs among household members either in long-run investment strategies or in responses to short-run opportunities or shocks. While a good deal can be surmised from this research, rather few studies have explicitly examined these sorts of interactions. One reason is that it is quite difficult.

Behrman (1988a,b) adopts the BPT model to examine intrahousehold resource allocations. As seen from equations [1]-[3], this model allows for a distinction between parameters of technical production functions and of taste parameters. Within taste parameters, it allows for a distinction between general inequality aversion and differential welfare weights for particular household members or groups. Identifying these structural parameters, in turn, allows one to distinguish between the effects of differential tastes and investing where returns are the highest.

Behrman examines the relationship from equation [3] among a series of health outcomes (weight, weight-for-height, and arm circumference) and five nutrient inputs. Using the Indian ICRISAT data, Behrman reports that there is very little difference in the mean nutrition outputs or inputs (relative to norms) for both boys and girls. However, after imposing the model structure on the data, he finds that there is, in fact, significant pro-male bias during the lean season, which evaporates during the surplus season. The bias is only apparent among the bottom castes, with the top caste indicating some pro-female bias. There is also evidence for inequality aversion among parents, but only during the surplus season. Behrman interprets the results as indicating that parents follow a pure investment strategy during the lean season, but when they can afford to (in the surplus season), they display considerable inequality aversion to the point of allocating nutrient inputs towards children with lower health endowments.

Unfortunately, the implications of the model lead to a regression of the ratios of outputs (child weight) of separate individuals to the ratios of inputs (nutrient intakes) used, as in equation [3]. Estimation of such an equation using OLS, in general, results in biases due to unobserved heterogeneity (omitted variables). In this case it is likely that not all the inputs into the health production function are observed and as well there may well be misspecification of the utility or production functions. Behrman argues the bias is likely to be upwards for the inequality aversion parameter. While, in principal, one could use instrumental variables to correct for such a bias, in practice it is difficult to find plausible instruments within the model, because any instruments should differ in value by individuals if they are to have any predictive power and many potential instruments, such as food prices, are identical across household members. In other words, to instrument for different quantities consumed across household members we would ideally like to use different prices, however, if all members face the same price for a particular good, there will be fewer prices than quantities (see Pitt 1995 for an excellent discussion).

In their study of the relationship between productivity and health, Pitt, Rosenzweig, and Hassan (1990) try to measure the effects of hard-to-observe health "endowments" on several outcomes, such as whether an individual engages in arduous tasks, or whether calorie intakes reinforce or compensate for such endowment differences. They also ask whether there are interactions among household members by looking for cross-effects in the impacts of endowments on calorie intakes. To get at these questions, they set out a structural model not unlike the BPT model. They view health "endowment" as an innate characteristic of an individual which is timeless. They assume that households can observe this innate "healthiness", even though in the data typically used, the analyst cannot. If health endowments are observable, they may affect resource allocations, as well as the ability to do work and earn income. Since they are exogenous by definition, if they could be measured, they belong in reduced form equations for such outcomes as nutrient intakes. The problem then becomes how one can go about measuring them.

Pitt, Rosenzweig, and Hassan follow a methodology pioneered by Rosenzweig and Schultz (1983) by estimating a "production function" for a health outcome, in this case adult weight for height. They take individual-specific residuals as a measure of the health endowment. Since they are estimating a technological relationship, provided all inputs are accurately measured and the functional form is well-specified, the residual should incorporate only technological information; no aspects of tastes or behavior should be embedded. If multiple measures of the residual were available, these could be averaged to obtain a measure of the time-invariant health endowment.

The advantage of this procedure is that is avoids the difficult issues of finding plausible identification assumptions needed to estimate structural models. The procedure does require several strong assumptions, however. The most difficult is probably that all inputs have to be well measured and the functional form well specified. It is difficult to measure all the various inputs well, particularly in a biological relationship. Pitt, Rosenzweig, and Hassan, for example assume that the production function is identical for both men and women and that past health inputs don't affect current weight-for-height (the inputs they use include current calorie

consumption, an indicator for working in a strenuous occupation, being pregnant and variables indicating sources of water).

A second difficulty is that even if all relevant inputs are accounted for and the functional form is specified correctly, random measurement error in inputs will lead to coefficients being biased towards zero. Pitt, Rosenzweig, and Hassan use lagged residuals and residuals from other health outcomes as instruments. However, in the face of systematic measurement error, for instance caused by omitted inputs, this is not likely to be satisfactory, since autocorrelation in inputs is likely due to common time-invariant conditioning factors such as long-run resource availability.

As discussed above, Pitt, Rosenzweig, and Hassan find that higher own-health endowments for men increase their calorie intakes, thus representing reinforcing behavior, make them more likely to engage in strenuous occupations and raise household income. These relationships are not found for women. When they look for "cross-effects", that is the effects of endowments of one group on allocations to another, they find no evidence of cross-effects; however when the average endowments of males and females are distinguished, then there is some evidence of a negative effect of the endowments of other males on any particular man's consumption. This is to be interpreted as meaning that when healthy men are fed more (thus enabling them to engage in work activities), the calories they consume are coming from less well-endowed men more than from women or children. However, since the significance of this is marginal, the authors' interpretation that men are bearing the brunt of the household compensation mechanism seems somewhat strong.

Pitt and Rosenzweig (1990) examine the impact of infant morbidity on time allocations of other household members. They point out that time allocations within the household are likely to be interdependent and that infant morbidity is not only affected by time allocation but may also affect these allocations. Focusing on mothers, sons and daughters, they distinguish three activities (schooling, home work and leisure), each of which is measured as an indicator variable. Allocations across pairs of activities are compared using a Chamberlain fixed-effects, conditional logit model to sweep out all household invariant effects. The difference in the latent variables for activities across types of people (e.g., mothers, daughters, sons) is then related to exogenous factors, plus the latent health variable for the infant. Infant's health is treated as endogenous and identification is achieved by assuming that community infrastructure and prices affect the activity levels of different people in the same way, conditional on infant health. This is a different identification strategy than the usual exclusion restrictions and it implies that the impact of infrastructure on time allocations is identical for wives, sons and daughters. Thus, infrastructure is swept out in the fixed-effects specification and so may be used as instruments for infant health in the conditional logit equation.[13] Treating infant morbidity as endogenous, they find that, as it increases, the time allocation of sons is little affected, but that the time allocation of mothers and

[13] The effects of other characteristics are allowed to vary across the demographic groups. This assumption is, perhaps, weaker than an *ad hoc* exclusion restriction, but it is nonetheless strong. It implies, for instance, that food prices only act as prices of health in their effects on time allocation.

daughters is significantly rearranged. Mothers tend to shift out of the labor force into home care, whereas daughters move out of school into the home, although the differences between mothers and daughters are not significant.

This discussion is at a general level, however, concern with intrahousehold allocations often has a policy concern with different groups within the household, typically women or children or both. We turn to a discussion of evidence regarding gender discrimination and discuss these issues in terms of unitary models of the household, since there is much that approach has to offer, at least as a starting point. We go on to discuss the hypothesized greater propensity of women over men in allocating resources towards their children. There is a substantial literature that argues that men and women have different preferences: it is often asserted that, relative to fathers, mothers care more about the health, education and well-being of their children. If true then this would suggest that women will seek to allocate more resources towards improving child health than would men. It is here that unitary models potentially break down and we discuss associated evidence.

3.2. Gender Differences in Human Capital Outcomes and Investments

Sen (1990) argues that "over 100 million women are missing" in Asia and North Africa, where female mortality rates are substantially higher than those for men.[14] Data on completed family size or parental intentions have been used to argue there is evidence for gender preference in fertility outcomes.[15] Other studies have looked at gender differences in a series of health inputs and outputs. Broadly speaking, in south Asia, and possibly southeast Asia, females tend to fare worse than males,[16] but the evidence elsewhere seems weaker.[17] In terms of schooling, there is evidence in a variety of countries, especially Africa and Asia, that women are significantly less

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[14] Also see evidence regarding infant and child mortality in Bangladesh (D'Souza and Chen 1980) and in India (Rosenzweig and Schultz 1982).

[15] See van de Walle (1992) for a review and Rosenzweig and Wolpin (1993b) for a good discussion of some of the problems in interpreting attitudinal and intention questions.

[16] Sen (1984), Sen and Sengupta (1983) and Behrman (1988a) argue that, on the basis of anthropometric indicators, boys receive preferential treatment in India. Several studies indicate that boys tend to be favored in the intrahousehold distribution of nutrients (Behrman and Deolalikar 1989 for India; Evenson et al. 1980 and Senauer et al. 1988, for the Philippines; Chen, Huq and D'Souza 1981 for Bangladesh; and Chernichovsky and Meesook 1984 for Indonesia). Strauss, Gertler, Rahman and Fox (1993) present evidence that women are more likely to have functional disabilities than men; this is true for older people in Malaysia and Bangladesh and for all ages in Jamaican families.

[17] For reviews of the anthropometrics literature see Behrman (1990); Svedberg (1990) for Africa and Schofield (1979) for Latin America. In the equivalence scale literature, there is little evidence for gender bias in the allocation of expenditures in the Côte d'Ivoire and Thailand (Deaton 1989), or in the United States (Gronau, 1988).

well-educated than men, although this difference seems to dissipate with a higher Gorss Domestic Product (GDP) and has narrowed in recent years (Schultz 1993a). Finally, in terms of labor supply, when time engaged in home production activities is included, women seem to work longer hours than men in many developing countries (see, for example, Evenson et al. 1980; Folbre 1984a; and King and Hill, 1993).

Why might households appear to discriminate against daughters? First, the expected returns to investing in sons might be higher. If households seek to maximize their total income, then in the absence of credit constraints, they should invest differentially in each child's human capital to fulfill this goal. The household may then use financial transfers to redistribute incomes among the children (Becker and Tomes 1979). Although it is far from clear why a household would seek to maximize income rather than utility, the assumption of no credit constraints is strong (particularly for low-income households) and so a greater market return to investments in sons is a potentially powerful reason for discrimination.

In many traditional societies, parents rely on their sons to look after them in old age, while daughters contribute resources to their husband's families (Caldwell 1977; see also Tang 1981; Greenhalgh 1985; and Das Gupta 1987). In such cases it would be efficient for the parent to invest more in a son than in a daughter. If parents care solely about themselves, then it is only expected net returns to the parent that matter in their investment calculation; both benefits and costs need to be included. Notice also that returns need not be measured only in terms of income (or remittances), but might also take account of the time spent caring for parents. Indeed, with the development of pension and social security programs, these aspects are likely to take on an increased importance.

The higher expected lifetime earnings of men are not sufficient to explain greater investments in sons relative to daughters, since parents must also be able to extract more resources from sons than daughters. Furthermore, if investing in a daughter leads to a better marriage and that married daughter provides resources to her parents, then discrimination may not be explained by market returns alone.

Using district-level data on mortality outcomes in rural India, Rosenzweig and Schultz (1982a) argue that male and female mortality rates respond to expected, relative market wages and find evidence to support this view. Relative male-female labor force participation rates are positively related to boy-girl mortality rates, controlling for education of the mother and father, non-labor income, land owned and various village characteristics.

On the other hand, gender wage differentials are abundant in both developed and developing economies, with the vast majority of the literature indicating that women earn lower wages.[18]

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[18] See, for instance, Birdsall and Sabot (1991). However, lower wages need not reflect either statistical or taste discrimination; some may be due to real productivity differentials. Foster and Rosenzweig (1992) argue that productivity differentials are responsible for most of the apparent gender wage differentials in areas of rural

But, since similar gaps are not typically observed in terms of male and female child mortality, it seems likely that other explanations for gender discrimination play important roles.

Differences in the costs of boys and girls may be a second source of apparent discrimination within the household. For example, in a dowry system girls incur an extra cost compared to boys. Bardhan (1988) has noted this overlap between those areas of India which have dowries and those areas with higher girl mortality. In some societies with dowries, the woman's origin household is even responsible for making contributions to the husband's family after marriage (Das Gupta 1987).

Investment costs may also differ. Young girls may provide child care or household services if they do not go to school, in which case the cost of schooling a daughter, inclusive of the cost of time, may be higher than the price of schooling a son. However, this argument can be easily reversed if sons provide help on the farm, which raises the question of why these costs might be different, an issue about which there has been little scientific research.[19] Notice that all these motivations for differential investments in sons and daughters can arise even with the parents being equally concerned about each of their children.

There might be differences, however, in resource allocations simply because of tastes, which may reflect social and cultural norms. Parents might just derive more pleasure, or utility, from investing in sons, rather than daughters. Differential human capital investments might also reflect attempts by parents to compensate for other investments (or endowment differences) in their children so that all their offspring are equally well-off. Quisumbing (1994a), for instance, finds that Filippino households give more land inheritances to sons, but more education to daughters. While no conclusions can be drawn regarding the extent of equalization, the direction seems clear.

There is a general concern with this genre of studies. While the evidence regarding substantial mortality and education differentials between boys and girls is unequivocal, other, more subtle, evidence regarding gender differences in health inputs and outputs is less readily interpreted. For example, simple comparisons of nutrient intakes of men and women tell us nothing about differences in resource allocations unless we also know the nutritional *needs* of these men and women. Needs are very difficult to measure, however, and are related to many factors, including activity levels, body size and previous nutrient intakes, all of which are endogenous. As an alternative, many studies use standards derived from healthy populations. This too raises a degree of arbitrariness and will give little insight regarding the reasons for the allocations.

India and the Philippines. Of the remainder, the overwhelming evidence is that it is related to statistical discrimination resulting from employer ignorance of true worker productivity; there is no evidence for taste discrimination.

[19] If it is only net returns that parents care about, then why not invest in only one son? Parents may be averse putting all their eggs in one basket should that son turn out to be a lemon or die.

Using food recall data, Haddad and Kanbur (1990) demonstrate that there is in fact considerable intrahousehold heterogeneity in the proportion of calories consumed relative to "requirements" (as set by international standards). They show, for example, that ignoring intrahousehold variation (that is, using household averages) results in a 20 to 40 *percent* underestimate of the poverty rate when compared with that estimated with individual data. However in light of the concerns just raised about "needs", it is not entirely obvious how to interpret these results.

Indeed, there is evidence that taking account of typically unobserved heterogeneity in energy output and body size can completely change inferences regarding evidence of gender differences in nutrient intakes. Pitt, Rosenzweig, and Hassan (1990) report that men in rural Bangladesh tend to consume more calories than women. At first blush, this might be interpreted as a pro-male bias. However, men also tend to be engaged in more active occupations than women: clearly, in order to assess whether men (or boys) are treated preferentially in the allocation of energy intakes, it is necessary to at least take account of energy output. Pitt, Rosenzweig, and Hassan examine the impact of health endowments on calorie consumption when endowments are measured by the "residual method" (in a series of anthropometric production functions). While the results rely on a series of strong assumptions (see below), they are certainly provocative. Higher own endowments increase nutrient intakes for only men- not for women. That is, households seem to allocate more resources to members with better health endowments, who are more likely to work at energy-intensive activities which pay relatively high wages. When the data are stratified by age, the authors find that endowments affect intakes for men older than 12 and for both boys and girls aged 6 to 12 which, they argue, are those individuals in the household with the greatest scope for varying energy intensity. Of course, this sidesteps the question of whether there is truly gender discrimination in the allocation of tasks, but at least the study directs us towards the questions that do need to be addressed.

We can avoid the types of problems raised by norms by asking whether additional resources available to a household are allocated differently to boys and girls. For example, if the household were to be given more income, who would benefit most?

Drawing on the equivalence scale literature, Deaton (1989) examines the impact of additional girls versus boys on *household* expenditure patterns, focusing on adult goods. If it is possible to measure household consumption of goods consumed exclusively by adults, such as cigarettes or alcoholic beverages, then one might expect that as children are added to a household, expenditures on these goods would be likely to fall. If this decline is smaller for additional boys, relative to girls, then this *may* be evidence of discrimination in favor of boys.

To properly make this inference requires that children have only income effects on the consumption of adult goods, since substitution effects would be difficult to interpret as discrimination. This, in turn, would be so if preferences were separable between adult and other goods and if children did not enter into the adult goods sub-utility function. Notice the similarity here to the separability assumptions used by Chiappori in his discussion of the collective model. Weak separability implies that utility can be represented as:

[14] $$V = V(U_a(x_a, Z_a), X, Z_a, Z_c)$$

where x_a are adult goods, X are all other goods, Z_a are adult characteristics such as number and age composition and education and likewise, Z_c are child characteristics. Then, conditional on total expenditures on adult goods, θ_a, x_a is a function only of prices of x_a, and Z_a. Total expenditures on adult goods, θ_a, will be a function of total income, all prices and adult characteristics, Z_a and child characteristics, Z_c. Thus, child characteristics will have only income effects. If we then examine the ratio of boy to girl effects on the ith adult good, x_{ai}, this ratio will equal the ratio of boy to girl effects on adult expenditures, θ_a. That is:

[15] $$\frac{\partial x_{ai}/\partial Z_b}{\partial x_{ai}/\partial Z_g} = \frac{\partial \theta_a/\partial Z_b}{\partial \theta_a/\partial Z_g}$$

Using data from the Côte d'Ivoire (Deaton 1989), India (Subramanian and Deaton 1990) and Bangladesh (Ahmad and Morduch 1993) there seems to be little evidence for gender differences in household allocations (see Gronau 1988, for related evidence for the United States and Haddad and Reardon 1993, for evidence from Burkina Faso). The results from south Asia are a bit surprising in view of the perceived wisdom that boys are favored over girls and so raises questions about the power of these tests.

That these tests might have very low power is not surprising. These tests are very indirect, in contrast to comparing gender-specific mortality rates, for instance. Moreover, we are typically trying to infer bias from differences in the consumption of goods with tiny budget shares or for which many households do not consume at all, such as alcohol or tobacco. Even more, these two goods are addictive, so it is unclear whether we should expect major changes, at least in the short run, in response to an unplanned birth; perhaps in response to planned births there might be more of a impact. Many other goods are difficult to assign exclusively to adults, even those goods which are, in principle, assignable (such as female adult clothing). Indeed, one could even make this argument for alcohol or tobacco; for instance, children driving parents to drink is fundamentally a substitution effect and hence inconsistent with the separability assumption needed for this analysis. Finally, this approach assumes that the number of children in a household is exogenous, rather than allowing for the fact that couples and families have preferences regarding the number of desired children and make consequent choices regarding contraception and other factors that impinge on fertility. If one allows for endogenous childbearing, then these empirical results are impossible to interpret as Deaton and others do (see Browning 1992, for an excellent discussion).

Browning and Subramaniam (1995) and Deolalikar and Rose (1995) take a different and more compelling approach. They use longitudinal data from the ICRISAT south India villages and ask what difference does the *gender* of a birth have on subsequent consumption, income generating

and other behavior.[20] Browning and Subramaniam extend Townsend's (1994) approach to modeling consumption smoothing by regressing changes in log household consumption, from the year before to the year after a birth, on a dummy equal to one for girls and minus one for boys. They add other variables as well, that one would expect to be factors from the risk pooling literature.[21] In contrast to the cross-sectional results, they *do* find that having a girl reduces consumption right after the birth for medium and large landowning households. Indeed the implied savings, added up over time, come very close the values of dowries reported in the data and so they conclude that it is marriage costs (dowry) that is the most likely explanation for unequal allocations favoring boys.[22] Their results do not hold for landless households, however.

Deolalikar and Rose use the same data and find, consistent with Browning and Subramaniam, that landed household savings rise after the birth of a girl.[23] However they do not find much of a change in consumption, rather they find that income, particularly crop income, increases after birth of a girl, relative to birth of a boy. The value of family labor is *not* netted out of income, and so the measure is not a pure profit measure. Why crop income should increase after birth of a girl is not well explained. If true, however, that suggests that the estimates adjustment made by Browning and Subramanian may be substantially understated. Deolalikar and Rose also find weak evidence that expenditures on health care rise after birth of a boy. This is potentially important as it is consistent with the evidence from Chen, Huq, and d'Souza from Matlab, Bangladesh that girls are denied health care relative to boys and would help to explain the findings of excess girl mortality in the literature. One note of caution for both the Browning and Subramanian and Deolalikar and Rose studies; the sample sizes they are dealing with are very small, 68 households over 5 years with 25 boy and 11 girl births for the Deolalikar and Rose study, for instance.

Thomas (1994) takes yet a different approach, with cross-sectional data, and examines the effects of household resources on a child specific outcome, height-for-age. He finds that maternal education and non-labor income has a larger impact on the height of a daughter, relative to that of a son and that paternal education has a bigger impact on a son's height, relative to a daughter's height. These results are robust to the inclusion of household fixed-effects and suggest that

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[20] As Deolalikar and Rose note gender might be endogenous if births and deaths for girls are systematically under reported.

[21] This includes changes in average village level consumption and changes in household demographics and household income.

[22] This is consistent with Bardhan's (1988) explanation for excess female mortality in India being concentrated in regions that use the dowry system.

[23] They use household fixed effects in their estimation, regressing levels of savings, consumption or income on separate dummies for a boy or girl birth, contemporaneous and lagged for four years. While the birth variables may be endogenous, the *difference* in coefficients is much less likely to be, especially after accounting for household fixed effects.

mechanisms underlying intrahousehold allocations among boys and girls may be quite complex. (See also Thomas 1990; and Thomas, Schoeni and Strauss 1996).

Several studies have compared the impact of community resources on individual welfare indicators for boys and girls, such as education, health inputs and outputs. There is some evidence that price and income elasticities of human capital investments are higher for girls than for boys. That is, according to several studies, if prices are raised, then girls are more likely than boys to drop out of school or not receive medical attention. See, for example, De Tray (1988) and Gertler and Glewwe (1992) who examine the demand for schooling in Malaysia and Peru respectively and Schultz (1988) who uses cross-national data on schooling. Behrman and Deolalikar (1989) also find a greater price responsiveness of girls' anthropometric outcomes in India and Alderman and Gertler (1989) find the same results for the demand for health care in Pakistan. Using data on individual nutrient intakes from the ICRISAT survey in India, Behrman and Deolalikar (1990) report that estimated price and wage elasticities of intakes are, in many cases, substantially and significantly lower (algebraically) for females than for males. Thus, for nutrients with negative elasticities (which is not all of them), women and girls would share a disproportionate burden of rising food prices.

3.3. Differences Between Siblings

Not only might there be differential investments in sons and daughters, but investments might differ by birth order, either because of biological factors, which work through birth weight and birth spacing, for example, or due to behavioral influences. These may complement or counteract each other and are likely to operate differently at different ages of the child (and parent). For instance, first-borns tend to have lower birth weights for biological reasons, yet if parents favor them in resource allocations, they may grow faster than later-born children.

For social scientists, behavioral influences are of paramount interest. For example, it may be that parents prefer their first-born or, perhaps, the youngest child more than the others. Part of this may reflect tastes, but in part may also reflect expected future returns, particularly if one of the children (the oldest or youngest) tends to maintain closer links with the parents later in life, as is traditionally the case.

An hypothesis with more of an economic foundation is that there is resource crowding within the household so that as more children are born, household resources are stretched and there is less available *per* child. If the household is able to perfectly smooth inter-temporal consumption (or investment) then resource crowding should have no impact on a child's well-being. In a world of credit constraints, however, this is an unlikely scenario. Whether the first-born or last-born is the best off is not unambiguous and clearly depends on the life cycle pattern of household income.

Wages tend to rise over the life cycle, thus mitigating resource crowding, though they may not rise rapidly enough to fund new investments as additional children join the household. Older

children, however, may enter the labor market and thus free up resources for their siblings or augment household resources which could be spent on their younger siblings. Younger siblings might also benefit from asset accumulation by parents who are later in their own life cycle and so have had time to accumulate resources; these assets might be drawn down to finance the schooling of their children or used as collateral for borrowing.

Higher birth-order children may also learn from the experiences of their older siblings. Along the same lines, parents are also likely to learn through their experiences and may be more efficient at raising later children. Thus, it may be useful to distinguish older from younger siblings and perhaps boys from girls, as they may have different roles in the household.

Studies of the effects of birth order on a child's schooling and health differ in whether the composition of siblings is considered and also by whether interactions are allowed between the number of children and their birth order. Also, most studies of birth order or household composition ignore possible heterogeneity bias resulting from the correlation of higher birth order or the number of siblings with the number of children ever born, although a few studies have attempted to struggle with this issue.[24]

Birdsall (1979, 1991) examines the impact of birth order on the educational attainment of urban Colombian children, distinguishing between different sized households, whether the mother is working for a market wage and household income. These stratifications allow a number of subtle questions to be examined, at the cost, however, of using arguably endogenous variables for the stratifications, with the number of children and whether the mother is working being particularly worrisome. She finds that being both the first- and last-born in a family of three children with a non-working mother is associated with higher schooling attainment relative to age-specific norms. This effect is not found among children with working mothers and yet it persists among higher income families. The latter result suggests that credit constraints are not the entire story; Birdsall hypothesizes that time constraints may be partly responsible for the pattern among high-income families.

Several other studies have examined the effect of birth order on child schooling outcomes, controlling for a fuller range of parental, household and community characteristics, although they also ignore potential heterogeneity bias associated with the number of siblings or birth order. Exploiting an unusual data set from Taiwan, Parish and Willis (1993) include a richer set of household and sibling composition variables to examine a child's completed education, along with

[24] Behrman and Deolalikar (1988) review the child quantity-quality literature. The essence of the problem is that prices of having or avoiding children are typically unobserved. Use of twins has been proposed as one way of avoiding heterogeneity (Rosenzweig and Wolpin 1980); another is to estimate biological fecundity as a residual from a fertility production function and then use the residuals in reduced form equations for health or other quality outcomes (Rosenzweig and Schultz 1985, 1987). These studies do not, however, examine the influence of birth order or other potential sibling influences.

the timing of marriage and work among both adults and children.[25] Controlling for the number of siblings and birth order, they find that additional siblings are associated with less education among both men and women and that this effect is largest among the most recent cohorts. Since higher birth order children (who are in more recent cohorts) tend to be better educated, it is the middle children who pay the largest penalty for having many siblings. The gender of the sibling also turns out to be key. For both men and women, more younger siblings of the same sex are a threat to educational attainment. The effect of older siblings is quite different, however: whereas older brothers reduce the educational attainment of only men, additional older sisters are associated with more education for *both* men and women. Parish and Willis argue this is because older sisters reduce the resource constraint on the family, either by marrying early (and thus reducing demands on the family as well as providing a bride price) or, to a lesser extent, by working (and possibly sending money home). All this suggests that households are not discriminating against all women, but rather that resource constraints are binding and older daughters bear a good part of that burden.

To test this view, the authors stratify their sample on a measure of socioeconomic security and find that the deleterious impact of larger sibsize is concentrated among those with lower economic security and, furthermore, that additional older sisters are the least damaging to one's educational prospects. Since family size has declined dramatically over time in Taiwan, one might expect resource constraints to be less binding among the more recent cohorts. Apparently, however, the negative effect of sibsize on education is highest among the most recent cohorts. Parish and Willis speculate that this reflects increasing opportunity costs of education (in terms of lost labor income) for recent cohorts and so this trade-off is the most apparent for younger women, who are increasingly entering the labor market.

The story, as told by Parish and Willis, suggests that this has less to do with preferences and more to do with resource constraints, which contrasts with Birdsall's results for Colombia. What is clear, however, is that it seems sibsize affects investments in children and that the gender and relative age composition of one's family are critically important factors determining resource allocation and the educational level one attains.

These studies are potentially affected by heterogeneity bias, although exactly how much is not clear. In a study that does attempt to control for heterogeneity, Horton (1988) uses household fixed effects to model the impact of birth order in reduced form equations for height-for-age and weight-for-height of Philippine children. Using the Bicol sample, she finds a negative effect of birth order on height, with a weak degree of concavity although, unlike Parish and Willis, this effect is not offset by better educated mothers or greater household assets. She does find a significant positive, although very small, interactive effect of birth order and number of children in the household, but since these effects are not interacted with gender or the composition of siblings, they cannot be directly compared with the findings of Parish and Willis. In contrast, however, she finds essentially no effects of birth order on the shorter-run measure of nutritional

[25] See, also, King and Lillard (1987) and Lillard and Willis (1994).

status, weight-for-height, except for a small negative effect in households with more than two children. She interprets the differences between the impact on height and weight-for-height as reflecting the impact of household resources although since assets are included in the model and have little impact on either outcome, it is not clear whether or not her interpretation is correct. It is striking that the magnitude of the negative birth order variable increases six-fold when household fixed effects are incorporated, compared with ordinary least squares (OLS), indicating that either heterogeneity or measurement error may be very important. At the very least, these results suggest that it is prudent to be cautious when interpreting birth order effects.

3.4. Differential Tastes Among Household Members

The above analyses can be interpreted in terms of a unitary model of household decision-making. However, there is also a view that resources in the hands of women will do more to promote child welfare than would the same amount of resources controlled by men. Some of the evidence for this view seems to be based on the observation that mothers contribute a large portion of the expenditures they make on children. Furthermore, those children whose mothers work, and thus earn income, are often healthier. While the number of studies examining this hypothesis is not extremely large, nor are the results universal, enough descriptive evidence has emerged to fuel numerous hypotheses.

A number of such findings come from the anthropological literature and derive from case studies. In some regions, household members may have separate purses and may perceive that they have obligations for purchasing certain items. For instance, Guyer (1980a, 1988) observes that women among the Beti in Cameroon contribute two-thirds of the total cash expenses for food and "routine" household supplies while earning only one-third as much as their spouses. Moreover the women also grow the main food crops for the household. Mencher (1988) finds that, among very poor, landless farm laborers in 20 south Indian villages, women consistently contribute a higher share of their income towards household subsistence than do men. Other examples can be found as well. Such evidence is not direct, since it may reflect specialization and greater efficiency in time allocation. Since women usually contribute the lion's share of total time used in caring for children, it may make sense to also specialize in the provisioning of non-labor inputs, such as food intake and health care, into child-rearing.

If women contribute more resources under their control towards child welfare, then children should be better off in female-headed households. While female-headed households may be poorer than male ones, the nutritional status of children may not necessarily be worse. Kennedy and Peters (1992) study the interaction of income and the household head's gender in the countries of Kenya and Malawi. Kennedy and Peters consider both *de jure* (those women considered legal heads of household by the respondents), and *de facto* heads (defined as the male household head being gone 50% of the time). While aggregate statistics show that female-headed households have lower income (as measured by per capita expenditure levels) female-headed *de jure* households and male-headed households in both Kenya and Malawi have per capita

expenditure levels that are not significantly different. While female-headed households spend a larger proportion of their income on food, when female-headed households are broken down into subgroups, differences in income (expenditure level) explain the basic difference in expenditure patterns. In Kenya, *de jure* female-headed households, whose expenditure levels are comparable to the male-headed households, spend a comparable share of their budgets on food, compared to male-headed households. In Malawi, both *de jure* and *de facto* female-headed households have less income than male-headed households and spend a larger share on food. However, the female-headed households of migrant workers in Malawi have larger incomes, with a smaller share of it going to food. These results are consistent with the notion that the income elasticity of food demand declines as incomes rise. To some extent, patterns do differ by gender of household head. In Malawi, male-headed households spend more on alcoholic beverages and a greater budget proportion on productive inputs, like fertilizers, than do female-head households, even after breaking female-headship into subgroups. Thus, expenditure patterns are a function of both gender and income.

The authors also examine the impact of income and gender on child health and nutritional status. Despite income differentials, the prevalence of malnutrition is lower in female-headed households, both *de jure* and *de facto*, than in male-headed households. Reflective of this result, in Kenya, the prevalence of illness and diarrhea is lower in the *de facto* female-headed households, again, despite their lower incomes. In both Kenya and Malawi, children in *de facto* female-headed households are allocated a higher proportion of total household calories than children in other households. These results, too, suggest that women may allocate resources differently than men.

Taken together, these pieces of evidence provide support for the view that resource allocations within households may depend critically on who is providing the income. However, the interpretation of this evidence is not straightforward. Comparisons of children in female- and male-headed households are difficult for several reasons. As discussed by Kennedy and Peters, a household may be female-headed for different reasons, which are likely to have different implications for such outcomes as child health. A male head of household may have become sick and die, leaving his wife as titular head, or the wife may become head while the male is still alive, but sick. The male may have migrated temporarily for economic reasons, leaving the wife as temporary head, or the couple may have divorced. In all of these cases, headship is potentially endogenous and factors that influence headship (both observed and unobserved) may also affect such outcomes as expenditures or child health.

As one such factor, positive correlations between a mother working (and hence bringing in more income) and the health of her children may simply reflect a positive correlation between child health and household income, if households with working women have higher total income. Not all studies control for total household income. Another confounding factor is that family members choose time allocation along with commodity consumption. Even if all the members' incomes are pooled, child health outcomes and the income earned by the mother may be positively related, after controlling for total household income. For example, sicker children

may divert a mother's time away from market work (consistent with Pitt and Rosenzweig's 1990 evidence), while the father may work longer to compensate for any loss in income.

Nor is there a simple interpretation of this observation in the collective model of the household allocation, without explicating the income-sharing rule. A woman working outside of the home may bring in income but that does not *necessarily* mean she gets a bigger share of the pie to allocate. It may be, for example, that a woman's share depends on the assets she owns or controls, what she will take away with her if she leaves the household, her options in the remarriage market or even the expected wealth of her (future?) extended family.

A theoretically more compelling test of the hypothesis of different preferences of household members might examine the impact on intrahousehold allocations of exogenous, individual-level characteristics which are plausibly related to any income-sharing rule (Behrman 1992; and Blumberg 1988 provide reviews). Measurement of such characteristics is not straightforward, however, and this raises another set of thorny problems. Most studies that have attempted this strategy have used measures of total income, nonlabor income or assets as indicators of family members' control over resources.

Johnson and Rogers (1993) examine differences in the nutritional status of children in the Dominican Republic by the gender of the household head. Per capita total income of female-headed households was only 88% of that of male-headed households and calories per adult-equivalent in male-headed households were significantly greater than in female-headed households. However, after controlling for other factors, within samples of the lowest income and two highest income quartiles, total household income did not have a significant impact on height-for-age or weight-for-age. Instead, the percent of household earnings contributed by women was significant for only the sample from the lowest income quartile. In those households, children from female-headed households also had significantly better nutritional status than those from male-headed households.

Engle (1993) studies the relationship between a mother's and father's income on child nutritional status (height-for-age, weight-for-age and weight-for-height) for 302 households in peri-urban Guatemala. Generally, purchases are seen as either the mother's or father's responsibility. Engle describes the sample of women as generally nonassertive and nonconfrontational regarding household spending. In nearly half of all households, women report that their spouses do not know how much they earn, hypothesized to be a strategy employed by women to avoid confrontation and keep their income under their control. Engle finds that women who earn a higher proportion of family income have more control over in regards to household purchases, with the exception of food purchases. As women tend to use their income for food expenses, food purchases are already primarily under their control. Among nonworking women, in 88% of households, food is the women's responsibility. However, Engle does *not* find that there is a significant difference between the percentage of mothers' and fathers' income that is contributed for family well-being. She does find, however, that different aspects of parental income are important for child nutritional status. The percentage of total family income that women earn is

highly associated with their children's nutritional status, both controlling for total household income and not, while the percentage of father's income *contributed to the food budget* is highly associated with children's nutritional status. As a woman's earning power increases, relative to their husband's, children's welfare improves, while the amount and percentage of income a woman contributes to the food budget is not predictive of child's nutritional status.

Schultz (1990) finds that in Thailand, resources in the hands of women tends to reduce fertility more than nonlabor income held by men and, furthermore, that the impact of non-labor income has different effects on labor supply outcomes, depending on who controls that income. Thomas (1990) reports that child health in Brazil (survival probabilities, height-for-age and weight-for-height), along with household nutrient intakes, tend to rise more if additional (nonlabor) income is in the hands of women rather than men. Using the same data, Thomas (1993) reports that income in the hands of women is associated with increases in the share of the household budget spent on health, education and housing as well as improvements in child health.[26] Evidence in India indicates that children are more likely to attend school and receive medical attention if the mother has more assets, mostly jewelry (Duraisamy 1992; Duraisamy and Malathy 1991). Pitt and Khandker (1994) find in Bangladesh that credit taken by women has a greater effect than credit taken by men (treating use of credit as endogenous) on a variety of outcomes from child schooling to household income and asset accumulation. Quisumbing (1994a) finds that among Philippine households, bequests to children are a function of resource control, with sons tending to get more land inheritances relative to daughters when fathers have more education or the household has more land.

While this literature is small, the results are also suggestive that resources in the hands of different individuals within a household do not have the same impact on the welfare of all members. In particular, there is some evidence that a reallocation of resources among men and women may affect household commodity patterns, as well as the health and welfare of children. The results, however, are certainly not universal: see, for example, McElroy and Horney (1981).

In sum, there appears to be evidence that in specific cases, the restriction of equality of income effects in the "traditional" model of the household is rejected by the data. Contrary to the interpretation of some authors, this obviously does not imply that bargaining models are more appropriate. Unfortunately, to date, there have been few tests of the implications of Pareto efficiency. Bourguignon, Browning, Chiappori and Lechene (1993) and Browning, Bourgignon, Chiappori and Lechene (1994) find that, in France and Canada, respectively, that the ratio of income effects is not unity (and thus they reject income pooling), but the ratios are constant across a range of commodities and so the data are consistent with the collective model (see also Thomas and Chen 1994 for evidence on Taiwan).

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[26] It turns out that this result holds for total (nonlabor and labor) income (measured at the individual level) where labor income is treated as endogenous and instrumented with nonlabor income.

All of these studies are subject, however, to at least one common caveat. They ignore the fact that income is neither exogenous nor likely to be measured without error. Labor income (and time allocation) is a choice and so should be modeled as part of the household allocation. Several of the studies use nonlabor income, either directly or, in the case of Thomas (1993), as an instrument for total income. Since nonlabor income is, in large part, the accumulation of previous savings and thus a function of prior labor supply, it too is endogenous in a dynamic model of choices (Smith, 1977). This concern may be less critical in those studies that focus on children (and thus households early in their life cycle) and in those that rely on measures of wealth that are typically inherited or given at the time of marriage (such as jewelry in India).

Thomas (1990) does attempt to address the measurement error issue. Using data on multiple outcomes, he assumes that measurement error in income is additive (and uncorrelated with any observables). The equality of true income effects for male and female nonlabor income on any one outcome translates into the equality of the ratios of observed male and female income effects across any pair of outcomes (a result that is similar to the Chiappori observation regarding Pareto efficiency). This equality cannot be rejected by the data and so the joint hypothesis of measurement error in income and income pooling cannot be rejected.

Taking a different strategy, Thomas (1994) has shown that nonlabor income in the hands of women has a bigger impact on the anthropometric outcomes of her daughters relative to her sons. This is not true for fathers, however. This result is robust to the inclusion of household fixed effects which amounts to a comparison of the differential impacts of mother's and father's income on sons and daughters. It is also consistent with the patterns observed for the impact of parental education on the height of their sons and daughters. Thomas, Schoeni and Strauss (1996) show the same pattern with respect to completed schooling and school enrollments of sons and daughters. It is very hard to explain these rejections of income pooling by appealing to either measurement error, endogeneity or other sources of unobserved heterogeneity.

It seems clear at this point, that it is necessary to know considerably more about the practical importance of modeling the household in this more general framework. A better understanding of how household allocations differ depending on who controls resources is a critical first step. We cannot, however, stop there: it is also necessary to explore how household productive decisions are made and whether these are potentially affected by intrahousehold allocations. Production allocations may be potentially socially inefficient because of intrahousehold disputes.

3.5. Gender, Production Relations and Household Allocative Inefficiencies

Many productive activities are differentiated by gender; men and women may have responsibilities for different crops or different activities for a given crop (see, for example, Dey 1981 for a summary of production relations between men and women among irrigated-rice farmers in the Gambia). The patterns of such gender differentiation differ widely across areas. For instance Guyer (1980b) notes differences in the role of women in cocoa production between

the Yoruba and the Beti (in Cameroon). Such specialization may or may not indicate inefficiencies or non-Pareto optimal allocations. For example, there may be some activities that require different levels of skills, such as strength. As Becker (1981) has noted, it may be that it is optimal for one gender to acquire specific human capital (by accumulating experience in specific activities) if there exists an initial comparative advantage (or market discrimination).

Different levels of human capital may result in different levels of remuneration, or alternatively, different levels of remuneration may result from taste discrimination. There are few studies which examine this issue for the agricultural sectors of developing countries. One of the few, Foster and Rosenzweig (1992), argues that in Bukidnon Province of the Philippines, wage premiums paid to men for harvesting can be largely explained by differences in physical productivity. This comparison can be made because numerous men and women work at harvesting both for piece rate wages, which should reflect underlying worker productivity, and for daily wages. Any differences in daily wages attributable to gender, net of differences in piece rate wages, can be attributed to a combination of statistical and taste discrimination. Foster and Rosenzweig find that the amount of discrimination is small and that it is almost entirely statistical.

Still the existence of gender-specific tasks and crops is certainly consistent with the possibility of inefficient allocations within the household. Indeed, some of the most damaging evidence against the unified household model comes from studies that focus on production relations. If there exist separate fields controlled by men and women, while other fields are "common", there will also exist issues regarding efficient allocations of inputs across fields. An efficient allocation in a simple, static model household would result in equalizing marginal value productivities across fields for each input. If the input were purchased, marginal value products would be equated with the input price and if there were a fixed amount of the input to be spread across all field types, then again marginal value productivities would be equalized. Equating marginal productivities needs to be inclusive of accounting for input quality, which may differ across different types of fields, for example. If there were differences in such factors as the riskiness of crops grown in different fields, this could result in an efficient allocation not involving equating marginal value products, but then for a given crop, productivities should be equated (unless the riskiness of field types differs).

This logic has been tested in a few studies, most notably in an important study by Jones (1983, 1986) and in a very recent study by Udry (1994).[27] These studies all reject the efficiency of allocations across men's and women's fields and thus, implicitly, the unified household model. However, they also are inconsistent with production efficiency and thus with the Pareto efficiency assumption of the collective models.[28]

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[27] von Braun and Webb (1989) also have some evidence bearing on this question.

[28] Although, consumption efficiency may still be attained; see the discussion in Udry (1994).

Jones (1983) examines the labor allocations of Massa women in north Cameroon. Men and women farm sorghum, often in separate fields, and an irrigated rice project rents out land which is typically farmed jointly, with the husband controlling the proceeds. Jones establishes that the husbands in effect pay their wives for working in the common, irrigated-rice fields (actual cash and in-kind payments are made).[29] The implicit wage paid to women for transplanting rice is approximately the same as the calculated average returns to labor for growing sorghum and the wage for planting sorghum (which occurs during the same period). However, implicit wages for weeding and harvesting of rice seem to be above alternative returns women could expect during those respective periods. Thus, it would seem that women are getting some of the rent accruing to irrigated-rice farming, although according to Jones' calculations (Jones, 1986), only about 20-25%. If labor returns are higher on irrigated-rice fields, why then don't women allocate more time there?

Indeed, Jones goes on to compare labor allocations of women who are widowed or otherwise independent, to those for married women. Both sets of women have very similar numbers of children, but widowed women spend significantly more time on irrigated-rice fields and correspondingly less time on sorghum (they also work somewhat more hours on all crops). Jones further, stratifies the married women into those who work as much on irrigated rice as widowed women and those who work less. She finds that those who work more have a higher implicit wage to do so. This still begs the question of why the women who work less on rice are not offered a higher wage to do so.

Jones' study is pioneering, but it still leaves many questions unanswered. The comparison of returns was for average, not marginal returns.[30] If returns to scale are constant, using average returns as the basis of comparison will not matter, but if not, it might. Also, because of her use of a very small sample (24 women, interviewed intensively), Jones is not able to control for all the relevant characteristics when she makes her comparisons. It may be, for example, that the women who work more in rice fields have a better nutritional status than those who work more in sorghum fields, thus explaining the higher calculated labor returns. One would really like to be able to examine differences in returns on sorghum and rice fields for the same women.

Udry (1994) examines land productivity, or yields, for identical crops across men's and women's fields in Burkina Faso, using the ICRISAT data and finds that yields for women's fields are lower (although the magnitudes are much less than the yield variation across households within a village). He takes advantage of the fact that households farm on multiple plots in his estimation strategy, using household-time-crop specific dummy variables (or fixed effects). Effectively, this amounts to comparing yields on women's and men's fields, *within* the same household, in the

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[29] Dey (1981) and von Braun and Webb (1989) also note that compensation is paid to wives for work in common fields in the Gambia.

[30] Other studies have also found average returns to labor to be lower in women's fields, both comparing across crops and for the same crop. See for instance, von Braun and Webb (1989).

same cropping year and for the same crop. Of course differences consistent with efficient allocations could still exist if land qualities were different or if there existed non-constant returns to scale. Udry also controls for a detailed set of toposequence and soil types, whether the plot is in the compound or village and the plot size (using a detailed set of dummy variables), but still finds lower yields on women's fields. When he examines input intensity he finds that while more female labor per hectare is used on women's plots, far less of male, child and hired labor is used and considerably less manure per hectare is used as well (indeed almost all manure is used on male controlled fields). It is also possible that inherent production risks may be different on different plots, especially given the considerable micro-variation in field quality and rainfall. Udry finds however, that yields on women's plots are more responsive to rainfall than those on men's plots, holding plot size, crop and land characteristics constant. Thus there is not clear evidence that women's plots are serving to reduce farming risk from rainfall, the major source of risk in the study areas. On the other hand, the magnitude of the inefficiency that Udry finds *within* households is quite small relative to the differences in efficiency he also finds across households.

Thus, evidence does exist that allocations within households are inefficient, particularly on the production side, although the magnitudes may not be large relative to inefficiencies across households. In any event, the question arises as to why? Women and men may care more about output on their own plots than on their spouse's plots (or, possibly, common plots) and well-developed factor markets do not exist which could equalize marginal value productivity. Which economic model is appropriate for these conditions is not at all clear. Udry develops a cooperative bargaining model in which the threat point corresponds to a non-cooperative solution in which consumption is equal to income produced on one's own fields. This provides an incentive to care about production on one's own fields more than on a spouse's fields, leading to a greater intensity of own labor use on one's own fields. While this very specific model is consistent with Udry's empirical findings, it is but one alternative. Another is a more innocuous story of allocative inefficiency, that more education, experience or extension services could perhaps attenuate.[31] If this is true, then it is not necessarily the case that strategic behavior is important.[32]

Further complicating any analysis is the fact that production relations are not stagnant. In the area that Jones studied, rice productivity gains resulting from an irrigation project led to men taking over that crop. Likewise in Gambia, Dey reports that the irrigated-rice schemes focused their efforts on males, even though upland and swamp rice was traditionally farmed by women. Indeed, studying the same area, von Braun and Webb found that patterns of labor use by gender changed dramatically, with men taking over most of the irrigated-rice, and women moving more

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[31] Notice, however, that it is harder to invoke the allocative inefficiency in the Jones case. Inefficiency cannot explain, for example, why she would observe an increasing supply of female labor with respect to wages to husbands' fields.

[32] Allocative inefficiencies will also cause problems for the collective model if they occur on the consumption side.

into groundnuts and cotton- traditional "male" crops. Yet in this case, it was still the case that women benefitted in terms of such welfare indicators as nutritional status (von Braun and Webb). That is not to say that they gained as much as they could have, but they did apparently gain.

Having looked some at household allocations from an intrahousehold perspective, it is useful to push further, especially to issues of complex household formation such as exists in many societies. It is to these issues we now turn.

3.6. Household Formation, Partition and Risk

Discussions of relationships within households, families or larger kin-groups focus the analytical spotlight on the meaning of the "household" or "family" as a decision-making unit. It is not clear that the usual definition of the "household" in survey data (such as individuals sharing a common cooking pot) is appropriate in all contexts. Given the prevalence of extended family members living in the same household, or multiple households living within a compound, these concerns may be especially important in the context of developing countries.

As Guyer (1986) points out, households within a kin-group (in west Africa) may farm separately but consume some goods jointly. Grain storage may be centralized at a compound level, perhaps to gain some economies of scale or save on transaction costs, even though field production is at the household-level. Dey (1981) describes how women in Gambian compounds form work groups and rotate their labor supply to each other's fields.

Clearly, the appropriate definition of "household" or "family" will depend critically on the nature of the research or policy question at hand. Given a definition, implementation in the field is not likely to be easy - especially when there is no clear concept of "household" in the community. For example, ICRISAT household data from Burkina Faso contain multiple household lists taken at roughly the same time, but by different investigators. Large discrepancies exist between these different rosters. In part this results from different sub-households, which may or may not be farming or consuming separately, being included in different lists.

In addition to identifying the proper level(s) of analysis and interactions among them, analyses need to take account of the possibility that these boundaries change and may be responsive to economic forces. This raises a number of complex issues that have been little explored. There are many dimensions across which household composition may change, ranging from marriage and divorce, to childbearing and fosterage, to migration, partition and extended living arrangements. As briefly discussed at the end of the theory review section, the marriage market may importantly affect intrahousehold distribution and may, under some circumstances, undo changes induced by public policy.

Dowry and bride wealth payments usually carry with them an implicit set of obligations for each spouse towards each other and each other's family. Dowry payments may be related to excess

female infant mortality, as hypothesized by Bardhan (1988). The nonpayment of dowries has been linked to wife beating (Rao and Bloch 1993). Gender-related changes in the system of land rights may simply be reflected in changed dowry or bride wealth payments (see Rao 1993 for evidence that dowry payments respond to characteristics of the groom in a manner consistent with a compensating price differential).

As yet, there are few precise descriptions of links between households, let alone appropriate models for analyzing them, although the theoretical and empirical analyses discussed in the previous sub-section may be usefully applied to address these questions. For example, tests of the nature of resource pooling across different household or sub-household groupings within a family- or kin-network may provide useful information.

Drawing on unusual longitudinal data from Bangladesh (the Demographic Surveillance System in Matlab), Foster (1993) matches household rosters from two surveys so that he can link households that were partitioned in 1982 but that reside in the same *bari* as the origin household in 1974.[33] He uses data on child education outcomes to test for income pooling within the extended households in order to determine whether partitioned households are different from those that remain intact.

If partitioned households have no ties with their origin (or linked) household, then characteristics of the latter households should have no impact on resource allocations. This hypothesis is unambiguously rejected: in particular, land ownership and education of the head in the origin household are positively associated with the educational attainment of children in the partitioned household. He further finds that income pooling is not perfect, since land ownership of the surveyed household has a significantly different effect from that of the origin household. A stronger form of the test controls for extended household fixed effects and still finds a significant effect of land ownership in the partitioned household. This implies that the *bari* (or extended household) is not the exclusive unit, at least with respect to child education.

There are a host of reasons why there may be economic links across households. These linkages manifest themselves in a variety of ways, including transfer of money, goods and time. First, households may be altruistic, in which case the basic model of Becker (1981) can be extended to the multiple household case. Second, transfers may be motivated by exchange through an implicit contract or strategic behavior (Bernheim, Schleifer and Summers 1985; Cox 1987). A particular form of exchange, insurance against income shocks, may be a key motive for inter-household links in a developing country context (Rosenzweig 1988a; Rosenzweig and Stark 1989; Agarwal 1991; Platteau 1991; Rosenzweig 1993; Townsend 1994). If so, then this suggests that the pool of potential donors and recipients may be very large.

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[33] A *bari* is a collection of usually related households that live in a larger compound and typically remain economically connected.

Several studies have attempted to disentangle altruism from exchange motives for transfers.[34] For concreteness, we focus on links between parents and children. If parents are altruistic, then those children whose consumption is lower than the long-run level should receive transfers.[35] Exchanges, on the other hand, need not be negatively related to the child's resources (Lucas and Stark 1985; Cox 1987).

The timing of transfers is also of paramount importance. If old age support is the primary motivation for transfers, then transfers will be made from parents to children when the children are young, but from children to parents when the parents are old. Further, there may be inheritances that children receive to help ensure their good behavior during the parents' lives (Bernheim, Schleifer and Summers 1985; Lucas and Stark 1985). Using cross-section data from Peru, Cox and Jimenez (1992) find that net transfers are greatest among those households with the youngest- and oldest-aged heads, which is consistent with the exchange interpretation.

Risk sharing has quite different implications for the timing of transfers (Rosenzweig 1988a, 1988b, 1993). The direction of net transfers should depend on which party has faced positive or negative shocks and the direction is unrelated to the life-cycle. This hypothesis is very hard to test without a long time series of data on both sides of the contract (and possibly on all households in the pool): few, if any, data sets of this nature exist.[36]

Using the Bangladeshi data described above, Foster (1993) finds, not surprisingly, that larger households are more likely to partition. He notes that even in rural Bangladesh, the vast majority of any individual's life is spent as a head, spouse or child of the head, although not necessarily in a simple nuclear family. He points out that households often include siblings of the head, or are vertically extended.

While the nature and timing of household partitioning is likely to be importantly influenced by social considerations, there may also be economic reasons for household partitioning. Presumably, when the present discounted value of the expected benefits associated with the public

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[34] Altonji, Hayashi and Kotlikoff (1992a), for example, use evidence regarding the expenditures of adult children and their non-coresident parents in the United States.

[35] This statement is true for an individual's lifetime consumption path. It is *not* the case that in a cross-section, altruism implies a negative relationship between transfers and income as argued by several authors (see, for example, Cox and Jimenez 1990b). In fact, if higher income households are more altruistic, then in a cross-section, there would be a positive association between income and transfers. Studies based on cross-section data are, therefore, very difficult to interpret.

[36] See Lucas and Stark (1985), Kaufman and Lindauer (1986), Ravallion and Deardon (1988), Cox and Jimenez (1990b, 1992) and Hoddinott (1992) who all use cross-section data. Apart from Ravallion and Deardon (who use predicted household expenditure as a measure of long-run income), these studies also suffer from problems associated with measuring income, because they use current income which mixes long-run income and transitory income shocks.

goods (or externalities) provided within the household are outweighed by the perceived costs, household members will split off and set up their own households.

Rosenzweig and Wolpin (1985) argue that in an agricultural setting with heterogeneity in land quality and weather, there is a return to investments in land-specific human capital, especially in an environment with few technological innovations. This suggests that adult children will seek to benefit from the experience of their elders by tilling the family farm with them. The model also predicts that there will be few land sales, land-owners will tend to not migrate and there will be a tendency for families facing greater income risks to be vertically extended, since the advantage of farm-specific experience will be more valuable in that environment. Using NCAER data from India, the authors present evidence that is consistent with this view of the world. Using the Indian ICRISAT data, Rosenzweig (1988b) shows that specific farm experience contributes significantly to agricultural profits and also mitigates the influence of rainfall, although not significantly.

Households may choose to mitigate risk through spatial diversification in living arrangements (see Rosenzweig 1988a for an excellent discussion). Rosenzweig and Stark (1989) argue that in south India, where women rather than men tend to move to new households, families will seek to locate daughters in different places if risk is a concern. The authors find almost complete diversification, with the extent of diversification being the greatest for the least wealthy, who, presumably, face the greatest risks due to weather shocks. Furthermore, daughters tend to marry kin, who, it is argued, are more likely to have concern about the origin family after their marriage. Rosenzweig (1988b) reports that, conditional on wealth, the variability of agricultural profits positively affects the number of co-resident daughters-in-law, which he interprets as a measure of intergenerational and spatial extension. In Rosenzweig (1993), this line of inquiry is extended, so as to compare the use of transfers as a consumption-smoothing method in those areas which differentially benefit from green revolution technologies and those areas receiving little benefit. It is found that transfers are less common in the green revolution areas. Consistent with this finding, households in those areas have fewer married daughter residing with them and young men are more likely to be residing away. These patterns could be the result of increased difficulty in assessing risks under the newer technologies, but whatever the reason, the incidence could fall differentially on women since marriage seems to be an important part of risk pooling and is apparently valued less. Unfortunately insufficient data are available in the Rosenzweig study to adequately test this hypothesis.

Rose (1995) is the one study to date that provides some direct evidence on the differential gender effects within the household of the ability to better smooth consumption. Using data from India, she estimates the impact of rainfall shocks on the relative mortality of girls versus boys and finds that good rainfall improves the odds of survival for girls relative to boys,[37] but more so in landless households.

[37] She attempts to correct for potential biases caused by a greater under reporting of births and deaths of girls.

In sum, exactly what is meant by "family" or "household" is likely to depend on the nature of any particular study of the behavior of individuals. To the extent that household composition and boundaries are endogenous, analyses of household behavior become far more complicated. And even if these boundaries are treated as exogenous; endogenous, intrahousehold allocations are still difficult to study. Until more work is been done with household models that take account of these concerns - both from a theoretical and empirical point of view - we cannot judge the importance of these considerations from a practical point of view. Tests of income pooling are suggestive that research along these lines may be fruitful, but much remains to be learned.

4. POLICY ISSUES

As this review has tried to indicate, research has been increasing on the broad topic of intrahousehold allocations, although it is still quite formative. What can we say that has bearing on policy? It is certainly possible to make some strong general statements (see Alderman et al., 1995, for one such example), yet we would argue that it is not yet prudent to reliably provide counsel on many specific issues.

Are the consequences of intrahousehold allocations important to policy formulation and, if so, are they of first order importance? Certainly in the recent academic and policy-oriented literature there seems to be agreement that there can be serious repercussions from the allocation of household resources, such as excess female mortality or less female schooling. One study, the Haddad and Kanbur (1990) study discussed above, calculates that poverty rates are significantly understated by ignoring intrahousehold distribution; however, as noted, it is not entirely clear as to how we should interpret their results since they are based on calorie intakes, which can be unequally, but optimally, distributed because of different energy expenditure needs. Likewise, there may be productive inefficiencies within the household, as documented by Udry; however, these may not be large relative to interhousehold inefficiencies. Indeed, Udry's results indicate just that for the few villages in Burkina Faso he studies.

In order to justify trying to influence intrahousehold allocations, it should be the case that there exist important inefficiencies or inequities and additionally it must be shown that public policy can influence such allocations in desired directions. We certainly agree that in general, public policy has potential ramifications on intrahousehold allocations. From either the unified or collective models, it follows that such allocations are affected by income and prices. In collective or non-cooperative bargaining models, such outcomes are also affected by factors that could impact the allocation of income shares. Many of these factors will be institutional in nature, such as allocation of land rights. The ultimate policy problem is that we still do not know much regarding what to base such policies on, and it is entirely possible that the policies could backfire, so care is needed in evaluating proposals.

Knowing the factors that in theory could affect intrahousehold distribution does not take us very far when formulating specific policies. Do these effects really matter and, if so, what kinds of magnitudes are being discussed? Are there likely to be unintended effects that could be counterproductive? These are questions to which we have very few answers. In addition, it will matter whether policy makers are more concerned with poverty alleviation or reducing inequality. We know from experience and accumulated knowledge that policies designed to alleviate household poverty are often different than policies to promote equality between households. There is no reason to think that the same issues will not affect policy choices regarding *intra*household allocations.

For example, take the issue of household income growth. Should policy makers rely on general growth to alleviate poverty, and perhaps inequality, within households? A plausible hypothesis

would be that the inequality of intrahousehold allocations may be reduced as incomes rise, at least after a point (see Kanbur and Haddad 1994 for a bargaining model resulting in a Kuznets-type inverted U curve between within household inequality and household income). King and Hill (1993) document, for instance, that aggregate female schooling levels, relative to males, have risen for upper middle-income developing countries, but have remained stagnant for lower-income countries. On the other hand absolute levels of female schooling *have* been rising in all cases.

At a more micro level, as incomes rise from extremely poor levels, household nutrient availability will also tend to increase (see the review in Strauss and Thomas 1994). As discussed above, one reason for differential allocations of food across household members is to feed more to one's workers, if doing so enhances their productivity or ability to work (recall the evidence from Pitt, Rosenzweig, and Hassan 1990). As incomes and nutrient availability rise, the productivity returns to consuming more nutrients are likely to diminish, reducing the efficiency gains from differential feeding. This is one interpretation of Behrman's (1988b) result that, in the Indian ICRISAT villages, households seem to be more inequality averse during periods of peak food availability. Related evidence comes from Rose's (1994) finding of differential impacts of rainfall shocks on boy-girl mortality in rural India, but not among households with more land; and with Parish and Willis' evidence from Taiwan, that it is among lower income households that having more younger siblings or older brothers reduces the likelihood of children getting more schooling. However, the micro-level evidence on this is limited and it is not uniform. For instance, Thomas' (1994) results on mother's nonlabor income having a larger effect on girls' health and father's on boys' health is apparently not a function of income level.

Just as in the case of between household inequality, relying exclusively on income growth to reduce inequalities may be objectionable because of the bluntness of the instrument. Another policy lever that will have potential intrahousehold effects is the provision of public infrastructure and services, particularly those that are targeted to particular groups such as the poor or women. For instance, Rose's evidence suggests that social safety net schemes to prevent extreme deprivation may have a useful effect on extreme inequities in resource allocations, that could result in death. A different example that is receiving attention lately is agricultural extension (see, for instance, Saito and Weidemann 1990 and Saito 1994). Dey (1981) points out that the rice irrigation project in Gambia she studied was initially designed to raise female incomes, however extension efforts ended up being aimed at men, despite the fact that women, not men, grew rice. There surely exist other, similar examples. Directed credit schemes are another example, particularly group-based schemes aimed at women's groups. For example, a new major study of the effectiveness of the Grameen Bank's lending activities in Bangladesh which carefully controls for the fact that the targeted groups have special characteristics which may be responsible for their apparent successes, shows that credit provision can indeed help improve female incomes, female and child health status and child schooling levels (Pitt and Khandker 1994).

More indirect, but not necessarily unimportant, will be the effects of providing services, such as health care centers or schools, which are not necessarily targeted at particular groups. Given the extensive evidence that shows that female schooling has a large effect in raising child health, improving the likelihood of children advancing farther in school and dramatically lowering fertility levels (see the reviews in Schultz 1993 or Strauss and Thomas 1995 for example), public policy interventions aimed at raising female school enrollments (especially at secondary or higher levels), such as making secondary schools more accessible and raising their quality, may be quite useful. In addition, there is, as mentioned above, a limited amount of evidence that the demand for health care (and schooling) by women (girls) is more price responsive than by men (boys). If so, then building local facilities, by lowering the full cost of use, may differentially benefit women and girls. On the other hand, current efforts at cost recovery may differentially reduce demand from women or girls, suggesting a need to consider compensatory steps such as reinvesting revenues in higher levels of quality. Our knowledge on this question is slim, but illustrative.

However, we do not have good answers to such questions as what the effects would be of targeting safety net schemes, such as food subsidies or employment programs, more towards women. A possible reason to do so is that it is possible that women and children bear the brunt of income fluctuations, but we don't even have enough information to reliably establish that as fact. The limited evidence regarding differential impacts of resources going to men *versus* women is often technically unreliable and for the more robust studies, the answers do not seem to be very uniform. For instance, it does not always seem to be the case that money targeted at women results in better child health or more child schooling. As Thomas demonstrates in some of his work, it may be that girls benefit disproportionately from resources targeted at women and boys from resources targeted at men. Even this evidence is fairly slim and not overwhelming in magnitude and statistical significance, in contrast to the estimated impacts of maternal schooling on child mortality.

One potential reason for a seeming absence of strong, uniform results is that targeting can easily be undone by household allocations, such as by varying implicit within household transfers (Becker and Tomes 1979; Becker 1981). A good example of this is provided by the abundant evidence that school feeding programs often lead to large leakages, because children receive less food than before at home, thus implicitly providing some of the extra food to other household members (see Beaton and Ghassemi 1982 for a classic survey).

In addition to policies relating to incomes, prices and consumption smoothing, policies related to institutions and property rights become potentially important when considering intrahousehold allocations, especially once we go beyond the traditional unified household model. A key potential example is land rights. Use rights for women in many sub-Saharan African economies derive from men (particularly in patrilineal societies, although there is certainly variation). In areas in which use rights are derived from men (husbands or sons), there are such potential issues

as whether women have sufficient incentives to make land-related long-run investments,[38] or whether a lack of clearly defined land rights provide a pro-fertility incentive, as argued by Jack and Pat Caldwell (1987). While there has been recent progress in understanding the nature of land rights in Africa and their effects (or lack of them) on agricultural investment and productivity (see, for example, Migot-Adholla et al. 1991 and Platteau 1992), these studies have not paid attention to the issue of differential effects on men and women (for a counter-example that discusses gender and land relations in south Asia, see Agarwal 1994).

However, in all of the policy discussions, not only are the short-run effects of particular policies unknown in general, but so too is the question of whether in the long-run, effects will be undone by changes in household allocation rules, such as induced by the marriage market (as discussed in Lundberg and Pollak 1993). This Ricardian equivalence question is potentially key.

[38] For instance, Quisumbing (1994b) reports instances in Africa in which women are less likely than men to invest in tree crops such as cocoa and coffee.

5. CONCLUSIONS

Issues of intrahousehold distribution have been increasingly analyzed by economists over the past 15 years. Such distributional questions are potentially important both in general and with respect to food security. The workhorse household production model of Becker has been extended to encompass intrahousehold distribution and empirical studies using this framework have shed considerable light on intrahousehold allocations. However, evidence has begun to emerge that suggests that modeling households as though they are individuals can be at variance with the household's true behavior. In some cases these newer models make different, or at least additional, predictions. In some cases, however, they do not imply very different empirical strategies given the data that usually exists; although they often imply additional data that can be fruitfully collected. More complicated models have begun to be proposed and are still in their formative stages; much remains to be done, though, both in extending the theories and in testing them empirically.

For policy considerations, however, there is still so much that we do not know that it is difficult in most instances to make clear recommendations. Results to date have not been very uniform regarding even the effects of targeting income to particular household members. Furthermore, unintended policy consequences can be easily imagined. Policy makers need to be active partners in knowledge accumulation in this area. Evaluations of existing and potentially new policies are in order, but they need to be given public support to be done effectively. Where feasible, experimental methods have much promise. This may include, for example, randomizing receipt of food subsidies between the head male and head female. It is only through such experiences that knowledge will accumulate to the point where it can be useful for policy development.

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