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Published on: 01 Jan 1994 - The Pakistan Development Review (Pak Dev Rev)

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The Pakistan Development Review
33 : 3 (Autumn 1994) pp. 253–296

Intra-family Distribution in Developing Countries

JERE R. BEHRMAN

Intra-household allocations appear to be quite important in the determination of time use, human resource investments, and intra- and inter-generational transfers in developing countries. The nature of such allocations has important implications for the efficiency, equity, and efficacy of the micro and macro-economic policies.

In the past decade and a half, there has been substantial progress in modelling intra-household allocations in ways that lead to testable propositions despite enormous data limitations regarding the nature of the allocation of unobserved variables and the impact of unobserved heterogeneous endowments.

The parent-child exchange literature is a subset of these studies that advances in two dimensions by allowing children to have different preferences from their parents' and by incorporating a broader notion of interactions, including the attention provided by the children to their parents. Yet this literature has most of the problems that are indicated with regard to the unified household preference models. The exchange literature to date has assumed away heterogeneity in endowments which plays such a critical role in the studies that assume the unified household preferences. It is also silent on how human resource investments enter into the relations between parents and children.

The collective models of household behaviour emphasise that different household members, usually husband and wife, may have different preferences and a different command over resources. Interesting theoretical results have been derived concerning the conditions under which the income-sharing rules and the allocation of non-assignable goods can be derived. But there are many limitations in this literature. The literature on the collective models of household behaviours is static and gives little consideration to the dynamic processes and learning.

1. INTRODUCTION

Causal observations and systematic analysis both suggest that what happens within households[1] has important implications for economic and social outcomes in develop-

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Author's Note: This paper was originally prepared for a Distinguished Lecture at the Ninth Annual General Meeting of the Pakistan Society of Development Economists, Islamabad, Pakistan, 7–10 January 1993. I acknowledge the help of and thanks various co-authors on papers related to the topics discussed in this paper, including Harold Alderman, Nancy Birdsall, Anil Deolalikar, Andrew Foster, Victor Lavy, David Ross, Richard Sabot, Barbara Wolfe, and particularly Robert A. Pollak, Mark Rosenzweig and Paul Taubman. I also thank an anonymous referee for useful comments on an earlier version of this paper.

[1]The definitions of families and households are not without ambiguities. Nuclear families constitute parents and their children. Nuclear families may be extended vertically (e.g., including grandparents in addition to parents and their children) or horizontally (e.g., brothers or sisters of the household head or spouse, perhaps with their children), or both. Households usually are defined by co-residence or by sharing the same "hearth" or "pot". Family members may or may not be in the same household. Households may be composed only of family members, or may include only individuals who are not related by blood or legal bonds, or may include both family members and non-related individuals. Much of the economic literature treats the terms "family" and "household" as if they both referred to a nuclear family that constitutes a household, though at times there is explicit reference to other types of families or households. In this paper I follow this practice, though I shall try to note explicitly if it is important for a particular analysis to use some other definition.

ing economies for at least four reasons.[2]

First, households have critical roles in determining human capital investments and time use, as is reflected in high inter-generational and sibling correlations in human resources such as schooling attainment or health indicators in most developing countries. Given the substantial role of households in these respects, and that such human resources are thought to be critical in productivity growth in developing countries, the question of whether such allocations are efficient is important.

Second, the nature of human capital allocations may have important implications for analysis of other outcomes, such as the impact of schooling in labour markets or on health, nutrition, and demographic outcomes, or the impact of health and nutrition on productivity in labour markets and in schooling. If such allocations are responsive to endowments, it may be critical to control for such endowments in order to be able to obtain consistent estimates of the effects of schooling, health, and nutrition.[3] Yet most of the literature on evaluating the impact of schooling in developing countries ignores such problems and therefore may be seriously misleading [e.g., see the surveys in Behrman (1990, 1990a, 1990b) and the recent evidence for a developed economy in Behrman, Rosenzweig and Taubman (1994)].

Third, there may be distributional concerns regarding the distribution of various household choice variables such as nutrients and leisure time, particularly regarding children and females. For instance, Sen (1990) states that over 100 million women are missing in Asia and North Africa because of relatively high female mortality due in considerable part to intra-household allocations that are not favourable to females.[4] There also are claims that whoever controls resources in households affects importantly the nature of intra-household allocations; for example, the more their mothers control resources, *ceteris paribus,* children fare better. Descriptions of the extent of variance in intra-household allocations from systematic socio-economic data sets are limited because many data sets take the household as the unit of observation for most of the information that they collect. But there are some data that suggest that within household variances are important [e.g., see Behrman (1992); Haddad and Kanbur (1989, 1990) and Harriss (1990)].

Fourth, the nature of intra-household allocations together with inter-household transfers may alter the effectiveness of policies ranging from transfer programmes directed towards particular types of household members (e.g., infants and small children, school-age children, pregnant and nursing women, the elderly) to the effectiveness of macro policies [e.g., the relevance of Ricardian equivalence, as in Barrow (1974)].

The focus of this paper in on what are the roles of gender, age, endowments,

[2]Intra-household allocations also are important for these reasons in developed economies. However, their importance is likely to be even greater in developing economies since households in such economies perform a number of roles that are performed by markets and governments in developed economies [e.g., Ben-Porath (1980); Pollak (1985)]. I review the literature in this area pertaining to developed economies in Behrman (1995).

[3]For example, Behrman and Lavy (1994) find that the impact of child health and nutrition (as represented by anthropometric indicators) on Ghanaian child cognitive achievement is overstated substantially if there is no control for unobserved household and community endowments. Behrman and Deolalikar (1993) report similar results for the estimated impact of schooling on labour earnings in Indonesia.

[4]His estimate is based on calculating how many more females there would be in these areas if they had the same age-specific sex ratios as does Sub-Saharan Africa.

household resource levels, labour market opportunities, marriage markets, human resource investment prices and preferences in intra-household allocations in developing countries. My interest is primarily in what are the nature and implications of empirical relations. However, particularly given the rarity of controlled social economic experiments, one cannot simply look at empirical correlations among observed variables and make confident deductions about the nature of intra-household allocations. Unobserved productive and preference endowments may make such interpretations very questionable. Association does *not* imply causality. Simple models of household behaviour are critical to make clear under what assumptions empirical interpretations are being made and what the pitfalls in such interpretations are. Therefore, I begin with a brief summary of economic models of intra-household allocations. Since most of the empirical literature that builds on these models focuses on intra-household allocations among children,[5] I focus on models related to such allocations. These models provide a basis for interpreting empirical evidence, to which I turn next. Finally, I conclude with a summary of what we do and do not know about intra-household allocations in developing countries.

2. ECONOMIC MODELS OF INTRA-HOUSEHOLD ALLOCATIONS

Economists have developed alternative models of intra-household allocations. These models have some common features in order to be tractable. Almost all of these models are one-period rather than dynamic, begin with the assumption that the consumption of goods or services or the command over resources that permits such consumption of various individuals is of primary interest, assume that parents make human resource investment decisions for their children, assume that imperfect capital markets mean that it is not assured that such investments can take place to the point at which the expected rate of return on such investments equals the market rate of interest on financial assets, and abstract from the question of what determines fertility, mortality and other demographic events that affect household size.[6] Nevertheless, these models differ in respects that have important implications. The most important differences have to do with the nature of the objective function of the household. In Section 2.1 I summarise models based on constrained maximisation of unified altruistic parental preferences.[7] In Section 2.2 I summarise models with unified altruistic parental preferences that are qualified because the parents try to actively shape the children's behaviour in the light of child responses to parental actions. In Section 2.3 I summarise models of collective household

[5] I recognise that in some applications such models have been used to explore allocations among adults as well as children. See, for example, Pitt, Rosenzweig and Hassan (1990) that is summarised in Section 3 below.

[6] Earlier models considered the determination of the number of children and of average child "quality" together with parental consumption, but not the differences among children within a family. Becker (1991) provides a recent summary and references; also see Willis (1973).

[7] Several different terms are used in the literature to describe these models. Lundberg (1988) refers to the "family utility models", Thomas (1990) uses "common preference models", McElroy and Horney (1981); McElroy (1990) and Schultz (1990) call them "neoclassical models", McElroy (1992) uses "altruistic models" (which she advocates because of the underlying Becker altruism that is often used to rationalise these models, but which does not seem clarifying to me as, for example, Bourguignon and Chiappori (1992) refer to McElroy's Nash models as having altruistic preferences since the utility of one household member depends on the consumption or utility of another), and Behrman, Pollak and Taubman (1995) use "consensus models".

behaviour in which individual parents and other household members have different preferences and command over resources.

2.1. Pure Parental Altruism Models with Unified Preferences

In the general intra-household altruistic allocation model, altruistic parents maximise unified preferences that depend, *inter alia,* on the levels of adult labour earnings of each of their children and on other adult income of each of their children.[8] Earnings of each child are produced by human resource investments in that child (e.g., investments in schooling and in health) and that child's endowments (e.g., genetic and environmental factors that affect earnings but are not allocated by the household).[9] Other income depends on transfers from the parents (or others) in the form of financial and physical assets. Parents maximise their level of satisfaction subject to the earnings (and perhaps other) production functions, a time-and-resource budget constraint, given prices and given assets (including endowments). This maximisation determines the optimal level of parental consumption, of human resource investments in each child, of earnings by each child, and of transfers to each child.

The general parental altruism model places few restrictions on the allocation of human resource investments and transfers to and among children. Two special cases of the parental altruism model–the wealth model of Becker and Tomes (1976, 1979) and the SET (separable earnings-transfers) model of Behrman, Pollak and Taubman (1982)–make stronger assumptions and yield sharper conclusions. These two special cases differ in their implications regarding whether parents allocate resources to compensate for or to reinforce endowment differences, whether child income capacities are distributed equally among members of a family, and whether human resource investments are likely to be efficient.

The Wealth Model

Becker and Tomes (1976) and Becker (1991) assume that parents are concerned with each child's total wealth but are not concerned with the sources of wealth–that is, parents are indifferent between earnings and transfers as components of the wealth of

[8]Alternatively, parental preferences might be written in terms of the children's adult consumption or their preference levels. For investigating the determinants of parental allocations among their children, however, the most transparent formulation is one that explicitly includes two sources of the children's income when they become adults: a human-capital-dependent component called "earnings" and another component called "transfers". Conceptually, earnings perhaps should be "full" earnings in order to value leisure and allow for endogenous labour supply choices.

[9]Endowments include all determinants of earnings (or of other outcomes of interest) that are given or predetermined prior to the human capital investment process, such as genetically inherited characteristics that are rewarded directly or indirectly (through their interaction with human capital investments) in labour markets or in own farm/firm production. Depending on the relevant labour markets, with differences over time and space, different endowed attributes may be valued differently. Endowments related to physical strength and stamina, for example, may be relatively highly valued in comparison with endowments related to intelligence given the low level of technology in some contexts with low levels of development, while the reverse may be the case in some modern, high-technology economies. If there are differences in the labour market rewards to individuals depending on their gender, moreover, a person's sex is an endowment for the purpose of this framework.

their children. The wealth model–like other models of parental altruism–is often further specialised by assuming "equal concern". Equal concern means that all children receive equal weight in the parents' preference function so that the preference function is symmetric with respect to the distribution of wealth among children. Becker and Tomes consider a particular case of the wealth model in which parents allocate sufficient resources to their children so that all children receive transfers. In this case, with equal concern and the additional assumption that investments in human capital are subject to diminishing returns given fixed child endowments, they conclude that parents invest in human capital for each child until the marginal rate of return on human capital investment in that child equals the return available on financial or physical investments; this is the wealth-maximising level of human resource investment. Any additional resources allocated to a child beyond this level takes the form of financial or physical transfers.

Figure 1 presents this case for a two-child family given a fixed level of resources devoted to children. For the *j*th child, Y_j^n designates the earnings level if there are no human resource investments in that child and Y_j^* designates the earnings level if human resource investments in that child are at the wealth-maximising level. The wealth possibilities frontier has three regions: (i) The northwest region between Y_1^n and Y_1^* in which child 2 receives both the wealth-maximising level of human resources and transfers, while child 1 receives less than the wealth-maximising level of human resources and no transfers, (ii) the central region between Y_1^* and Y_2^*, in which the frontier is linear with a slope of minus one, in which both children receive the wealth-maximising levels of human resources and both receive physical or financial transfers, and (iii) the southeast region between Y_2^* and Y_2^n in which child 1 receives the wealth-maximising level of human resources and transfers, while child 2 receives less than the wealth-maximising level of human resources and no transfers. Regions (i) and (iii) are both convex to the origin because of diminishing returns to human resource investments. For simplicity, I assume here and in the rest of this section that child 1 is more educable due to greater endowments than child 2, so the wealth possibility frontier is elongated in the direction of wealth for child

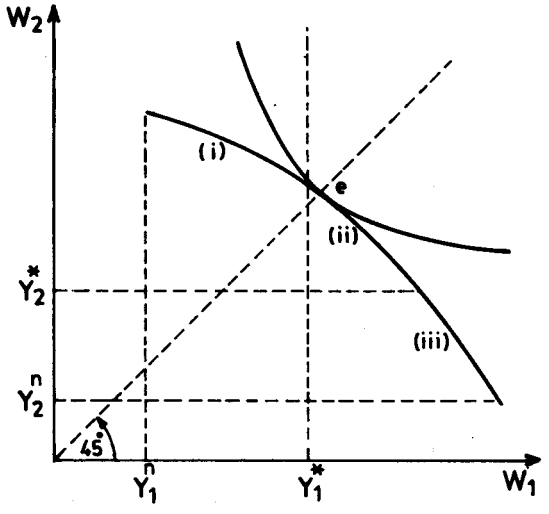

Fig. 1. Wealth Model with Equal Concern and Very High Resources.

1.[10] The assumption that parents devote a "very high" level of resources to their children ensures that the 45° ray from the origin intersects (at point e) and is perpendicular to the linear segment of the frontier (region ii). The assumption that the parental welfare function exhibits equal concern ensures that this intersection is the point of preference maximisation.[11] Hence, in the very high resource case with equal concern, parents (a) provide each child with the efficient (i.e., wealth-maximising) level of human resources (i.e., Y_1^* and Y_2^*) and (b) use transfers to equalise the children's wealth, offsetting fully the differences in earnings resulting from the differences in endowments and human resources. Given the assumption that child 1 is more educable at all interest rates, the earnings from human resource investments are greater for this child (i.e., $Y_1^* > Y_2^*$), and the other child receives more transfers in equilibrium (i.e., $T_2 > T_1$).

To summarise, Becker and Tomes claim that under these assumptions: (1) Parents are likely to allocate human resources investments so as to reinforce endowment differentials among their children, since the returns from a given level of human resource investments are likely to be greater for children with greater endowments; (2) human resource investments in the children are socially efficient (i.e., Pareto-optimal) if there are no externalities or other distortions, so that prices reflect true social marginal costs; (3) human resource investments in the children are privately efficient (i.e., wealth-maximising) from the family perspective even if prices do not reflect social marginal costs; and (4) parents obtain equality in the children's wealth by distributing transfers among their children so as to offset earnings differences, whether these arise from the differences in endowments or the differences in human resources.

These implications of the wealth model have shaped the way most economists view intra-household allocation and investment in human capital. But Behrman, Pollak and Taubman (1995a) note that these conclusions depend on three crucial assumptions.[12]

First, the social efficiency conclusion, although not the other results, depends on the absence of externalities and on perfect capital markets so that all private prices equal social marginal costs. It is often asserted that human resource investments such as schooling generate important externalities that cause social returns to exceed what private returns would be if private individuals were to pay the marginal costs for such schooling. For example, there may be benefits to future generations if the current generation receives more education and this leads to higher future productivity because the future stock of knowledge is greater.[13] Also publicly subsidised schools, health services or food that are common in many developing countries cause the social efficiency conclusion not to hold even if there are not externalities.

Second, the conclusion regarding the reinforcement of endowment differentials

[10]If which child is more educable depends on the interest rate, the child with the highest average earnings need not be the child with the highest marginal earnings. In this case, the wealth possibility curve need not be elongated in the direction of the child with the greater endowments. Behrman, Pollak and Taubman (1995a) elaborate on this point.

[11]Any welfare function that causes parents to select a point on the linear segment of the frontier implies that each child receives the wealth-maximising level of education.

[12]Other assumptions also play a role–for example, the decision-making power rests with parents rather than with children.

[13]Belief in this effect lies at the heart of much of the so-called "new economic growth" literature [e.g., Romer (1986); Lucas (1988); Azariadis and Drazen (1990) and Stokey (1991)].

depends on restrictions on the earnings production function. Consider a family with two children. For a given interest rate, the children can be ranked in terms of the resources required to give them the wealth-maximising level of human resources. Designate the child for whom more resources are required to provide that child with the wealth-maximising level of human resources as "more educable".[14] If the marginal return to human resource investments for one child always lies above the corresponding marginal return to human resource investments for the other child, then the identity of the "more educable" child is independent of the rate of interest. There is, however, no reason why these schedules cannot intersect. If they intersect and if both children receive the wealth-maximising level of human resources, the more educable child need not be the child with higher earnings: higher *marginal* returns need not imply higher *average* returns to human resources. Thus, even if parents devote enough resources to their children to attain the wealth-maximising levels of human resource investments, the Becker and Tomes conclusion that the allocation of educational resources tends to "reinforce" differences in endowments rather than "compensate" for them depends crucially on the assumption that the earnings production function is such that the child with higher marginal returns to human resources also has higher average returns to human resources.

Third, all of the conclusions depend on the assumption that parents devote "enough" resources to their children. Parents who are insufficiently wealthy or insufficiently altruistic (i.e., those who fail to place "sufficient" weight on their children's wealth in their own preference function) fail to provide their children with the socially efficient, wealth-maximising levels of human resources, and fail to equalise their children's wealth. Whether such parents reinforce or compensate for endowment differentials, moreover, may depend on preference parameters in addition to the nature of the earnings production function. Behrman, Pollak and Taubman (1995a) examine the implications of the wealth model in the cases ignored by Becker and Tomes in which parents have more than one child and allocate an "intermediate" level of resources to their children, with the result that the parental preference maximisation (tangency) is not along the 45° ray as in Figure 1, but elsewhere as in Figure 2. As parental resources allocated to the children are reduced, *ceteris paribus*, the wealth possibility frontier moves closer to the origin and the linear region ii shrinks (since there are less resources left over for transfers after paying for the wealth-maximising human resource investments for both children) until it disappears. Figure 2 illustrates a case in which there still is a region ii but it does not intersect the 45° ray from the origin, and Figure 3 illustrates a case in which there is no region ii and, in fact, parental resources are "very low" in the sense that they are not sufficient to attain the wealth-maximising human resource investment for either child. It is immediately clear from these figures that the Becker and Tomes's result–that parents with equal concern equalise wealth among their children–generally does not hold if parents do not allocate sufficient resources to their children.[15] Instead,

[14]This is the designation used by Behrman, Pollak and Taubman (1995a). This terminology seems clear for human resource investments in the form of education, but would need to be modified in an obvious way for other human resource investments such as those in health and nutrition. Nevertheless, I proceed to use "more educable" as a convenient short-hand expression for the child for whom the wealth-maximising human resource is greater at a given interest rate.

[15]It holds for the lower resource cases if and only if the parental welfare function is L-shaped so that parents value only equity, not productivity.

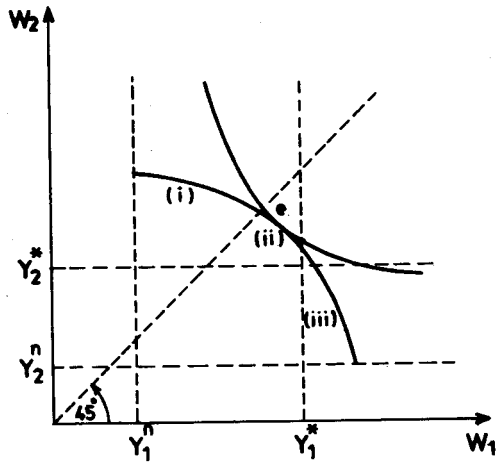

Fig. 2. Wealth Model with Equal Concern and Intermediate Resources.

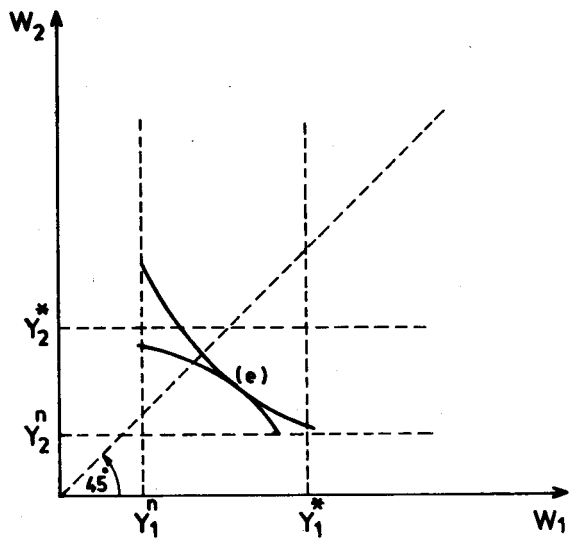

Fig. 3. Wealth Model with Equal Concern and Very Low Resources.

the more educable child has the higher wealth ($W_1 > W_2$) because the equilibrium tangency is below the 45° ray from the origin. It also is clear that for the cases below the very high resource case, at most one child receives transfers at the equilibrium (i.e., in Figure 2, $T_2 > 0 = T_1$ and in Figure 3 $T_2 = T_1 = 0$), which contrasts with the Becker and Tomes implicit very high resource assumption in which both children receive transfers. It also is clear that if parents do not provide enough resources for the very high resource case, human resource investments in at least one child are below the wealth-maximising level (i.e., in Figure 2 for child 1 and in Figure 3 for both children), so the Becker and

Tomes conclusion about human resource investments being socially efficient does not hold even if private marginal rates of return to such investments are the same as social marginal rates of return at the wealth-maximising levels of human resource investments. Finally, which child receives the greater human resource investment may depend on parental preferences in addition to the properties of the earnings production function–again in contrast to the claim by Becker and Tomes–as can be seen by considering the very low resource case in Figure 3, with the modification (not drawn) of parental preferences with extreme inequality aversion (L-shaped) so the equilibrium point e is on the 45° ray from the origin, which implies greater human resource investment in child 2 even though that child is less educable and the impact of human resource investments in the earnings production function increases with child endowments. Thus, the Behrman, Pollak and Taubman consideration of the wealth model for the less than very high resource case, on which Becker and Tomes concentrate, suggests that the implications that Becker and Tomes draw do not necessarily hold for resources less than in the very high resource case.

These considerations about the wealth model lead to several possible tests of the model conditional on equal concern: If all children in a sibship receive financial and physical transfers from their parents, do the differences in transfers received offset the differences in earnings? If all children in a sibship receive transfers from their parents, do they all have the same marginal rate of return to human resource investments and is this rate of return equal to the rate of return on financial assets? If one child in a sibship does not receive transfers and at least one child does receive transfers from their parents, does the child that receives the transfer have less earnings but a higher marginal rate of return to human resource investments than does the child who does not receive transfers and is this rate of return for the latter child equal to the rate of return on financial assets? If no child in a sibship receives transfers from their parents, are the marginal rates of return to human resource investments higher for the children with smaller earnings and are all of these rates of return greater than the rate of return on financial assets? Unfortunately, these tests are not easy to implement because it is very difficult to estimate marginal rates of return to human resource investments for different individuals in a sibship within a framework that is consistent with the wealth model, because of the difficulties of controlling for *individual* endowment differentials [e.g., Behrman, Rosenzweig and Taubman (1994)] and because of the difficulty of obtaining data on all transfers from parents to children, including *inter vivos* gifts and bequests. I am unaware of any studies using such tests persuasively for developing countries (or, for that matter, for developed economies).

The Separable Earnings-transfers (SET) Model

Behrman, Pollak and Taubman (1982) introduced the SET model in which the parental welfare function is separable between their children's distribution of income from labour earnings and their children's distribution of income from physical and financial transfers received from their parents. This separability assumption may be rationalised because parents value income that their children earn by their labour differently from the income received from assets since, for example, a person who "earns his or her way" may be valued more, or it many be viewed as lower status if a person has to work to earn income. The separability assumption enables the analysis of the distribution of

human resource investments among children without regard to the magnitude or distribution of transfers. Thus, the predictions of the SET model about earnings distributions coincide with those of the wealth model with zero transfers, with the exception that the SET model does not predict that the level of human resource investments must be less than or equal to the wealth-maximising level in order for there to be no transfers. That is, for the SET model, there is a figure similar to Figure 3, but with earnings measured on the axis (not wealth) and with the location of Y_1^* and Y_2^* not specified necessarily to be greater than the maximum wealth possible, given the wealth possibility frontier constraint.

Two features of the parental sub-welfare function for earnings are of particular interest: the equity-productivity trade-off and equal concern. Figure 4 illustrates the

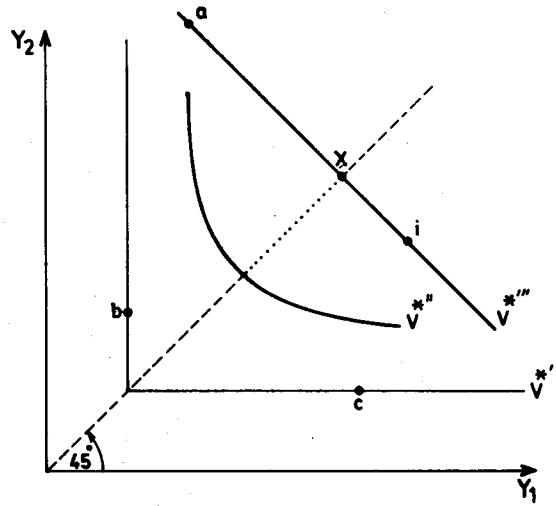

Fig. 4. Alternative Parental Sub-welfare Equity-productivity Preference Trade-offs with Equal Concern.

range of possibilities for the equity-productivity trade-off in the two-child case with equal concern. At one extreme, parents may be concerned exclusively with equity or fairness and place no value on productivity, *per se*, in which case the sub-welfare function indifference curve is L-shaped, as is V*', indicating that there is no welfare gain if, from an initially equal earnings distribution such as at point a, the earnings of one child increase while those of the other remain unchanged, moving to a point such as b or c. At the other extreme, parents may be concerned solely with aggregate earnings or productivity of their children, so that the sub-welfare function indifference curve is linear, as is V*'''. In this case, the parents are not concerned with the distribution of earnings among their children, but only with the sum of their children's earnings. Hence, they are indifferent among distributions such as e, f, and g. Between these two extremes are intermediate cases in which parents trade off equity or fairness against productivity, such as V*''. Conditional on the validity of the model, the magnitude of the equity-productivity trade-off implicit in parental allocations is an empirical issue (see Sub-section 3.2.1 below).

The second feature of the earnings sub-welfare function, equal concern, already

has been discussed in conjunction with the wealth model. Unequal concern might be based on a variety of characteristics: sex, birth order, beauty, cuteness, brightness, energy, innate health. In Figure 5, $V^{*'}$ illustrates an indifference curve that places greater weight on the earnings of child 1 than child 2. Some empirical estimates of the extent of unequal concern are summarised in Sub-section 3.3.1 below.

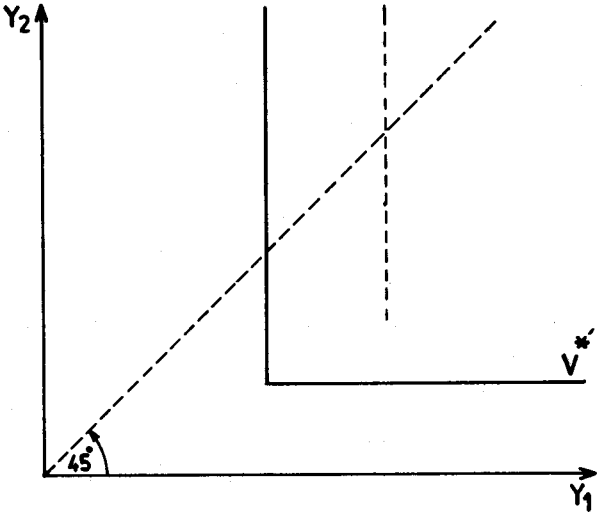

Fig. 5. Parental Sub-welfare Preference Curve with Unequal Concern.

The equity-productivity trade-off and the extent of equal concern are distinct features of the earnings sub-welfare function. Parents may exhibit substantial concern with equity or fairness (reflected in indifference curves that are nearly L-shaped), but exhibit unequal concern (so the indifference curves are asymmetric around the 45° ray). Or parents may be primarily interested in productivity (so that their indifference curves are almost linear), but have equal concern (so that the indifference curves are symmetric). Thus, there is no necessary link between equal concern and concern with equity or fairness in the equity-productivity trade-off.

In the SET model, human resource investments in children and thus the children's earnings capacities are determined by maximising the parental sub-welfare function for their children's earnings subject to an earnings production function and a budget constraint on human resource investments in the children. Figure 6 illustrates this constrained maximisation. A parental earnings sub-welfare curve is indicated by W* With equal concern, this curve is symmetric around the 45° ray. The budget constraint, the earnings production function, and the given endowments and human resource investment prices imply an earnings possibility production frontier. In general, this frontier is *not* symmetrical around the 45° ray because endowments and human resource investment prices may differ among children. In this figure the solid earnings possibility frontier is drawn as if child 1 has greater endowments and faces lower human resource investment prices. Constrained maximisation leads to a point such as h, where the indifference curve of the parental sub-welfare function is tangent to the earnings possibility frontier. Even with equal concern, the maximising outcome is not in general equal earn-

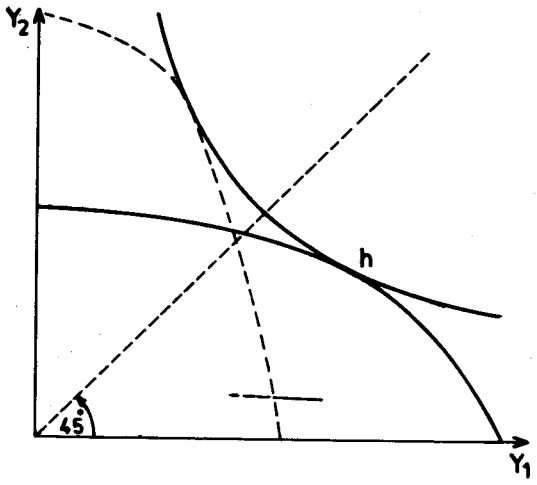

Fig. 6. SET Model Equilibria with Two Earnings Possibilities Frontiers and Equal Concern.

ings for the children because the frontier is not symmetric. Instead, the more educable child and/or the child facing lower human resource investment prices has higher earnings.[16] If parents are concerned solely with equity or fairness, then their indifference curves are L-shaped. If, in addition, they have equal concern, then unequally endowed children receive equal earnings. If parents have unequal concern, the parental sub-welfare function is shifted in the direction of the favoured child.[17]

Figure 6 also can be used to educate one's intuition about identifying the curvature and asymmetry of the parental sub-welfare functions. In general for any pair of children in the same or different families, relative endowments differ. For a second pair of children, for example, the earnings possibility frontier might look like the dashed line in this figure. By examining the tangencies between a whole set of earnings possibility frontiers for different pairs of children with a single parental sub-welfare curve, the curvature and the asymmetry of the parental sub-welfare function can be traced out, conditional on the earnings production function and on the parental sub-welfare function being homothetic.

Behrman, Pollak and Taubman (1982) also use specific functional forms to derive tractable expressions for the relative human resource investments and relative earnings of siblings. They assume that the parental sub-welfare function defined over their children's earnings is CES, with a parameter d to represent the curvature (i.e., the equity-productivity trade-off)[18] and parameters h_j to represent possible asymmetries in weights

[16]Human resource investment prices may be functions of endowments if, for example, merit scholarships are important. See Behrman, Pollak and Taubman (1989) for the analysis of such a case for tertiary education in the United States.

[17]This suggests the possibility of a borderline case in which equal earnings result because parents prefer the less-well-endowed child just enough to offset the impact of differential endowments on the earnings possibility frontier.

[18]The curvature parameter is $-\infty < d \leq 1$, with the former limiting value concern about only equity and the latter concern only about productivity.

placed on the earnings of different children (i.e., unequal concern). The earnings production function is assumed to be log-linear or Cobb-Douglas, with $0 < \lambda < 1$ giving the elasticity of earnings with respect to human resource investments. The equilibrium ratio of the two siblings' human resource investments and earnings are:

$$(H_1/H_2) = [(h_1 p_{H2})/(h_2 p_{H1})]^{1/(1-\alpha d)} (E_1/E_2)^{d/(1-\alpha d)} \text{ and} \quad \ldots \quad \ldots \quad (1)$$

$$(Y_1/Y_2) = [(h_1 p_{H2})/(h_2 p_{H1})]^{\alpha/(1-\alpha d)} (E_1/E_2)^{d/(1-\alpha d)}, \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where the p's refer to the prices of human resource investments in the two children and the E's refer to their respective endowments.

The implications of the SET model with these specific functional-form assumptions for compensation versus reinforcement of endowments through human resource investments patterns are the clearest when human resource investment prices are the same for all children (i.e., $p_{Hj} = p_H$) and parents have equal concern (i.e., $h_j = h$). In this case, the expressions in brackets [ ] are unity, so parents reinforce the children's endowment differentials if and only if $d > 0$ and compensate if and only if $d < 0$. The borderline case separating reinforcement from compensation is a Cobb-Douglas parental sub-welfare function ($d = 0$) in which parents are neutral, neither compensating nor reinforcing endowment differentials among their children, so that human resource investments in the children are identical and the earnings ratio is proportional to the endowments ratio. These conclusions differ from those of the wealth model for values of $d \leq 0$.

Unequal concern implies that $h_1 \neq h_2$ in the brackets at the front of the right-side of relations (1) and (2). As one would expect, unequal concern shifts resources towards the child with greater preference weight and increases the absolute and relative earnings of the preferred child. The greater the product αd, the greater are these shifts. This product is greater and, in turn, the greater is the concern about productivity (or, equivalently, the less is the concern about equity) and the greater is the elasticity of earnings with respect to human resource investments.

Identifying the Returns to Schooling

The intra-household allocations in the wealth model and the SET model have implications for estimates of returns to schooling [Behrman (1987a)], to which I now turn. Parents invest in their children not only with expenditures on schooling but also with time and goods allocated to health, nutrition, and general development. In poor societies, the value of the resources devoted to these non-schooling investments may exceed that devoted to schooling.[19] This observation raises two questions. *First*, in the absence of data on non-schooling investments, under what conditions can an investigator distinguish between the effect of schooling investments and the effects of correlated non-schooling investments? *Second*, if one cannot identify the effect of schooling, how should one interpret the estimated coefficient of schooling in an equation for earnings or some other outcome affected by schooling?

[19] And the returns to such investments may be higher as well see the survey in Behrman (1993).

To answer these questions, first consider a model consistent with the wealth model (in the low resource case) and the SET model. Suppose that parental preferences with regard to their children depend on a single outcome for each child (e.g., earnings). Assume that the human resource investments in each child that enter into the production relation for earnings include schooling (S_j) and other investments in the child (e.g., nutrients, N_j) in addition to endowments. If this constrained maximisation problem has an interior solution, then manipulation of the first-order conditions yields the standard tangency condition in which the marginal products of the last expenditures on each input (i.e., S_j and N_j) are equalised. Depending on the prices relevant for investments in this child and the form of the earnings production function, this relation can imply a strong association between the schooling and non-schooling investments in a particular child. For example, suppose that the earnings production function is CES with the elasticity of substitution between any two inputs σ and with a's being the weights on the inputs. In this case, the relation between the inputs implied by the first-order conditions is:

$$N_j = [(p_{Sj}a_N)/(p_{Nj}a_S)]^{\sigma}S_j. \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

If the prices and the earnings production functions are identical for all children in a family, the subscript j can be dropped from the prices and the production function parameters[20] and relation (3) implies that schooling and non-schooling investments are perfectly correlated across children regardless of differences in their endowments. If the earnings production function and the prices are identical for children in different families (e.g., in a region or a class), then this perfect correlation holds for these children regardless of differences in their endowments. Under such assumptions, the impact of schooling on earnings can not be identified.

These assumptions–observations on schooling but not non-schooling investments, identical CES earnings production functions and identical prices for all children within a family–do not permit the estimation of the returns to schooling. If schooling alone is included in the earnings relation as in Mincer (1974) and in many estimated wage, earnings, and production functions such as those surveyed for developing countries in Psacharopoulos (1988), then the estimated impact of schooling is biased upwards because schooling serves as a proxy for all human capital investments.

Child Quality

The intra-household allocations in the wealth model and the SET model also have implications for the interpretation of schooling as child quality [Behrman (1987)], to which I now turn. Child quality plays a critical role in the analysis of fertility and investments in children's human capital in the dominant model in economic demography, the "quantity-quality" model of Becker and Lewis (1973) and Willis (1973). Child quality also is of considerable interest because of its relation to well-being and productivity. Despite its apparent relevance to economics and demography, the concept of child quality remains elusive.

In the theoretical literature, child quality is sometimes defined as a set of desirable

[20]Since the children's individual endowments appear as arguments of the earnings production function, this does not imply that the earnings possibility frontier is symmetric.

characteristics that appear as arguments of the parents preference function, sometimes defined as expected adult earnings or income [e.g., Becker (1991)], and often not defined at all. In empirical studies, child quality is usually treated as an unobserved variable and is represented by child schooling (or, occasionally, by some other variable, such as health).[21] For example, in her presidential address to the Population Association of America, Blake (1981) explicitly equates child quality with child schooling. The widespread practice in empirical work of equating child quality and schooling raises the question: How good a proxy for child quality is child schooling? The answer to this question bears on the validity of estimates of parents' willingness to trade off the quality for the quantity obtained using this schooling as a proxy for child quality.

When child quality is viewed as the output of a production process, schooling is widely regarded as one of the critical inputs. Thus, all else being equal, schooling is likely to be highly correlated with child quality. But all else is not equal. Children differ substantially–both within and across families–in the endowments they carry with them to school [e.g., Behrman, Rosenzweig and Taubman (1994)]. If parents allocate schooling investments to compensate partially for the distribution of endowments, as they may in the SET model, then schooling may be a poor proxy for child quality. If different households face different prices for schooling relative to other human capital investments (e.g., expenditures on health, nutrition, and general development) because, for example, food is relatively more expensive in urban than in rural areas, then the schooling-quality association also may be weakened.[22] The problem is not simply that schooling is likely to differ from quality, but that the differences may be systematic.

Insights into the empirical relationship between schooling and quality can be gained by considering parental altruism models of intra-household allocation. First I consider the case in which quality is embodied in children, in the sense that it affects their expected earnings, and then I turn to a broader definition of quality that reflects their command over resources. The absence of direct observations on child quality and child endowments precludes testing the empirical association between child quality and child schooling by estimating directly the production relations for child quality.

If child quality is embodied in the children's expected earnings capacities, then the SET model can be used to analyse the determinants of child quality. In this case, within families, the association between child quality and schooling may be negative, zero, or positive. The sign and magnitude of this association depends on (1) how easily schooling can be substituted for endowments in the production of quality, (2) the willingness of parents to trade off equity (or fairness) and productivity and (3) whether schooling prices for children depend on their individual endowments. The greater the substitutability of schooling for endowments in the production of quality, the greater the parental concern about equity in the distribution of quality among their children; and the less the schooling prices depend on individual endowments, the lower the schooling-quality association. These results can be seen by deriving an expression for the relation between quality (Q, instead of Y for earnings) and schooling of two children within a family from a parental sub-welfare relation and a CES quality production function with

[21]For example, see Blake (1981); DeTray (1977); Leibowitz (1974) and Rosenzweig and Wolpin (1980).

[22]These difference may be substantial in developing countries with fragmented markets.

an elasticity of substitution between schooling and other inputs of σ.[23]

$$Q_1/Q_2 = (S_1/S_2)^{1/(1-(1-d)\sigma)}(h_2 p_{S1}/h_1 p_{S2})^{\sigma/(1-(1-d)\sigma)}. \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

If there is equal concern (so $h_1 = h_2$) and if each child in the family faces identical schooling prices (so $p_{S1} = p_{S2}$), this expression implies that relative schooling is a perfect proxy for relative child quality if and only if $(1-d)\sigma = 0$. If there is substitution in quality production ($\sigma > 0$) and some parental inequality aversion ($d < 1$ so that $(1-d) > 0$), relation (4) implies a less than perfect correlation between schooling and quality, even with equal concern and with schooling prices independent of endowments. As $(1-d)\sigma$ increases in value, the correlation becomes smaller and schooling becomes a poorer proxy for quality. If $(1-d)\sigma = 1$, the correlation is zero. If $(1-d)\sigma > 1$, the correlation is negative and schooling is inversely related to quality. Thus, the greater the parental inequality aversion and the easier the substitution in the production of quality, the poorer a proxy for quality is schooling. This is the case because the greater is σ, the more the schooling for a particular child can be substituted for limited genetic and environmental endowments, and the less is d, the more the parents want to make such substitutions. If there is unequal concern that does not depend positively on endowments, then the schooling-quality association is likely to be weakened further. If schooling prices depend negatively on endowments, then the schooling-association is likely to be weakened (and vice versa for a positive association).

If quality is embodied in children (e.g., in their earnings), if wealthier families devote more resources to children, and if wealthier families face lower marginal funding costs or if their children have better endowments, then the inter-family association between schooling and quality will tend to be greater than the within-family association. On the other hand, three factors work in the opposite direction. *First*, the expressions above for the intra-family comparison of relative quality and schooling incorporate additional factors if they are derived for inter-family analysis that probably lessen the quality-school correlations (e.g., family Lagrangian multipliers on the budget constraint). *Second*, underlying the imperfect representation of quality by schooling may be variations in genetic endowments that are likely to be greater among unrelated individuals than among siblings. *Third*, schooling prices relative to other prices are more likely to vary across families than within families due to different locales, which tends to weaken the schooling-quality association, as can be seen by examining relation (4).

If quality is defined more broadly to include the children's expected total command over resources, the wealth model applies. For the very high resource case emphasised by Becker and Tomes, the intra-household association between schooling and quality is zero. If all children receive positive transfers, all households face the same marginal costs of funds for schooling investments and the same relative prices for schooling, and there is no association between child endowments and the total resources devoted to children, then the wealth model implies that the inter-family association between schooling and quality also is zero. Under such assumptions, if wealthier families devote more resources to their children, they give the extra resources to their chil-

[23]Correlations in real world data are affected by measurement errors. But the point here refers to the true values implied by the models, abstracting from measurement errors.

dren in the form of transfers, not greater schooling. If wealthier parents devote more resources to their children and face a lower marginal cost of funds or tend to have children with better endowments, however, then there is a positive inter-family association between schooling and child quality even in the very high resource case. For lower levels of resources devoted to the children, the intra-household association between schooling and quality may be positive, negative, or zero.

Finally, in both the wealth model and the SET model, imperfect information about child endowments at the time schooling investment decisions are made weakens the schooling-quality association.

This review of the implications of the wealth model and the SET model for the association between schooling and quality suggests that the associations, if they are positive, may well be weak. Hence, the use of schooling as a proxy for child quality must be interpreted carefully; clarity would be increased if schooling were simply called schooling in empirical work. If a representation of child quality is required to test some hypothesis, the use of some representation that is likely to be more highly correlated with child quality than is schooling would be desirable.

2.2. Qualified Parental Altruism

The wealth model and the SET model are purely altruistic in the sense that parents allocate human and financial resources among their children with interest in their children's satisfaction without attempting to affect their children's subsequent behaviour.[24] I turn now to models of parental altruism which are qualified by parents taking additional actions, either subsequent to those of the children or prior to those of the children, to affect the outcomes. The two examples of such models that are summarised in this section are Becker's "rotten kid theorem" and Bernheim, Shleifer and Summers's model of strategic bequest motives. In both cases the parents have unified preferences, in contrast to the models of collective household behaviour that are discussed in Section 2.3 below, but the children have preferences that differ from those of the parents. The essence of these models is captured by considering the nature of intra-household allocations between a child and a parent rather than among children, though there are direct implications for allocations among children.

The Rotten Kid Theorem

Becker (1974a, 1981) argues in his "rotten kid" theorem that variations in parental transfers to selfish children (or other household members) force such children to consider their parents' interests. Each beneficiary, no matter how selfish, maximises the total family income available to the altruistic benefactor. Assume, for example, that the parents' preferences depend on their own consumption and on the child's satisfaction that depends on the child's consumption, but that the child is selfish in the sense that the child's preferences depends only on the child's consumption. Also assume that the parents provide positive transfers to the child. In this case, if the child takes some action

[24]Though the SET model, in a sense, constrains the children's choices by designating certain intergenerational transfers to occur in the form of human resources and others in the form of physical or financial assets.

that affects both the income of the parents and the child and the parents make a subsequent preference-maximising transfer to the child, the rotten kid theorem states that the child chooses an action that maximises total family income (i.e., the sum of parents' and the child's income) and therefore an action that maximises parental welfare. As long as the parents make positive transfers, the allocation of consumption between the parents and the child is determined by the tangency of the parental preference function with the inter-generation family income constraints. Thus, assuming that the preference level of the child is a normal good for the parents, the child maximises his/her own consumption and preference level by maximising family income. The parents do not need to manipulate the child's decisions because parental adjustments in their transfers to the child create optimal incentives. It is also the case that a forced transfer from the parents to the child has no effect on either the parents' or the child's consumption as long as the parents still make positive transfers to the child after the forced transfer, which is the basis of the Ricardian equivalence theorem [Barro (1974)] regarding the ineffectiveness of macro policies.

There are at least three important reasons why the rotten kid theorem may not hold. *First*, as Hirshleifer (1977, 1985) points out, the parents must make their transfer after the child makes all his/her actions that affect family income. If not, the selfish child can maximise his/her income at the expense of the family. *Second*, Bergstrom (1989) and Bernheim, Shleifer and Summers (1985) demonstrate that the theorem may not hold if preferences do not depend solely on transferable commodities (see below). *Third*, Bruce and Waldman (1990) show that the theorem may not hold in a two-period model with savings. If the parents make transfers only in the second period, the child chooses efficient income-generating actions in both periods without the need for parents to engage in retaliatory strategies, but consumes too much and saves too little in the first period in order to be more impoverished and receive greater transfers in the second period (i.e., the "Samaritan's dilemma"). If the parents pre-commit by making sufficiently large transfers in the first period so that the second-period transfer is inoperable, the child no longer has incentives to save too little in the first period but the rotten kid theorem is not operable in the second period. Therefore, if parents cannot behave in a retaliatory fashion, they must chose between an operative second-period transfer with a Samaritan dilemma-type inefficiency and a non-operative second-period transfer with a rotten kid-type inefficiency. In either case the family unit does not achieve the Pareto frontier.

Strategic Bequest or Exchange Model

Bernheim, Shleifer and Summers (1985) develop a simple model of strategic bequests in which the parents influence the behaviour of their children by holding wealth in bequeathable form and by conditioning the division of bequests among their children (and perhaps others) on the beneficiaries' actions. This model incorporates into the intergenerational relation some action that children may take: for concreteness, it might be attention given to the parents (e.g., care, visits, etc.) that affects both parental and child satisfaction levels. They assume that parents tire of attention from their child only after the child tires of giving attention, though parents' overall satisfaction level eventually declines with more attention either because of tiredness from too much attention or because concern for the child's dissatisfaction dominates the parents' direct desire for

attention. They argue that parents can manipulate child behaviour to improve their own satisfaction so that the child provides more attention and receives greater transfers than would occur without such strategic behaviour if the parents credibly can pre-commit larger transfers.

Neither Bernheim, Shleifer and Summers nor other users of these exchange models address directly how unobserved endowments, which are such a central part of the models in Section 2.1, enter into the strategic bequest/exchange stories. These authors also are silent on how human resource investments enter into the analysis and what the relations, if any, are between human resource investments and earnings on the one hand, and transfers on the other. It would seem, for example, that for the exchange models there would be child attention endowments–some children are better at or enjoy more giving attention to their parents than others–in addition to earnings endowments. But these studies do not comment on the possibilities of such endowments, or on what is the relation among various types of endowments. Some evidence for the United States is presented by Bernheim, Shleifer and Summers and other authors that they interpret to be consistent with these exchange models, but it is hard to know how to interpret such evidence in light of the empirical difficulties related to the failure to control for unobserved earnings and attention endowments and inter-generational correlations in endowments. I am not aware of any efforts to apply exchange models to data from developing countries, though that may be a productive area for research since inter-generational interactions seem to have numerous non-economic dimensions in many developing country contexts.

2.3. Collective Models of Household Behaviour

Micro-economic theory traditionally has considered the household (or at least the parents) as the basic decision-making unit, with a single unified preference function that is maximised subject to budget and production function constraints as in the previous two sections. This traditional approach, however, has been challenged increasingly by advocates of a "collective" or "non-consensual" approach to household behaviour in which a household is described as a group of individuals, each of whom has particular preferences and among whom a collective decision process occurs. The critique of the traditional approach is that, by aggregating individuals into households, it ignores the individual preference differences that motivate the processes of household formation and dissolution and of intra-household allocations. Collective models tend to focus on decisions between husbands and wives, rather than allocations among children as in the unified parental preference models that are discussed above.

Among collective household models, a basic distinction is between cooperative processes (in which case only Pareto-efficient outcomes can be reached) and non-cooperative processes (in which case the game generally does not lead to Pareto-efficient outcomes). A particular sub-class of cooperative models that has been widely considered relies on Nash bargaining with equilibrium concepts borrowed from game theory that I first consider. Then I turn to Pareto-efficient collective models.

Nash Bargaining Models of Intra-household Allocations

Manser and Brown (1980) and McElroy and Horney (1981) introduced a particu-

lar sub-class of cooperative family models that relies on Nash bargaining with equilibrium concepts borrowed from game theory and that has been widely considered. The Nash cooperative bargaining model of family behaviour generalises the comparative statics of a unified preference constrained maximisation. Demand-changes result from the changes in the objective function that reflect the changes in relative bargaining power in addition to twists and shifts in the budget constraint.

In the Nash approach, first threat points are defined for each household member that reflect the welfare levels that each individual could obtain if there was no collective agreement, say Φ^M and Φ^F in a two-person case, each of which depends on prices broadly defined and on the respective income the particular individual would receive if there was no collective agreement. In some cases, the threat points are assumed to be determined by divorce and in other cases by a non-cooperative equilibrium in the household, such as Lundberg and Pollak's (1993) example, in which threat points are traditional gender roles. Then the surplus from cooperation is shared geometrically so that the household maximises $(U^M - \Phi^M)(U^F - \Phi^F)$ subject to the budget constraint (where U^j refers to the satisfaction level of person j). The result is a system of demand equations for goods and leisure that depends on prices broadly defined and on all predetermined assets of the individual members of the household.

In recent writings, for example, McElroy (1990, 1992) has emphasised individual non-earnings income among possible assets and prices broadly defined, including both a market price vector and "extra-household environmental parameters" (EEPs) that are factors that shift the threat points for at least one individual in a marriage (e.g., "sex ratios in the relevant marriage market, laws concerning divorce, alimony, and child support, transfers targeted for children that upon divorce predictably go with the custodial parent, caste, and general ability to survive or prosper outside of the family", [McElroy (1992), p. 7]; [McElroy (1992), p. 28] summarises the hypotheses of the Nash-bargaining model [that she presented in detail in McElroy (1990)] as:

(N1 and N2) Symmetry and negativity of the Nash generalisation of the substitution matrix.

(N3) Income controlled by the wife has a different effect on demands than income controlled by the husband, and these separate effects are related by a particular across-equations restriction.

(N4) Changes in demands resulting from changes in the EEPs take on a particular form.

McElroy (1992) characterises the empirical tests to date as including tests of across-equations restrictions (of which there are "few and inconclusive") and single-equation tests (which have "produced strong results favouring the bargaining models") (pp. 11-12). I return to some of the single-equation tests below in Section 3.4 since some of the ones that McElroy highlights are for developing country contexts.

But since some kind of bargaining approach to the determination of intra-household allocations, both in developing and developed economies, has a strong *a priori* appeal and has been advocated by a number of commentators [e.g., Folbre (1984, 1986)], it is useful to comment on why there have not been more systematic studies of the cross-equation restrictions implied by this approach. The reason is that undertaking

such studies in a persuasive fashion is very difficult for a number of reasons. *First*, estimation strategies proposed by McElroy (1990) and others include the estimation of selectivity controls for being married versus being divorced, but do not provide guidance regarding what variables possibly could affect the divorce decisions that are not incorporated into the threat points so that they could identify the selectivity correction. It would seem to me that there are no obvious candidates, so that such procedures may not be implementable in a persuasive way. *Second*, such procedures and the resulting tests are conditional on the specification of the threat points, so the tests are of compound hypotheses (i.e., that the threat points are divorce or separation, and that Nash bargaining occurs). With different threat points such as the non-cooperative outcomes suggested by Lundberg and Pollak (1993), it is hard to know how such a procedure could be used to identify the threat points since non-cooperation within a marriage does not obviously bring into the picture a set of usually observed prices parallel to McElroy's EEPs. *Third*, such procedures seem to depend on cardinal measures of utility to calculate the threat point. *Fourth*, the Nash intra-family literature, in general, and the suggested estimation procedures ignore the possible roles of heterogeneity in unobserved endowments that underlie critically the wealth and SET models of intra-household allocation in Section 2.1 above and some of the more interesting empirical explorations in Section 3. The lack of attention to such endowments may cause serious problems of interpretation in the estimation of threat points and the household demand systems, as well as in the interpretation of the coefficients of variables such as "unearned" income (see Section 3.4 below for elaboration). This same problem, in fairness to the literature on the Nash household bargaining models, plagues other efforts at collective household modelling and much (though not all–see Section 3) of the literature based on unified preferences. *Fifth*, the suggested procedures use estimated threat points but do not consider the implications of measurement error, which–as illustrated in the Pitt, Rosenzweig and Hassan (1990) study that is summarised in Sub-section 3.2.2–may cause considerable problems in efforts to obtain consistent parameters of the relations underlying household demand systems.

Pareto-efficient Collective Household Models

Chiappori (1988, 1992) and co-authors [e.g., Bourguignon, Browning, Chiappori and Lechene (1991, 1991a)] have developed collective cooperative household models that only assume that allocations are Pareto-efficient, but without assuming any explicit solution process.[25] Thus, this approach is more general than those approaches that are based on Nash or other game theory equilibrium concepts.

Central to the empirical explorations in this literature are: (1) *Distinctions among types of private consumption goods*–a good is exclusive if it is consumed by one member only, such as an individual's leisure (if it has no public good characteristics). A non-exclusive good is assignable if each member's consumption can be observed independently (and otherwise it is non-assignable). (2) *Income-sharing rules*–all cooperative models have an income-sharing rule interpretation in that any efficient decision process can be interpreted as one in which household members allocate the total income (minus

[25]Bourguignon and Chiappori (1992) survey this still rapidly evolving line of research.

that devoted to public goods) by some sharing rule that may depend on income and prices (e.g., F receives θ (p,y) and M receives $y - \theta$ (p,y)) and then each member maximises her/his preference conditional on the level of pubic goods, subject to the budget constraints so defined.

The flavour of the empirical tests possible with the efficiency approach can be obtained from Chiappori (1988, 1992), who proves for the case in which each household member's labour supply is freely chosen, observable, and exclusive and there is a single aggregate consumption good. (1) If individuals are egoistic (i.e., have no altruism), conditions can be derived both from parametric (e.g., partial differential equations on labour supplies) and non-parametric ("revealed preference"-type conditions) perspectives. These conditions are totally independent from "neo-classical" ones, so empirical tests may be performed to compare the two settings. (2) The sharing rule can be recovered from labour supplies except for an additive constant. Each individual's satisfaction level also can be recovered, up to the same additive constant. The key intuitive point is that, under the exclusive good assumption, each individual household member's wage and common non-earning income only can have income effects through the sharing rule on the spouse's behaviour.[26] (3) If individuals have altruistic preferences, what can be said depends upon the number of goods relative to the number of household members. Any finite set of labour supply data can be exactly rationalised by adequately defined preferences, even if the sharing rule is known *ex ante*, for a two-member household with only one positive labour supply and one consumption good. If, all else being equal, there is a second labour supply, non-parametric conditions can be identified.[27]

Bourguignon and Chiappori conclude their survey with these words: "The collective approach described above is still in a preliminary stage. Several theoretical issues remain unsolved; and the empirical work only begins. We however believe that it constitutes a coherent and promising research programme, which is likely to be pursued in the forthcoming years" (p. 9).

My assessment of this research programme, of course, must be tentative because it appears to be developing fairly rapidly with much work still underway or projected for the future. I applaud a number of dimensions of it: the effort to elucidate exactly what can and what can not be estimated about a number of dimensions of intra-household behaviour, such as clarifying the conditions under which individual consumption of non-assignable goods can be recovered, under the general assumption of Pareto-efficient collective household behaviour; the stated intent to link rigorously modelling of household behaviour with empirical testing; and the goal of seeing how much can be said with fairly minimal assumptions about the collective decision process. Nevertheless, how positively one assesses the results to date relates to the old saw about whether the glass is a quarter full or three quarters empty. Some of the results are impressive, such as the

[26]For instance, if a 10 percent increase in the husband's wage and a 5 percent increase in common non-labour income both have the same effect on the wife's behaviour, this provides the bases for estimating the marginal rate of substitution between the husband's wage and common non-labour income in the sharing rule (and vice versa for the wife's wage), so the partials in the sharing rule can be recovered (up to a constant). These results can be extended to the case of several consumption goods, each of which generates additional empirically testable restrictions. For non-assignable consumption goods, individual consumptions can be recovered up to a constant.

[27]It is not known whether non-parametric restrictions can be obtained in more general settings (e.g. if there are several goods) though the conjecture is that they may be obtainable.

development of income-sharing rule approaches that under some conditions allow the estimation of individual household member Engel curves for non-assignable goods. On the other hand, a more pessimistic view is that the results to date suggest how difficult it is to make progress in this area since the assumptions must be very strong to make the headway made in various alternative and partial models to date–e.g., that households face varying wages but the same prices, that leisure has no public good characteristics. Also the papers in this genre to date and the very limited empirical work that has been undertaken do not show sensitivity to the estimation problems involved if there are unobserved heterogeneities in productivities and preferences, but appear naively implicitly to assume away these difficult problems. To date, this approach has not been applied to developing country data. Other than its cautionary implications regarding how difficult it is to explore empirically intra-household allocations with available data unless some strong assumptions are made, the extent to which it will have implications for future research on intra-household allocations in developing countries may depend on future developments in the literature.

3. EMPIRICAL EXPLORATIONS OF INTRA-HOUSEHOLD ALLOCATION MODELS FOR DEVELOPING COUNTRY CONTEXTS

The models that are reviewed in Section 2 have some important implications for understanding intra-household allocations, their implications for efficiency and equity: Whether such allocations tend to reinforce or compensate for endowment differentials, if it is important in terms of some objectives, whether men or women have increased command over resources, and even for other considerations such as Ricardian equivalence and thereby the efficacy of macro-economic policies. But empirical explorations of these and related models are difficult indeed because of a number of data limitations: *First*, individual endowments generally are not observed in socio-economic data sets, so direct estimates of the impact of differential endowments among household members usually are not possible; nor is it easy to control for the impact of endowments in estimates of the impact of other variables. *Second*, the intra-household distribution of transfers, and of consumption and investments goods, is rarely directly observed–with the exception of schooling, certain types of purchased health goods and services, non-labour market time, non-schooling time, and, in a very few data sets, food or child-parental contact. *Third*, virtually no data sets have experimental information, such as random income supplements to different types of individuals; so it is very hard to separate out the effect of observed variables, such as individual incomes, from unobserved productive and preference endowments. *Fourth*, data that are available usually cover fairly short time-periods, but in some important cases the relevant concepts are for life-time variables, such as the flows of transfers (*inter vivos* and bequests) between children and their parents or life-time earnings. *Fifth*, many data sets do not link adults who are not co-resident with their siblings, so the impact of childhood intra-household allocations on adult outcomes can not be investigated, even for variables such as wages that are collected in many socio-economic data sets (though increasingly special data sets have become available with such linkages). *Sixth*, many outcomes that are affected by intra-household allocations are not observed (e.g., rates of return to human resource investments) or are

rarely observed (e.g., non-pecuniary aspects of jobs, health outcomes). *Seventh*, the extent of measurement error in observed variables is often difficult to assess.

Despite these data problems, some interesting empirical explorations have been undertaken that permit some insights in some developing country contexts into the relative merits of some of these models; and in other cases, into the implications of the models. These explorations also reveal the difficulties of undertaking empirical research in this area, due in substantial part to the data problems just summarised.

3.1. Intra-household Human Resource Allocation Responses to Prices Related to Individual Endowments: Indian Male-Female Infant and Child Mortality Differentials and Labour Markets

The parental altruism models in Section 2.1 generally imply greater resource investments in children for whom endowments are such that the earnings possibilities frontiers are more elongated in the direction of their earnings.[28] Similar predictions arise if parents are not altruistic but reap all of the gains from investments in their children, or if the investment in each child reflects pure investment decisions with perfect credit markets.[29] In all of these cases, the distribution of endowments among the children in a family affects the relative human resource investments in those children.

Some important dimensions of endowments, as noted at the start of Section 2.1, may relate to prices that depend on such endowments. One example is that expected returns in labour markets may depend on endowments such as sex because of discrimination or gender specialisation in those markets.[30] This possibility may relate to the considerable interest and concern about differences in male and female mortality, particularly in Asia and North Africa. Sen (1990), as noted in the introduction to this paper, suggests that "over 100 million women are missing" primarily because of intra-household allocations that result in relatively high mortality rates for females relative to those for males in Asia and North Africa in comparison with the sex-specific mortality rates in Sub-Saharan Africa. Rosenzweig and Schultz (1982) analyse the determinants of male-female differentials in child survival rates in rural India, using both the 1971 rural household and the 1961 district-level data. They argue that the male-female survival differential depends on the expected relative returns to male and female labour because those expectations influence parental investments in sons and daughters. They use predicted employment rates of current men and women as proxies for the economic returns to investing in boys and girls under the assumption of static expectations that they suggest is plausible in the pre-Green Revolution period from which their data come. They argue (not entirely persuasively) that wage rates may not reflect the value of time

[28]With the exceptions of the case in which parental preferences reflect extreme inequality aversion in the SET model and the parental resources provided to children are very low in the wealth model.

[29]But, as noted above in Section 2.1, the more-educable child at the margin, given the interest rates, does not necessarily have greater earnings.

[30]But, as Behrman and Deolalikar (1995) note, higher wages for males do *not* necessarily imply higher rates of return for investing in the education of males than of females. Their estimates suggest, in fact, that in Indonesia the rates of return to time spent in schooling by females are higher than for males, so that the gender gap in wages favouring males declines with schooling levels. They also suggest that the opportunity costs of attending school are higher for females, perhaps in part because of the gender division of tasks in the household, such as the care for younger sick siblings that Pitt and Rosenzweig (1990) explore.

as well as the employment rates because cultural factors such as religion and caste may prevent women from equalising the marginal products of market and household labour; so the use of employment rates is preferable to the use of wage rates.[31] They do not observe that where employment rates are higher for current women, the opportunity cost of women's time in child-care is likely to be higher, which would tend to work in the opposite direction of their posited effects. In both the household and the district-level samples, they find predicted female (but not male) employment rates to be a significant negative determinant of the male-female child-survival differential. They interpret these results to imply that children who seem likely to become more economically productive adults receive a greater share of family resources and, therefore, have a greater propensity to survive than other children. In a comment on this article, Folbre (1984) suggests that these results are supportive of a model in which women who have greater income have greater influence in intra-household allocations which leads to greater investments in daughters, which is in the spirit of the collective models of household behaviour that are discussed in Section 2.3. Rosenzweig and Schultz (1984) respond by observing that the available data do not permit one to identify whether the underlying allocations reflect such a bargaining model versus responses to differential expected returns. I elaborate on related concerns at the end of Section 3.4 below.

3.2. Estimates of Reinforcement or Compensation of Endowments

One of the issues that the models in Section 2.1 raise is whether parental allocations of human resources among children in a family tend to reinforce or compensate for endowment differentials among the children. Becker and Tomes (1976) (in their presentation of the wealth model) claim that such allocations are likely to be reinforcing because of the positive effects of greater endowments on the marginal product of human resource investments in the earnings production function, though the more-educable child at the margin is not necessarily the child with greater endowments on the average; and for cases in which parental resources allocated to their children are less than "very high", preference parameters as well as production function parameters enter into this decision (see Section 2.1). The Behrman, Pollak and Taubman (1982) SET model, in contrast, posits that such investments may be reinforcing, compensating, or neutral, depending on the extent of equity-productivity trade-off in parental preferences and the properties of the earnings production function. This section summarises two sets of estimates of whether reinforcement or compensation prevails within the developing country context.

3.2.1. SET Model Estimates for the Allocation of Nutrients among Children in Households in Rural South India

Section 2.1 develops the general SET model and discusses many of its implications. It also discusses an empirically tractable version of the SET model conditional on

[31] As [Pitt, Rosenzweig and Hassan (1990), p. 1143] observe with regard to their model discussed below, "it is not market work time (or even the average wage rate) that matters for food allocation as in Rosenzweig and Schultz (1982), but the type of activity engaged in, as defined by the wage-effort-health association."

the specific functional form assumptions that the parental sub-welfare function defined over their children's expected earnings is CES, and that the earnings production function is Cobb-Douglas. This formulation leads to an expression in terms of the ratios across children of their expected earnings and of their human resource investments. An advantage of this formulation is that the unobserved Lagrangian for the budget constraint and, the unobserved endowments that enter into the earnings production function do no appear directly.[32] Estimates of this relation give, conditional on the functional form assumptions, estimates of the curvature in the parental welfare function and, therefore, whether reinforcement or compensation (or neither) occurs.

To estimate this relation requires a sample of adult siblings with at least both human resource investments (such as years of school) and earnings data. A few estimates have been made with United States data [e.g., Behrman, Pollak and Taubman (1982, 1986) and Behrman and Taubman (1986)] that imply substantial concern about equity and therefore challenge the spirit of the wealth model and of pure investment models of human resource investments. But no estimates based on adult earnings for siblings have been made for developing countries.

In Behrman (1988, 1988a), however, I estimate a SET model with anthropometric measures of child health as the outcome and nutrients as the inputs (instead of earnings and schooling, respectively) for rural south India using the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) panel data set on 240 households in six villages. These papers consider two extensions of the SET model: one in which there is but one latent output ("health") and one latent input ("nutrients") but multiple indicators of each, and a second alternative in which the basic SET model is generalised to include multiple outputs and multiple inputs. For both approaches, the data are divided between the lean season in which food is relatively scarce and the surplus season in which food is relatively available, since seasonal variations are strong and allegedly important in this region. Non-linear maximum likelihood estimates suggest that there are significant differences between the seasons, that in the surplus season there is significant compensation with much greater concern about equity than in the U.S. estimates, but substantial reinforcement (close to the pure productivity case and much higher than in the U.S. estimates) for the lean season when food is relatively scarce. These results are robust, moreover, when the specification is augmented by including in the parental preference function the estimated impact of nutrients on labour market productivity as estimated from the experience of current adults (under the assumptions that labour markets are quite stable in this part of India, and that there are high correlations between child age-standardised anthropometric indicators and those that the children will have when they are adults).

However, there are several possible problems in estimating this SET relation from data on health indicators and nutrients for siblings.

First, the sample requirements raise the question of whether there is likely to be a sample selectivity problem since households with at least two children in the relevant age range may not be a random sample of households. There may be some underlying unobserved household effects related, for example, to tastes for having children and characteristics that affect health and nutrition. However, the estimated relation effective-

[32]Of course, both enter into the underlying maximisation problem that leads to this expression.

ly is a within-household estimator that controls for unobserved household fixed effects that might lead to such selectivity.

Second, health and nutrient intakes are determined simultaneously in this model, so the disturbance term in the estimated relation is not independent of the right-side ratio of health indicators, though–as just noted–it is purged of household fixed effects. If data were available on the endowments (E_j), these data could be used to instrument the health indicators in this relation in order to avoid the simultaneity bias. But, generally, such data are not available so that the estimates presented in these studies do not deal with this possible simultaneity problem. However, Behrman and Taubman (1986) demonstrate that Ordinary Least Squares procedures in this context bias upwards the estimate of the equity-productivity preference parameters (i.e., towards the productivity end of the spectrum). This means that the surplus season estimate is definitive regarding compensation, but the lean season estimate is not definitive regarding reinforcement, even as conditional on functional forms since the upwards-biased estimate is (by asymptotic t tests assuming no biases) significantly above the neutral value of zero; so consistent estimates may be above or below this value. But this direction of bias does not affect the challenge that these estimates offer to the spirit of the wealth model.

Third, it may appear that the SET model may not translate so naturally to the cases that I study because it would seem to require that in parental preferences the distribution of child health is independent of the distribution of other child outcomes, such as schooling. However one of the implications of the discussion of problems in estimating the rate of return to schooling in Section 2.1 is that, under the assumptions given there, even though ignoring schooling well might lead to biases in the estimated impact of health on earnings or other outcomes (and vice versa), the high or perfect correlation among human resource investments does *not* cause biases in the estimate of the parental preference parameters.

3.2.2. *Intra-household Distribution of Nutrients, Health, Work Effort, and Endowments in a Poor Subsistence Economy*

Pitt, Rosenzweig and Hassan (1990) develop and estimate a model that incorporates linkages among nutrition, labour-market productivity, health heterogeneity, and the intra-household distribution of food and work activities in a subsistence economy. This model builds on and integrates several literatures, including that on the productivity impact of health and nutrition in such societies and on gender variations in intra-household allocations [see Behrman (1992, 1992a) for reviews], as well as the more general literature on intra-household allocations.

A household is assumed to have individuals in m classes (defined by age and sex so that within a class the health and wage production functions are the same for all members of the household). The household maximises its unified preference function that is defined over the health, food consumption, and work effort of each individual (with positive effects of health and food consumption and negative effects of work effort). The constraints on this maximisation include (i) a budget constraint that posits that income from labour and other sources must be greater than or equal to expenditures on food and other consumption, and (ii) production functions for health (positively dependent on nutrient intakes and endowments and negatively dependent on energy

expended) and wages (positively dependent on health and on energy expended)[33] for each class of individuals. The health endowments (i.e., that component of health influenced neither by nutrient intakes nor by work effort) are observed by the household members but not by social scientists.

The first-order conditions indicate that the lower the marginal cost of allocating nutrients at the margin to an individual, the greater is the extent to which that person's health improves with more nutrition and the more that person's wage increases with better health. If different classes of individuals participate in different work, as appears widely to be the case in South Asia with respect to gender, and the wage effects of health vary across types of work, the marginal costs of food allocated to different classes of individuals may vary substantially. Within a class, the distributions of food and work effort across individuals depend on the distribution of endowments among those individuals.

Compensation or reinforcement can be examined by investigating the first derivative of health with respect to endowments which includes the partial effects on health through both work effort and nutrient intakes. In the case in which endowments enter additively in the health production relation, there is compensation (reinforcement) if the sum of these two partial effects is negative (positive). The cross effect of *j*'s endowment on *i*'s nutrient consumption is more negative if the household preference function is nonlinear with the consumption of *i* and *j* as substitutes, the stronger is the relation between health and effort productivity for *j*.

To explore empirically whether there is compensation or reinforcement, estimates of the endowments must be obtained first. To do so, the health production function is estimated directly and, based on the parameter estimates and the actual nutrients consumed and work effort expended by each individual, individual-specific endowments are calculated. There are two problems that must be dealt with in this "residual" endowment method. *First*, since endowments are not observed by social scientists and they influence household allocations, OLS estimates of the health production technology are not consistent. Pitt, Rosenzweig and Hassan, therefore, use as instruments "food prices, labour market variables reflecting labour demand, and exogenous components of income" under the assumption that such variables "determine resource allocations but do not directly affect health status, given food and activity levels" (p. 1145). *Second*, the residually derived endowments are likely to be measured with systematic error because of random measurement error in the observed inputs into the health production function, such as individual nutrients, which carry over to cause errors in the estimated endowments, which in turn causes biases in the estimated impact of the endowments on allocated variables. These biases tend to make households appear more compensatory than they really are.[34] To obtain consistent estimates, Pitt, Rosenzweig and Hassan use instrumental variables in the form of estimated health endowments for weight-for-height, mid-arm circumference, and skinfold thickness from other survey rounds than the one for

[33]Work time is assumed to be the same for all individuals because there are no data on time allocations, and because casual observations suggest that there is very little leisure in the sample area.

[34]Pitt, Rosenzweig and Hassan show that, if the true impact of such endowments on nutrients is positive, the estimated impact will be downwards-biased. But if the true impact is negative, the classical measurement error bias is towards zero (and therefore positive) while the bias due to the correlation of the estimated endowment with the measurement error in nutrients is negative, so the overall effect is indeterminate.

which the allocation estimate is being made, under the assumption that the period-specific measurement errors are not correlated across time-periods.

The data requirements for this study are considerable: individual specific observations on nutrient intakes, health outcomes, and work effort; sufficient cross-sectional variation in exogenous instruments needed for consistent estimation of the health production function; and repeated observations on individuals to purge estimated endowments of measurement errors. They use data from the 1981-82 Bangladesh Rural Nutrition Survey of 385 households in 15 villages, though with intra-household nutrient data available for about half of these households and longitudinal data on intra-household allocations available for a further subset. They use FAO/WHO classifications of the 14 occupations provided in the data as "very active" and "exceptionally active" to characterise higher than normal work effort and control for whether women were lactating or pregnant in the sample period to control for non-work nutrient use.

Estimates of the health production function for weight-for-height suggest that the impact of calories is understated and the signs of the coefficients of the work effort variables are wrong if OLS is used instead of 2SLS. Then the residual endowments obtained from the consistently estimated health production technology were used for the households with longitudinal data to obtain consistent estimates of the impact of individual endowments on individual nutrients. These estimates suggest reinforcement in the sense that individuals with better endowments receive more nutrients once there is control for the measurement error problem noted above (which, if not controlled, leads to estimates that are opposite in sign, suggesting compensation); these effects are about ten times larger for males than for females, which is consistent with their model, given that their data indicate that women do not participate in energy-intensive activities. Within-household estimates by gender with age-specific endowment effects suggest that reinforcement is significant for males 12 years of age or older and for both males and females in the 6–12 year age range, but that compensation may occur for those under six years of age of both sexes (though the standard errors are large); for females 12 years of age or older, the sign of the coefficient is positive but the magnitude is very small and the standard error very large. Next, Pitt, Rosenzweig and Hassan explore what the impact of (instrumented) endowments is on household income and on participating in an exceptionally active occupation (in the absence of data on individual wage rates or earnings). Their estimates suggest that there is a pecuniary return to health and effort, that adult males with higher endowments are more likely to undertake exceptionally energy-intensive work, and that adult female health endowments are relatively unimportant (in comparison with those for adult males) in determining activity choices or household income. Finally, the net effect of a change in own endowments on own health are calculated from the estimated health production functions and the estimated endowment effects on the nutrient and work effort variables in those production functions; the elasticities of own health with respect to own endowments are 0.88 for adult males and 0.97 for adult females. Thus, the net Bangladeshi households exhibit compensatory behaviour with respect to adult health endowments, so that these elasticities are less than one, with adult males being "taxed" more than females to the benefit of other household members.

As with all empirical work, this study has some limitations. The use of the instruments to obtain consistent estimates for the health production function depends upon the assumption that there are no allocated inputs into the production of health that are not

observed, which seems to be a strong assumption. If women's time in household production (not observed), for example, has an effect on health, instrumented nutrients and work effort may be representing in part the impact of women's time allocations since such allocations presumably respond to the same set of exogenous instruments. The assumption that measurement errors in nutrient intakes are not correlated across periods, moreover, may be strong if the intra-household allocation of food was altered to favour certain groups identified by age or sex because of the presence of outside dietary investigators. The measure of work effort based on 14 occupational categories, finally, is quite crude, ignores what probably are substantially variations within such categories, and may impart a gender bias since some have claimed that the FAO/WHO estimates understate the energy used in various household activities performed primarily by females. Nevertheless, this study is the most thorough available study to my knowledge of intra-household allocations that builds in part explicitly on the estimation of structural relations. As such, it is a model for emulation in a number of respects, including its wide perspective about what allocations are interlinked, its care with regard to estimation issues, and its use of especially rich cross-sectional and panel data in a systematic and integrated manner.

3.3. Other Evidence on Gender and Birth-order Effects

The previous two sections contain some systematic analysis of gender and birth-order (or at least age) effects in intra-household allocations, particularly the extent to which in some contexts they are responses to gender specialisations in labour markets and related endowment differentials. But such topics have been among the more emphasised in the intra-household literature, so I here summarise some additional studies on these topics.

3.3.1. Gender Differences in Schooling and in Inter-generational Transfers in Philippine Rice Villages

Quisumbing (1993) examines schooling, land, and non-land asset transfers from parent to children in 344 households in five rice villages in Central Luzon and Panay Island in the Philippines using retrospective survey data. These inter-generational relations are more consistent with a model with family fixed effects than with individual random effects or no unobserved heterogeneity (there is observed heterogeneity with regard to birth order and gender). Thus, family endowments are important. Families with different land constraints have significantly different patterns of schooling investments, primarily because there is a strong secular trend in schooling for households that do not bestow land, but not for those that do. This suggests that particularly the children of land-constrained households, and even more so the daughters in those households, have benefited from the secular expansion of schooling opportunities. For land-constrained households (but not those that bestow land) the estimates suggest that the eldest and the youngest daughters receive significantly less schooling, which suggests unequal concern favouring sons and middle-birth-order daughters in the terminology of Section 2.1. Analysis of a sub-sample by combined land status with completed inheritance decisions indicates that daughters are not disadvantaged in schooling at least at the five percent significance level (though there is weak evidence of an effect in interaction with parental

characteristics at the 10 percent level) but receive significantly less land and total inheritance, with partial compensation through receiving greater non-land assets. Thus these results for the sub-sample with competed inheritance suggest equal concern by gender with regard to human resources, though unequal concern favouring males for land transfers and overall inheritances. There does not seem to be any compensation between human resource investments and physical and financial transfers at least with regard to gender, which is consistent with the SET model but not the wealth model.

3.3.2. SET Model Estimates with Unequal Concerns

The SET model, with unequal concern under the assumptions about specific functional forms that are discussed in Section 2.1, leads to an expression with an additive term that is *ln* of the ratio of the unequal concern parameters (i.e., the h_j's in Section 2.1). Estimates can be made, with this extended version of the SET model, of the dependence of unequal concern on observed characteristics of the children. Such estimates have been presented for rural south India [as well as for the United States in Behrman and Taubman (1986) and Behrman, Pollak and Taubman (1986)].

For rural south India, in Behrman (1988, 1988a) I use the ICRISAT panel data to estimate extensions of the SET model, with the output(s) being health (with anthropometric indicators) and the inputs being individual nutrient intakes as noted above. Non-linear maximum likelihood estimates suggest that in the surplus season when there is significant compensation as noted above, there also is equal concern, but that in the lean season, when food is scarce, the parental equity-productivity trade-off is close to the pure productivity case as noted above, and unequal concern significantly favours older children over younger children and sons over daughters. Therefore, during the lean season, the combination of relatively little concern about equity and preference weights that favour older children and sons may leave the more vulnerable younger children and daughters at considerable nutritional risk.

3.3.3. Health and Nutrition Demand Variations

The previous sub-section summarises some evidence about systematic differences in preferences by birth order and sex of children, conditional on specific functional forms. Such differences can be one source, but not the only possible source (since production function differences also could have such an effect) of the differences in reduced-form demand relations for different types of household members. I now summarise three studies of different reduced-form demand relations by type of family members for three different Asian developing societies.

Pit and Rosenzweig (1985) use data on 2,347 Indonesian farm households (from the 1978 SUSENAS socio-economic survey) to estimate separate "illness demand"-ordered probits for husbands and wives, and a fixed effect logit for the difference between the husband's illness and the wife's illness. The right-side variables in these functions are the prices of thirteen consumption goods (foods and non-foods); source of drinking water; availability of hospitals, family-planning clinics, public lavatories, and clinics; land ownership; farm profits; and the age and education of the husband and the wife.[35] They find relatively few significant determinants of health, but the fixed-effects

[35]Farm profits are treated as pre-determined since a Wu-Hausman test does not reject such treatment.

logit estimates suggest that there are some differences in the effects on men versus women. The presence of clinics and the price of vegetables, for example, significantly increase the health of women relative to that for men, while the opposite is the case for the price of fish. Pitt and Rosenzweig attribute the lack of precise estimates to measurement problems: illness was reported by the sick themselves (or by the household head or spouse)–and hence subject to differences in sensitivity to symptoms and in propensities to report them–and was recorded over a period of only one week.

Horton (1988) analyses the demand for individual health outcomes with 1978 data on approximately 2,000 predominantly rural Filipino children (in the Bicol region) aged 15 or less. To control for family preferences (particularly with respect to child quality and quantity) and other unobserved family fixed effects, Horton explores the differences in weight-for-height and height-for-age[36] among children *within* each family in terms of age, sex, and birth order. She also allows some household-specific variables to enter her health demand function indirectly by specifying that the coefficient on birth order depends on maternal education and total household expenditure per capita. Her results suggest that higher birth order significantly lowers height-for-age and weight-for-height, with the effect reinforced for larger sibship sizes for weight-for-height but reduced with larger sibship sizes for height-for-age.[37] Sons also are significantly below daughters in weight-for-height.

Behrman and Deolalikar (1990) estimate separate nutrient demand relations for men, women, girls, and boys for the rural south India ICRISAT sample introduced above. This exploration depends, of course, on the presence of individual food consumption in this data set. These estimates suggest that nutrient price responses are significantly smaller algebraically for females than for males. This means that females eat less when food is scarce and the marginal value of food is relatively high, even if there are corresponding increases in their food intake when food prices are low (but when the marginal value of nutrients also is lower). This is consistent with the lean season results for preference parameters with unequal concern favouring sons that is discussed in the previous sub-section.[38] However, they do not find significant evidence of systematic differences by age group.

3.3.4. Child Health and Gender Inequality in Time Allocation

In most societies there is gender specialisation in the provision of home health care, with females providing most such care. Pitt and Rosenzweig (1990) develop and implement a method with data from Indonesia for estimating the effects of infant morbidity on the differential allocation of time of family members within the context of a household model in which health is determined simultaneously. They note that identification of the effects of the health of person k on the behaviour of person j when the

[36]The dependent variables are z scores, which give the number of standard deviations; a particular observation is below or above the means for the reference population of United States' children.

[37]Maternal education tends to weaken the birth-order effects, but with coefficient estimates that are significantly non-zero only at the 25 percent level.

[38]Whether or not such seasonality deprivation has longer-run effects has been a subject of controversy (i.e., the debate on "catch-up" child growth). See Behrman, Deolalikar and Lavy (1994) for evidence that, once there is control for unobserved growth heterogeneity, catch-up is complete by the next season for India and the Philippines.

behaviour of person *j* may affect the health of person *k* (e.g., through child care) is not easy, in part because it is difficult to find instruments that directly affect *i*'s health but not directly that of *j* (net of any indirect effects through *i*'s health). They develop a method, based on some strong simplifying assumptions, to estimate how older siblings and mothers reallocate their time in response to an infant's morbidity.

They assume that households have a preference function defined over the home time and health of each household member and a composite jointly-consumed consumption commodity with heterogeneity in such preferences across households. This preference function is maximised subject to a budget constraint (which includes the wage for each household member type as well as non-labour earnings) and a health production function (which includes the home time of each household member, the health of every other household member to allow for intra-family health externalities inclusive of contagion and/or health efficiency effects on home time, and private health-related goods and services). As noted above, the absence of exogenous person-specific health prices makes the consistent direct estimation of the health production functions difficult. By imposing more structure, however, Pitt and Rosenzweig are able to obtain estimates of the impact of the health of one family member on time allocations of other household members. They posit that the linearised demand relations for home time of household members *i* and *j* are conditional on the health of household member *k*, in which the coefficients on the price of private health-related goods is the same for *i* and for *j* (e.g., if the health production function is the same for *i* and *j*). The differenced version of these relations then gives the difference in the home time of *i* and *j* as a function of the difference in their wage rates, any difference in the impact of the price of the jointly-consumed composite commodity price on their home time use, and any difference in the impact of the health of *k* on their time use. Conditional on the assumptions underlying this relation, a consistent estimate of the impact of the health of *k* on the difference in home time use between *i* and *j* can be obtained by using the prices of health-related goods as instruments.

The data requirement for estimating such relations are substantial: information on child health, the activities of all household members, and the prices of health-related goods, as well as a large enough sample so that there are enough families with the family types of interest with whom the within-estimates can be made (i.e., mothers, teenage daughters and sons, and infants). The 1980 Indonesian Socio-economic Survey (SUSENAS) linked with other information on prices and health programmes, has such data for 5,831 households. However, what is available in this data set for both health and time allocations is discrete indicators (dichotomous for health), trichotomous for activities–labour force, school, home time), which complicates the estimation. Pitt and Rosenzweig adopt a fixed-effects or within-family logit procedure that is parsimonious in terms of parameters to be estimated, permits identification, and controls for possible selectivity of households into this sub-sample. The estimates obtained indicate that teenage daughters were significantly more likely to increase their participation in household-care activities and to reduce their participation in market activities and at school, in comparison with teenage sons, in response to increased morbidity of infant siblings. Moreover, such estimates differed markedly from the estimates obtained if there was not control for the simultaneity of child health determination and time uses of household members, though the conclusions need to be qualified because the critical identifying

assumption seems to be a strong one.

3.4. Tests of Income Pooling in Demand Relations

There have been several recent studies that purport to test whether male and female non-earned income can be pooled. As I note in Section 2.3 above, some observers have interpreted these estimates to be strong evidence in favour of the Nash household bargaining models over models with unified preferences. I summarise three of these studies on developing societies here, and then comment on interpretations of them.

Schultz (1990) explores whether there are different effects of men's and women's unearned income on female labour supply and recent fertility, using over 8,000 households with adults between 25 and 54 in age from the 1980-81 Thai Socio-economic Survey (SES). He finds that women's unearned income has significantly different effects (i.e., reducing more) than men's unearned income on women's labour supply, but not for men's labour supply. He also finds that women's non-earned income has a significant positive effect on the number of co-resident children under five years of age (a proxy for recent fertility) but men's unearned income does not. However, he notes that his relation may reflect reverse causality if women with more children are likely to receive more transfers from their families and other sources. Schultz concludes that this paper "has rejected one of the restrictions implied by the neo-classical model of family demand behaviour, that for female labour supply" (and, with more qualifications, perhaps that for fertility).[39]

Thomas (1990) explores whether there are different effects of men's and women's non-earned income on child survival rates, anthropometric measures, and nutrient intakes for children, using 1974-75 Estudo Nacional da Despesa Familiar (ENDEF) Brazilian data for over 25,000 urban households.[40] Non-earned income (not wages) is used and parents' education is controlled in order to focus on the income effects alone, without the price effects that wages would entail. The estimates indicate a much larger effect on child survival and child anthropometric measures of women's non-earned income than of men's, with some further gender differentiation in that mothers' non-earned income has greater impact on daughters than on sons, while fathers' non-earned income has greater impact on sons.[41] He also reports that the estimated effects of both women's and men's non-earned income are positive but decline as income increases.[42] But the estimated impact of women's non-earned income is about seven times of that for men's, for both calories and proteins. Thomas concludes that these results reject the unified preference model of households often used for economic analysis[43] and suggest

[39]He also notes that sample selectivity for conducting such tests only on co-habitating couples appears to cause selectivity biases in the Thai case.

[40]These estimates are only for urban areas because in the rural data all of the income of a family farm is attributed to the household head.

[41]There are some possible anomalies, such as the indication that non-earned income of non-parents has much greater impact on anthropometric measures for boys than either mothers' or fathers' non-earned income.

[42]In the household demand relation for calories, other non-earned income has a possibly puzzling *negative* estimated impact, declining with income.

[43]Though he notes that ratios of income effects are not significantly different from each other, which is consistent with the common preference model if income is measured with error, as well as consistent with differential intra-household preferences that are homogenous in the relative preference weights that mothers and fathers have for the health outcomes.

that mothers' income is much more important in determining children's health than is fathers' income. In a more recent paper, Thomas (1992) further explores the income-pooling possibility with the same data by investigating whether non-labour income or total income can be pooled across men and women in estimates of the determinants of income shares. He finds that income under the control of women is associated with a larger increase in the share of the household budget devoted to human capital investments (i.e., health, education, and household services) but less devoted to food consumption.

Hoddinott and Haddad (1991) use a sub-sample from a national household survey (the World Bank Living Standards Measurement Study) for the Côte D'Ivoire to estimate the relevance of income-pooling. Since this survey does not identify non-labour earnings by individuals, they limit their analysis to a comparison of households with only adult males and household with only adult females. They then compare consumption shares and cash income effects on child anthropometric outcomes for these two types of households. They interpret their estimates to mean that increases in the share of cash income accruing to women significantly raise the budget shares of food and lower those of alcohol and cigarettes, as well as increase anthropometric outcomes for children (somewhat more for boys than for girls). They suggest that "to the extent that such changes are regarded as desirable, the results provide additional reasons for policy measure to improve women's access to income-generating resources" (pp. 23–4).

What do these studies mean with regard to the unified preference model and collective alternatives? There are a range of answers to this question. [McElroy (1992), p. 12] interprets these and related studies to be part of the "strong results favouring bargaining models". Schultz and Thomas both claim that they have presented evidence that rejects one of the restrictions implied by the unified preference model, but Schultz is explicit that "the evidence does not actually accept the 'bargaining' model" (p. 623) and Thomas also explicitly recognises this point. [Bourguignon and Chiappori (1992), p. 6] argue strongly that such evidence may reject the traditional unified preference model, but that it does not thereby support any particular collective model. Bergstrom (1993) suggests that these results violate Preto-efficiency but are consistent with inefficient non-cooperative equilibria such as in the separate-spheres model of Lundberg and Pollak (1993), in which only the wife provides the public good. Udry (1994) provides related evidence of inefficient allocation of productive resources across land plots operated by different household members (men versus women) in Burkina Faso.

But I have problems even with the interpretation that these results reject the pooling assumption of the unified preference model. To test that assumption, what one would like to do would be to conduct an experiment in which extra income were distributed randomly to males and females and then to observe whether the marginal propensities to use such income differed depending upon who is the recipient. However, neither Schultz nor Thomas, nor Hoddinott and Haddad (nor, to my knowledge, anyone else) uses such data. Instead, Schultz and Thomas use individual "non-earned" income. They explicitly use non-earned income rather than earned income or total income in order to abstract from the price (i.e., opportunity costs of time) and taste effects that wages would represent.[44] But is there any reason to think that non-earned income is orthogonal to wages,

[44]Also there are preference effects that alter time use and raise the same problems as the productivity effects on which I focus in this paragraph.

productivity, and tastes? The answer depends in part on what the sources of non-earned income are. In the data for both studies, the sources are largely pensions and social security, both of which are related to past wages, productivity, and preferences regarding time use. Even the earnings from assets may reflect past productivity and preferences if such assets were acquired out of past labour earnings. Therefore, unearned income may in part represent productivity in the labour market activities associated with household activities pertaining to health, nutrition, fertility, and time allocations and/or preferences for time use. If so, these results do not necessarily mean that shifting income to women would have more positive effects on, say, child health than shifting equal income to men, but simply that more productive women have more positive effects on their children's health. These results, in fact, are consistent with the true effects involving income-pooling, but the non-earned income coefficient estimates being biased differentially by proxying for unobserved productivity endowments given gender specialisation in household tasks. The Hoddinott and Haddad estimates have at least as great a problem in this respect since they use cash income, which includes current labour income;[45] in addition, it is difficult to interpret what their results mean, given their sample selection criterion for including only households with all adults of one gender.

3.5. Dynamics and Learning over Time

The empirical studies surveyed up to this point are basically static in approach. A rare exception that incorporates dynamics and learning is Rosenzweig and Wolpin (1988). They develop a simple dynamic model of child health that includes unobserved heterogeneity among households and uncertainty regarding unobserved heterogeneity in each child's health endowments prior to birth. They compare estimates using ordinary-least-squares versus fixed-effect procedures to control for heterogeneity in child health relations. based on data from 109 households with two or more children under six years of age in Colombia for the period 1968 to 1974. The dependent variables are the age-standardised weights of the children at birth, and within six months of birth. The right-side variables include birth-order, birth-spacing and timing, per capita family food consumption. DPT inoculations, breast-feeding, maternal age, and the sex of the children, all except the last of which are treated as endogenous in lagged instrumental variable fixed-effect estimates. Control for unobserved heterogeneity alters the statistical inferences substantially. They then use their estimated relations to calculate unobserved family- and child-specific endowments (by averaging over the appropriate residuals). They find that family health environments are significantly correlated with parental education (as well as with family income), which implies that estimates of child health outcomes that do not control for such endowments have upwards-biased coefficients, since such variables are partially proxies for the uncontrolled health endowments. Their results also are suggestive of possible upwards biases in the estimates of the effects of parents' schooling (as well as breast-feeding and family income) on child weight if there

[45]They recognise that there may be a simultaneity problem and use a set of instruments for income (e.g., demographic variables, location variables, indicators of the nature of consumer durables and housing, schooling variables, land variables, etc.) However, they do not present persuasive evidence that these instruments are independent of the disturbance terms (which may include the unobserved productivity and taste factors).

is no control for unobserved household and child heterogeneity, though their estimates have considerable imprecision.

4. CONCLUSIONS

Intra-household allocations appear to be quite important in the determination of time use, human resource investments, and intra- and inter-generational transfers in developing countries. The nature of such allocations has important implications for efficiency, equity, and the efficacy of both micro and macro economic policies.

In the past decade and a half, there has been substantial progress in modelling intra-household allocations in ways that lead to testable propositions despite enormous data limitations regarding the nature of the allocations of unobserved variables and the impact of unobserved heterogeneous endowments. This progress has been made by using better data, by increasing the rigour of the relation between the modelling and the empirical estimation, and by assuming away possibly important aspects of the data problems. In contrast to many areas of economics, many of the most interesting studies in the economic analysis of intra-household allocations have been for developing countries because of the recent expanded availability of interesting micro household data sets for such countries. Different researchers, or different schools of researchers, have made different assumptions and focused on different dimensions of intra-household allocations.

Most of the analytical modelling, and most of the empirical work, has been within a one-period framework, with unified parental preferences. The best of the studies within this framework have elaborated on and tested hypotheses about the role of unobserved heterogenous endowments in intra-household allocations within the context of labour, product, and marriage markets. Their results suggest that controlling for such unobserved heterogeneity is indeed critical for understanding the nature of and the impact of intra-household allocations. These studies have tended to deal with an ever-widening range of issues in more integrated ways and with increasing sensitivity to estimation issues. Nevertheless, even the best studies in this tradition are characterised by some strongly maintained hypotheses, though with some variance regarding the exact assumptions (implicit and explicit) in different studies: unified household, or at least parental preferences, perhaps with additional strong assumptions regarding separability; no problems with dynamics or with imperfect information; all of the relevant choice variables are observed in the estimation of household production functions; the determinants of household structure are not addressed and are assumed not to be critical;[46] restraints such as credit market imperfections are assumed to prevail; estimates of structural relations are conditional on functional forms; and the demand relations estimated may not be integrable to obtain even locally unique preferences.

The parent-child exchange literature is a sub-set of these studies that advances in two dimensions by allowing children to have different preferences from their parents'

[46]Because much of this literature has been for developing countries, it has been more sensitive than many economic literatures to differing institutions in different economies. More specifically, if often has incorporated features such as extended families and arranged marriages that are not common in the United States. Nevertheless, there are other aspects of households in some other societies, such as the child-fostering that is widespread in some parts of Africa that Ainsworth (1992) describes, that have not yet been subject to very satisfactory analysis.

and by incorporating a broader notion of interactions, including the attention provide that children to their parents. Yet this literature has most of the problems that are indicated above in regard to unified household preference models. In addition, and in contrast to the literature that assumes unified household preferences, the exchange literature to date has assumed away the heterogeneity in endowments that plays such a critical role in the studies that assume unified household preferences. It is also silent on how human resource investments enter into the relations between parents and children. Further, it adopts as a maintained assumption that the parents obtain all of the surplus from their interaction with their children, rather than there being some splitting of that surplus. Finally, to my knowledge, the insights of the exchange literature have not been applied as yet to data from developing countries.

The collective models of household behaviour emphasise that different household members, usually husband and wife, may have different preferences and a different command over resources. On the basis of casual observations, this seems to be an important feature of households in many developing societies. It also, in some cases, leads to an integration of concern about intra-household allocations with concern about household formation/dissolution. Interesting theoretical results have been derived concerning the conditions under which the income-sharing rules and allocations of non-assignable goods can be derived. But there are many limitations in this literature to date. The Nash bargaining sub-set of this literature depends on the cardinal measure of utility to generate threat points. The literature on the collective models of household behaviours is static and gives little consideration to the dynamic processes and learning. This literature abstracts from the possibly important roles of household production. Perhaps most important, both the theoretical and the empirical studies in this literature (implicitly) ignore the role of unobserved heterogeneous endowments. The limited empirical studies that are part of this literature to date also tend to pay but a limited attention to other econometric problems, such as those related to measurement errors. For such reasons, the limited empirical results in this strain of analysis are not persuasive even on the topic on which most work has been done, that is, whether there is income-pooling within households.

So, while progress has been considerable regarding the economic analysis of intra-household allocations in developing countries, there remain considerable potential for making advances in this area. The most useful advances probably will further the recent research in this area, ones in which theoretical modelling, special data, and appropriate econometrics are carefully integrated.

REFERENCES

Ainsworth, Martha (1992) Economic Aspects of Child Fostering in Côte D'Ivoire. Washington, D. C.: World Bank. (Living Standards Measurement Study Working Paper No. 92.)

Azariadis, Costas, and Allan Drazen (1990) Threshold Externalities in Economic Development. *Quarterly Journal of Economics* 105:2 (May), 501–526.

Bardhan, Kalpana (1993) Women and Rural Poverty in Some Asian Cases. In M. G. Quibria (ed) *Rural Poverty in Asia: Priority Issues and Policy Options*. Hong Kong: Oxford University Press.

Barro, Robert (1974) Are Government Bonds New Wealth? *Journal of Political Economy* 82: 1063–93.

Becker, Gary, S. (1965) A Theory of the Allocation of Time. *Economic Journal* 75: 493–517.

Becker, Gary (1991) *A Treatise on the Family*. (Second Edition). Cambridge, MA: Harvard University Press.

Becker, Gary S., and H. Gregg Lewis (1973) On the Interaction between the Quantity and Quality of Children. *Journal of Political Economy* 81:2 Part 2 (March/April) S279–S288.

Becker, Gary, and Nigel Tomes (1976) Child Endowments and the Quantity and Quality of Children. *Journal of Political Economy* 84: S143–162.

Becker, Gary S., and Nigel Tomes (1979) An Equilibrium Theory of the Distribution of Income and Intergenerational Mobility. *Journal of Political Economy* December.

Behrman, Jere R. (1987) Is Child Schooling a Poor Proxy for Child Quality? *Demography* 24:3 (August) 341–359. Reprinted in Jere R. Behrman, Robert A. Pollak and Paul Taubman (1995) *From Parent to Child: Inequality and Immobility in the United States*. Chicago, IL: University of Chicago Press.

Behrman, Jere R. (1987a) Schooling and Other Human Capital Investments: Can the Effects be Identified? *Economics of Education Review* 6:3 301–305. Reprinted in Jere R. Behrman, Robert A. Pollak and Paul Taubman (1995) *From Parent to Child: Inequality and Immobility in the United States*. Chicago, IL: University of Chicago Press.

Behrman, Jere R. (1988) Nutrition, Health, Birth Order and Seasonality: Intrahousehold Allocation in Rural India. *Journal of Development Economics* 28:1 (February) 43–63.

Behrman, Jere R. (1988a) Intrahousehold Allocation of Nutrients in Rural India: Are Boys Favoured? Do Parents Exhibit Inequality Aversion? *Oxford Economic Papers* 40:1 (March) 32–54.

Behrman, Jere R. (1990) *Human Resource Led Development*? New Delhi: India. ARTEP/ILO.

Behrman, Jere R. (1990a) *The Action of Human Resources and Poverty on One Another: What We Have Yet to Learn*. Washington, D. C.: Population and Human Resources Department. World Bank.

Behrman, Jere R. (1990b) Women's Schooling and Nonmarket Productivity: A Survey and a Reappraisal. Philadelphia: University of Pennsylvania. (Prepared for the Women in Development Division of the Population and Human Resources Department of the World Bank.) (Mimeographed.)

Behrman, Jere R. (1992) Intrahousehold Allocation of Nutrients and Gender Effects: A Survey of Structural and Reduced-form Estimates. In Siddig R. Osmani (ed) *Nutrition and Poverty*. Oxford: Clarendon Press. World Institute for Development Economics Research (WIDER) series on *Studies in Development Economics* 287–320.

Behrman, Jere R. (1993) The Economic Rationale for Investing in Nutrition in

Developing Countries. *World Development* 21:11 (November) 1749–1772.

Behrman, Jere R. (1995) Intrafamily Distribution. In Mark R. Rosenzweig and Oded Stark (eds) *Handbook of Population and Family Economics.* Amsterdam: North-Holland Publishing Company.

Behrman, Jere R., and Nancy Birdsall (1983) The Quality of Schooling: Quantity Alone is Misleading. *American Economic Review* 73: 928–946.

Behrman, Jere R., and Victor Lavy (1994) Child Health and Schooling Achievement: Association, Causality, and Household Allocations. Washington, D.C.: World Bank, PHR. (Mimeographed.)

Behrman, Jere R., and Paul Taubman (1986) Birth Order, Schooling and Earnings. *Journal of Labour Economics* 4:4 (July, Part 2) S121–S145. Reprinted in Jere R. Behrman, Robert A. Pollak and Paul Taubman (1995) *From Parent to Child: Inequality and Immobility in the United States.* Chicago, IL: University of Chicago Press.

Behrman, Jere R., and Anil B. Deolalikar (1990) The Intrahousehold Demand for Nutrients in Rural South India: Individual Estimates, Fixed Effects and Permanent Income. *Journal of Human Resources* 25:4 (Fall) 665–96.

Behrman, Jere R., and Anil B. Deolalikar (1993) Unobserved Household and Community Heterogeneity and the Labour Market Impact of Schooling: A Case Study for Indonesia. *Economic Development and Cultural Change* 41:3 (April) 461–488.

Behrman, Jere R., and Anil B. Deolalikar (1993a) The Intrahousehold Distribution of Market Labour Supply in Rural South India. *Oxford Bulletin of Economics and Statistics* 55:4 (November) 409–420.

Behrman, Jere R., and Anil B. Deolalikar (1995) Are There Differential Returns to Schooling by Gender? The Case of Indonesian Labour Markets. *Oxford Bulletin of Economic and Statistics.*

Behrman, Jere R., Robert A. Pollak and Paul Taubman (1982) Parental Preferences and Provision for Progeny. *Journal of Political Economy* 90:1 (February) 52–73. Reprinted in Jere R. Behrman, Robert A. Pollak and Paul Taubman (1995) *From Parent to Child: Inequality and Immobility in the United States.* Chicago, IL: University of Chicago Press.

Behrman, Jere R., Robert A. Pollak, and Paul Taubman (1986) Do Parents Favour Boys? *International Economic Review* 27:1 (February) 31–52. Reprinted in Jere R. Behrman, Robert A. Pollak and Paul Taubman (1995) *From Parent to Child: Inequality and Immobility in the United States.* Chicago, IL: University of Chicago Press.

Behrman, Jere R., Robert A. Pollak and Paul Taubman (1989) Family Resources, Family Size, and Access to Financing for College Education. *Journal of Political Economy* 97:2 (April 1989) 398–419. Reprinted in Jere R. Behrman, Robert A. Pollak and Paul Taubman (1995) *From Parent to Child: Inequality and Immobility in the United States.* Chicago, IL: University of Chicago Press.

Behrman, Jere R., Robert A. Pollak and Taubman (1995) Introduction. In Jere R.

Behrman, Robert A. Pollak and Paul Taubman (1995). *From Parent to Child: Inequality and Immobility in the United States*. Chicago, IL: University of Chicago Press.

Behrman, Jere R., Robert A. Pollak and Paul Taubman (1995a) The Wealth Model: Efficiency in Education and Equity in the Family. In Jere R. Behrman, Robert A. Pollak and Paul Taubman (1995) *From Parent to Child: Inequality and Immobility in the United States*. Chicago, IL: University of Chicago Press.

Behrman, Jere R., Anil B. Deolalikar and Victor Lavy (1994) Dynamic Decision Rules for Child Growth in Rural India and the Philippines: Catching Up or Staying Behind? Philadelphia, PA: University of Pennsylvania. (Original 1992). (Mimeographed.)

Behrman, Jere R., Mark R. Rosenzweig and Paul Taubman (1994) Endowments and the Allocation of Schooling in the Family and in the Marriage Market. *Journal of Political Economy*.

Ben-Porath, Yoram (1980) The F-Connection: Families, Friends, and Firms and the Organisation of Exchange. *Population and Development Review* 6:1 (March) 1–30.

Bergstrom, Theodore (1989) A Fresh Look at the Rotten Kid Theorem–and Other Household Mysteries. *Journal of Political Economy* 97: 1138–1159.

Bergstrom, Theodore (1993) A Survey of Theories of the Family. Ann Arbor, Michigan: University of Michigan. (Mimeographed.)

Bernheim, B. D., A. Shleifer and L. Summers (1985) The Strategic Bequest Motive. *Journal of Political Economy* 93: 1045–1076.

Blake, J. (1981) Family Size and the Quality of Children. *Demography* 18: 421–442.

Bourguignon, R., M. Browning, P. A. Chiappori and V. Lechene (1991) Intrahousehold Allocation of Consumption: Some Evidence from French Data. DELTA. (Mimeographed.)

Bourguignon, R., M. Browning, P. A. Chiappori and V. Lechene (1991a) Intrahousehold Allocation of Consumption: Some Evidence on Canadian Data. DELTA. (Mimeographed.)

Bourguignon, Francois, and Pierre-Andre Chiappori (1992) Collective Models of Household Behaviour: An Introduction. *European Economic Review* 36: 1–10.

Bruce, N., and M. Waldman (1990) The Rotten-Kid Theorem Meets the Samaritan's Dilemma. *Quarterly Journal of Economics* 105: 155–166.

Chiappori, P. (1988) Rational Household Labour Supply. *Econometrica* 56: 63–89.

Chiappori, Pierre-Andre (1992) Collective Labour and Welfare. *Journal of Political Economy* 100: 437–467.

Deaton, Angus (1989) Looking for Boy-Girl Discrimination in Household Expenditure Data. *World Bank Economic Review* 3:1 (January) 1–15.

Deaton, Angus (1995) Data and Econometric Tools for Development Analysis. In Jere R. Behrman and T. N. Srinivasan (eds) *Handbook in Development Economics 3*. Amsterdam: North-Holland Publishing Co.

DeTray, D. N. (1977) Child Quality and the Demand for Children. *Journal of Political Economy* 81:2 (Pt. 2) S70–S90.

Folbre, Nancy (1984) Market Opportunities, Genetic Endowments, and Intrafamily Resource Distribution of Resources: Comment. *American Economic Review* 74: 518–520.

Folbre, Nancy (1986) Cleaning House: New Perspectives on Households and Economic Development. *Journal of Development Economics* 22:1 (June) 5–40.

Haddad, L., and R. Kanbur (1989) Are Better Off Households More or Less Unequal? A Bargaining Theoretic Approach to 'Kuznets Effects' at the Micro Level. Development Economics Research Centre, University of Warwick. (Discussion Paper No. 99.)

Haddad, L., and R. Kanbur (1990) How Serious is the Neglect of Intra-household Inequality? *Economic Journal* 100: 866–861.

Haddad, Lawrence, John Hoddinott and Harold Alderman (eds) (1993) *Intrahousehold Resource Allocation in Developing Countries: Methods, Models, and Policy.* Washington, D. C.: IFPRI.

Harriss, B. (1990) The Intrahousehold Distribution of Hunger. In J. Dreze and A. Sen (eds) *The Political Economy of Hunger* I. Oxford: Clarendon Press.

Hirshleifer, Jack (1977) Shakespeare vs. Becker on Altruism: The Importance of Having the Last Word. *Journal of Economic Literature* 15: 500–502.

Hirshleifer, Jack (1985) The Expanding Domain of Economics. *American Economic Review* 75: (Supplementary Issue) 53–68.

Hoddinot, John, and Lawrence Haddad (1991) Household Expenditure, Child Anthropometric Status and the Intrahousehold Division of Income: Evidence from the Cote D'Ivoire. Princeton, NJ: Princeton University. Research Programme in Development Studies. Woodrow Wilson School of Public and International Affairs. (Discussion Paper No. 155.)

Horton, Susan (1988) Birth Order and Child Nutritional Status: Evidence on the Intrahousehold Allocation of Resources in the Philippines. *Economic Development and Cultural Change* 36:2 (January) 341–354.

King, E. M., and R. E. Evenson (1983) Time Allocation and Home Production in Philippine Rural Households. In M. Buvinic, M. Lycette and W. P. McGreavy (eds) *Women and Poverty in the Third World.* Baltimore: Johns Hopkins University Press. 35–61.

Leibowitz, A. (1974) Home Investments in Children. *Journal of Political Economy* 82:2 (Part 2) March/April S111–S131.

Lucas, Robert E. (1988) On the Mechanics of Economic Development. *Journal of Monetary Economics* 21: 3–42.

Lundberg, S. (1988) Labour Supply of Husbands and Wives: A Simultaneous Equations Approach. *Review of Economics and Statistics* 70: 224–235.

Lundberg, Shelly, and Robert A. Pollak (1993) Separate Spheres Bargaining and the Marriage Market. *Journal of Political Economy* 6:101 (December) 988–1010.

Manser, M., and M. Brown (1980) Marriage and Household Decision-making: A Bargaining Analysis. *International Economic Review* 21: 31–44.

McElroy, M. (1990) The Empirical Content of Nash-Bargained Household Behaviour.

Journal of Human Resources 25: 559–583.

McElroy, M. (1992) The Policy Implications of Family Bargaining and Marriage Markets. Duke University. (Mimeographed.)

McElroy, M., and M. Horney (1981) Nash-Bargained Household Decisions: Toward a Generalisation of the Theory of Demand. *International Economic Review* 22: 333–349.

Mincer, Jacob B. (1974) *Schooling, Experience, and Earnings*. New York: NBER.

Pitt, Mark M., and Mark R. Rosenzweig (1985) Health and Nutrient Consumption Across and Within Farm Households. *Review of Economics and Statistics* 67:2 (May) 212–223.

Pitt, Mark M., and Mark R. Rosenzweig (1990) Estimating the Behavioural Consequences of Health in a Family Context: The Intrafamily Incidence of Infant Illness in Indonesia. *International Economic Review* 31:4 (November) 969–989.

Pitt, Mark M., Mark R. Rosenzweig and M. N. Hassan (1990) Productivity, Health and Inequality in the Intrahousehold Distribution of Food in Low-Income Countries. *American Economic Review* 80:5 (December) 1139–1156.

Pollak, Robert A. (1985) A Transaction Cost Approach to Families and Households. *Journal of Economic Literature* 23: (June) 581–608. Reprinted in Jere R. Behrman, Robert A. Pollak and Paul Taubman (1995) *From Parent to Child: Inequality and Immobility in the United States*. Chicago, IL: University of Chicago Press.

Psacharopoulos, G. (1988) Education and Development: A Review. *The World Bank Research Observer* 3:1 (January) 99–116.

Quisumbing, Agnes R. (1993) Intergenerational Transfers in Philippine Rice Villages: Gender Differences in Traditional Inheritance Customs. *Journal of Development Economics* 43:2 (April) 167–196.

Romer, Paul M. (1986) Increasing Returns and Long-run Growth. *Journal of Political Economy* 94:5 1002–1036.

Rosenzweig, M., and T. P. Schultz (1982) Market Opportunities, Genetic Endowments, and Intrafamily Resource Distribution: Child Survival in Rural India. *American Economic Review* 72: 803–815.

Rosenzweig, M., and T. P. Schultz (1984) Market Opportunities, Genetic Endowments, and Intrafamily Resource Distribution of Resources: Reply. *American Economic Review* 74: 521–522.

Rosenzweig, Mark R., and Kenneth I. Wolpin (1980) Testing the Quantity-Quality Model of Fertility: Results of a Natural Experiment–Twins. *Econometrica* 48:1 (January) 227–240.

Rosenzweig, Mark R., and Kenneth J. Wolpin (1988) Heterogeneity, Intrafamily Distribution, and Child Health. *Journal of Human Resources* 23:4 (Fall) 437–461.

Schultz, T. P. (1990) Testing the Neoclassical Model of Family Labour Supply and Fertility. *Journal of Human Resources* 25: 599–634.

Sen, Amartya K. (1990) More Than 100 Million Women are Missing. *New York Review of Books* 37:2 (20 December) 61–66.

Stokey, Nancy L. (1991) Human Capital, Product Quality, and Growth. *Quarterly*

Journal of Economics 106: 587–616.

Strauss, John, and Duncan Thomas (1995) Human Resources: Empirical Modelling of Household and Family Decisions. In Jere R. Behrman and T. N. Srinivasan (eds) *Handbook of Development Economics 3*. Amsterdam: North-Holland Publishing Company.

Thomas, Duncan (1990) Intra-household Resource Allocation: An Inferential Approach. *Journal of Human Resources* 25:635–664.

Thomas, Duncan (1993) The Distribution of Income and Expenditure within the Household. *Annales de Economie et de Statistiques* 29: 109–136.

Udry, Christopher (1994) Gender, Agricultural Production and the Theory of the Household. Evanston, IL: Northwestern University. (Mimeographed.)

Willis, Robert J. (1973) A New Approach to the Economic Theory of Fertility Behaviour. *Journal of Political Economy* 81:2 (Part 2) (March/April) S14–S64.