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1. Introduction

The purpose of this chapter is to review the economic literature on household formation. Since the seminal work of Becker (1981), economists have devoted an increasing amount of attention to issues surrounding the household. This is true in advanced economies as well as in developing countries. The volumes edited by Haddad, Hoddinott and Alderman (1997) and Quisumbing (2003), for instance, are representative of the intrahousehold literature in developing countries. Household formation in developed countries is discussed, inter alia, in Bergstrom (1997) and Grossbard-Shechtman (2003).

Our ultimate objective is not to review the entire literature on intrahousehold issues, which is now extremely voluminous. Rather we seek to organize the abundant theoretical and empirical material into a coherent whole that can serve as starting point for analyzing intrahousehold issues in developing countries. The conceptual framework proposed here is intended to be sufficiently general to encompass many specific models and ideas found

in the literature, while remaining internally consistent. We use it to guide the reader through part of the literature and to provide a basis for evaluating the abundant empirical evidence.

Households are important. They fulfill many critical functions – from production and reproduction to consumption, saving, insurance, and human capital accumulation. Changes in their function helps explain changes in their size and shape over time and across societies. At the heart of many households is a couple. The matching process by which couples are formed has deep implications regarding intergenerational mobility and long-term equity. This is particularly true in agrarian societies that still characterize much of the developing world today. Households can also dissolve, shed members, or gain new ones. Economic theory of household formation and marriage markets provide a framework for thinking about changes in household structure over time.

Each section of this chapter combines a presentation of the empirical evidence with a conceptual discussion focusing on testable predictions and testing strategies. Section 2 focuses on the reasons for household formation. Marriage markets are discussed in Section 3. Marriage dissolution is covered in Section 4 while Section 5 discusses the circumstances leading to single parent or single adult households. The last Section contains a brief discussion of other issues pertaining to household structure, such as the factors affecting the decision to leave or join an existing household.

2. Household Formation

Throughout this chapter the term "household" is used to designate a group of individuals living together. It is distinct from the term "family", which designates a group of individuals related by marriage and consanguinity. In general, households are composed of family members.[1] But they can also include unrelated individuals (servants, visitors, fostered children). Families typically consist of multiple households forming a network of kith and kin, related by blood or marriage but not necessarily living together. Family and kinship networks are the object of a separate chapter in this volume.

2.1. Coercion and free will

Households are facts of life, so much so that we normally take them for granted. Yet economic theory is couched in terms of individual agents. As economists, we may wonder why people live in households. One possibility is that they do not have the choice. Minor children, for instance, are normally not allowed to leave their parents until they come of age. If they run away from home, they can be compelled to return, by force if necessary. The same is true in some societies for wives and other adult female dependents.

This begs the question of why society would force people to live together. In the case of minor children, most people would probably agree that society has the welfare of children at heart. Since children are vulnerable, society may calculate that the abuse they would endure while living on their own is in all likelihood worse than the abuse to which they could be subjected at home. While there certainly are exceptions to this principle, it is

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[1]We follow the common practice of omitting from the definition of a household all formal institutions in which generally unrelated individuals share room and board. Examples of such institutions include boarding schools, retirement homes, monasteries, army barracks, ship crews, and prisons.

safe to assume that it holds on average. The welfare of young children is thus probably an important motivation for the formation of households, a point that we revisit below.

Feminists have sometimes argued that households are nothing but a device for adult males to extract forced labor from women and children: a male dominated society improves male welfare, the story goes, by coercing wives, children, and dependent adult females to remain in the household (Folbre 1997).[2] Domestic violence and the indoctrination of women are the weapons by which such enslavement is accomplished. In the popular psyche, this is best illustrated by the cliche of the good-for-nothing husband who drinks his income away while his wife and kids labor at home. We do not dispute that such men exist. We also do not dispute that women's agency is highly restricted in some societies where the law assimilates them to minor children and where ostracism rewards those who challenge women's socially assigned role. We do not have much to say about these practices here, except that they are abhorrent and should be eliminated.

Our focus is elsewhere. If households were solely the result of coercion, they would disappear once women are recognized freedom of choice. Yet they do not: all countries have households, whether or not their legal code and social mores recognize women's free will. This means that households have to be explained. Living together typically puts constraints on individual choice. Why then do people form groups that, de facto, restrict their freedom of choice? Answering this question is the focus of the first part of this Chapter.

If free individuals decide to form a household, it must be that living together yields

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[2]Ironically, recent research suggests instead that in developed economies men would do better financially by staying single (e.g. Jarvis and Jenkins 1999, Bourreau-Dubois, Jeandidier and Berger 2003).

higher personal welfare than living alone. This fundamental intuition is the organizing principle behind the economic analysis of household formation. Gains from household formation also help sustain households in the presence of coercion, and probably play a central role even in societies that do not recognize women's free will. Even when legal and customary rules prohibit individuals from leaving a household, enforcing these rules may be problematic given that running away from home always remains an option, albeit perhaps not an attractive one. Gains from household formation make the rules easier to enforce because leaving the household means losing many of the benefits it provides. When gains from household membership are sufficiently large, these rules can even become self-enforcing in the sense that individuals find it in their interest to follow them.[3] Furthermore, if the household head is a dictator at home, he can decide to shed members. For the household to be sustainable, it must be in the interest of the head to keep all its members. Gains from household formation, especially if they are captured by the household head, make shedding members less likely.

With these few words of introduction, we are ready to delve into the economic literature on household formation. To represent household formation formally, let vector A_i denote the endowments and characteristics of individual i, such as assets, education, health status, etc. Let $W_i(A_i)$ be the utility individual i can achieve on his or her own. Consider another individual j with assets A_j and autarchy payoff $W_j(A_j)$. Let the utility they achieve by living together be denoted $V_i(A_i, A_j)$ and $V_j(A_i, A_j)$ which, for now, we take as exogenously determined. It is in the joint interest of i and j to form a household if and

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[3]This abstracts from the welfare gain that individuals may derive from agency itself, that is, from making their own decisions.

only if:[4]

$$V_i(A_i, A_j) \geq W_i(A_i)$$

$$V_j(A_i, A_j) \geq W_j(A_j)$$

The same approach naturally extends to groups of more than two individuals.[5]

To understand household formation in a free society, we must therefore understand the origin of the welfare gains generated by living together. Our first insight into the source of these welfare gains comes from the definition of a household. Its defining characteristic is the sharing of resources and activities. Coresidence is usually regarded as a necessary condition for a group of people to be regarded as a household. This excludes children living separately from their parents, for instance. Coresidence is seldom sufficient, however. Tenants in an apartment building live under the same roof but form separate households. For this reason, a household is often defined as a group of people 'eating from the same pot', that is, sharing cooked meals (e.g. Grosh and Glewwe 2000, Deaton 2000). The advantage of this definition is that it is factual and does not depend on legal categories, such as whether people are married or related.[6]

Sharing resources is only one of many possible gains generated by household forma-

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[4]Of course, it is conceivable that i and j nominally form a household but continue to live in exactly the same way as before, in which case $V_i(A_i, A_j) = W_i(A_i)$ and $V_j(A_i, A_j) = W_j(A_i)$. To rule out such uninteresting cases, we require that at least one of the above inequalities be strict. Alternatively, we may assume that some transaction cost must be incurred in order to form a household.

[5]The formalism of the model can be extended to households in which membership is coerced by recognizing that members can run away but incur a penalty (psychological, physical, or financial) for doing so. The stronger the penalty, the more constrained choices are. We discuss constrained choices later in the Chapter.

[6]This definition works well in poor countries but it is becoming obsolete in parts of the world where households no longer cook their own food. There, a better definition would probably be people 'eating from the same fridge' or 'sharing the same food budget'.

tion. In this Section, we briefly discuss various potential gains from living together as a household and, whenever possible, presents empirical evidence relative to the evidence and strength of these effects. The form and strength of these gains may also help us understand the optimal size and composition of households.

2.2. Companionship and reproduction

The first welfare gain from living together is emotional. Human beings are social animals. They enjoy companionship. Living alone often is a source of anxiety and depression. Based on this observation alone, we would expect human beings to live in large groups, not small household units. There must therefore exist a countervailing force that discourages the formation of very large groups and incite human societies to organize in groups of a few individuals only. Part of this negative externality probably has to do with freedom of choice: because individual preferences are heterogeneous, sharing resources and activities often means doing things that are not optimal from a purely individual point of view. The larger the group, the stronger the loss of autonomy.

Putting these two ideas together yields Figure 1. Group size N is on the horizontal axis, individual utility on the vertical axis. For the purpose of the Figure, all individuals are assumed identical. Autarchy utility is a flat line. The utility cost from lost autonomy is depicted as a downward sloping curve below the horizontal axis. The utility gain from companionship is shown here as a concave curve above the horizontal axis. Adding the two to autarchy utility defines the utility from living in a household of size N. Optimal household size N^* is achieved when the marginal gain from companionship equals the marginal utility cost of lost autonomy. What the graph illustrates is that, if marginal

returns to companionship are decreasing rapidly, N^* is small. The fact that actual households often are small suggests that marginal gains from companionship decrease rapidly with group size. This makes intuitive sense: going from living alone to living with someone else makes a big difference to one's feeling of loneliness; going from 2 to 3 makes less of a difference.

If the sole purpose of households is to fight loneliness, companionship can a priori be achieved by any arbitrary grouping, not necessarily couples or parents with children. The fact that most households are made of couples with or without children suggests that sex and reproduction play an important role in household formation. Although sex can be sought outside a couple, coresidence cuts down on transactions cost and facilitates regular sexual interaction, making it an important dimension of companionship for many couples. Furthermore, sex often fosters strong emotions that can bind people together. Since sexual activity tends to decrease with age, as couples age together companionship probably takes on a more important role. As we all know, however, mutual sexual attraction need not last forever and can change in unexpected ways. This introduces an element of unpredictability in household formation and dissolution.

Many social phenomena cannot be understood without realizing that sexual interaction need not take place within households. For instance, because of financial or legal reasons, migrant husbands are often unable to bring their wife to their place of work. As a result they often seek sexual encounters outside marriage. Wealthier men may also indulge in their craving for sexual diversity by having extra-marital affairs. This creates a demand for prostitution services, a topic we will revisit later when we discuss exit options open to married women dissatisfied with their fate. Prostitution in turn has an important role in

the dissemination of diseases, most notably HIV-AIDS and tuberculosis. How adequately households satisfy sexual needs can therefore have far-reaching repercussions on society.

Casual empiricism suggests that reproduction is another important function of households. Young children cannot support themselves. For them, autarchy is not a viable option. For many years, they have to be cared for by adults. Fortunately, human beings have been genetically programmed to care about children, especially their own (Buss 2005). The altruism most parents feel towards their progeny encourages them to look after young children, which is most easily achieved if they reside together.

This simple process undoubtedly plays a major role in household formation. But it is important to recognize that both reproduction and child care can be achieved outside households. By adopting or fostering children, adults can obtain offspring without being their biological parents (e.g. Akresh 2004b, Castle 1996). There are, however, differences in outcomes across genetic versus adoptive offspring. Careful analysis of US and South African data shows that, controlling for household size, age composition, and income, food expenditures are less in households in which a child is raised by an adoptive, step, or foster mother (Case, Lin and McLanahan 2000). Daly and Wilson (1987) provide evidence that child abuse and child homicide are significantly correlated with the presence of a stepparent; abusive stepparents abuse only stepchildren while sparing their natural offspring within the same household.

The urge to have children is quite strong, so much so that many couples are willing to spend much money and effort to adopt children or to seek fertility care. This urge also explains why, in certain societies, men repudiate or divorce women unable to bear them children. In societies where repudiation is not permitted and divorce frowned upon,

husbands may even be tempted to kill an infertile wife, as occurs for instance with wife burning in South Asia.[7]

Although the desire to have children is strong in many societies, enormous differences in fertility rates have been observed between countries or within countries over time. Very high fertility rates have been found in societies expanding the frontier of human settlement. In contrast, low fertility levels are now prevalent in many rich countries, and a fertility decline has been observed in most countries in the latter part of the last century. These dramatic changes in the number of children per woman affect household formation in profound ways. When having children no longer is a primary objective of couples, marriage is less necessary and can be replaced by cohabitation, which is more flexible. Marriage also occurs later and unions may be less durable. Adult children may choose to remain with their parents longer. In Japan, for instance, demographers have noted that many adult men and women in their 30's now live with their parents. This new phenomenon has been explained in part by fertility decline and in part by the cost of real estate, which makes setting up an independent household more expensive. We revisit the latter point below.

It is possible for a single man or woman to obtain a biological offspring without forming a household with the other parent. In fact, this is usually what happens upon divorce. It is also possible for a parent to care for a child without being in the same household, as when a divorced parent pays child support for a child residing with his or her former spouse. Finally, it is possible for children to be raised in institutions. The

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[7]Failure to pay the dowry in full is also a contributing factor in bride burning. But if the wife has a child, especially a son, bride burning is likely to be met with extreme disapproval even by those who condone it in other circumstances.

AIDS epidemic in Africa has created millions of orphans, many of whom are taken care of by other relatives or by institutions (Evans 2004b). Children who are not absorbed into households or institutions typically end up as street children. What little we known about their welfare is sufficiently disturbing to justify emphasizing the child care role of households.

Altruism towards children is a major driving force behind the formation of households. Altruism towards parents is also present, and often explains why adult children co-reside with elderly parents in order to care for them. Duflo (2003) provides some interesting insights into this issue by examining children residing with their grandparents. Duflo takes advantage of the 1993 extension of the South African social pension program to the black population to investigate the effect of grandmother altruism on child nutritional status. Estimates suggest that pensions received by women had a large impact on the anthropometric status (weight for height and height for age) of girls but little effect on that of boys. No similar effect is found for pensions received by men. These results suggest systematic gender differences in altruism towards children, a point that is revisited in the chapter on extended family and kinship networks in this volume.

Altruism alone, however, does not explain household formation: parents who care for children or children who care for parents could demonstrate their altruism simply by paying for their children or parents to be taken care of by others, say, a boarding school or a retirement home. Coresidence is not an automatic consequence of altruism. Other forces are at work as well. To these we now turn.

2.3. Consumption

Households are the locus where most consumption takes place. Many consumption goods are non-rival in the sense that consumption by one does not reduce (by much) consumption by others. This is true for instance for housing, numerous household electronics, and many forms of family entertainment. Consumption items enjoyed by one household member can be passed on to others, such as books or children clothes. Non-rival consumption goods are often referred to as household public goods in the literature (e.g. Bergstrom 1997, Browning and Chiappori 1998, Lechene and Preston 2005). By pooling consumption expenditures, household members reduce duplication of household public goods and achieve higher utility. In some cases, joint consumption can even raise individual utility, such as taking a meal together.

Formally, consider a symmetric model in which $U(C_i)$ is utility and C_i is the consumption vector of individual i. We partition C_i into rival C_i^r and non-rival goods C_i^n with $C_i = \{C_i^r, C_i^n\}$. Let X denote consumption expenditures per person, which for simplicity we assume identical across individuals. We wish to show that individual utility increases with household size. Since all household members consume the same non-rival goods, $C_i^n = C^n$ for all i. We have:

$$\max_{\{C_i\}} \sum_{i=1}^{N} U(C_i^r, C^n) \text{ subject to } NX = Np^r C_i^r + p^n C^n$$

which, by symmetry, can be rewritten as:

$$V(X, p^r, \frac{p^n}{N}) = \max_{\{C\}} U(C^r, C^n) \text{ subject to } X = p^r C^r + \frac{p^n}{N} C^n$$

Since $\frac{\partial V}{\partial p} < 0$ for consumed goods, it immediately follows that $\frac{\partial V}{\partial N} > 0$: thanks to non-rival consumption, utility increases in household size.

The above model ignores the fact that, beyond a certain household size, congestion sets in and consumption goods are no longer non-rival. How quickly congestion sets in determines optimal household size N^* from a consumption maximization point of view. If, as is likely, congestion sets in faster for certain goods than for others, N^* depends on individual tastes. For instance, people who love to play sports together probably have a larger optimal household size than people who like to read. By the same reasoning, optimal household size may also vary with income level. If the rich have more individual forms of consumption, they will have smaller households, and vice versa. Technological change can affect N^* by changing the type of consumption goods available and the extend of non-rivaly in consumption. For instance, a TV can be watched by several people while a walkman is, by design, individual. A shift towards smaller, more individualized consumer durables encourages – or at least assists – the formation of smaller households.[8]

Utility gains from pooling non-rival consumption goods can also be achieved outside the household, for instance by engaging in sports with friends or by watching a football match in a bar. As emphasized before, the existence of substitutes outside the household is also likely to affect optimal household size. Whether outside options are good substitutes for consumption within the household depends on transactions costs – e.g., coordinating a game with friends, going to the bar. Higher population density in urban areas tends to reduce such transactions costs – it is easier to find people with similar tastes, distance

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[8]It is also conceivable that the reduction in household size induces technological innovation towards rival consumption goods, such as single user consumer electronics.

to the bar is on average smaller. It is also likely to increase the range of consumption substitutes outside the household. For these reasons, we expect household size to be smaller in urban areas.

The literature has looked for evidence of economies of scale in consumption. Lanjouw and Ravallion (1995) investigate the relationship between household size and food consumption. The starting point of their enquiry is the empirical negative relationship between household size and consumption per head. The authors note that it would be erroneous to interpret this relationship as necessarily implying that welfare is lower in large households. The reason is the possible existence of economies of scale due to household public goods. They note the crucial importance of these issues when it comes to poverty targeting. Their approach focuses on an equivalence scale parameter θ such that welfare depends on x/n^{θ}, where x is household consumption expenditures and n is the number of household members. If $\theta = 1$, individual welfare is proportional to consumption per head; if $\theta < 1$, there are economies of size. If welfare levels are, on average, the same in large and small households, x/n^{θ} should on average be the same across households of different sizes. Using household data from Pakistan, they find that a value of θ around 0.5 or 0.6 would yield no relationship between x/n^{θ} and household size.

Lanjouw and Ravallion then use an Engel approach to estimate θ from household data. Their idea is that a decrease in the food share as household size increases can be interpreted as indicating the presence of positive economies of scale. If the estimated $\widehat{\theta}$ is larger than 0.6, this would also indicate that smaller households are better off in terms of food consumption per equivalent person. To obtain an estimate of θ the authors regress

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the food share ω on the logs of total expenditures and household size:

$$\omega_i = \alpha + \beta \log x_i - \beta\theta \log n_i + \gamma z_i + u_i$$

where the z_i are various controls. Taking the ratios of the two coefficients, the authors obtain $\widehat{\theta} = 0.59$, which is indicative of strong returns to household size.

The application of Engel equivalent scales to welfare comparisons between households of different sizes is severely criticized by Deaton and Paxson (1998), who argue that it 'makes no sense'. Deaton and Paxson point out that, because the food share ω_i is per-capita food expenditure divided by total per-capita expenditure, a decline in ω_i keeping total per-capita expenditure constant can occur only if there is a decline in food expenditure per capita. Because food is a rival good, they argue, a decline in individual food consumption cannot be a welfare improvement. This argument ignores the possibility of scale economies in the transformation of purchased food products into consumed food, a point we revisit in the next section.

Using household level data from a series of developed and developing countries, Deaton and Paxson propose an alternative methodology to test for the existence of economies of scale driven by explicitly distinguishing between exclusive goods – such as food – and household public goods. The basis for their test is the observation that, if people pool resources, they save on household public goods and can afford to spend more on rival goods. This should be particularly true for food, which is not easily substitutable. This leads to the prediction that, at constant per capita expenditure, demand for food should increase in household size. Furthermore this effect should be stronger in poor countries

because, at low levels of income, food is a more important determinant of individual welfare – and thus should increase more as households economize on household public goods. Using data from seven countries (three developed and four developing), the authors instead find a negative relationship between household size and food shares, controling for per capital expenditures. Moreover, this negative relationship is stronger in poor countries. These results contradict the economies of scale hypothesis.[9] The authors are unable to explain their paradoxical findings.

A resolution is proposed by Gan and Vernon (2003). Revisiting the Deaton and Paxson data and methodology, these authors show that, as predicted by theory, the share of food in consumption expenditures on food and goods known to be more public than food (e.g., housing) increases with household size. They also analyze the share of food in expenditures on food and a good known to be more private than food and find this share to be decreasing with family size. Consumption of food away from home also decreases with family size. Finally, instead of comparing across countries, the authors compare the elasticity of food share with respect to household size across expenditure quartiles within countries. They find this elasticity to be larger among poor household. These results suggest that the economies of size hypothesis may hold but that careful data analysis is required. More work is needed in this area.

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[9]The literature has sometimes given a different interpretation to such findings. According to Engel's second law, a lower food share is taken to indicate higher welfare. Consequently, a decrease in food share as household size increases has sometimes been interpreted as indicating the presence of positive economies of scale (Lanjouw and Ravallion 1995). Deaton and Paxson (1998) argue that such inference is misguided.

2.4. Production

As first modeled by Becker (1965), Nakijima (1965) and Sen (1966), households are a locus where much production occurs. Household production takes many different forms and is not restricted to poor farmers in developing countries. As Becker (1965) pointed out, all household chores – such as preparing a meal, cleaning the house, or fetching firewood – can be regarded as part of a household production function whereby household endowments $A = \{A_1, ..., A_N\}$ and purchased commodities $Z = \{Z^1, ..., Z^K\}$ are transformed into individual flows of consumption services $C_i = \{C_i^1, ..., C_1^M\}$ where M is the number of consumption services. Total consumption of good j is denoted C^j. The household maximization problem can be written in fairly general terms as:

$$\max_{\{C_i, Z\}} \sum_{i=1}^{N} \omega_i U_i(C_i) \text{ subject to}$$

$$0 \geq G(C^j, Z, A) \qquad \text{(production function)}$$

$$\sum_{i=1}^{N} X_i = \sum_{k=1}^{K} p^k Z^k \qquad \text{(budget constraint)}$$

$$C^r = \sum_i C_i^r \qquad \text{(rival goods)}$$

$$C^n = C_i^n \qquad \text{(non-rival goods)}$$

where X_i is the monetary income brought by individual i and the ω_i's denote arbitrary welfare weights. For now, both are taken as exogenous.

We have written the production technology $G(C^j, Z, A)$ in the broadest possible way to allow for economies of scope, fixed costs, and the like. One common example of economies of scope is child care and house-based chores: many chores can be completed while at the

same time attending to a child. The production function can of course be simplified to suit modeling purpose. For instance, if certain purchased goods are consumed without transformation, we have $C^j = Z^j$. The notation can also be expanded to allow for the fact that households consume what is left of an endowment – say time – after it has been partly used for household production.

2.4.1. Gains from specialization

A detailed analysis of such models is beyond the scope of this chapter and can be found, for instance, in Singh, Squire and Strauss (1986) and de Janvry, Fafchamps and Sadoulet (1991). What interests us here is what insights this model generate about household formation. Our first insight is about household production of non-rival consumption goods. Many household chores have this quality. For instance, cleaning the house benefits all household members. A closely related insight is that many household production activities have fixed costs or local increasing returns. For instance, cooking for three does not take much more time than cooking for two. Both effects – non-rival consumption goods and increasing returns in household production – generate returns to scale in household size (e.g. Deaton and Paxson 1998, Lanjouw and Ravallion 1995, Fafchamps and Quisumbing 2003). The stronger these returns to scale, the larger is the optimal household size N^*. This probably explains why household size tends to be larger in places where much consumption is home produced. This is typically the case in poor rural economies where households self-provide much of what they consume – i.e., not only agricultural produce but also house construction, animal husbandry, food processing, fuel, water, child care, elderly care, crafts, and entertainment.

Considering the household as a production unit enables us to borrow further insights from the theory of the firm. These insights are particularly useful to understand who joins the household and how tasks and responsibilities are shared among members. Becker (1981) was among the first to point out that if there are gains from specialization in household production, members should specialize.

Gains from specialization may be static. This happens whenever two separate tasks are better taken care of (e.g., more cheaply) if they are undertaken by two distinct individuals. To see why, think of driving a car and reading the map: these two tasks are best performed if one person drives while the other reads the map, not if both try to do both at the same time. In order to achieve this kind of task specialization, some coordination mechanism is required. We also need to provide incentives for individual members to perform the task adequately. Borrowing from the theory of the firm, one possible way of solving such coordination and incentive problems is to opt for a hierarchical structure that allocates tasks to individual members and holds them responsible for that task. Some evidence to this effect can be found, for instance, in Fafchamps and Quisumbing (2003).

For certain tasks, allocation among members is arbitrary: all members could perform the task equally well. In this case each household may decide to allocate tasks differently and to change task allocation over time, if only to relieve boredom. Coordinating task allocation may be time consuming even if allocation is arbitrary. It may also lead to haggling if certain tasks are more pleasant than others. In this case, social norms or focal points may be used to minimize the need for coordination – and the risk of disagreement. Gender casting, for instance, is common in many societies whereby certain tasks are reserved for women while others are reserved for men. Social roles may also be assigned

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to children, or to daughters-in-law, etc.

Gender casting has strong implications for household formation. If, for instance, men are not supposed to cook, it will be difficult for a man to live alone. By making men and women complementary in the tasks reserved to them, societies may seek not only to reduce haggling but also to make men and women necessary to each other – and thus to reduce the risk of divorce.

Many tasks require specific skills. Sometimes these skills are innate. For instance, tasks that require physical strength are better entrusted to healthy adult males who, on average, are stronger than children or women. Other times, skills are acquired, either through schooling or through learning by doing. Tasks that require literacy, for instance, are best entrusted to educated household members. Cooking is best entrusted to someone who knows how to cook. Consequently, household members who have acquired certain skills are more likely to undertake tasks that require those skills.

As pointed out by Becker (1981), differences in skills may also determine which household members work outside the home and which take care of most household chores. For instance, consider a household with two tasks: working outside the home for a wage, and taking care of household chores. Suppose that both are equally skilled at household chores but that the husband is better educated and that wages are higher for educated people. Comparative advantage dictates that the husband should work outside the home while the wife does household chores.

This begs the question of why the husband is better educated in the first place. Becker (1981) argues that parents may seek to orient the future allocation of tasks for their children by imparting them task-specific skills, e.g., by teaching girls to cook and boys to

read. Parental investment in skills for their offspring may also respond to social norms and gender casting: if wives are supposed to cook, then parents should teach daughters to cook. Gender-specific skills learned during childhood play the same role as gender casting in making husband and wife complementary.

These issues are examined in detail by Fafchamps and Quisumbing (2003) using data from Pakistan. In that paper, we begin by testing the presence of returns to scale in household production. To this effect, we regress total time L_{ij} devoted in household i to chore j on household size n_i. Controls are included to capture wealth effects and household composition. We find evidence of economies of scale in household chores. For certain chores such as fetching firewood, collecting water, and visiting the market, the coefficient of n_i is non-significant, suggesting that the amount of time spent on these chores does not vary with household size: these activities appear to represent fixed household costs. Cooking, washing clothes, and cleaning the house increase less than proportionally with household size, indicating economies of scale there as well. Only livestock herding appears to increase faster than household size, but the coefficient of n_i is not precisely estimated so that we cannot rule out constant or decreasing returns to scale.

We then test whether differences in task allocation between household members reflect comparative advantage. This is accomplished by regressing the share $S_{ij}^k = L_{ij}^k / L_{ij}$ of each task j performed by household member k in household i on characteristics of individual k such as education, age, gender, and height. Results indicate that, as predicted by Becker (1981), human capital plays an important in determining who does what. We find that better educated individuals are more likely to work off-farm and less likely to tend the livestock, work as casual workers, or perform household chores – except visit

the market. Education also raises leisure time, suggesting that better educated household members have a higher welfare weight. Age and height also matter. Activities reserved for youngsters are essentially home-based chores such as cooking, washing, knitting, and cleaning the house. Older household members focus on activities that require travel outside the house. Intrahousehold task allocation thus responds to differences in skills and education, providing some evidence in support of Becker's comparative advantage hypothesis.

Human capital differences, however, do not explain everything. There are large systematic differences by gender and status within the family. Males focus on market oriented work while females focus on self-substence activities and household chores. We also observe large differences in leisure consumption, with all male categories consuming more leisure than females. Family status also matters. The head of household and his wife do most of the work. Other adults of similar age and gender work less. The only exception is that daughters-in-law work much harder than daughters of similar age and education level – and work even harder than the head's wife. They are also less likely to participate in activities that involve traveling outside the household and earning an independent income. From this we conclude that gender casting and social roles explain a major proportion of intrahousehold task allocation.

Finally, we examine the data for evidence of returns to specialization and learning by doing. We find overwhelming evidence of specialization in the sense that individuals tend to be exclusively responsible for certain tasks. To find out whether this specialization is the result of learning-by-doing, we examine whether individuals change tasks over time. Indeed, if tasks take time to learn, we would expect household members to keep doing

the same task over time. Except for activities such as farming and off-farm employment, we find instead that household members swap tasks frequently, thereby suggesting that learning-by-doing does not lock individuals into specific tasks. Returns to specialization thus appear to result from incentive and coordination concerns.

2.4.2. Technology and markets

In the long run, the organization of tasks within the household is affected by technology. The development of household appliances such as the stove and microwave oven has reduced the importance of food preparation skills: while cooking a meal in clay pots on an open fire requires quite a bit of skill and practice, everyone, including a child, is capable of heating a simple meal in a microwave oven. This has had far reaching effects in developed countries (Goldin 1992). The time freed by these appliances has enabled women either to join the labor force or to focus on other chores such as child care. Because less skill is required to perform house chores, it is easier to reallocate these chores among household members as needed. This has enabled women to challenge traditional roles assigned to them by tradition. Similar processes can be observed in poor countries, although around different technologies. The introduction of food processing technology such as corn mills and fuel-efficient stoves in African villages frees up women's time to do other things.

In households where many production activities are undertaken simultaneously, decisions are largely decentralized, one household member being responsible for an activity. Technology may also dictate whether farm activities are organized in a decentralized or hierarchical way. Boserup (1965) observed, for instance, that hoe agriculture such as it is still practiced in much of Africa does not generate any returns to scale or economies

of scope in farming. In this context, decentralized field management is usually optimal. Once animal draft power is introduced, however, economies of scope arise because of complementarities between animal husbandry and crop production. With animal draft power the centralization of power in the hands of the household head is often beneficial because it facilitates integrated management of a more complex organization of production.

This contrast between hoe agriculture, where fields are managed by individual household members, and plough agriculture, where production decisions are centralized, further suggest that when returns to coordination are low enough, households naturally gravitate towards autonomy of decision. This suggests that autonomy surfaces whenever the cost of decentralized decision making is low enough.

Decentralization may reduce efficiency, however, because it reduces the scope for the pooling of resources. This point is made most clearly by Udry (1996) using detailed plot-level data from Burkina Faso. The author finds, in contrast, that plots controlled by women are farmed much less intensively and receive less manure than similar plots within the household controlled by men. The estimates imply that about 6 percent of output is lost because of inefficient factor allocation within the household.

Other forms of technological innovations can also affect the internal organization of work within the household. A good example is the introduction of rice irrigation in the Gambia discussed by von Braun and Webb (1989). The author document how the introduction of irrigation in rice cultivation dramatically affected the division of labor between men and women. Until irrigation was introduced, the cultivation of rice along the banks of the Gambia river was exclusively a female activity. Once irrigation was introduced, however, returns to rice cultivation rose considerably and control over the

crop shifted rapidly into male hands. This resulted in a concentration of control over labor resources in the hands of the household head, thereby affecting the division of labor and balance of power within the household.

2.4.3. Household formation

The above issues are important in their own right but they have an immediate relevance for household formation. First, gains from specialization, whether static or dynamic, generate economies of scale in household size – at least over a certain range, a bit like in Figure 1. Gains from specialization are thus essential to understand optimal household size.

Second, essential tasks often can only be performed by certain categories of people because of acquired skills or social norms – for instance, women for food preparation or children for tending livestock. This implies that in order for a household to be an effective production unit, all these categories of people must be present. In the Ethiopian highlands, for instance, a man who enters the kitchen is laughed at. In these conditions, at least one woman has to be present in the household in order to prepare meals. By the same token, in livestock producing areas, children and young adults often play a major role in tending animals. The presence of children in the household is then essential to enable livestock production. Of course, one could "purchase" livestock tending services by hiring children from other households, but at higher transactions costs and possible risk of moral hazard. This simple observation may explain why school enrollment is often lower and fertility higher in livestock producing countries. The need for specific skills and the magnitude of returns to household size may also explain why young males marry later or

stay with parents after marriage (Binswanger and McIntire 1987). In rural communities, parents can effectively delay the age of marriage of their sons by failing to provide start-up capital and access to lineage land.

We have discussed how markets can substitute for home consumption and thus enable small households to reap the benefits of non-rival consumption goods. A similar observation can be made regarding household production. If markets are perfect and complete, household size and composition no longer matter; production decisions only depend on market prices. Missing skills are hired from the market and non-produced goods are secured outside the household. This is the standard separability result for household models (e.g. Singh et al. 1986, de Janvry et al. 1991). It follows that production considerations affect household formation only when some markets are missing. Because of population density, markets are usually best developed in and around cities. This enables household to be smaller. Fafchamps and Shilpi (2005), for instance, shows that households living in urban areas are much more specialized in their production pattern than those living in remote rural areas. Fafchamps and Wahba (2006) similarly find that children living in and around urban centers work less on the household farm or doing house chores, and spend more time in school.

In practice, it is very common for certain markets either to be missing entirely or to be unattractive because of transactions costs. For instance, eating out enables the household to avoid cooking its own food, but it means going out and waiting for food once at the restaurant. Take-away food reduces some of the transactions cost but still implies some transportation. When markets exist but are subject to transactions costs, some households typically choose to self-provide while others rely on the market either as

sellers or as buyers (Key, Sadoulet and de Janvry 2000).

To economize on transactions costs, households may aim to be just large enough so as to self-provide most of their needs. If this cannot be achieved, they may hire domestic servants, a practice that is widespread in developing countries. Hybrid cases also exist. For instance, in the Ethiopian highlands there exists an ancient marriage contract stipulating that a woman joins a man 'as a servant and a wife'. In case of marriage dissolution, the woman does not share household assets but is paid a compensation equal to the wage she would have earned as a servant over the time she was married. This was a kind of pre-nuptial agreement used by rich husbands – usually older men – unwilling to share their wealth with their bride. This ancient practice illustrates well the dual purpose of this kind of marriage.

In this context, technological innovation in home production can have dramatic consequences on household formation. In developed economies, the introduction of household appliances over the last fifty years, combined with a wider availability of goods through the market, have sharply reduced returns to household size and enabled households to shrink Deaton and Paxson (1998). Nowadays, there are many single person households, especially in large urban centers. A similar phenomenon can be found in the cities of developing countries, where many migrants live in single person households. In contrast, rural households often are quite large and produce a very diversified range of consumption goods and services. The fact that human beings often choose to live on their own when the economic penalty for doing so is reduced suggests that many value consumption autonomy, a force we discussed at the beginning of this section but that is usually ignored in the literature.

2.5. Insurance

A discussion of the reasons for household formation would be incomplete without bringing out their role as risk coping mechanism (Fafchamps 2003). It has long been recognized that one of the primary functions of the family is to protect its members against shocks. This is best exemplified by the traditional wording of the wedding ceremony which emphasizes risk sharing (e.g., "in sickness and in health"). One of the purposes of household formation is to pool resources for risk purposes: the able can look after the sick, the more fortunate can share with the less fortunate (Fafchamps 1992).

The need for old age support is largely predictable and is not, strictly speaking, an insurance problem. It nevertheless has an important insurance component because it is difficult to predict the exact time at which support will be needed – and the precise nature of the required support. Integrating an elderly parent into one's household can in principle be done at the time when the need arises. But it can also be anticipated through co-residency.

The insurance role of the household is so much taken for granted that much of the literature on this issue has focused on pathological cases in which household members fail to pool resources. The literature on famines, for instance, has described situations in which households break apart under pressure because members better able to feed themselves find it impossible to provide for their spouse, parents, or children (e.g. Sen 1981, Alamgir 1980, Greenough 1982). Anthropological accounts of the bushmen tell of households abandoning elderly members who can no longer walk. In a paper focusing on North-East Tanzania, Miguel (2003) shows that the practice of 'witch' killings covers

mostly the physical elimination of elderly people (principally women) in times of duress. Put differently, accusations of witchcraft are brought disproportionately upon the elderly precisely at a time when their family finds it difficult to support them.

Absence of risk-sharing is not confined to pathological cases. Evidence from West Africa suggests that husbands and wives do not necessarily pool risk (e.g. Doss 2001, Goldstein 2000, Duflo and Udry 2004). In their paper on risk sharing between spouses, Dercon and Krishnan (2000) come to the more upbeat conclusion that in most of the Ethiopian highlands, risk is shared efficiently. They do, however, find significant deviations from risk sharing in parts of the country. This is also the part of the country where the status of women is the weakest (e.g. Pankhurst 1992, The World Bank 1998, Fafchamps and Quisumbing 2002).

The nature of risk can have a profound effect on household formation. It is well known that, other things being equal, better risk pooling can be achieved in a larger group. Risk pooling thus militates in favor of large household size or larger kin networks that may be spatially diversified. In their discussion of agrarian institutions in land abundant economies, Binswanger and McIntire (1987) for instance point out that it is in environments characterized by a lot of risk that we mostly observe households that are integrated vertically (parents living with married children) and horizontally (married brothers living together). In troubled times (e.g., war, economic crisis), it is common to observe people putting more emphasis on family ties. This can be seen as a natural response to the heightened salience of risk in people's lives. The marginal gain from adding members to the group falls with group size, however. If the marginal cost of household size is constant or increasing, it follows that the household size that is optimal from a risk

sharing point of view is finite.

Households can also realize gains from risk-sharing through spatial diversification, and may even choose household members' location and occupation to insure against spatially covariant risk. Rosenzweig and Stark (1989), for instance, find that Indian farm households with more variable profits tend to engage in longer distance marriage-cum-migration. In contrast, wealthier families, which are better able to self-insure, are less likely to engage in such long-distance insurance schemes. In the Dominican Sierra, female migrants play the role of insurers; men insure parents only if there is no other migrant in the household (de la Briere 1996). Migrant family members who have not established independent households are also likely to have regular salaries or incomes that are not highly covariant with their household of origin. In the Philippines, the family's short run need for a stable source of income motivates unmarried female migrants to seek wage-earning jobs, despite their lack of long-term stability, since parents expect remittances to decrease after daughters marry and have their own familial obligations (Lauby and Stark 1988).

Dercon and Krishnan (2000) test the risk sharing role of the household using data from rural Ethiopia. They point out that, irrespective of the internal decision structure of the household – e.g., whether unitary or collective – efficient allocation of resources between risk averse individuals within the household requires that individual shocks be pooled. Building on a framework developed by Altonji, Hayashi and Kotlikoff (1992), Mace (1991), and Cochrane (1991) and first applied in a developing context by Townsend (1994), they test whether individual illness shocks affect the evolution of an individual nutrition index, controlling for a variety of confounding factors. To correct for possible

endogeneity of illness shocks, the regression is estimated in a dynamic framework using a GMM estimator developed by Arellano and Bond (1991). The authors cannot reject the null hypothesis of efficient risk pooling within households, except for poor women in the Southern part of the country. They use their results to estimate the relative welfare weights of men and women in the household. They find that a wife's relative position is better if customary laws on settlement at divorce a favorable or if she comes from a relative wealthy background. Poor Southern women have lower Pareto weights in allocation, confirming the relative deprivation of these women.

This point is revisited more in detail by Duflo and Udry (2004) who reject the hypothesis of complete insurance within households, even with respect to publicly observable weather shocks. Different sources of income are allocated to different uses depending upon both the identity of the income earner and upon the origin of the income. Using data from Cote d'Ivoire the authors find that conditional on overall levels of expenditure, the composition of household expenditure is sensitive to the gender of the recipient of a rainfall shock. For example, rainfall shocks associated with high yields of women's crops shift expenditure towards food. In the studied country, strong social norms constrain the use of profits from yam cultivation, which is carried out almost exclusively by men. In line with these norms, Duflo and Udry find that rainfall-induced fluctuations in income from yams are transmitted to expenditures on education and food, not to expenditures on private goods (like alcohol and tobacco). Income pooling between coresident sons and fathers is also rejected by Kochar (2000) in rural Pakistan. She finds instead that sons contribute to household public goods, such as consumer durables and ceremonies, thereby enabling their father to work less.

Optimal household size also depends on the risk coping strategies open to individuals. In developed economies, many of the risks people face in their everyday life are insured. In some developing countries this is achieved primarily via government social programmes such as national health insurance, disability provisions, and redistributive pension schemes. In others, this is achieved largely through private markets. Whatever the precise means by which social insurance is achieved, what matters to us is that it eliminates or dramatically reduces one of the gains from household formation. This effect, combined with the other factors discussed earlier, might explain why households in countries with social insurance are smaller than households in countries without it. It certainly can explain why elderly parents seldom live with their children: they are taken care of by their retirement pension and the health insurance system. This process can also explain why groups with restricted access to social insurance (e.g., migrants) put more emphasis on family – either by sending remittances to relatives elsewhere, or by having more children (e.g. Rosenzweig and Stark 1989, Stark and Lucas 1988).

Exclusive reliance on public and private insurance program can be mistaken, however. A sizeable proportion of the poor and destitute seem to be people from broken families – runaway children, single parents, and lone individuals who, for various reasons, have severed all ties with their relatives. This appears to be true everywhere, even in middle income or developed economies. What this suggests is that, even in richer economies, the household continues to play an important insurance role.

2.6. Saving, investment and capital accumulation

So far we have focused primarily on static gains from household formation. There are dynamic gains as well. One possible gain is in joint saving. By pooling their precautionary savings together, household members can better smooth risk. Pooling savings also enables them to better diversify their asset holdings, either because there are non-divisibilities (e.g., house, livestock) or because there is a minimum threshold to enter a more remunerative financial asset. One good illustration of this idea is when couples jointly purchase a home in which they intend to retire. If one of them passes away, the other still has the benefit of a larger home.

Households are also the locus in which start-up capital can be accumulated for the creation of a new household unit. This is particularly true in farming communities. In order to set up an independent farm, a son needs land and equipment. The same is true for any other business. In many countries, much of the land, equipment, and working capital of newly formed households originates from parental transfers. In some cases, parents transfer (or 'lend') the money required to purchase the necessary capital. In other cases, they transfer the land and equipment in kind. Evidence of this is provided for Pakistan by Kochar (2004) who finds that households save in anticipation of the ill-health of young adult males, but also reduce investment in productive assests. The reason is that the expected return on productive assets is lower due to the poor health of young adults. Put differently, this means that in households where young adult males are in good health, parents accumulate productive assets for them. Parents may also use their contacts and social capital to access productive resources for their children – as when parents lobby

the chief or peasant association for common land for their offspring.

A corollary of the above is that parents have some control over the time at which their children leave the household: children have to wait for parents to authorize their leaving the household. In practice, this often means that children must negotiate with their parents the right to marry and form their own household. Children who leave the household without authorization or who choose to elope run the risk of not receiving parental transfers. This may explain why, in agrarian societies, many young adults continue to live with their parents well into their late twenties and early thirties.

Inter vivos transfers at marriage are not the only form of transfer from parents to children. In most human societies, human capital formation takes place primarily in the household. By taking good care of their children, parents endow them with a good health and nutritional status. Children who have been malnourished early in life often are stunted and have poorer health. Parents impart a number of vocational and social skills to their offspring. The overwhelming majority of farmers, for instance, learn to farm with their parents. Many other skills are imparted in the same manner, that is, through learning-by-doing. The desire to transmit skills to children may affect household formation and composition, for instance when parents place one of their offspring as apprentice. Depending on circumstances, this may require that the child move to another household. In the case of land inheritance, both the physical asset and specific experience in using land are transmitted from parent to child (e.g. Rosenzweig and Wolpin 1985, Fafchamps and Wahba 2006).

Most parents also help their children attend school by paying for school expenses and by providing them with encouragement and intellectual support. Since this issue

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is covered in detail in other chapters, we do not discuss it further, except to say that school attendance may require that the child leaves the household, at least for part of the year. It is common, for instance, for children to move with relatives in order to attend secondary school elsewhere. Children may also go to boarding school. Because of the lack of financial independence that it implies, attending school may also induce the child or young adult to remain with his or her parents.

When capital and labor markets are imperfect, parents may find themselves forced to ration available funds and time between their children. One consequence is that children become rivals for household resources. In economies with pro-male bias, sibling rivalry yields gains to having relatively more sisters than brothers. Garg and Morduch (1998), for instance, find that on average if Ghanaian children had all sisters (and no brothers) they would do roughly 25-40% better on measured health indicators than if they had all brothers (and no sisters). Using Indian data, Rose (1999) provides an extreme example of sibling rivalry. She shows that female children are more likely to die following an income shock, suggesting that severely constrained parents choose to neglect girls relative to boys. More work is needed in this area.

2.7. Centrifugal forces

In this section we have reviewed various sources of mutual gains from household formation. This presentation would nevertheless remain incomplete without a discussion of the forces that operate against household formation. We have already briefly mentioned some of them in passing. Here we discuss them more fully.

The first factor militating against household expansion is congestion: household public

goods that are non-rival when the household is small often become rival as it expands. This is true for instance of housing and consumption durables. This implies, for instance, that the housing stock has an influence on household size: if houses are small and cannot accommodate large families, this should discourage parents from having more children, for instance. To the extent that real estate prices are higher in town than in the countryside, rural-urban migrations may favor a decline in fertility simply because parents cannot find large enough houses. By the same reasoning, the size of cars or consumption durables offered on the market may affect fertility as well.

Of course, the size of houses and cars is partly determined by demand: if parents demand larger houses, the market should accommodate them. There are reasons to suspect that this need not always be the case. First, regulation and zoning restrictions may limit the size of dwellings. In countries where large families are found mostly among immigrant populations, many city councils may seek to keep immigrants away by favoring development schemes that emphasize small dwellings. Second, in the presence of fixed product development or production costs, producers may optimally choose not to serve certain segments of the market, such as parents with large families, focusing instead on the median household size. This would restrict the range of goods available to large households, thereby creating congestion in consumption for them.

Congestion may also arise on the production side of the household. It is common for family enterprises to benefit from increasing returns to scale over a narrow range. These increasing returns may originate from non-divisibilities in production – e.g., a pair of oxen or a shop – that are underemployed when the family business is too small. They may also originate from non-traded factors of production – e.g., lineage land, entrepreneurial

acumen, specific skill – that cannot reach their full potential if the size of operation is not large enough. Once the minimal size of operation has been achieved, returns to scale become constant or even decreasing (Fafchamps 1994). This is particularly true of managerial capability: many entrepreneurs can only handle a small firm and get overwhelmed once the business expands beyond a certain size, for instance in poor countries where many of them are illiterate or poorly educated. This observation suggests one reason why more entrepreneurial individuals may choose to have a larger household: they can keep everyone productively occupied.

Loss of autonomy is another limit to household size. As we have argued earlier (see Figure 1), pooling household resources often increases average consumption because of non-rival goods. But it is also likely to result in a lower adequacy between consumption and individual preferences; household members must compromise in order to achieve the gains from household formation. It follows that factors influencing individuals' willingness to compromise affect household formation. Age, for instance, may induce young adults to become more assertive and to seek a consumption pattern that better reflect their tastes. It should therefore come as no surprise that it is young adults who often leave the household to create a separate consumption unit.

Restricted autonomy in production decisions may also affect optimal household size. This occurs because of moral hazard: it is often difficult to mobilize the energy and initiative of household members in a given household production activity when they are not responsible for that activity. Determining the precise reason for this state of affairs is beyond the scope of this chapter, but it probably due to a combination of morale consideration, material and psychological incentives, and coordination failure. It is therefore

common for households to decentralize activities by making specific members responsible for a given task, field, or business (e.g. von Braun and Webb 1989, Fafchamps and Quisumbing 2003, Goldstein 2000, Duflo and Udry 2004). As we have explained earlier, doing so is not always possible. To the extent that the household head – or the central couple in the household – remains the residual claimant of household resources and can redistribute gains across members, decentralizing may fail to resolve all adverse incentive problems. In such cases, it becomes more efficient to 'spin off' part of the household production activities as a distinct production unit or household.

To illustrate this idea, consider the following example. A father and son work a farm together. Suppose that, because of coordination gains, it is more efficient to run the farm as a single production unit. Because the son is not residual claimant, however, he works less hard than his father. If the son had his own farm, he would work harder but lose some of the gains from joint production. Combine this idea with the son's loss of autonomy in consumption decision, it follows that, depending on the balance between coordination gains, reduced incentives, and loss of autonomy, there is a point at which it is optimal for the son to leave. We revisit this issue when we discuss the endogeneity of family structure.

From a theoretical point of view, many incentive problems arising within the household – whether moral hazard or loss of autonomy – could be solved via long-term contracting. In our earlier example, the father could motivate his son by promising a reward at harvest time. The problem is that contracts between households members are surprisingly difficult to enforce. From a legal point of view, this arises because of rules regarding the joint ownership of assets between spouses. This creates an essential fungibility that nullifies attempts to modify claims on household resources. Legal and traditional norms regarding

the control of resources within the household also put limits on what can credibly be promised. Of course, a repeated game argument could be invoked to solve these commitment problems. But as we know well, repeated game no longer works when household members anticipate that the household will break apart. Broken promises are indeed often invoked to justify leaving the household – whether between spouses or between parents and children.

Finally, one should not forget that household members often have the option to leave the household. This is true for spouses, who can divorce or separate. This is also true of children after they have come of age. Minor children, in contrast, can be constrained, by law, to live with their parents. But many choose to escape the law by running away from home. Individuals can also be lured away from their household by an outsider, for instance to elope. Outside bidding is at the core of Becker's theory of marriage, to which we turn in the next section.

It is reasonable to assume that, in general, people choose to remain in a household if it provides a better life for them than what they could achieve by leaving. In many cases, this is indeed the case. It is been shown that the wealth and income of spouses fall after a divorce, especially for women and children (see Jarvis and Jenkins (1999), Bourreau-Dubois et al. (2003) and the references cited therein). This fall is due not only to legal costs, but also to duplication of a house, car, appliances, etc. Children who run away from home often face a very bleak future living on the streets of a anonymous city, at the mercy of various criminals. Understanding the gains achieved through household formation can thus help us understand the process by which households are formed and broken. To this we turn in the next section, starting with a discussion of the marriage

market and continuing with other entry and exit processes.

2.8. Summary

Many of the factors that affect household formation are amenable to economic analysis. Optimal household size can be seen as resulting from a trade-off between the multiple gains from living, consuming, accumulating, and producing together and the associated costs in terms of loss of autonomy, incentive problems, and congestion. This trade-off is perfectly summarized in Figure 1. Marginal gains from household formation are all declining beyond a certain household size while marginal costs increase. This implies that optimal household size is always finite.

From our discussion, it appears that certain factors influencing the returns and costs of household formation affect entire societies: technology change in household appliances, social insurance. Other factors operate at a more disaggregated level, i.e., at the local (e.g., market availability) or individual level (e.g., entrepreneurial talent). Although societal factors are quite salient for most of us – by comparing how our parents were living and how we live – they are difficult to test formally without long-term panel data. More work is required in this area.

Local effects are easier to analyze empirically, either by examining the behavior of migrants over time, or even by cross-section analysis. Individual factors are in principle the easiest to test, although many of the forces we have emphasizes in the preceding pages are difficult to measure or instrument – e.g., entrepreneurial talent, altruism, taste for large families, preference for autonomy. More work is needed in this area.

Given the focus of this Handbook, we want to emphasize again how important the

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issues raised here are for farming households. Most farms anywhere are family operated. This means that the farming enterprise is managed by a household, relying heavily on the manpower, expertise, assets, and managerial capability of the household. The farm enterprise is virtually indistinguishable from the household. The immediate corollary is that household formation is extremely important for the success or failure of individual farm enterprises: the loss of a single member can cripple the enterprise, while the addition of extra hands can enable it to prosper. It is therefore no surprise if farming households the world over put a lot of emphasis on marriage and children: marriage marks the creation of a new enterprise, and without children this enterprise cannot reach its full potential.

Other factors reinforce this even further. Farming households normally reside close to the land they farm. This implies that they are scattered over a large territory, often far from urban centers. As we have argued, geographical isolation raises transactions costs in consumption and thus incites households to be more self-reliant. This is certainly true in consumption, many farming households self-providing much of what they consume. It is also true in coping with risk: geographical isolation makes it difficult if not impossible to rely on others (ambulance, fire brigade, police) in case of trouble. Farmers must be able to respond to many emergencies themselves. These observations probably explain the strong sense of individualism that is often associated with farming.

Households also play a central role in the gestation process of new farming enterprises. There is no better place to learn farming than on a farm. Unlike nearly all other occupations, learning-by-doing remains essential to farming. Much of the knowledge about the land, the animals, and the complex decision process is imparted from parents to children. This is true not only of the human capital needed to be a successful farmer, but

also of the physical capital required – i.e., land, machinery, and working capital. Parents often play a crucial role in accumulating the assets required for a new farm to be created for their children. Depending on the existence of economies of scale, indivisible assets, returns to specific experience, or superior managerial talent of the household head, the transmission of assets can take place either inter vivos at the time of marriage, or at the time of death. The latter case arises in particular when married children choose to remain on the farm and to take over the farm once their father dies or retires. In the rural Philippines, for example, where rice farming does not involve much economies of scale, parents typically bestow a son with a portion of land upon marriage, forming part of the male "land dowry" (Quisumbing 1994). In contrast, in India and Bangladesh, married brothers typically jointly farm land owned by their father; land is divided typically only after the father's death (e.g. Foster and Rosenzweig 2001, Joshi 2004) The bottom line is that enterprise formation and household formation are deeply intertwined as far as farming is concerned.

3. Marriage

In the preceding section we have discussed various reasons for the existence of households. Now we discuss the process by which households are formed. We begin with marriage, which often marks the creation of a new household. Like Becker (1981), we do not distinguish between legal marriage and common-law unions although being married may confer additional benefits not available to common-law partners. Edlund (2005) argues, for example, that while sex, children, and cohabitation are increasingly more frequently

available outside marriage, only marriage automatically confers paternity: a husband is considered the father of a child borne by his wife. Enforcing claims to children and establishing clear inheritance rights may be one of the more important functions of marriage as an institution, at least in the Western World. Things are less clear-cut in rural areas of developing countries, where many marriages—or unions—follow customary rather than statutory law, and where allegiance to an extended family may be more important than establishing paternity.[10]

3.1. Assortative matching

To the best of our knowledge, the phrase 'marriage market' was first coined by Becker (1981). This terminology often is misleading to the neophyte because the word 'market' conjures up concepts of supply, demand, and price – seemingly suggesting that marriage is a process by which, say, husbands buy wives. This is not the intended mental association. The correct analogy is that of the labor market, the function of which is to match employees and employers. In a well functioning labor market, employees suited for bread making should work in a bakery while those suited for management should be CEOs. The labor market can thus be seen as a sorting process by which workers are allocated to the job that best suits them, and by which employers hire the workers best suited for the position they need to fill. This process is called assortative matching.

Becker's fundamental insight is that for a match to constitute an equilibrium of any assortative matching process, an employer must not be able to lure an employee from his

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[10]In matrilineal areas of Ghana, for example, inheritance follows the uterine line (Awusabo-Asare 1990), and prior to the promulgation of the Intestate Succession Law in 1984, a man's children may be left with nothing if he dies intestate, his property reverting to the matriclan.

or her current match, and vice versa. To illustrate this, suppose that there are N workers.
Workers differ only in one dimension, say λ_i, $i \in N$. For simplicity we suppose that there
are no ties, that is, no two workers with the same talent λ. Let us sort workers according
to λ_i so that workers with the lowest index have the highest talent λ. There are N jobs
which vary in their return to talent λ. Let the return to talent for firm j be denoted $g_j(\lambda)$
with $g'_j(\lambda) > 0$ for all $j \in N$. We sort jobs such that jobs with the highest return have
the lowest index. Further assume that

$$g'_j(\lambda) > g'_k(\lambda) \text{ for all } \lambda \text{ and all } j < k$$

It immediately follows that the efficient match is that which gives the job with the highest
marginal return to talent to the most talented worker, the second highest job to the second
highest workers, and so on. Put differently, workers and jobs of equal rank should be
matched together.

It turns out that this assignment is also the only stable equilibrium of a matching game
in which workers and employers can bid for jobs and employees. To see why, consider an
assignment in which a less talented worker $i > m$ has been matched with job m and, at
the same time, worker m has been matched with less demanding job i. Worker m can
credibly offer to perform job m better than worker i while at the same time employer
m can credibly offer a higher wage to worker m than what employer m can offer. Put
differently, employer m and worker m can mutually deviate from any allocation in which
worker m is matched with an inferior job. Of course, employer i and worker i prefer the
status quo but, as long as contracting is voluntary, they cannot make an offer equivalent

to what worker m and employer m can make. This simple but powerful reasoning is the basis for the assortative matching argument.

Assortative matching applies to a wide variety of situations, from academic jobs to medical interns (e.g. Gale and Shapley 1962, Roth and Sotomayor 1990). It also applies to marriage because the decision to form a particular union depends not only on the specific merits of a particular match, but also on the whole range of opportunities available to each partner. Since individuals in any society have many potential partners, this situation resembles a matching problem.

To see this formally, consider a population of suitable grooms and brides. We assume that polygyny (multiple wives) and polyandry (multiple husbands) are not allowed. Let W denote the discounted future utility from marriage. The welfare W of the newlyweds depends upon what they bring to marriage, namely physical wealth A_m and A_f and human capital H_m and H_f, where m stands for groom and f stands for bride. Thanks to the various gains from household formation discussed in the previous section, we assume that gains from household formation permit newlyweds to both achieve a welfare level higher than autarchy. We have:

$$W = W(A_m + A_f, H_m, H_f; Z) \qquad (3.1)$$

where $W(.)$ captures all the gains from household formation discussed in Section 2 and Z represents a vector of location or time-specific factors that exogenously affect the utility from marriage. We assume that $\frac{\partial W}{\partial A}' > 0, \frac{\partial W}{\partial H_m}' > 0$, and $\frac{\partial W}{\partial H_f}' > 0$: the utility from marriage increases with assets and human capital.

An interesting special case is when human capital is only valued for its income gen-

erating potential and there are no externalities from one spouse's human capital to the other's. In this case, the utility from marriage can be written:

$$W = W(A_m + A_f + \gamma_m H_m + \gamma_f H_f; Z) \tag{3.2}$$

where γ_m and γ_f denote life-time returns from human capital, with $\gamma_m > 0$, and $\gamma_f > 0$. In this special case, brides and grooms can be unambiguously ranked: all brides prefer grooms with high $A_m + \gamma_m H_m$ and all grooms prefer brides with high $A_m + \gamma_m H_m$.

We now move to the marriage market proper. There are M potential grooms and F potential brides in the economy, each with an endowment of assets A_i and human capital H_i. If equation (3.2) holds, then without loss of generality, potential grooms and brides can be indexed according to their physical and human capital such that:

$$
\begin{aligned}
A_m^1 + \gamma_m H_m^1 &> A_m^2 + \gamma_m H_m^2 > ... > A_m^M + \gamma_m H_m^M \\
A_f^1 + \gamma_f H_f^1 &> A_f^2 + \gamma_f H_f^2 > ... > A_f^F + \gamma_f H_f^F
\end{aligned}
$$

For simplicity, assume that there are no ties so that each of the above inequalities is strict. Following Becker (1981), a assignment of potential brides and grooms is *not* a marriage market equilibrium if a groom (bride) wishes to attract another bride (groom) and this bride (groom) prefers to marry this groom (bride) than her (his) currently allotted partner. An assignment is stable if (1) there is no married person who would rather be single; and (2) there are no two persons who both prefer to form a new union with each other. Given our assumptions, we have:

Proposition 1. *(Assortative Matching) If equation (3.2) holds, the marriage market equilibrium is unique. In this equilibrium, the top ranked groom marries the top ranked bride, the second ranked groom marries the second ranked bride, etc. In the absence of polygyny and polyandry, supernumerary brides (if $M < F$) or grooms (if $M > F$) do not marry. (Proof: See Becker (1981).)*

Assortative matching implies that we should observe a correlation between the combined physical and human capital of all brides and grooms in a given marriage pool. Competition between individuals for the best match means that, on average, the rich and educated marry the rich and educated.

In practice, other factors affect rankings so that a perfect correlation is not observed. Some of these factors are perfect substitutes for wealth but are not observable (e.g., business acumen). Other factors are ranked differently by different individuals. For instance, it is possible that farming grooms value brides with farm experience while other grooms do not. In this case, the ranking of brides differs across grooms. Assignments can also be influenced by external factors or chance events (e.g., kinship and family ties, personal traits, geographical proximity, similar interests). A detailed discussion of such cases is beyond the scope of this chapter. Recent theoretical papers on assortative matching are given by Legros and Newman (2004) and Hoppe, Moldovanu and Sela (2005).

There is ample empirical evidence in support of the assortative matching hypothesis (Montgomery and Trussell 1986). Boulier and Rosenzweig (1984) is an early example from a developing country. Empirical findings from the Philippines support the hypothesis that schooling, marital search, and spouse selection are endogenous variables influenced

directly or indirectly by the total resources of parents, endowed traits of offspring, the cost of schooling, and marriage-market conditions. Instrumental variable techniques confirm that there are payoffs to spouse search and positive assortative mating with respect to schooling, even if female labor force participation is low. The results also suggest that while additional schooling attracts a higher-value spouse, it lowers the gains from marrying. Consequently, women with more schooling and less attractive women tend to marry later than other women. The results also reject the hypotheses that more educated women in the Philippines have lower fertility because of a higher value of time and lower preferences for children. Instead, the observed female education-fertiliy association in the Philippines reflects the optimal search and mating behavior of agents with heterogeneous marriage market traits that are substitutes for children in household consumption. Fafchamps and Quisumbing (2005b) show that the formation of new couples in rural Ethiopia is characterized by assortative matching. Parental background variables, particularly parental land, strongly predict what individuals bring to marriage, particularly the first marriage. Combined with high inequality in assets brought to marriage, their results suggest that the pairing of prospective brides and grooms favors the reproduction of rural inequality over time, consistent with studies of earnings inequality elsewhere (e.g. Hyslop (2001) for the United States).

Empirical modeling of marriage markets has been stymied by the absence of data on all potential matches. There are few studies that have been able to link longitudinal data on marriages to censuses to model potential matches, as in Foster (1998) study of marriage selection in Bangladesh. Proxies for potential opportunities – whether in the marriage or labor markets – have been used in certain studies, such as that of Rao (1993).

Given the typical age difference between husbands and wives in rural India, Rao uses the district sex ratio of marriageable females (females 10-19) to marriageable males (males 20-29), to proxy the "marriage squeeze".

Empirical evidence suggests that assortative matching on human capital attributes has increased relative to sorting based on parental wealth and physical capital. Quisumbing and Hallman (2003) examine the family background, education, and assets brought to marriage by husbands and wives in six countries. They find that correlations between personal characteristics (e.g. schooling) have increased through time, while correlations based on parental characteristics (parental wealth) have decreased. A secular trend indicating increased sorting on human capital is also evident in marriages of young Guatemalan adults (Quisumbing, Behrman, Maluccio, Murphy and Yount 2005). We also find this trend (at least, in our Ethiopia data) as the number of marriages increases (subsequent marriages seem to sort more on personal rather than parental characteristics) but the evidence also shows that this is a secular trend (Fafchamps and Quisumbing 2005b).

Assortative matching is an important factor to consider in assessing the impact of spousal attributes on child outcomes. Perhaps the most often cited link is that between mother's schooling and child health and nutrition. It has been argued that the magnitude of this link is overstated. If men who preferred to have fewer and better educated children married wives who are better educated and who prefer to have fewer and better educated children, mother's schooling – or better educated women's preferences for fewer, better quality children – cannot be solely responsible for better schooling outcomes. Rather, better educated children could be due to the higher home productivity of the mother's schooling, the preferences of women for higher quality children, or an outcome of the

marriage matching process and men's and women's preferences (Schultz 2001). Studies from Bangladesh (Foster 2002) and India (Behrman, Birdsall and Deolalikar 1995) suggest that part of the correlation between women's schooling and their children's schooling is due to assortative matching, and thus can be attributed to men's preferences rather than to women's differential productivity in educating their children.

Assortative matching is also of interest to policymakers because of its effect on inequality, both within and among households. Fafchamps and Quisumbing (2005b) find that, to a large extent, the formation of new couples in rural Ethiopia is characterized by assortative matching, with sorting based on human capital becoming more important through time. There is also substantial inequality in assets brought to marriage, with a Gini coefficient for all combined assets of 0.621. We also observe extreme inequality in assets brought to marriage by brides: most brides bring nothing while a few bring a lot. Gini coefficients for individual assets are higher than for total assets combined, the highest being for land, reflective of the high inequality in parental landholdings. They also find that the correlation between parental wealth and wealth at marriage is high, thereby suggesting relatively low intergenerational mobility. However, the correlation between assets at marriage and current assets is lower, indicating either that couples continue to accumulate assets over their married life, that bequests counteract some of the initial asset inequality at marriage, or that public redistribution policies (particularly the redistribution of land by Peasant Associations) have had an impact on current inequality. Combined with high inequality in assets brought to marriage, the pairing of prospective brides and grooms based on human capital favors the reproduction of rural inequality over time. This result is consistent with studies of earnings inequality elsewhere: Hyslop

(2001), for instance, shows that in the United States assortative matching contributes over one-quarter of the level of permanent inequality, and 23 percent of the increase in inequality between 1979 and 1985.

3.2. Polygyny and polyandry

Many societies practice polygyny, whereby one man can marry several women at the same time.[11] Becker argues that, other things being equal, polygamy should improve the welfare of women. The basic intuition is that if marriage is voluntary, polygamy cannot hurt women: if a woman is satisfied with a proposed monogamous match, there is no reason for her to agree to switch to a polygamous marriage. Polygamy can therefore only arise when women prefer to enter in a polygamous union than remain in a monogamous marriage with a lower ranked groom.

Let us illustrate with a simple example that a rich groom can attract several wives because he can guarantee them a higher level of welfare than the next richest groom can provide. For simplicity, assume utility is monotonically increasing in the sum of all assets divided by the number of people.[12] Suppose men like having several wives, either because they derive satisfaction from multiple regular sexual partners, or because they value the added manpower and children that multiple wives bring. The assets of brides do not matter in this example, so without loss of generality we assume they have nothing.

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[11]Polyandry is when one woman is married with several men; it is a rare phenomenon (e.g., the Naxi). Both can be modelled in the same way.

[12]This is a conservative assumption. As we discussed in the previous section, with economies of scale, utility falls less fast with the addition of new members to the household.

Payoffs to grooms m and brides f can be written:

$$W_m \left[\frac{A_m}{1+B}, B \right]$$
$$W_f \left[\frac{A_m}{1+B} \right]$$

where B is the number of wives and A_m is the assets of the groom.

Consider the simplest possible case: two grooms and two brides. If one bride marries the top ranked groom and the other marries the lower ranked groom, their utility is:

$$W_m^2 \left[\frac{A_m^2}{2}, 1 \right], W_f^2 \left[\frac{A_m^2}{2} \right] \quad \text{in the first marriage}$$
$$W_m^1 \left[\frac{A_m^1}{2}, 1 \right], W_f^1 \left[\frac{A_m^1}{2} \right] \quad \text{in the second marriage}$$

In contrast, if both brides marry the top groom, utilities are:

$$W_m^2 \left[\frac{A_m^2}{3}, 2 \right], W_f^2 \left[\frac{A_m^2}{3} \right], W_f^1 \left[\frac{A_m^2}{3} \right] \quad \text{in the polygamous marriage}$$
$$W_m^1 \left[\frac{A_m^1}{1}, 0 \right] \quad \text{for the unmarried groom}$$

To capture the idea that men prefer multiple wives, we assume that:

$$W_m^2 \left[\frac{A_m^2}{3}, 2 \right] > W_m^2 \left[\frac{A_m^2}{2}, 1 \right]$$

This implies that the highest ranked groom prefers the polygamous union. Furthermore, he can lure the second bride provided that the second bride prefers to be the second wife

of the rich groom than be the first wive of the poor groom, i.e., if:

$$W_f^1 \left[\frac{A_m^2}{3} \right] \quad > \quad W_f^1 \left[\frac{A_m^1}{2} \right] \text{ that is, if}$$

$$A_m^2 \quad > \quad 1.5 A_m^1 \tag{3.3}$$

Since both brides are identical, the first bride also prefers to remain in the polygamous union than marry the low ranked groom. It follows that both brides prefer the polygamous union because it guarantees them a higher welfare than marrying the poor groom. This illustrates the idea that, since marriage is voluntary, women only enter in a polygamous union when it is in their interest. For this reason, Becker (1981) argues that polygyny is in the interest of women but against the interest of poorer men who remain unmarried.

As it turns out, the condition for women to prefer polygamy ex ante is more stringent than (3.3), a point that is not always recognized. To show this, let's compare the expected utility that the two (identical) brides can achieve in a monogamous society with what they can achieve in a polygamous society. For women to prefer polygamy ex ante, it must guarantee them a higher expected utility:

$$\frac{1}{2} W_f \left[\frac{A_m^1}{2} \right] + \frac{1}{2} W_f \left[\frac{A_m^2}{2} \right] < W_f \left[\frac{A_m^2}{3} \right]$$

Joint sufficient conditions are that $A_m^2 > 3 A_m^1$ and that $W_f[]$ is not risk loving.[13] Note

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[13]Proof: Say $U_f(.)$ is linear. In this case, the inequality is satisfied only if:

$$\frac{1}{2} \frac{A_m^1}{2} + \frac{1}{2} \frac{k A_m^1}{2} \quad \leq \quad \frac{k A_m^1}{3}$$

$$3 \quad \leq \quad k$$

By Jensen's inequality, if brides are risk averse, they prefer polygamy for lower values of k.

that A_m^2 has to be quite a bit bigger than $1.5A_m^1$ for women to prefer polygamy ex ante. This is because in a monogamous system, one bride would have achieved the higher utility level $W_f\left[\frac{A_m^2}{2}\right]$.

This tension is reflected if marriages are sequential instead of simultaneous. The first wife does not like her husband to take a second wife if her utility falls with the second marriage. In order to convince the first wife to accept a second one, the husband has to alter the welfare distribution between wives so that the first wife keeps the same utility as in a monogamous marriage but the second wife receives less. To illustrate this point, continue to assume that all consumption is rival and further assume that the husband needs $\frac{A_m^2}{3}$ (the same level as before) to prefer polygamy. What the husband can offer to the second wife is:

$$A_m^2 - \frac{A_m^2}{2}\text{(for first wife)} - \frac{A_m^2}{3}\text{(for himself)} = \frac{A_m^2}{6}$$

For the second wife to prefer this to marrying the poor groom, it must be that:

$$\frac{A_m^2}{6} > \frac{A_m^1}{2}$$
$$A_m^2 > 3A_m^1$$

which is the same as the sufficient condition for women to prefer polygamy ex ante. This may explain why many polygamous societies require the first wive to give her assent to further marriages (e.g., Kenya).

Does the above reasoning imply that the welfare of women is higher in polygamous

societies? Not necessarily. Monogamous and polygamous societies differ in many respects. For instance, it is very common for polygamous societies to limit the legal rights of women and to restrict female inheritance, thereby reducing their bargaining power within the household. The net effect on female welfare may thus be negative.

Empirical work on polygyny is scarce; what exists is focused on Sub-Saharan Africa. Because women play an important role in agriculture in Sub-Saharan Africa, attempts have been made to link the demand for wives to women's productivity in agriculture. Anthropologists such as Goody (1976), using highly aggregate ethnographic data, have found that the incidence of polygyny across societies is associated with the extent of female involvement in agriculture. Grossbard (1976), using an urban sample, indicates that wealthier men take more wives, but the effect of greater male wealth cannot be separated from that of greater female home productivity. Singh (1988)'s empirical analysis of about 60 agricultural households in Burkina Faso finds that farmers with greater landholdings have more wives, interpreting this as a shadow price effect.

Jacoby (1995) criticizes Singh (1988)'s approach as unsuccessful in controlling for farm size and farm income simultaneously. He also calls attention to the assumption that land and other farm assets are exogenous variables, which is questionable given that wives themselves are partially viewed as farm assets. Jacoby (1995) uses a large scale household survey conducted in Cote d'Ivoire to estimate the productivity of female labor in farm households and then relates it to the number of wives of the household head, controlling for differences in wealth and other male characteristics. Empirical results support Becker's emphasis on inequality across men within a marriage market in explaining polygyny. First, men with greater wealth have more wives. This positive wealth effect means that

wealthier men are able, and willing to, compete wives away from less wealthy men. Second, conditional on wealth, men with more productive farms have more wives; that is, wives are attracted to husbands on whose farms their labor is more productive. This finding substantiates the role of male inequality, but also suggests that the productive contribution of women is important. Third, taller men have more wives, a finding that is interpreted as capturing a number of traits, whether physical attractiveness, ability to support his wives, or other unobserved characteristics.

Jacoby (1995) explicitly relates his findings to Boserup's hypothesis linking polygyny to women's role in agricultural production. He finds that women's productivity is relatively high in regions with a large proportion of land devoted to certain food crops – particularly yams, peanuts, rice, and plantains – compared to regions growing mainly cocoa and coffee. In these areas where female labor contributes a larger share to agricultural income, men have more wives. Jacoby (1995) hypothesizes that the modest decline in rural polygyny in Cote d'Ivoire in the 1960s and the 1970s may be related to the increase in cocoa and coffee production for export, two crops where women's productivity is lower. If the expansion of export crops diminished the role of women in agriculture, wives may have become dearer, leading to less polygyny.[14]

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[14]Wives may also have become dearer through other mechanisms. In Western Ghana, the expansion of cocoa cultivation led to increased private property rights for women, as husbands had to grant women stronger property rights on land to cocoa, in return for labor in weeding and taking care of trees while the trees were still young. Women were able to accomplish this task because food crops and cocoa trees are typically intercropped while the trees are not yet mature Quisumbing, Payongayong, Aidoo and Otsuka (2001). Because men had to give wives "gifts" of land to assure their labor input, women's labor became relatively more expensive.

3.3. Parental involvement

So far we have assumed that the bride and groom act in isolation when deciding who to marry. In practice, parents often get involved. As we have discussed in the previous section, this is particularly true in agrarian societies where parents transfer capital to children at the time of marriage. Since assets brought to marriage in large part come from the parents of the bride and groom, bequest considerations come into play as well. It is also common for parents to be involved in the choice of a suitable spouse. They can do so either directly or via match makers. In this case, parents act on the behalf of their children.[15]

The bequest choice facing altruistic parents marrying off their children can thus be represented as:

$$\max_{A_m, A_f, H_m, H_f} U(S - \sum_b A_m - \sum_g A_f - \sum_b sH_m - \sum_g sH_f; Z) +$$

$$\sum_b \omega_b W_m(A_m + \overline{A}_f + \gamma_m H_m + \gamma_f \overline{H}_f; Z) +$$
$$\sum_g \omega_g W_f(\overline{A}_m + A_f + \gamma_m \overline{H}_m + \gamma_f H_f; Z)$$

where the b and g subscripts denote boys and girls, respectively, $U(.)$ is the utility of parents, S is their wealth, s is the cost of human capital (e.g., school fee), and the ω's are welfare weights for sons and daughters. Variables A_m and A_f denote the assets given to sons and daughters as they marry; H_m and H_f denote their level of human capital.

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[15] In some cases, children are not even involved in the choice of a spouse.

Variables $\bar{A}_m$, $\bar{A}_f$, $\bar{H}_m$, and $\bar{H}_f$ represent the assets and human capital of the people sons and daughters marry. In the above model, we have assumed symmetry among sons and among daughters.[16] We also assume that $W'' < 0$, so that parents have an incentive to equalize the welfare of their children.

The solution to the parents' choice can be characterized as follows:

1. Given symmetry, all sons and all daughters are treated equally.

2. Sons and daughters receive more if their welfare weight is larger, parents are wealthier, or they have fewer siblings.

3. Parents invest more in human capital relative to assets if the cost of human capital s is lower or the return to human capital γ_i is higher.

The empirical evidence strongly indicates that sons and daughters are not treated equally (e.g. Strauss and Thomas 1995, Behrman 1997). The extent of gender inequality nevertheless varies across cultures, depending on patrilineal, matrilineal, or bilateral forms of kinship and inheritance (Quisumbing, Estudillo and Otsuka 2004). A series of studies in the Philippines, Sumatra, and Ghana explores the allocation of land and schooling across siblings. In the Philippines, where kinship is bilateral, analysis of a rice farming households who have completed inheritance decisions finds that daughters are not disadvantaged in schooling, but receive significantly less land and total inheritance, with partial compensation through receiving greater non-land assets (Quisumbing 1994). A follow-up study of the same households finds that, in the younger generation, girls receive

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[16]For a discussion of asymmetric bequest norms such as primogeniture, see for instance Platteau and Baland (2001) and Chu (1991).

significantly more schooling, but less land; however, this does not translate to significant differences in lifetime incomes for sons and daughters, owing to women's higher participation in non-agricultural labor markets where returns to schooling are higher (Estudillo, Quisumbing and Otsuka 2001).

In Sumatra, a traditionally matrilineal society, the inheritance system is evolving from a strictly matrilineal system to a more egalitarian system in which sons and daughters inherit the type of land which is more intensive in their own work effort. That is, daughters receive large areas of paddy land, since rice is more intensive in female labor, while sons inherit bush-fallow land, consistent with the requirement of men's labor for future development of such land (Quisumbing and Otsuka 2001a). There is also evidence of sibling rivalry: more sisters decrease one's inheritance of paddy land, while more brothers decrease receipts of agroforestry and bush-fallow areas. This is consistent with the differences in comparative advantages in lowland and upland farming between daughters and sons. In Western Ghana, while daughters are disadvantaged in both schooling and land inheritance, the allocation of land and schooling is biased against daughters. However, the bias against daughters in both land and schooling is decreasing in the generation of the respondents' children (Quisumbing et al. 2004). This is consistent with the strengthening of women's land rights associated with the adoption of cocoa cultivation (Quisumbing et al. 2001).

Sibling rivalry can affect the assets received from parents, although the effect may depend on the timing of transfers. In Ethiopia, for example, the groom's number of brothers has strong negative effects on both total and land inheritance, but an insignificant effect on assets at marriage (Fafchamps and Quisumbing 2005b). Possibly because sons

do not all marry at the same time, or because new couples are allocated land from the Peasant Association, siblings do not compete for parents' land resources at the same time, unlike in the case of inheritance, when an estate is typically divided among all eligible heirs at the same time. With sisters, competition is much less pronounced since women inherit less in general. This results is consistent with other findings on sibling rivalry in Africa (e.g. Garg and Morduch 1998, Morduch 2000).

Extreme cases of sibling rivalry can also be found when some children are sacrificed to the welfare of their siblings. In our model, this corresponds to cases in which $W'' > 0$, that is, welfare is convex. In this case, parental welfare is maximized by sacrificing some children in order to raise the utility of others. Examples of such situations include children who do not marry and remain to care for elderly or sick parents. More extreme cases have been documented in which children are sold to landlords or sweatshops or even to prostitution in order to raise the funds required to educate their siblings. The extent to which some children are sacrificed to the welfare of others remains an under-researched area.

3.4. Dowry and brideprice

So far we have reasoned in terms of the assets the bride and groom bring to marriage, recognizing that many of these assets are transmitted to them by their parents (e.g., education, land, start-up capital). In many societies, marriage is also the occasion for large transfers of wealth between the family of the bride and that of the groom. Brideprice refers to the case when assets are transferred from the groom's family to the bride's; when assets flow from the bride's family to the groom's, it is called a dowry. Others define dowry

as a large transfer made to the daughter at the time of her marriage, regardless of whether it is controlled by her or by the groom's family Botticini and Siow (2003). The world can in general be divided into dowry and brideprice countries. Asia is generally dowry-based while sub-Saharan Africa generally follows a brideprice system.[17]

There are several explanations for the presence of dowry and brideprice.[18] One explanation posits that dowries (or brideprice) are pecuniary transfers used to clear the marriage market. The model has two predictions. When grooms are relatively scarce, brides pay dowries to grooms; when brides are relatively scarce, grooms pay brideprices to brides. Moreover, since a dowry is a component of bridal wealth, when other components of bridal wealth become more important, the dowry is predicted to disappear and may be replaced by brideprice. In support of the first prediction, Rao (1993) attributes the rise of dowries in South Asia to a "marriage squeeze" caused by population growth, resulting in larger younger cohorts and a surplus of women in the marriage market. The prices of brides and grooms in the marriage market have been shown to be determined by spousal attributes – both individual and family characteristics. Consistent with South Asia's arranged marriage system, Deolalikar and Rao (1998) for instance find that grooms and brides in six villages in South Central India are matched by both individual and household characteristics, and that household characteristics are more valued in the marriage market.

Rao's (1993) specification uses trait differences, defined as female – male, to eliminate

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[17]There may also be other kinds of transfers, such as contributions to the cost of the wedding ceremony itself. These are relatively small compared to the value of assets ultimately transferred to the bride and groom. They are not discussed separately here, except to say that money is fungible. What matters is net transfers.

[18]See Botticini and Siow (2003) for a review of these explanations.

sources of measurement error common to husband and wife. He also argues that because assortative mating is very high, across all spousal traits, a specification using traits of both spouses as explanatory variables, without differencing them, could be potentially affected by multicollinearity. Thus, his specification focuses on the impact of relative differences between the traits and the spouses. The analysis of Rao (1993) has been criticized by Edlund (2000). She argues that regressing dowries on differences between spousal attributes imposes the restriction that attributes influence dowries in a symmetrical fashion. Using the same data, she finds that regressing dowry on individual traits instead of differences improves model fit considerably. She also fails to replicate Rao's result that the ratio of women aged 10-19 to men aged 20-29 contributes significantly to increasing dowries, casting doubt on the marriage squeeze hypothesis. Edlund (2000) argues that calculating dowry as the net difference between bride and groom families' transfers to the couple at the time of marriage is likely to overstate the relative contribution of the bride's family to the new couple, especially among wealthy families. If dowries are premortem inheritances for daughters, the larger the bequest component of the dowry (which would be the case for wealthier families), the larger the difference between the bride and groom families' transfers at the time of marriage. If parental bequests increased over the studied period, dowry thus computed could also increase without necessarily indicating a "rising price of husbands."

Unfortunately, it does not seem possible to resolve this issue definitively. In his rejoinder, Rao (2000) points out that differences in his and Edlund's decisions on how to construct a consistent series of the marriage ratio variable have resulted in significantly different versions of that variable. Because of possible earlier errors in data entry or

program, Rao (2000) was unable to replicate his earlier results. However, he also points out that it is unlikely that parents transferred larger premortem bequests to daughters. First, evidence from the villages does not indicate that wealth has significantly increased Walker and Ryan (1990). Second, he cites recent anthropological evidence from India (e.g. Raheja 1995, Kapadia 1996) that shows that contemporary dowries are not bequests but involuntary payments often coercively extracted by the groom's family.

One of the main ideas in the economic literature on dowry and brideprice is that these represent prices paid for future services.[19] Married women join their husband's family, bringing with them their manpower, human capital, and reproductive potential. The brideprice is seen as compensation to the bride's family for letting go one of its female members. According to this reasoning, the brideprice is expected to rise if the value of what women bring to marriage increases. For instance, if the value of female farm labor rises, so should the brideprice.

By joining the husband's family, the bride also gains access to a certain lifestyle. Parents keen to ensure their daughter a good life may be willing to pay something in order for her to marry a wealthy groom. This is the rationale for a dowry system. Following this reasoning, the dowry is predicted to rise the wealthier the groom's family is.

Putting the two together gives a theory of dowry and brideprice that depends on the relative values the groom's family assets and the bride's human and reproductive capital. Intuitively, the lower the value of female labor and the higher the groom's assets, the higher the dowry – or the lower the brideprice. Seen in this light, dowry and brideprice are nothing but advanced inheritance transfers by which parents seek to manipulate the

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[19]On this point the classic contribution in the anthropological literature is Goody (1973).

marriage market outcomes of their progeny. In a society where women are free to work outside the home, devoted parents may choose to purchase their daughter a top education; in a society where women are more or less confined to the home, devoted parents choose instead to help their daughter marry the wealthiest possible groom. The rationale is the same: altruism towards children. Only the method differs.

Botticini and Siow (2003) argue that the market clearing explanation does not fully explain the existence of dowries. If the main purpose of dowries is to clear the marriage market, how do marriage markets clear in societies without dowry or brideprice? Moreover, the traditional theory of dowries does not explain why the timing of intergenerational transfers is gender-specific, with dowries given to daughters at marriage and bequests to sons. Botticini and Siow (2003) develop a model that is consistent with historical evidence ranging from ancient Near Eastern civilizations to modern times. They suggest that in virilocal (mostly agricultural) societies, parents provide dowries for daughters and bequests for sons in order to mitigate a free riding problem between their married sons and daughters. Since married sons live with their parents, they have a comparative advantage in working with the family assets relative to their sisters. If daughters leave home to marry, it will be difficult for them to claim parental assets upon their parents' death. The authors also argue that dowries will disappear as labor markets develop and children become less dependent on their family's assets for their livelihoods. As the demand for different types of occupations grows, parents will invest more in general rather than family-specific human capital. Instead of the dowry, parents will transfer wealth to both sons and daughters as human capital investments and bequests.

Expectations and strategic considerations are present even when large transfers be-

tween the bride and groom's family do not take place. Parents' bequest decision may depend on their expectations regarding marriage market outcomes. For instance, if parents expect husbands to bring lots of assets to marriage, i.e., if $\bar{A}_m$ is large and $\bar{A}_f$ is small, they may compensate by giving less to daughters and more to sons, themselves contributing to the observed pattern of bequeathing more to sons.

Parents may also seek to strategically manipulate marriage market outcomes by raising what they give to their child. For instance, parents may raise what they give to their daughter if doing so enables her to marry a higher ranked groom. Bidding for grooms can thus raise bequest from parents to children. Fafchamps and Quisumbing (2005a) find some evidence of strategic bidding in rural Ethiopia. While parents do not transfer wealth to children in ways that compensate for marriage market outcomes, certain parents give more assets to daughters whenever doing so increases the chances of marrying a wealthy groom.

Dowries and brideprices serve other functions besides market clearing and bequests. They can be used to increase the bargaining power of the bride in the allocation of resources in the new household, thereby raising her welfare and protecting her from ill treatment by in-laws (Zhang and Chan 1999). Indeed, Bloch and Rao (2002) find that non-compliance with dowry agreements increases the incidence of domestic violence. Dowry can also be used to guarantee sexual fidelity, although the effect can be asymmetric. In Uganda, being in a union in which a brideprice was paid reduces the probability that a woman reports engaging in an extramarital liaison by 20 percent (Bishai, Pariyo and Hill 2003). Interestingly, men who report paying a brideprice have roughly twice the odds of reporting extramarital relations. Men may thus be substituting cash payments for their

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own fidelity to secure wives who provide marital fidelity.

Lastly, the timing of payment of bridewealth can serve a risk-smoothing function. In Zimbabwe, bride wealth is paid in installments rather than a lump sum on the date of marriage. Bridewealth is demanded by the bride's parents when the household experiences a loss in cattle possessions or has a low wealth status. Payment of an installment takes place when a household has high wealth status and the transfer of cattle does not endanger the cattle possessions of the debtor. In this environment where rural insurance markets are absent, flexibility in both the timing and type of bride wealth payment enhances household security beyond what is feasible through income pooling between relatives related through marriage (Dekker and Hoogeveen 2002). The additional security results from the creation of a large pool of contingent, enforceable claims on assets (usually livestock) that are valuable for income generation and consumption smoothing purposes.

This issue is revisited by Hoogeveen, van der Klaauw and van Lommel (2003) who focus on the timing of marriage itself. Zimbabwean marriages are associated with bride wealth payments, which are transfers from (the family of) the groom to the bride's family. Unmarried daughters could therefore be considered assets who, at time of need, can be cashed in. The authors investigate to what extent the timing of a marriage of a daughter is affected by the economic conditions of the household from which she originates. They distinguish household-specific wealth levels and two types of shocks–correlated (weather) shocks and idiosyncratic shocks. The authors estimate a duration model using a unique panel survey of Zimbabwean smallholder farmers. The estimation results support the hypothesis that the timing of marriage is affected by household characteristics: girls from households that experiences a negative (idiosyncratic) shock in their assets are more likely

to marry.

3.5. Bargaining, threats and pre-nuptial agreements

So far we have assumed that the discounted future utility from marriage W is an exogenously given function. We now seek to endogenize it. We begin by noting that, as emphasized in the previous section, marriage generates welfare gains. The question then is how are these welfare gains divided between spouses.

A good starting point for understanding intrahousehold bargaining is the model by McElroy and Horney (1981). The authors posit that spouses derive utility from consuming rival and non-rival goods. Children are regarded as non-rival public goods since both parents derive satisfaction from their children's achievements. Spouses could live on their own, in which case their utility would be the outcome:

$$V_m(p_m, I_m^d) \equiv \max_{x_0, x_1, x_3} U_m(x_0, x_1, x_3) \text{ subject to } p_0 x_o + p_1 x_1 = p_3(T - x_3) + I_m^d$$

$$V_f(p_f, I_f^d) \equiv \max_{x_0, x_2, x_4} U_f(x_0, x_2, x_4) \text{ subject to } p_0 x_o + p_2 x_2 = p_4(T - x_4) + I_f^d$$

where x_0 denotes the public good, x_1 the male good, x_2 the female good, x_3 male leisure, x_4 female leisure, T is time endowment, I_m^d the unearned income of the husband upon marriage dissolution, and I_f^d is the unearned income of the wife upon marriage dissolution. The indirect utility functions $V_m(p_m, I_m^d)$ and $V_f(p_f, I_f^d)$ represent the utility husband and wife could guarantee to themselves upon marriage dissolution. This is regarded by McElroy and Horney as setting up their respective threat points in a bargaining game

modeled as a cooperative Nash equilibrium:

$$\max_x \; \left[W_m(x) - V_m(p_m, I_m^d)\right] \left[W_f(x) - V_f(p_f, I_f^d)\right] \text{ subject to}$$

$$p_0 x_0 + p_1 x_1 + p_2 x_2 + p_3 x_3 + p_4 x_4 = T(p_3 + p_4) + I_m + I_f$$

where I_m and I_f are the income of each spouse during marriage. In the paper, the authors make the strong assumption that $I_m = I_m^d$ and $I_f = I_f^d$. In practice, this is unwarranted because the income spouses would earn upon marriage dissolution depends on many factors such as alimony and child support, the division of household assets upon divorce, possibly influenced by a pre-nuptial agreement, and the capacity to combine work and child care.

Lundberg and Pollak (1993) revisit the bargaining model and argue that in most cases the threat of divorce is too strong to be credible because leaving the household means losing the gains from household formation. They propose an alternative model where threat points come from non-cooperation within the household. The equilibrium concept they propose is the non-cooperative (Cournot) equilibrium where each spouse takes the consumption level of the other as given and chooses his or her own independently.

Formally, we have:

$$x^m(p, I_m, x_{0f}) \equiv \arg \max_{x_{0m}, x_1, x_3} U_m(x_{0m} + x_{0f}, x_1, x_3) \text{ subject to}$$

$$p_0 x_{om} + p_1 x_1 = p_3(T - x_3) + I_m$$

$$x^f(p, I_f, x_{0m}) \equiv \arg \max_{x_{0f}, x_2, x_4} U_f(x_{om} + x_{0f}, x_2, x_4) \text{ subject to}$$

$$p_0 x_{of} + p_2 x_2 = p_4(T - x_4) + I_f$$

The non-cooperative Nash equilibrium is the vector $\{x_{0m}, x_{0f}\}$ such that in which $x_{0m} = x_0^m(p, I_m, x_{0f})$ and $x_{0f} = x_0^f(p, I_f, x_{0m})$. Let the utility values associated with this equilibrium be denoted $V_m^*(p_m, I_m)$ and $V_f^*(p_f, I_f)$, respectively. The rest of the model is solved as in the cooperative Nash bargaining model of McElroy and Horney, replacing threat points $V_m(p_m, I_m^d)$ and $V_f(p_f, I_f^d)$ with $V_m^*(p_m, I_m)$ and $V_f^*(p_f, I_f)$, respectively. Lundberg and Pollak implicitly assume that, in a non-cooperative household, spouses would have full control over their individual income.

Formally, the main difference between the two models is that in the Lundberg and Pollak model, if spouses stop cooperating, they continue to share household public good x_0 since they remain together but they no longer coordinate their contribution to it. As a result, one would expect under-supply of labor and under-provision of non-rival goods in non-cooperative marriages. Drawing on the public finance literature, Bergstrom (1997) provides an excellent review of the issues surrounding the provision of public goods in non-cooperative households.

Fafchamps (2001) points out that the threat of divorce and the threat non-cooperation

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within marriage are not independent from each other. To see this, suppose that:

$$V_m^*(p_m, I_m) \quad < \quad V_m(p_m, I_m^d)$$

$$V_f^*(p_f, I_f) \quad > \quad V_f(p_f, I_f^d)$$

This means that the wife prefers to threaten non-cooperation within marriage while the husband prefers divorce – perhaps because the law favors husbands in case of marriage dissolution. In this case, non-cooperation by the wife is met with divorce by the husband. Consequently, the credible threat points are $V_m(p_m, I_m^d)$ and $V_f(p_f, I_f^d)$. Spouses may also use violence as bargaining tool (Fafchamps 2001). As shown by Bloch and Rao (2002), domestic violence is unfortunately predominant in many countries.

These different kinds of threat points have very different implications in terms of empirical applications. If divorce is the relevant threat, what matters most is the income spouses would earn after divorce, the assets they would keep, and possible alimony and child support transfers.[20] In poor countries, alimony payments are rare. Wife and child support are typically organized through the distribution of assets. Land, for instance, may be given to the wife for her to support herself and her children (Fafchamps and Quisumbing 2002).

In contrast, if the relevant threat is non-cooperation within marriage, what matters most is control over household finances and sources of independent income. In many societies, households hold a common purse, but who actually is in charge of consumption

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[20]The level of such transfers is a function of laws and customs and may involve court action. Divorced spouses may also seek to elude their obligations, in which case the likelihood of legal transfers being made enters the calculation of threat points.

expenditures varies considerably from place to place. Moreover, some expenditures are dictated by norms and customs. For instance, in many African societies, the husband is supposed to provide food and shelter for the household. Failure to provide would be interpreted as breach of contract and could trigger divorce proceedings and asset transfers (Fafchamps and Quisumbing 2002). In many instances, spouses retain areas of independent control over 'pocket money' which they can spend as they wish. Some societies (e.g., West African coast), in contrast, hold separate finances for both spouses, each having a separate source of income and distinct responsibilities regarding common household expenditures (e.g. Goldstein 2000, Duflo and Udry 2004).

We know of very few empirical attempts to distinguish between divorce and "separate spheres" models of exit options in developing countries. As discussed above, theory predicts that bargaining power within marriage depends on the division of assets upon divorce (exit options) and on control over assets during marriage (separate spheres). Using detailed household data from rural Ethiopia, Fafchamps and Quisumbing (2002) show that assets brought to marriage, ownership of assets, control within marriage, and disposition upon death or divorce are only partly related. Control over productive resources tends to be centralized into the hands of the household head, be it a man or a woman, irrespective of ownership of assets at or after marriage. Disposition upon death or divorce only loosely depends on individual ownership during marriage but control is associated with larger claims upon divorce. Assets brought into marriage have little impact on disposition upon death, but matter in case of divorce. The study did not test which type of threat point had a greater impact on intrahousehold allocation.

These issues are discussed in greater detail in the chapter devoted to intrahousehold

issues. What we would like to emphasize here is that the bride and groom (and their parents) may seek to anticipate future bargaining in the household by manipulating threat points. This can be achieved at the individual level. The bride and groom, for instance, may sign a pre-nuptial agreement that shapes the distribution of assets upon divorce. They may also negotiate their 'rights' and 'duties' during marriage, e.g., the right for the wife to work or to have an independent income.

In most countries, laws and customs impose strong restrictions on individual negotiations. In some countries, for instance, it is illegal for women to work. Until recently, many European countries had restrictions on the kind of work women were allowed to undertake, restrictions inherited from an earlier era in which trade unions had sought to protect women from unsafe and arduous work. In some countries, women are not allowed to hold an individual bank account or are not eligible for a bank loan. In agrarian societies, it is common for women to be excluded from any freehold ownership on lineage land. The purpose is admittedly to keep land within the patriarchal lineage, thereby ensuring the future of the blood line. Social norms may also play a role. For instance, it is customary for Japanese and Filipino wives to hold the household purse and to look after household finances. In contrast, Ethiopian husbands control most household expenditures.

Economic conditions also influence what spouses can negotiate. For reasons that are beyond the scope of this Chapter, female workers in most countries get paid less than men for equal jobs (Altonji and Blank 1999). This undoubtedly affects spouses' outside options. As Becker (1981) pointed out a long time ago, it may also influence how they choose to allocate work among themselves. More work is needed on these issues.

4. Marriage dissolution

Marriage dissolution is largely the mirror image of marriage formation: the same factors that affect the formation of a new couple affect its dissolution.

4.1. The causes of marriage dissolution

The starting point of the economic theory of marriage dissolution is the marriage market. Suppose grooms and brides are paired with each other in a way that violates assortative matching. Because the pairing is not an equilibrium, it is unstable: better grooms are able to reject a lesser bride to attract a better bride from a lesser groom. This process of bidding and counter-bidding resembles what happens in the academic job markets for PhD economists: between the job interviews at the ASSA meetings in early January and the end of the fly-outs, several weeks unfold during which tentative matches are made, only to be unmade when a candidate receives a better offer from another department.

Transposed to the marriage market, this mutual search process may take prior to marriage but some of it may take place afterwards as well. According to this view, extra-marital affairs can be seen as a search process by which one or both spouses continues to search for a better match. Of course, in such a union, the other spouse is likely to question the philandering partner's commitment to the couple.

Imperfect information may also play a role. Some characteristics of the bride and groom are not perfectly observable. Each has an incentive to misrepresent his or her own traits to achieve a better match. As information is revealed after marriage, one of the spouses may discover that he or she can achieve a better match elsewhere. Time,

for instance, may reveal that one spouse has a proclivity for domestic violence, crime, or gambling. Infertility may also motivate husband and wife to seek another partner with whom to have children. These considerations can explain why a high proportion of divorces occur relatively shortly after marriage.

Individual traits change over time. Some people may develop an addiction to alcohol or drugs, or succumb to depression. People's priorities and behavior often change after child birth in ways that are seldom fully anticipated by their spouse (or themselves). External shocks may affect the gains spouses derive from a particular marriage. For instance, individual assets can be destroyed by events (drought, fire, warfare, natural disaster). Human capital can change, as when people earn a new degree or suffer a disability. Looks obviously change over time in ways that cannot be fully anticipated. Changes in traits and external shocks would alter rankings and destabilize existing pairings.

Empirical evidence suggests that the likelihood of marriage dissolution is influenced by changing conditions. It has been noted, for instance, that famines trigger divorce and separation (e.g. Sen 1981, Alamgir 1980, Greenough 1982). The same is true for warfare. Drug and alcohol addiction are often associated with divorce. So is depression.

Marriage dissolution may result from mistakes. While bargaining over the distribution of gains from household formation, spouses may escalate their threats and counter-threats in ways that eventually lead to divorce. We have seen in the previous section that escalation is likely to arise whenever one spouse – say the wife – can credible threaten non-cooperation within marriage but the other – say the husband – can retaliate by threatening to leave the household. In such situations, miscalculation by one or both parties may result in divorce even though no external forces are at play.

Government programs can affect the probability of marital dissolution by affecting women's options outside marriage, the subject of a large literature on the effects of welfare payments in developed countries, e.g. Schultz (1994) for the United States. In Mexico, for example, PROGRESA, a national conditional cash transfer program designed to improve children's education and health outcomes, targeted cash transfers to women conditional on children's enrollment and visits to health clinics. Bobonis (2004) finds that families that were eligible for the transfer experience a significant increase in separation rates, with most of the effect concentrated among indigenous households. While the absolute size of the effect is modest (0.7 percentage points), it is large relative to the underlying separation rate in the control group of households that were not eligible for the transfer.

4.2. The probability of divorce

So far we have discussed the factors that are likely to influence the likelihood of marriage dissolution in a specific couple. Theory also makes predictions about the unconditional probability of divorce in different societies. If the gains from household formation are very strong, divorcing someone to search for a better match is extremely costly. This serves as a strong disincentive to divorce. In contrast, when the gains from household formation are limited, spouses may be more easily tempted to leave their current partner in the hope of finding better elsewhere. This, for instance, would predict that couples without children are more likely to divorce while farming households are less likely to.

Society may also seek to limit marriage dissolution, either by banning it entirely, or by discouraging search. Most human societies, for instance, disapprove of adultery, which is an effective way of making search of a new partner difficult. In some societies, adultery

is even considered a crime and punished severely, especially female adultery. Laws and social norms may also seek to limit the exit option of one gender only, e.g., women. By making it extremely difficult for women to live independently, these laws and norms make it unlikely that a women would initiate marriage dissolution. The problem of course is that this also weakens the bargaining power of women within marriage. In some societies, the situation is partially redressed by other norms that compel husbands to provide for their wife and to treat them well.

It follows from the above that there is a strong relationship between exit options, stability of marriage, and what happens to divorced women. The world can be grossly divided into three groups: those countries that regard all women as dependent; those countries that regard all women as independent; and those that are somewhere in between.[21]

In the first group of countries, women must be taken care of by a man. Consequently, they have no access to factors of production, except in special circumstances when they need to take care of small children on their own (e.g., widowhood). To eliminate the latter circumstance, some societies go as far as banning divorce entirely and requiring that a man marry his dead brother's wife (levirate). This approach is well exemplified by Sharia law, but also by the Napoleonic code of law as practiced in continental Europe in the early 19th century. In this system, women typically do not inherit land. Much of the rural areas of the developing world fall in this category.

In the second group of countries, women and men are both regarded as independent adults. Since women have the right to live independently, they must be put in a position

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[21] In some societies, it is men who are considered as dependent. In Sumatra, for instance, land ownership is in the hands of women. Polyandry societies usually fall into this category. Because such societies are numerically very rare, we do not discuss them further here.

to take care of themselves. Hence, they have more or less equal access to factors of production. This means, for instance, that they inherit land and that they have a right to half of farm assets upon divorce. Much of the Western world falls in this category today, although this is a relatively recent development.

In the third category, we find many societies in transition, caught half-way between the two systems. This is the case, for instance, of many middle income countries, especially in urban areas. As discussed for land tenure by Andre and Platteau (1998) in Rwanda and by Otsuka and Quisumbing (2001) in Ghana, the weakening of a female dependency system need not result into female independence but rather in a muddle where social norms of support for women are weakened but land ownership remains largely inaccessible to them.

4.3. Female headship

In this section, we delve more deeply into the issue of female headship. Policy makers are concerned about female headship owing to its possible impact on child outcomes and on the welfare of women themselves. Most comparisons of this issue have been between male-headed and female-headed households, motivated by the assertion that female-headed households are overrepresented among the poor. The evidence behind this assertion, however, is mixed. Buvinic and Gupta (1997), for example, review 61 studies on headship and poverty and fine that female-headed households are disproportionately represented among the poor. In contrast, Quisumbing, Haddad and a (1995), using stochastic dominance techniques, find that the relationship between female headship and poverty is strong only in two out of ten countries in their sample, Ghana and Bangladesh. Dreze and Srinivasan (1997) also find that, using standard poverty indices based on household per-capita

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expenditure, there is no evidence that widows in India are disproportionately concentrated in poor households, or of female-headed households being poorer than male-headed households. However, poverty incidences are quite sensitive to the level of economies of scale. Even relatively small economies of scale imply that the incidence of poverty among single widows, widows living with unmarried children, and female households heads (who tend to live in smaller households) is higher than in the population as a whole.

These comparisons can be misleading for a number of reasons. First, in many comparisons male-headed households are composed primarily of households in which both spouses are present, while female-headed households are made up mostly of households in which a husband is not present. This is because, in nearly all societies, if both husband and wife are present, the husband is listed as head of household. As we have discussed in Section 2, living together generates many benefits. Due to returns to specialization, gender casting, and differentiated access to factors of production, households in which only a woman is present fail to capture all the benefits achieved by a household with a man and woman. It follows that female-headed and male-headed households are not directly comparable. A more appropriate comparison would be between single-parent households headed by males and single-parent households headed by females, or between single women and single men living alone.

Secondly, comparisons between male-headed and female-headed households pay little attention to the endogeneity of female headship. Female headed households are a highly heterogenous category. Female headship could result from women not marrying at all (as in many Western societies), to marriage postponement, to widowhood, or to temporary female-headedness due to migration, war, etc. The factors influencing the likelihood of

a woman being selected into one of these various categories are likely to differ markedly across categories. Furthermore, as emphasized by the literature, we need to distinguish between *de jure* female headed households (headed by divorced or widowed women) and *de facto* female headed households (in which the husband is absent, but may contribute to – or even control – household finances). The consequences of female headship may differ quite markedly depending on the process by which a household becomes female-headed (Joshi 2004).

A substantial literature exists examining the impact of female headship on child outcomes. This literature is vulnerable to selection bias. Indeed, if household formation decisions are correlated with preferences regarding children, conventional OLS estimates of the effect of headship on child outcomes will be biased. For instance, if women who care less about their children are more likely to live separated from the children's father, this will result in a negative correlation between female headship and child welfare.

Heterogeneity and endogeneity of female headship have policy implications. Since not all female-headed households are poor, the heterogeneity of female heads should be considered in designing policies that aim to improve child outcomes. Moreover, neglecting the endogeneity of female headship structure may result in unanticipated results, for instance by encouraging women to leave their husband. While this may be in the interest of the women concerned, it need not serve the interest of the children that the policy maker seeks to assist.

Examples of studies that examine the impact of female headship on child outcomes, controlling for the endogeneity of female headship, are from Jamaica and Bangladesh. The prevalence of female-headedness in Jamaica (42 percent) is one of the highest incidences

in the world. Handa (1996a), citing work by anthropologists, claims that mating and residential patterns of adult women in Jamaica is a response to local economic conditions. The poor economic conditions in the region and the high rate of male unemployment make reliance on a male partner an uncertain proposition. At the same time, the presence of an unemployed male in the household restricts a woman from receiving support from her relatives and other male partners. Thus, female headship emerges as a survival strategy chosen by women to secure their own and their children's welfare, particularly in the lower socioeconomic classes.

Handa (1996a) estimates a structural probit model that examines whether outside opportunities, or threat points, affect the decision to become a female head. An increase in the expected level of adult women's consumption and their children's welfare, associated with being a female head, significantly increases the probability of becoming a head. Labor market work also increases the welfare of women and is an important determinant of the decision to head one's household. In another paper, Handa (1996b) finds that sex and union status of the household head has a significant influence of household expenditure behavior. While the presence of a female decision maker generally increases the share of the household budget allocated to child and family goods, female-headed households also spend more on adult wear and less on health. However, lower health expenditures are partially offset by the differential use of other health inputs in female-headed households In this study, Handa also takes into account the endogeneity of female headship.

The situation surrounding female headship in Bangladesh is quite different. Most female-headed households fall into two groups: widows, and married women, most of whom are wives of migrants. Joshi (2004) examines the impact of female headship on

children's outcomes using a two-stage least squares procedure that controls for the endogeneity of both types of female headship. She finds that these two types of female heads differ not only in their income, asset ownership, and children's outcomes, but also their socioeconomic backgrounds prior to marriage. Compared to wives of male heads, widows are less likely to have brought dowries to their husbands' families, more likely to have lost a parent before their marriage, had fewer brothers, and come from poorer families than the families they married into. The situation of married wives of male heads is almost the exact opposite. She finds that residing in a household headed by a widow increases the likelihood of working outside the home by 93%, but has no statistically significant impact on any measure of children's schooling. However, children residing in a household headed by married women are 12% less likely to work outside the home, 19% more likely to have ever attended school, 8% more likely to be currently enrolled in school, and 41% more likely to have finished at least two or more years of school. In most cases, the hypothesis of exogeneity of female headship is rejected.

Structural estimation of the effects of headship on other household outcomes can be stymied by the difficulty of identifying the headship variable, as illustrated by Handa's study Handa (1996a) of the effects of female headship on household expenditure decisions. This study uses three types of identifying restrictions: (1) unearned remittance income (from friends and relatives); (2) a dummy variable indicating whether the household is eligible for food stamps; and (3) nonlinearities in the reduced-form probit. However, it is doubtful that remittance income affects the probability of headship without affecting expenditure decisions. In many developing countries, such transfers may be earmarked for particular expenditures, for example, a child's schooling or health expenditures, or

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investments in assets. Regarding the second identifying variable, Handa argues that the small size of the income transferred through food stamps makes it highly unlikely that households would alter their structure simply to become eligible for the program. However, the criteria for eligibility are closely linked with household demographic structure, which could exert its own independent effects on household demand patterns. The difficulty in identifying appropriate instruments continues to be a challenge in this literature, one that can potentially be overcome if one has longitudinal or retrospective data on family background or conditions at the time of marriage. Joshi (2004), for example, uses information on family background (whether the mother's father was alive at the time of her marriage), weather (the average level of rainfall when the mother was between the ages of 11 and 15), the fraction of the village with siblings residing in other thanas of Bangladesh (excluding Dhaka city or abroad), and the fraction of the village that has siblings residing in either Dhaka city or outside the country. The first two variables are though to be correlated with the probability that the woman is a widow, while the latter two instruments have strong explanatory power in explaining a parent's decision to migrate away from the village.

5. Changes in household structure

Changes in household structure can be explained as the result of many of the same forces as those driving marriage formation and dissolution. Families are residentially extended when the gains from being extended (public goods, etc.) outweigh the gains of being nuclear (privacy, etc.). We can expand this to look at, for example, migration decisions and

other changes in family structure such as child fostering. While our framework suggests that household structure is endogenous, in empirical work household structure is typically treated as an exogenous, or given, characteristic – usually because of the absence of data to control for selection bias.

The emerging literature suggests that an improved understanding of household formation or dissolution is useful for evaluating the impact of government policies, particularly those that are targeted on demographic characteristics (Edmonds, Mammen and Miller 2005), dealing with the potential selectivity of panel designs that drop dividing households (Foster and Rosenzweig 2001), and for studying household behavior and income change more generally.

Households can adjust their composition by sending or receiving household members. Because households can adjust their structure in response to government programs, it is critical for policy makers to recognize that changes in household structure may counteract some of the intended objectives of government programs. In this section we examine two phenomena clustered at two ends of the age distribution: child fostering and old age living arrangements. We also briefly discuss household division.

5.1. Child fostering

Child fostering is an institution by children live in a household other than that of their biological parents. Child fostering is particularly widespread in Sub-Saharan Africa where the percentage of households with foster children ranges from 15 percent in Ghana to 37 percent in Namibia (Vandermeersch 1997). Factors affecting child fostering include risk-coping (Evans 2004b), the quality of social networks (Akresh 2004b), and imbal-

ances in household demographics vis-à-vis the requirements of household production (e.g. Ainsworth 1990, Ainsworth 1996). In recent years this institution has attraced increasing attention as researchers seek to understand how poor households deal with the AIDS epidemic.

The role of child fostering as a risk coping strategy has best been documented by Akresh (2004b). In a remarkable study on child fostering in Burkina Faso that uses data on sending and receiving households, he finds that households are more likely to send out a child if they experience a negative income shock, have better quality social networks, or have additional children in a given age and gender class. Increases of one standard deviation in a household's agricultural shock, percentage of good members in its network, or number of older girls would increase the probability of sending a child above the current level of fostering by 29.1, 30.0, and 34.5 percent, respectively.

Concern about the welfare of non-biological children in households (e.g., fostered children and orphans, especially in the context of the HIV/AIDs epidemic) has stimulated proposals from international development organizations trying to prevent children from growing up away from their biological parents. There is indeed ample evidence about the poorer outcomes of orphans in Africa. Orphans are equally less likely to be enrolled in school relative to both non-orphans as a group and to the non-orphans with whom they reside (Case, Paxson and Ableidinger 2003). Children living in households headed by non-parental relatives fare systematically worse than those living with parental heads, and those living in households headed by non-relatives fare even worse. Case et al. (2003) find that much of the gap between the schooling of orphans and non-orphans is explained by the greater tendency of orphans to live with more distant relatives or unrelated care-

givers. The difference persists across income groups, but does not seem to differ by gender, although gender could potentially matter in cases of abuse.

Despite the growing evidence that fostered children may be treated differently from biological offspring, cross-country studies for Latin America, the Caribbean and Africa – such as that by Filmer and Ainsworth (2002) on orphans and school enrollment – suggest that the extent to which orphans are disadvantaged is country-specific. Ainsworth (1996) and Harper, Marcus and Moore (2003) note that a number of West African studies, including those from Mali (e.g. Castle 1996, Engle, Castle and Menon 1996) and Sierra Leone (Bledsoe 1990), show that the reason for fosterage – whether it reflects a desire to strengthen ties between families, childlessness on the part of the household fostering-in, or resulting from death, divorce or migration of the biological parents – affects the support a fostered child receives.[22] In a particularly good study, Akresh (2004a) finds that fostered children are *not* negatively affected (in terms of school enrollment) in either the short or long run by living away from their biological parents (see also Evans (2004a)). If child fostering insulates households from adverse shocks, provides them access to the benefits of extended family networks, and moves children to households where they are more productive, then restricting the movement of children as a policy prescription needs to be reevaluated.

Similar to living arrangements of children, residential status of the elderly is a household decision variable. Edmonds et al. (2005) study the impact of an old-age income support program on the living arrangements of elder black women in South Africa. So-

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[22]Other studies include Haddad and Hoddinott (1994), Lloyd and Blanc (1996) and Strauss and Mehra (1989).

cial pension income for these women depends primarily on age-eligibility: women become eligible for the pension at age 60. Edmonds et al. (2005) identify the impacts of pension income on elderly living arrangements, overcoming the problem that pension income is age dependent, by exploiting the discontinuous nature of the age eligibility rule in the pension eligibility formula. Allowing for flexible smooth trends in age, the authors look for discontinuous changes in household composition that occur at the age of pension eligibility. In contrast to the results for developed countries, the authors do not find that the additional pension income leads to an increased propensity to live alone. Rather, at the age of pension eligibility, prime working age women depart, and the presence of children under 5 and young women of child bearing age increase. These shifts in co-residence patterns are consistent with a setting where prime age women have comparative advantage in work away from the extended family relative to younger women,who may be less productive in market work owing to child care obligations and less labor market experience. Moreover, the grandmother may help with the child care of young children, thereby improving the ability of young mothers to work in addition to their household production activities. The additional income from old age support then enables the household to allocate labor more optimally by moving young women in and prime age women out.

The fluidity of household structure in response to government programs emphasizes the need to pay attention to the endogeneity of household structure. In addition to the usual distortions imposed by government transfer programs such as the one studied by Edmonds et al. (2005), a policy that is conditioned on household composition may introduce additional distortions because it interferes with households' optimal responses to income changes. For example, targeting cash transfers to children but varying transfers

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with household size or limiting transfers to households with single parents may prevent individuals from adjusting their living arrangements in response to income fluctuations. In South Africa, the extension of a retirement insurance scheme to the poor has been shown to be associated with a massive change in the family structure of the elderly (Case and Deaton 1998).

5.2. Old age support

The literature has identified several reasons for co-residence with elderly family members. Supporting elderly people may reflect social norms of reciprocity: parents supported you when you were a child, you have to support them when they can no longer support themselves. Altruism is also likely to affect one's willingness to support the elderly. As argued in the Chapter devoted to extended family and kinship networks, altruism is affected by genes. It is therefore widely believed that, in developing countries, elderly men and women are taken care of by their children.

Kochar (2000) investigates this issue in Pakistan. She examines the negative correlation between the days of work reported by fathers in rural Pakistani households and the incomes earned by their coresident adult sons. She finds that the decline in fathers' days of work that accompanies increases in sons' incomes primarily results because such income is used to finance expenditures on household public goods, such as consumer durables and ceremonies. Empirical tests reject most alternative explanations of the benefits of coresidence, including the belief that sons contribute to fathers' wealth.

What is true for leisure need not be true for health care. In another article also on Pakistan, Kochar (1999) documents a robust correlation between a sharp decline in

individual wage with age and a reduction in medical expenditures for the elderly. She argues that this constitutes evidence that the intergenerational old age support is unable to meet the higher health care needs of the elderly.

Another reason for old age support is that elderly people are still useful in spite of their age. They can assist with light chores such as child care, thereby enable younger members of the household to work outside the home. They are the repository of much valuable experience and social history. By recalling past events, they can provide useful insights regarding rare occurrences. Their farming and business experience may also be quite useful (Datta and Nugent 1984). Note that these benefits can in principle be obtained from many elderly persons, not necessarily from relatives – unless relatives have household-specific experience that is of value, such as experience with a given plot of land or a given business. Evidence for India is provided by Rosenzweig and Wolpin (1985) who test and calculate the contribution to agricultural profits of the farm experience embodied in coresident elderly kin.

Old age support need not imply co-residence. In many developed countries, elderly people are increasingly taken care of through the market – e.g., they join a retirement home or community. Children may remain involved, for instance by assisting financially. But co-residence is no longer considered a requirement of old age support. It is interesting to note that this development in developed countries arises at a time when elderly people are less useful in the home (fewer children, more household appliances) and when experience is less relevant, either because children are in another line of business or because technology has changed so much that the experience of the elderly is not longer valued. As developing countries urbanize, we can expect similar forces to reshape the way in which the elderly

are taken care of – or not.

5.3. Household division

The above discussion has focused on incremental changes to household structure. Households may also undergo more radical changes, such as household partition. The basis for extended family structures is similar to the rationale for household formation: households can be extended if the gains from extension outweigh those from being nuclear. Conversely, if the gains from being an extended family are less than the gains from being nuclear, the family will split.

While the collective model of the household has usually been applied to the analysis of intrahousehold allocation, it can also be used to examine household division. Foster and Rosenzweig (2001) formulate a collective model of household division in which individuals are assumed to optimize subject to a set of pre-defined entitlement rules (inheritance laws) and intrahousehold allocations are efficient. Gains from co-residence arise from cost-sharing a household-specific public good and lower barriers to information-sharing on farming techniques. Whether such gains are sufficient to make co-residence desirable depends on the existence of scale economies or diseconomies in production and on how household structure affects risk-sharing. In the Indian data studied by the authors, most splits occur at the death of the household head. In the context of the model, the death of the household head would lead to division if the head has above average preferences for the public good, or if the head has superior knowledge about agricultural practices. The authors test the model using panel data from India starting from the onset of the Green Revolution in the late 1960s through 1982. As predicted by the model, within- household

inequality in schooling, marriages, and risk increase the probability of household division. In particular, households that eventually divided resided in slightly riskier areas and had on average a grater number of daughters of the household head who had left the household, presumably for marriage, and a greater number of married claimants (sons) initially residing within the household compared with households that remained intact.

The authors argue that taking into account the process of household division is essential to understanding the effects of technical change on inequality. Due to the importance of human capital externalities in production, combined with greater within-household schooling inequality in richer households, and the presence of decreasing returns to scale in production under the Green Revolution technology, technical change that occurred during the first decade of the Green Revolution tended to differentially reduce household division among households with more land resources per capita. Because of these reductions, the average effect of technical change on income growth for members of these richer households was weaker than the effects on less wealthy households at the beginning of the period. Thus, without taking into account the possible consequences of technical change on household division, it is possible to overestimate the extent to which better-off households benefited from technical change relative to poorer ones.

6. Conclusions

Through this very incomplete survey of the literature, we hope to have convinced the reader that economics has much to say about family formation. Many empirical patterns regarding marriage, dowries, child fostering, or old age support can be explained using

simple economic concepts.

The economic literature on family formation and marriage is important not only for is positive content, but also because of its far-reaching policy implications. Laws regarding marriage, divorce, and child support shape incentives in profound ways, leading to – or at least accompanying – massive social changes, such as the dramatic rise of out-of-wedlock birth in France where it now represents half of all newborns. [23]

Laws and social customs regarding female wages and labor market participation shape the bargaining power of women within and outside marriage. Restricting women's access to income generating opportunities may be a way of cementing marriage by reducing the exit options of women. But it does so largely at the expense of women's welfare. This is particularly true in societies where traditional safeguards protecting women have been eroded, but market opportunities for women have not increased enough to compensate for this erosion. No matter how strongly society seeks to discourage marriage dissolution, it is a fact of life that some couples are ill-suited and that separation is inevitable. This means that some women will find themselves without the protection of a husband or father. When these women do not have adequate access to employment or business income, they may be forced into unhealthy or demeaning activities, such as begging or prostitution (Cohen 1969). The rise of HIV/AIDS has made prostitution a particularly dangerous way of generating income. Based on the analysis presented here, we suspect that this has worsened the bargaining position of women, particularly those for whom prostitution is the only viable exit option.

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[23]Edlund(2005) mentions that more than one third of children are born to unmarried mothers in the US, Canada, the UK, Ireland, France, and the Nordic countries.

As shown most vividly in the case of South Africa (Case and Deaton 1998), welfare programs such as retirement and widowhood insurance can have a dramatic impact on household formation. In some countries such as the UK, social programs such as child care benefits have been amended to favor women. Lundberg, Pollak and Wales (1997) have shown that this change has led to a significant – albeit small – increase in household expenditures earmarked for female consumption.

As illustrated by a growing literature (e.g. Haddad and Kanbur 1990, Behrman 1997), much inequality exists within households. Economists and policymakers alike need to better understand the ways that marriage markets contribute to perpetuating inequality both within and across households, given the evidence that marriage markets and assortative mating provide a powerful engine for sustaining, if not widening, the inter-household inequalities in most societies. The impact of assortative mating on human capital on inequality is likely to increase, especially as human capital endowments become more important both in the overall output of societies and as attributes that individuals value in future spouses. The literature presented here gives us ways to think about the various factors affecting this inequality while at the same time suggesting policy levers through which intrahousehold inequality can be alleviated.

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Figure 1. Net Gain from Household Formation

Utilty

Household size N

- utility under autarky
- utility cost of lost autonomy
- gain from household membership
- net gain