

Chicks, Hawks, and Patriarchal Institutions:

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Manuscript version of "Chicks, Hawks, and Patriarchal Institutions," *Handbook of Behavioral Economics*, ed. Morris Altman. Armonk, N.Y.: M.E. Sharpe, 2006.

Cooperation occurs only in the shadow of conflict.

Jack Hirshleifer (2001:11)

Conflict lies at the heart of sexual reproduction.

J .R. Krebs and N. B. Davies (1981:134)

Introduction

The notion that conflict between men and women plays a central role in the evolution of hierarchical social institutions has a long intellectual history. In the nineteenth century, William Thompson, Friedrich Engels, and August Bebel, among others, insisted that collective male efforts to consolidate control over women helped explain the origin of the state. Gerda Lerner lent historical substance to this argument with her study of ancient Mesopotamian and Hebrew societies, *The Origin of Patriarchy* (1986). Yet institutional economists pay scant attention to gender conflict.¹ They tend to focus on property rights relevant to the market or the state, rather than the family. They often accept the predominant economic assumption (formalized in a joint utility function) that mothers, fathers, and children share common preferences. And they seldom entertain the possibility that men and women have different collective identities and interests.

The intellectual division of labor within the academy has contributed to uneven development of feminist theory. Scholars within more qualitative (and also generally more "feminine") disciplines of history and anthropology have been more intrigued by gender conflict than those within the more quantitative ("masculine") sciences of economics and biology. As a result, arguments concerning the impact of gender conflict on social institutions have often been expressed in narrative, rather than analytical form. In this

chapter I make an explicit effort to translate narrative arguments into game theoretic models in order to clarify their structure and encourage interdisciplinary discussion.

I begin with a brief review of three areas of research that help explain the genealogy of my perspective. From behavioral ecology, I take the claim that natural selection for different levels of parenting and mating effort between males and females leaves an imprint on preferences that can influence behavior. From political economy, I take the claim that coalitions engage in collective actions that serve their interests, ranging from violent coercion to establishment of advantageous property rights or political rules. From feminist theory, I take the claim that coalitions based on gender can shape social institutions and influence the level of male domination within groups, with implications for intra-group competition and conflict.

The second section builds on this interdisciplinary literature to outline my general approach to an institutional “battle of the sexes.” Evolutionary biologists emphasize that males and females of a given species co-evolve within a specific ecological niche; I emphasize that a social process of bargaining over institutions governing human reproduction represents an analogous form of cultural evolution. Important strategic interactions take place between individual men and women, between gender-based coalitions within groups, and between strongly male-dominated and more gender-egalitarian groups. Small initial differences in gender-based endowments and preferences lead to the emergence of patriarchal social institutions that favor males. However, technological and social change may alter bargaining environments in ways that improve the relative position of females.

The next section focuses on individual decisions regarding investments in children, criticizing the standard neoclassical economic model of parental investments. The model I develop translates the insights of behavioral ecology into language more familiar to

economists, showing that parents face different budget constraints that lead fathers to prefer child quantity over quality. The potential impact of differences in parental preferences is illustrated by a discussion of the non-cooperative game popularly known as “Chicken.”

The following sections turn to more explicit consideration of the evolution of patriarchal institutions in early hunter-gatherer societies. A graphical analysis of the implications of different fall-back positions for males and females in “autarkic promiscuity” illustrates the relative gains to parental collaboration formalized by rules of marriage. Specific conditions may lead to the emergence of patriarchal marriage rules that are more advantageous to males than females.

The paper concludes with explicit consideration of group selection, suggesting that male domination of political decision making (like male domination of household decision making) will shift investments toward child quantity rather than child quality. The logic of a Hawk-Dove game in which the costs and benefits of aggression are defined in terms of child quantity/quality outcomes shows why male domination may increase a group’s propensity to adopt hawk-like strategies of military aggression. This argument, foreshadowed by Plutarch’s account of the rape of the Sabine women, is consistent with anthropological research on “woman-stealing” and lends support to Gerda Lerner’s (1986) historical analysis of the relationship between patriarchy and slavery.

A Theoretical Ménage Trois

What do individuals want and how do they go about getting it? Evolutionary biology suggests that the forces of natural selection reward those who maximize their reproductive fitness. Economic theory suggests that individuals consciously seek to maximize their own happiness or utility. These two suggestions are not inconsistent: a species with utility functions that did not provide psychological reinforcement for fitness-improving behaviors would be unlikely to last for very long (Bergstrom, 1996). Yet there are obvious tensions

between these two models of optimization, related to the longer time-horizon of natural selection and the rapid pace of environmental and institutional change, which may lead to long periods of disequilibrium. Cultural evolution provides humans with greater flexibility through the establishment of norms and rules that may, in turn, modify or at least modulate individual preferences (Boyd and Richerson, 1985).

Both biology and economics are riven by controversies over the relative importance of individual versus group dynamics. Biologists critical of so-called group selection (e.g. Dawkins, 1976) often invoke arguments similar to those wielded by economists skeptical of the role of collective action (e.g. Olson, 1971). Yet some scholars in both disciplines are now emphasizing multi-level selection, rather than focusing exclusively on one or the other (Sober and Wilson, 1998; Bowles, 2003). Kin-based altruism and family life represent an arena of human interaction intermediate between the individual and the larger society. Feminist emphasis on the potential for both cooperation and conflict within the family promises some intriguing insights.

A full exploration of these interdisciplinary issues would require a superhighway. This chapter carves a narrower trail of reasoning from biological differences to implications for collective decision-making in households and social groups. Social institutions lead to stronger forms of male domination than biological differences alone are likely to generate. The combined impact of technological and social change, however, can lead to significant improvements in women's relative bargaining power.

Behavioral Ecology

Evolution plays tricks that most human cultures would describe as cruel. On the one hand, individuals who fail to reproduce fail to replicate their genes, which are consequently less well represented in the gene pool. On the other hand, those who do reproduce are subjected to a tug of war between the interests of potential and actual offspring, which

plays out in conflict between the interests of parents (who must survive in order to produce future potential offspring) and the interests of current offspring. Robert Trivers (1972) provides the classic formulation of this conflict and points to the biological basis for conflicts of interest between mothers and fathers.

Differences in the size and quantity of gametes males and females produce, combined with the physiological cost of gestation, nursing, and prolonged nurturance have significant implications. Mothers have more invested in individual offspring and more to lose (in terms of reproductive fitness) from loss of a child. Women also lose their reproductive capacity at a much younger age than men. Mothers bond more closely and more quickly with offspring than fathers do (Hrdy, 2000). As a result, fathers are in a stronger position than mothers to make a credible threat to abandon offspring.

The biology of gender differences implies that a different set of evolutionary pressures operates on males and females. Natural selection rewards males who improve their mating effort, increasing their sexual access to females. But natural selection rewards females who increase their parenting effort, improving the likelihood that their offspring will successfully reach maturity (Daly and Wilson, 1983). Female parenting effort may take the form of bargaining with males for increased support of offspring (Low, 2000).

These evolutionary pressures may also have implications for the broader development of male and female capabilities and preferences. Physical strength becomes an advantage for males in competition with other males. Selection for mating effort tends to place males in "winner-take-all" games that reward risk-taking behavior. If they fail to mate, their long-term success helping nurture offspring becomes irrelevant. Selection for parental effort places females in strategic environments more likely to reward cooperation. Rather than facing a shortage of potential partners, they face substantial long-term risks of being unable to raise highly dependent offspring to maturity (Low, 2000). Evolutionary

psychologists note that gender-based differences in preferences are likely to influence the relative social and economic position of men and women (Buss, 1996). They have less to say about the social institutions that may emerge as a result of (or alter the implications of) these gender differences.

Economic Theory

Neoclassical economists following Gary Becker's lead (1981) devote considerable attention to family decision making. Contradicting their own commitment to methodological individualism, they generally begin from the assumption that family members share a joint utility function, which implies no significant differences in preferences or interests. An emerging literature on bargaining within the family draws from both cooperative and non-cooperative game theory, emphasizing conflicts of interest over the distribution of goods and leisure time (Lundberg and Pollak, 1993; Katz, 1997). This literature focuses almost entirely on individual decisions, setting aside issues of collective action.

Some institutionalist economics, notably Sam Bowles (2003) and Herb Gintis (2000), develop multilevel analyses of individual and social bargaining in an evolutionary context. They focus on the emergence of strong reciprocity and relatively egalitarian social institutions. Another evolutionary economic perspective, represented by Jack Hirshleifer (2001) and Stergios Skaperdas (2002) places more emphasis on collective conflict and physical violence. Unfortunately (and hopefully temporarily) both these perspectives largely ignore issues of gender conflict. The exception is an important but often overlooked article by Stephen Cheung (1972) that explains the mutilation of Chinese women's feet as a way of enforcing patriarchal property rights.

Institutionalist economic reasoning provides a framework for understanding exchange, conflict, and the development of social institutions. The difficulties of enforcing contracts and solving coordination problems, combined with information and transactions

costs, require the development of social institutions such as rules, laws, and norms (Bowles, 2003). Groups devise ways of overcoming free-rider problems to pursue their collective interests. The so-called “technology of conflict” determines the relative payoffs to conflict and exchange (Hirshleifer, 2001). Strong groups may gang up on weak ones.

Although both individuals and groups may seek to optimize, they are often able to reach only local optima, or may be required to choose among a variety of Pareto-efficient outcomes. Outcomes may reflect a complex interaction among random variation, explicit optimization efforts, and coordination problems that create substantial inefficiencies. Individuals participate in a complex strategic environment of overlapping games; cooperation with one group may aid them in conflict with another. Individual preferences may influence which social institutions are feasible, but institutions in turn tend to influence preferences (Gintis, 2000; Bowles, 2003). This dialectic is particularly relevant to the issue of gender-linked preferences. Social institutions may reinforce the gender differences that influence their genesis. At the same time, however, technological change and collective bargaining may lead to institutional changes that reconfigure preferences.

Feminist Theory

Biological reasoning has often been used to justify institutionalized gender inequalities (Tavris, 1992). It is hardly surprising, therefore, that many feminist social theorists express deep skepticism regarding so-called sociobiological explanations of gender differences. In recent years feminist scholars in anthropology and biology have bridged that skepticism by offering evolutionary interpretations that insist on the “context-dependent nature” of women’s biological and behavioral responses (Lancaster, 1991:1) and emphasize “behavioral flexibility, cross-cultural variability, and possibilities for future change” (Smuts, 1995:1).

Evolutionary biology has traditionally emphasized the selection pressures at work on

males, emphasizing their competition among each other for females. A growing literature, however, emphasizes the selection pressures at work on females. Among species in which offspring are dependent on maternal nurturance and protection for a prolonged period, females are selected not merely for maternal altruism, but also for the intelligence, resourcefulness and strategic thinking required to help offspring reach maturity (Hrdy, 1999). Males may be selected for their ability to manipulate and control females, but females are, likewise, selected for their ability to minimize the adverse effects of such manipulation on their own reproductive fitness (Gowaty, 1997; 2003). Female primates often form coalitions designed to protect themselves and their offspring from male violence (Smuts, 1992).

Feminist theorists in the social sciences have much to gain from more serious consideration of evolutionary biology. Gowaty's emphasis on the "coevolution" of male and female strategies of maximizing reproductive fitness suggests a direct parallel with gender-based collective bargaining over social institutions. Feminist political scientists often use the term "sexual contract" to refer to social institutions that seem to reflect the interplay of coercion and negotiation between men and women (Pateman, 1988). This approach extends the liberal metaphor of the "social contract" to the realm of family life and sets the stage for an analysis of collective bargaining over social institutions. It rejects the common presumption that the social/sexual contract generally evolves toward egalitarian solutions or 50/50 sharing rules (Skryms, 1996).

As suggested by the earlier reference to Stephen Cheung's seminal essay on patriarchal property rights, institutionalist analysis can be extended to inequalities based on gender. Restrictions on women's rights to own or accumulate property independently of fathers and husbands often have conspicuous economic implications (Braunstein and Folbre, 2001). Moreover, feminist theory insists that the concept of property rights must be

extended to include “reproductive rights” such as those pertaining to custody of children and access to contraception and abortion. Indeed, reproductive rights can be construed as a kind of property right over the production and maintenance of human capital.² In many societies, men enjoy greater sexual freedom and less responsibility for the care of dependents than women. The emergence of these asymmetric rights and responsibilities through the institutionalization of marriage rules predates the emergence of rights to private property in livestock or land.

A feminist approach to institutional economics also calls attention to the rules of collective governance and larger structures of constraint (Folbre, 1994). Why have women so often been excluded from participation in institutions of inherited power (such as “kingships”) as well as from voting? What are the possible causes and consequences of such exclusion? What are the links between patriarchal control over women within the family and by the state? Evolutionary theories of social institutions should pose such questions. Game theory provides a useful analytical framework for answering them.

Gender Games

Institutionalist economists are critical of neoclassical or Walrasian assumptions that economic transactions always represent simple, costless forms of mutually advantageous exchange. Sexual intercourse between men and women provides an excellent example of a complex, multidimensional, risky transaction. It may represent the reciprocal exchange of physical pleasure or the violent coercion of rape. Its reproductive outcome is often uncertain. An agreement to collaborate in raising offspring is even more complex. Women typically offer childbearing and child rearing services and implicit or explicit guarantees of paternity in return for economic assistance. This contractual relationship lasts for a long period of time and is difficult to enforce. It seems likely that the costs of monitoring female sexual fidelity are lower than the costs of enforcing male economic

commitments.

In terms of reproductive fitness, females offer a good—the ovum—that is more scarce than the good offered by males, the sperm. Males are forced to compete with one another for access to this good. But once the ovum is fertilized, the higher costs of losing it put females in a weaker position. Fathers enjoy a “first mover” advantage. If they violate a contractual agreement to provide support they can be fairly confident that mothers will provide for offspring. In the Greek myth dramatized by Euripedes in the 4th century BC, Jason announces that he is sending his first wife, Medea, and their two sons into exile in order to marry another woman, the daughter of a powerful king. Medea realizes that she cannot retaliate without hurting herself as well: “What point in racking their father’s heart,” she asks, “If I break my own twice over?” (Euripedes, 2002:31). Still, she chooses revenge over love, and murders not only the new bride, but also her own children. Few mothers are willing to engage in such drastic and costly retaliation. They become, in a sense, prisoners of love.

The “Battle of the Sexes” that enjoys standard treatment in most game-theory texts is often described as a trivial coordination problem. A husband would prefer to go to a prize fight, while his wife would prefer to attend the opera, yet both would prefer one another’s company. The quality/quantity tradeoff regarding investments in children represents a far more profound issue. Even if fathers and mothers prefer to collaborate, they may have different preferences concerning the terms of their collaboration. They are players in a noncooperative game in which they may both gain from social coordination. But they are also players in a cooperative game in which they may conspire to develop forms of social coordination that work to their advantage.

The following three sections provide simple illustrations of gender games between individual men and women, between and among groups of men and women, and between

“fiercely patriarchal” and more egalitarian groups.

Individual Bargaining over Quantity/Quality of Offspring

The insights of evolutionary biology can be translated into terms more familiar to economists through their application to standard utility maximization and to simple game theory.

The Quantity-Quality Tradeoff

The standard neoclassical economic analysis of fertility starts with a married couple that maximizes a joint utility function and faces a budget constraint that represents a tradeoff between number of children and expenditures per child or “child quality” (Becker, 1981). A series of indifference curves represent their preferences for child quality relative to child quantity. The optimal combination is represented by the point of tangency between the budget line and the indifference curve farthest from the origin (See Figure 1).³

From an evolutionary point of view, the indifference curves could also represent isoquants that represent combinations of quantity and quality that offer equivalent levels of reproductive fitness. This would imply that environmental factors influencing fitness remain stable over a sufficiently long period of time to select for the optimal preferences within the population. One could argue that husbands and wives in monogamous relationships share common preferences for quantity versus quality (independent of costs) precisely because they both seek to maximize their reproductive fitness.

Even under this restrictive assumption, however, reproductive biology suggests that the budget constraints for mothers and fathers are different. The biological maximum of children for women is much lower than that for men. Even under rules of monogamy, men are more likely to remarry and raise additional children after the death of their spouse. Fathers can compensate mothers for some of the physiological costs of childbearing by transferring resources to them. The biological stresses, strains, and risks of motherhood,

however, cannot be fully compensated. Investments in child quality are more fungible, but also lack perfect substitutability. A mother's milk, for instance, is superior to most substitutes. For mothers, the costs of child quantity are costlier in terms of quality than those for fathers, as reflected in the flatter of the two budget constraints in Figure 2. As the same figure illustrates, the optimal choice for mothers differs from the optimal choice for fathers, even assuming they face identical indifference curves.

How will the couple reconcile this difference? In principle, it could be resolved through exchange. The father could offer a side payment to the mother to have more children; likewise, the mother could offer a side payment to have less. But the terms of this exchange, and indeed, the larger process of negotiation can be affected by coercion, contracting problems, and strategic maneuvers. In the language of institutional economics, it represents a "hold-up problem" that may be affected by differences in the physical strength of men and women or the "technology of conflict." It may also be affected by differences in maternal and paternal preferences.

Gendered Preferences

The notion that gendered preferences can be described in terms of a Chicken game is widely appreciated in the evolutionary biology (Trivers, 1972; Smith, 1982; Low, 2000). Economists, however, have yet to fully acknowledge this point. In many game theory texts, the Chicken game is described as a contest between two teenage males, designed to show who is the most Macho.⁴ They drive their hot rods toward each other. The one who swerves first is a chicken or a Wimp. If neither swerves, both are killed (the worst outcome). If both swerve, both are revealed as cowards, and humiliated. The best outcome for either individual is for the other to swerve. As the payoff matrix in Figure 3 suggests, there are two pure-strategy Nash equilibria. Each player strictly prefers the equilibrium in which the other player backs down.

Given these payoffs, individuals fare best if they play a mixed strategy, choosing to swerve 50% of the time and incurring significant costs (since a fatal crash will occur 25% of the time). In an evolutionary setting, with a population of Machos and Wimps, the Machos do best in a population dominated by Wimps, and vice versa; with the payoff matrix above, we expect an evolutionarily-stable strategy with a population equally divided between the two types. If the two types are easily observable to one another (e.g. one wears blue, the other pink) further efficiency gains can be expected. A “correlated convention” may emerge. Blues will never swerve when playing with Pinks and Pinks will always swerve when playing with Blues. Norms that help shape and signal risk aversion based on gender could offer social benefits.

The game of Chicken also describes collective action problems concerning the supply of effort to projects that offer public benefits. In this context, the payoffs resemble those described above but the actions differ. Instead of Wimps who swerve, we have Suckers who devote effort. Instead of Machos who don't swerve, we have Opportunists who shirk. If both players provide effort, some inefficient duplication occurs. Each player would prefer the other to provide effort, but the worst possible outcome is one in which neither provides effort (Bowles, 2003).

Parental effort devoted to children can be described in these terms (Folbre and Weisskopf, 1997). If mothers and fathers care equally about their offspring but parental effort is costly, they will prefer that the other parent provide high effort, while they provide only low effort. If neither parent provides a high level of effort, the offspring will suffer. However, behavioral ecology suggests that payoffs to fathers and mothers of child welfare are asymmetric, as in Figure 4. Assume that mothers value the extra benefits of high effort for children more than fathers do, by some amount x . Likewise, they are more averse to the costs of low effort, by the amount $-x$.

This remains a Chicken game, in the sense that each parent would prefer to choose the opposite of what the other parent chooses. The possibility of a low effort/low effort outcome remains, but the risk is lower, since the optimal mixed strategy for mothers to provide high effort becomes $(1+x)/(x+2)$. It is greater than 50% as long as x is positive, and approaches 100% as x increases. The payoffs to this game may be further modified if one assumes “warm glow” altruism or endogenous preferences (see Appendix A).

In sum, the insights of evolutionary biology suggest that mothers and fathers face different costs in the production of child quality and child quantity even if they share a common preference for the optimal quality of offspring. In a bargaining context, mothers are likely to be more risk-averse than fathers, and also to devote more effort to children. These outcomes do not inevitably lead to patriarchal institutions. But these outcomes are likely to affect the outcomes of decentralized forms of repeated collective action and the collective bargaining power that coalitions of men and women can exercise over the formation of social institutions such as marriage rules.

Collective Bargaining over Marriage Rules

Monogamy is widespread among bird species, and human beings may also be behaviorally predisposed to it. But such predispositions are apparently inadequate coordination devices. Most societies institutionalize strict marriage rules that range from strict monogamy to polygamy and polyandry and also govern obligations for the care of dependents. I argue that such rules are typically shaped by processes of collective, as well as individual negotiation. Gender, like class, race, or nation, represents a form of collective identity that is conducive to coalition formation.

The Potential Gains from Monogamy

Evolutionary biologists studying non-human species and historian/anthropologists studying humans concur that monogamy is most likely to emerge in circumstances in which

it improves reproductive fitness. By constraining males to the number of offspring one female can provide, monogamy better aligns the reproductive interests of males and females. Yet monogamy can take many different forms. Sexually exclusive partnerships between males and females may last for a week, a breeding season, or a lifetime. They may also involve different degrees of cheating by concealing intercourse with another partner. One implication of this variation is that social rules of monogamy may favor one gender over another.

Monogamy is often described as a metaphorical bargain in which males provide more assistance to females in rearing offspring in return for greater assurance of paternity.⁵ In environments in which offspring are unlikely to survive without care from both parents, monogamy offers distinct evolutionary benefits (Krebs and Davies, 1981). But it is important to note that the overall gains from monogamy do not require egalitarian or gender-neutral rules. This point can be illustrated with the Nash-bargaining approach that economists use to explain gains from marriage (McElroy, 1990) using a metric of reproductive fitness rather than utility or income. In Figure 5 the reproductive fitness frontier (drawn to resemble a utility frontier or a production possibilities curve) represents the potential combinations of male and female reproductive fitness resulting from the parental cooperation, which can take the form of polygamy, polyandry, monogamy, or combinations thereof.

The vertical line represents the female fall-back and the horizontal line the male fall-back of reproductive fitness that would result from absence of collaboration in parenting effort. This might be termed the "autarkic promiscuity" fall-back. For the purpose of simplicity, imagine a situation in which all males randomly meet and mate with all females; all females become pregnant and raise children without any assistance from men or from one another. Fall-backs for males and females would be symmetric.⁶ (I will shortly explore

a more realistic assumption).

In Figure 5, the large area to the northeast of the intersection of the fallback positions but still within a feasible set represents the large potential gains to cooperative agreements between mothers and fathers, or “marriage.” These gains are not necessarily equally shared. Polygamous rules of cooperation allocate several women to one man, excluding some males from mating. Such rules increase the average reproductive fitness of men who acquire wives, but may also lower the average reproductive fitness of females, who must compete with one another for resources from one husband. Still, women will benefit as long as their reproductive fitness is at least as high as it would be in autarkic promiscuity. Only with “perfect” monogamy, defined as neither partner reproducing with another (even after the death of the original partner) would mothers and fathers have equal reproductive fitness, represented by point E on the frontier.

Very different circumstances are depicted in Figure 6. There, parental collaboration offers potential gains to each partner, but there is no distribution of the gains in reproductive fitness that leaves both the mother and father better off than they would be in autarkic promiscuity. There are no points to the northeast of the intersection of the fall-backs within the feasible set. In these circumstances parental collaboration is unlikely. In between these two extremes of equal fall-backs with large gains and equal fall-backs with no gains lies a more interesting alternative: asymmetric fall-backs combined with large gains from collaboration.

Several possible factors could lead to asymmetric fall-backs for men and women. Males have the physical strength and physiological capacity to rape females who fail to gain protection from another male, thus restricting their choice of mates or the timing of their reproductive commitments. Some anthropologists suggest that females opt for marriage as a way of gaining protection from unwanted copulations (Jones et al. 2000). If the strongest

males are able to exclude other males from mating and all females are impregnated, fathers will enjoy higher average reproductive fitness than mothers.⁷ This, in turn, creates an incentive for females to mate only with dominant males, rejecting those who are subordinate. Female choices could lead to further psychological differentiation between males and females (Buss, 1996).

Stronger fall-back positions for fathers would also result from a situation in which initially monogamous males who abandon females with offspring can mate with other females, while initially monogamous females with offspring are unable to find males willing to help provide for their current or future offspring. These circumstances are consistent with first-mover advantage and the “caring chicken with asymmetric payoffs” scenario described above. Because fathers are more willing to abandon offspring than mothers, their fall-backs within collaborative relationships are stronger.

Figure 7 illustrates fathers’ stronger fall-back positions. Even if both mothers and fathers gain from collaboration, perfect monogamy is an unlikely outcome and fathers enjoy a distinct advantage in relative fitness, because the range of feasible outcomes on the fitness frontier is well above the point at which reproductive fitness of both partners is equal (Medea would have ended up within that range of outcomes had she accepted exile).⁸ In most areas of the world negative sanctions imposed on women having intercourse outside of marriage have traditionally been much harsher than those imposed on men (Daly and Wilson, 1983:291). This result does not depend on any specific bargaining rule, such as a Nash solution. Rather, it follows simply from the asymmetric fall-backs: even if men agree to the feasible collaborative outcome that favors them the least, they will still fare better than women.

Coalitions and Collective Bargaining

In hunter-gatherer societies, it is men who tend to exchange women, rather than

the other way around. (Lévi-Strauss, 1969). Rules of marriage tend to be formulated by men, rather than by women, and to offer men more favorable terms.⁹ Such rules could emerge in at least three different ways. They could result from a decentralized process of collective action and gradually become institutionalized. Alternatively, men could get together around the campfire, discuss the rules of marriage they would prefer and make women an offer. Women would then make a counter offer. A final possibility is that men simply choose the rules they prefer without explicitly bargaining with women, but taking potential contract enforcement or principal-agent problems into account.

What evidence supports the claim that collective gender bargaining might take place? Evolutionary biology offers strong support for the relevance of gender coalitions. The threat of violence is particularly effective when carried out (or simply condoned) by large groups of males (Smuts 1992, Wilson, Daly, and Scheib, 1997). Among primates, as well as other animal species, male invaders often kill the young offspring of other males (Hrdy, 1999). Male strategies can also include affiliative control—rules regarding who females are allowed to come in contact with and under what terms (Gowaty, 1997). Studies of bonobos and rhesus monkeys show that females can form coalitions that mitigate male violence and encourage intra-female cooperation in the care of offspring (Smuts 1992, 1995). Females who develop systems of “allomothering,” improve their collective fall-back position (Hrdy, 1990).

Gender coalitions in human societies are even more conspicuous, and they are likely to influence the formation of social institutions (Folbre, 1994). As Daly and Wilson put it, “men strive to control women and to traffic in female reproductive capacity (1983:290). The establishment of marriage rules represents a social institution that probably predates the establishment of property rights over land and livestock, and could help explain why many hunter-gatherer societies exclude women from collective governance.

Attention to gender coalitions does not preclude attention to coalitions based on other dimensions of collective identity. Indeed, it strengthens a larger theory of collective action and coalitional bargaining. It has been suggested that subordinate males form coalitions in order to challenge polygamous rules and establish rules of monogamy that lead to greater equality among men (Alexander, 1987). A coalition between subordinate males and females would be even more likely to succeed in this respect. On the other hand, coalitions based on class or race tend to cross gender lines and often reinforce gender inequalities. Several accounts of the emergence of foot-binding and genital mutilation suggest that mothers' gains from ensuring their daughters' marriageability to higher status males exceed the losses imposed by such actions (Dickemann, 1979; Mackie, 1996). As these examples suggest, the outcomes of gender based coalition formation and collective bargaining also have important implications for group selection.

Gender Inequality and Military Aggression

A number of factors could explain why males typically have more influence than females over the collective governance of hunter-gatherer societies. Under technological conditions in which physical strength has a significant positive impact on productive potential and ability to coerce others, females operate at a disadvantage. The typically male activity of hunting may be conducive to the formation of strong male alliances. Patterns of patrilocality in which women marry out of the group and are less likely to coreside with biological kin may weaken their ability to form coalitions. Specialization in child rearing itself may weaken women's bargaining power through the prisoner of love dynamics described above.

A Hawk-Dove Scenario

Could differences in male and female preferences for child quality affect the success of strongly patriarchal groups relative to those in which women have a stronger voice? If

this were the case, the emergence of strong male political dominance could result from a process of group selection in which patriarchies prevail over matriarchies, or in which “fierce” patriarchies out-compete “gentle” ones.

Most historical discussions of group warfare focus on underlying economic capabilities that shape military technology (Diamond, 2002). However, in the hunting and gathering societies characteristic of much of human history, the technology of conflict had distinctly different consequences for fathers than for mothers. The primary cost of war was the high mortality of young adult males and the primary benefit of war was the capture of young females (Lévi-Strauss, 1969; Chagnon, 1983).

Women-stealing allows a group to increase child quantity. Capture of new females benefits males directly, by increasing their pool of potential mates. However, it benefits females in the tribe only indirectly, if it increases the fitness of the group as a whole. It may actually lower their reproductive fitness, by encouraging substitution away from quality toward quantity, or diluting the resources available to their own offspring. Indeed, the loss of young male warriors who have not yet fulfilled their reproductive potential represents a reduction in child quality that is costlier to warriors’ mothers than to their fathers.

The payoffs of a Hawk-Dove game help explain the impact of systems of group governance on the probability of adopting an aggressive strategy. When two Hawks meet they fight, paying costs but enjoying some positive probability of benefits. When Hawks meet Doves, they consume them at no cost. When Doves meet Doves, they share equally and avoid conflict. As shown in the payoff matrix in Figure 8, V refers to the value of the resource gained, and C to the cost of aggressive behavior. In an individual choice model, individuals choose a Hawk or Dove strategy. In an evolutionary model, different individuals in the population represent Hawks or Doves, and their interactions determine the composition of the population.

Here, I apply the model to a specific form of group selection. Different groups choose to act as Hawks or Doves based on explicit calculation of the potential benefits. What determines their choices? Assume, for the purpose of simplicity, that a Hawk group has a 50% chance of winning against another Hawk group. The dynamics of the game depend on the relative sizes of V and C . If $V > C$, the game becomes a Prisoner's Dilemma and Hawks invade and take over even though this is not the socially most efficient outcome. If $V < C$, the game resembles Chicken. Hawks prefer to meet Doves, but there is no pure strategy equilibrium. I expect a polymorphic population of groups.

Assume further that the relevant set of costs and benefits are those facing decision-makers, not those facing the group as a whole (alternatively, one could argue that decision makers simply place a disproportionate weight on their own costs and benefits). Decision makers in patriarchal groups face costs C_p that are lower than the costs C facing decision makers in other groups. Similarly, the resources gained through conflict offer greater benefits V_p to decision makers in patriarchal groups than the benefits V facing decision makers in other groups.¹⁰

Under these assumptions, Hawk becomes a more attractive strategy for patriarchal groups than for others, because $V_p - C_p > V - C$. Even if $V_p < C_p$, leading to a mixed strategy, patriarchal groups will adopt this strategy more frequently than others. As aforementioned, their decision-makers may also be less risk averse than those of other groups. Will they be able to successfully invade and dominate society as a whole? The answer depends on the relative size of V and C as well as V_p and C_p . But since the optimal strategy depends on the proportion of Hawks within the stable polymorphic population, the emergence of patriarchal groups could lead to a tipping phenomenon. If the ratio of V_p to C_p is greater than one, Hawk strategies become completely dominant among patriarchal groups, which could in turn make Hawk strategies dominant for other groups. Furthermore, the advantages of adopting a Hawk strategy could encourage patriarchal governance.

A Hawk-Chicken Scenario

The scenario above depends on certain assumptions regarding the technology of conflict. The outcomes would obviously be different if groups sent young women to fight and captured young men as potential slaves (perhaps this is what the Amazons originally had in mind). This technology of conflict is obviously influenced by biological differences between men and women. In hand-to-hand combat, men make better warriors than women. In a world of high desired fertility, women represent a more valuable reproductive asset than males. Also relevant are the differences in male and female preferences described in the Chicken game above.

Women are more easily domesticated by capturing groups because maternal altruism holds them hostage. Once impregnated by their captors, they have much to gain from cooperation with them in order to promote the welfare of their children. When a band of men first founded the city of Rome, they found it difficult to obtain sufficient women to start families of their own. They resorted to trickery, inviting the neighboring Sabines to bring their daughters to a festival, then seized the women. The Sabine men retreated, and by the time they had mustered sufficient military force to demand their daughters' return, many of them were pregnant with Roman children.

In a dramatic gesture famously narrated by Plutarch, the Sabine mothers ran onto the battlefield and pleaded with their fathers and husbands not to fight, essentially saying that it was too late:

You did not come to vindicate our honour, while we were virgins, against our assailants; but do come now to force away wives from their husbands and mothers from their children, a succour more grievous to its wretched objects than the former betrayal and neglect of them. Which shall we call the worst, their love-making or your compassion? (Plutarch, 33).

The scene has been painted by some of the most influential painters of Western civilization, including Poussin, David, and Picasso. Rape and forced marriages are also a central image in Biblical warfare (Low, 1992).

A stronger version of this overall approach to Chicks and Hawks would allow for the possibility that no explicit calculation is made, and an evolutionary process selects among groups that have randomly chosen to be Hawks or Doves, and to seize either males or females (or both) from other groups. In this case, the benefits to the group as a whole would be more relevant than the benefits to the governing gender. In future work, I hope to model this interaction in more detail. In the meantime, however, I suggest that explicit calculations by governing coalitions are relevant to a consideration of the dynamics of collective conflict. And I would be delighted by evidence that patriarchal strategies of group aggression might, in the long run, prove less than evolutionarily stable.

Conclusion

Bargaining is a form of cooperation that takes place in the shadow of conflict. Its outcomes are determined not only by exogenous factors, but also by non-cooperative outcomes and endogenously determined social institutions. Individual men and women bargain over the terms of their collaboration as parents. Coalitions of men and women bargain over the establishment of marriage rules that influence more general rules of political governance. Groups with different rules of political governance compete with one other for resources. Thus, small initial differences in gendered endowments and preferences may be amplified by the development of social institutions and the process of group selection.

Much of this chapter has focused on possible explanations for the emergence of patriarchal institutions of marriage and collective governance. However, I believe that an even greater strength of this approach is the potential ability to explain factors that may increase women's bargaining power and lead to the weakening of patriarchal institutions.

The process of economic development is generally associated with processes of technological change that reduce the relative importance of physical strength, leading to a reduction of male physical advantages in both production and coercion. More importantly, it is associated with increases in women's ability to restrict child quantity and exercise more direct control over reproductive decisions. In most of the developed countries, women have dramatically improved their economic and political position relative to men.

The increased demand for child quality (specifically, high levels of education) that is also associated with economic development has more contradictory effects. On the one hand, it helps align the interests of mothers and fathers who realize that they must collaborate effectively in order to ensure their children's success. On the other hand, when combined with increased female potential for economic independence, the high costs of raising children may increase fathers' temptations to default on their commitments. Cross-national differences in the degree of public support for child rearing are significantly influenced by coalitions based on class and race (Folbre, 1994). A better understanding of the dynamics of individual and coalitional conflict could improve our collective well-being.

Appendix A

The outcome of the game shifts even further if mothers derive an extra payoff y from devoting high effort themselves. In other words, they care not only care more about making offspring better off, but they want to be the ones to do so, whether because this is more pleasurable to them (what Andreoni calls “warm glow” altruism) or more productive, or both, as is the case with breast feeding. I will term this situation The Parent Trap.

Figure A. 1. The Parent Trap

| | | Father | |
|--------|-------------|----------------|----------------|
| | | high effort | low effort |
| Mother | high effort | $2 + x + y, 2$ | $1 + x + y, 3$ |
| | low effort | $3 + x, 1$ | $-x, 0$ |

In this case, if $x > 0$ and $y > 1$, mothers have a pure dominant strategy: to provide high levels of effort whether fathers provide it or not. Fathers have a pure dominant strategy: to provide only a low level of effort. Note that in this case mothers would prefer fathers to provide high effort, but are unable to attain that result precisely *because* fathers can depend on them to provide high effort regardless.

Figure 1. Parental Investments in Quality/Quality Assuming a Common Budget

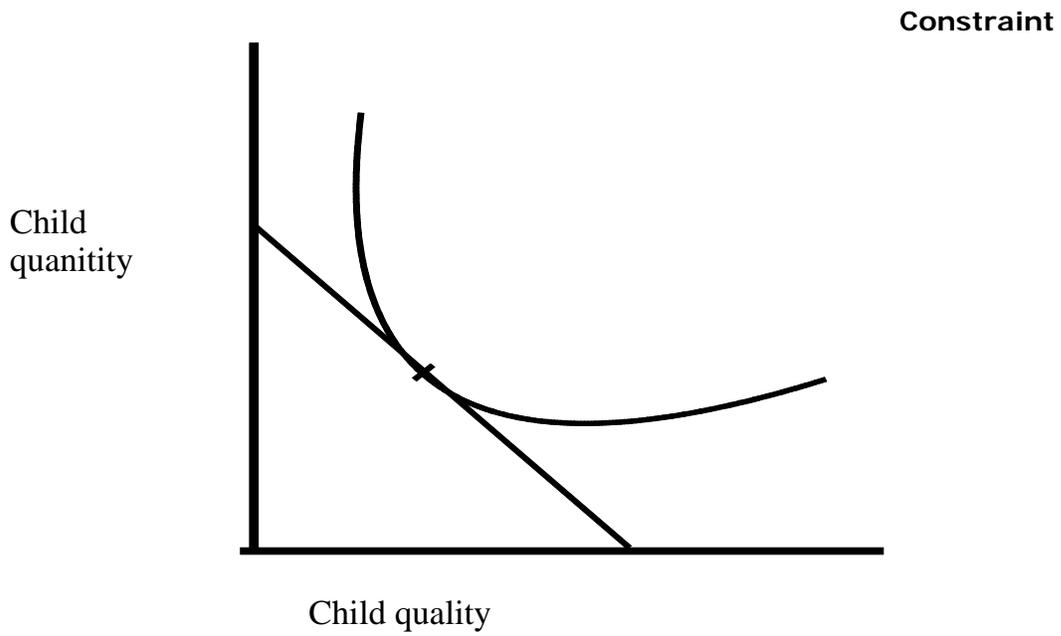


Figure 2 . Maternal and Paternal Investments in Quantity/Quality Assuming Different Budget Constraints

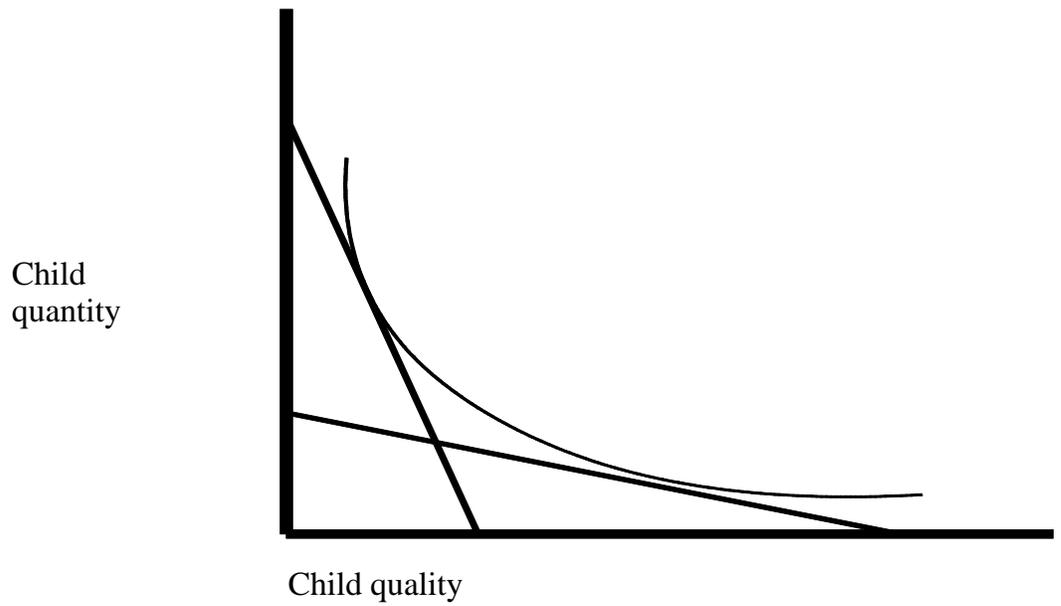


Figure
3.
Traditio

nal Chicken

| | | Teenage Boy 2 | |
|---------------|----------------------|---------------|----------------------|
| | | wimp (swerve) | macho (don't swerve) |
| Teenage Boy 1 | wimp (swerve) | 2, 2 | 1, 3 |
| | macho (don't swerve) | 3, 1 | 0, 0 |

Figure 4. Caring Chicken with Asymmetric Payoffs

Effort Devoted to Children with Differing Parental Altruism

| | | Father | |
|--------|-------------|-------------|------------|
| | | high effort | low effort |
| Mother | high effort | $2 + x, 2$ | $1 + x, 3$ |
| | low effort | $3 + x, 1$ | $-x, 0$ |

Figure 5. Large Potential Gains in Reproductive from Parental Cooperation
 (Straight lines represent fall-backs in the absence of cooperation; curved line represents tradeoffs between paternal and maternal fitness.)

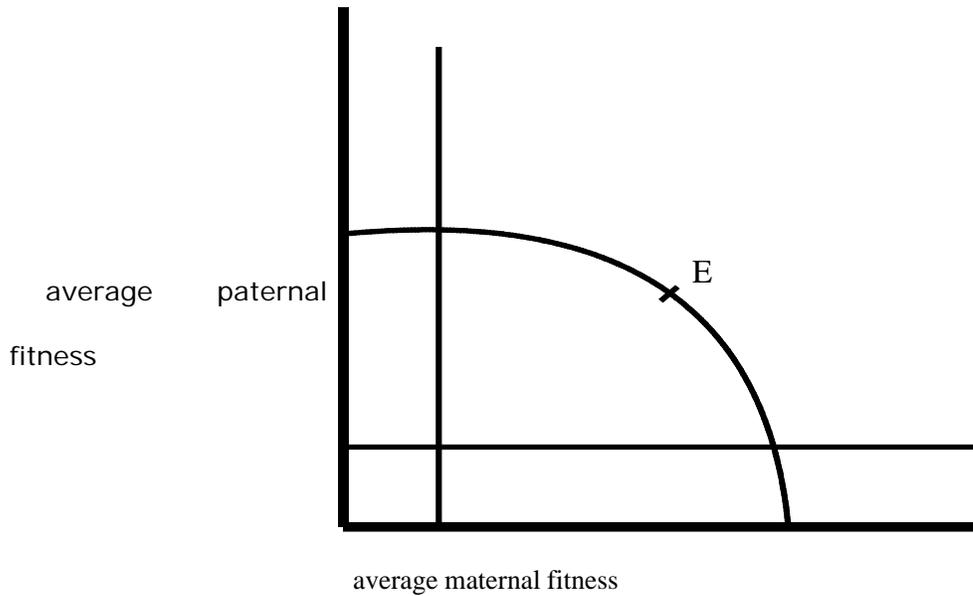


Figure 6. No Joint Gains from Parental Cooperation
 (Straight lines represent fall-backs in the absence of cooperation; curved line represents tradeoffs between paternal and maternal fitness.)

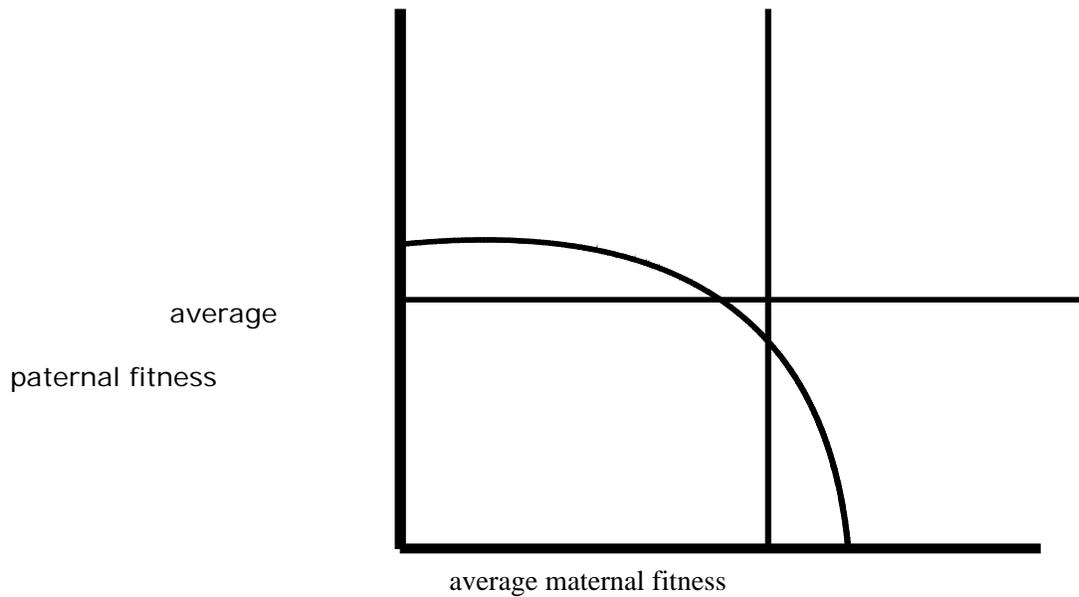


Figure 7. Unequal Joint Gains from Parental Cooperation

(Straight lines represent fall-backs in the absence of cooperation; curved line represents tradeoffs between paternal and maternal fitness.)

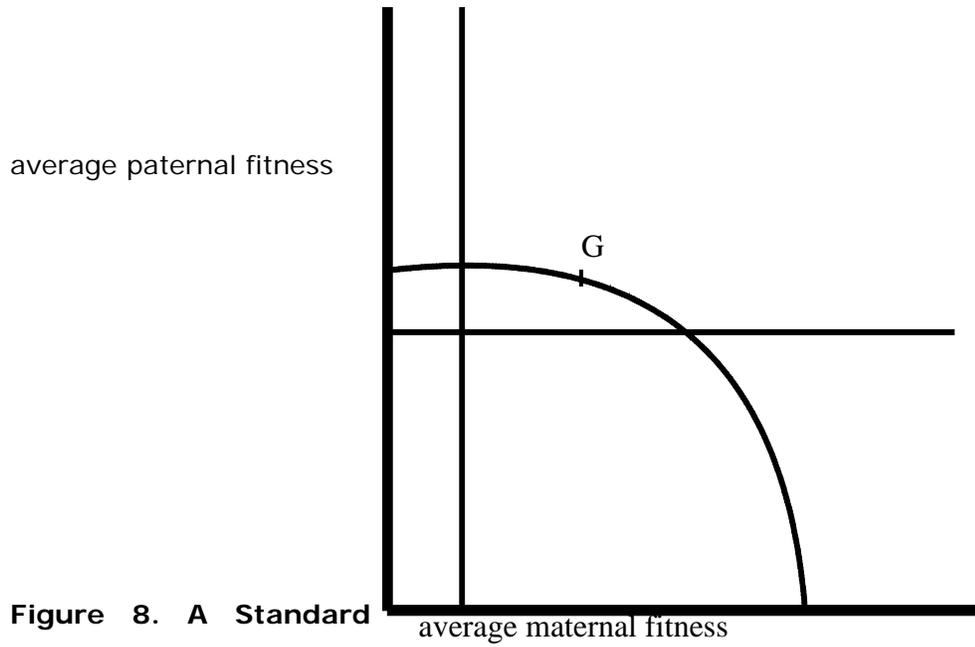


Figure 8. A Standard Hawk-Dove Game

| | | | |
|---|------|---------------------|------------|
| | | B | |
| | | Hawk | Dove |
| A | Hawk | $(V-C)/2, (V-C) /2$ | $V, 0$ |
| | Dove | $0, V$ | $V/2, V/2$ |

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Notes

1. The term "institutionalist" economists who have we have in mind here include Bowles (2003), North (1981), Olson (1982) and Hirshleifer (2001). The exceptions to this generalizations include Cheung (1972), who developed a pioneering analysis of patriarchal property rights, and Akerlof and Kranton (2000), who emphasize the importance of gender as a form of identity.
2. Most of the traditional literature on human capital defines it narrowly in terms of cognitive skills acquired in school or on the job. But the biological and social "substrate" for such knowledge also represents capital, and has been treated as such by scholars as diverse as Irving Fisher (1930) and John Kendrick (1976). This was also the approach taken by Cheung (1972).
3. Becker makes the additional assumption that child quality will be constant across all children, an assumption which offers a more complex interpretation of the tradeoff between quality and quantity than a simple linear budget constraint would imply. Biologists will recognize that this assumption is inconsistent with the principle of parent-offspring conflict. We set this issue aside here because it has no direct bearing on the argument at hand.
4. For a more direct application of family politics to parenting effort see Gintis (2000:81).
5. Human females, unlike those of many related species, do not physiologically signal their fertile periods, and, indeed, may be unaware of them. Does this trait have adaptive significance?
It has been speculated that intelligent females could have learned to avoid copulation during fertile periods, lowering their reproductive fitness compared to less intelligent females; inability to identify fertile periods preempts this strategy (Burley and Barkow, 1980).
6. At first glance it might seem that males would have a higher fall-back position simply because they are willing to settle for a lower ratio of quality to quantity per child than females. But the aggregate reproductive fitness of males must equal the aggregate reproductive fitness of females.
7. Note how this argument differs from the more traditionally neoclassical model developed by Willis (1999) which assumes that in equilibrium married and unmarried males must be equally well off.
8. An alternative interpretation of the bargaining asymmetry would suggest that, holding reproductive fitness constant for both sexes, wives pay a higher price for that fitness in terms of their own level of consumption and leisure. This is the outcome more commonly described in the economic household bargaining literature.
9. For a discussion of marital property rights within the Anglo-American tradition, see Braunstein and Folbre (2001).
10. Note that one could argue, in a parallel fashion, that "matriarchal" societies would be governed by individuals who place too "low" a benefit on group aggression.