

**Reconsidering Gender and Investment in the Intrahousehold Decision-Making  
Process**

**Lin Johnson III**  
**Reed College**

## **Abstract**

In the very recent past, the economics of the household and the economics of development appear to be edging toward a new convergence of concern around the nature and use of assets. However, these two literatures of economics continue to exist in separate spheres. I draw from both bodies of literature in order to examine gender differences in asset portfolios. I find systematic differences in the way that certain assets held by husbands versus wives influence household decision outcomes. A clear understanding of the nature and functions of various types of assets in hands of husbands and wives is necessary to better understand the gendered impacts of economic and social institutions in developing countries.

## **I. Introduction**

In the very recent past, the economics of the household and the economics of development appear to be edging toward a new convergence of concern around the nature and use of assets, particularly by populations that are conventionally thought of as “poor.” This new convergence could be strongly connected to different ways in which assets strengthen individuals’ positions in different institutions. In the developmental economics literature, scholars are concerned with the influential role of economic and social institutions in establishing individuals’ economic positions and how their interactions with assets potentially alter their economic and societal positions. Alternately, scholars of household economics concentrate on the institutional effects of family dynamics on economic resource allocation within the household and how assets determine the distribution of household economic resources. However, neither of the two literatures has fully incorporated each other’s way of thinking about the nature and use of assets into their own respective analyses.

Although these two literatures of economics continue to exist in separate spheres of economics, an intrahousehold approach that focuses on the nature of and use of assets can potentially bridge the gap between economics of household and of development. The intrahousehold approach is concerned with the household unit and its decision-making processes about material needs, therefore assets serve as crucial links between the nexus of developmental economics and household economics because they allow cultural, political, social, and economic institutions to enter into household decision-making processes about economic resources allocation. Hence, institutional structures of developing economies may influence household dynamics through household members’ possession of assets.

Inspired by this innovative idea, I will attempt to strengthen the relationship of “household economics” and “developmental economics” with intrahousehold thinking and my use of an asset analysis and a gender-based examination of the process of marital investment. Moreover, this analysis will potentially further the convergence of household and development economics toward the nature and use of assets. The main question of this analysis is “how do wealth portfolios of human capital, physical capital, and precautionary assets affect the marital bargaining positions of husbands and wives in Indonesia?” With a clear understanding of the nature and use of various types of assets in hands of husbands and wives, policymakers can possibly improve economic, social, and familial well-beings of poor people and institutions in developing countries.

The original research of this article provides the intrahousehold literature with two important extensions. First, I connect the intrahousehold marital bargaining literature to the developmental economics literature concerned with labor, credit, and insurance markets in order to show the relationship between husbands’ and wives’ wealth portfolios and marital bargaining positions. The purpose of this particular nexus is to illustrate how different economic institutions may treat husbands and wives differently, which potentially influences their investment behaviors and hence their marital bargaining positions.

Second, I introduce an endogenous threat point into the marital bargaining model and specify its determinants as three categories of wealth. My goal is to incorporate the effects of different social and economic constraints on husbands’ and wives’ investment strategies in a game-theoretical economic framework. Thus, the game-theoretical approach may provide more insight into husbands’ and wives’ investment behaviors and bargaining positions within the household, given external social, cultural and economic market constraints.

I focus on how human capital, physical capital, and precautionary assets affect the individual and relative marital health outcomes of husbands and wives. The health outcome is a proxy for household health expenditure, so a disproportionate relative health outcome suggests that one individual gains more health care expenditure than his or her spouse does.

The article is divided into three major sections. The first section discusses how social and environmental norms and parameters affect gender within economic structures, which may influence the investment behavior and marital bargaining positions of husbands and wives. The second provides a Nash cooperative bargaining theoretical framework that models the marital investment behavior of husbands and wives. Within this framework, I am able to derive basic demand functions and comparative statistics of husbands' and wives' health expenditures. In the last section, I empirically test the effects of the three asset portfolios on husbands' and wives' health expenditure demand functions. In the conclusion, I briefly summarize my results and analyze the policy implications of the study's findings.

## **II. Gender and the “Household”**

Gender is not simply a “household” phenomenon, but operates at multiple levels of economy and society and is a pervasive element in the way all institutions are constructed and the dynamics through which they change (Hart 1995, 58).

The above statement indicates the importance of gender in the interactions between intrahousehold processes and non-household institutions, and hence the outcomes of policy and economic changes. In recent feminist economic literature, economists analyze the importance of gender in the development of economic, political, and social institutions and how its influences in these structures affect the dynamic of the “household.”

In very recent intrahousehold literature, economists attempt to analyze how various assets possessed by the household head and spouse affect their bargaining positions in the household. In Section II, I attempt to unite the literature about gender effects on social and economic structures with the intrahousehold literature about the household bargaining process. I begin by presenting a brief history of household behavior models, which provides possible explanations about the favorability of the household bargaining model in relation to other household models. In the second section, I concentrate on the household bargaining model in order to investigate the determinants of household bargaining positions. In the third section, I analyze how different economic markets and social norms influence husbands' and wives' possession of assets, which is an important determinant of household bargaining positions. In the last section, I conclude this section with a brief presentation of key feature of Indonesia's economy and society, particularly emphasizing those aspects that influence the economic interactions of husbands and wives.

#### **A. Brief History of Household Decision-Making Models**

Economic analyses have treated the household as a black box in which the preferences of all household members can be aggregated into a single joint utility function (Becker 1991). The unitary model of household behavior views the household as a collection of individuals who behave as if they agreed on how best to combine their time, goods purchased in the market, and goods produced at home. The key advantage of a unitary framework is that it is relatively easy to analyze the impact of changes in policy and other relevant variables on a single agent's behavior. Until recently, strong critiques of this unitary view of the household have come from sociologists, anthropologists, and non-neoclassical economists who insist on the importance of recognizing both conflict and cooperation in intrahousehold relations (Hart 1995).

The unitary model has two important limitations. First, the model can allow prices to differ for various household members, but it assumes that all household resources (capital, labor, and land) are pooled (Alderman 1995, 3). This assumption requires that at least one member of the household is able to monitor the other members and to sanction those who fail to comply with the household rules, which are both issues of information and control. Second, the unitary model assumes that there is a single set of preferences guiding how resources are distributed within the household. This unitary preference assumption implies that household members are fully cooperative and conflicts among household members do not exist, which may be a simplification of household dynamics.

Over the past years, the emergence of the household bargaining model during the 1980s has stirred debate between the approaches of unitary and collective models of the household. The major thrust of the debate is whether individuals should be characterized by their own preferences, rather than aggregated as one unit. Collective modeling advocates believe that individualism should be preserved when modeling household behavior. Therefore, most collective modelers view rules that influence intrahousehold allocation as having multiple forms, which is a completely separate view from the unitary view.

The main advantage of collective modeling is that intrahousehold and interhousehold relations are the basic focus of the research. Rather than simply shifting from the household to individual, there is a need to focus on relationships within and among households, as well as in non-household institutions, and on the way these relationships are defined in terms of gender (Hart 1995, 58).

The collective models can be categorized into two broad groups: non-cooperative models which allow for informational asymmetries and enforcement problems, and are generally not

Pareto optimal, and cooperative models which conform to Pareto-optimality (Hart 1995, 58). The non-cooperative approach (Ulph 1988; Carter and Katz 1992; Lundberg and Pollak 1993) relies on the assumption that individuals cannot enter into binding agreements and enforceable contracts with each other. Instead, individuals' actions are conditional on the actions of others. For instance, Lundberg and Pollak's non-cooperative model specifies that each spouse makes decisions within his or her sphere and responds to the other's decisions by altering their level of voluntary contributions to shared goods.

On the other hand, the cooperative approach assumes that individuals form a household when it is more beneficial to them than remaining alone. Higher benefits could occur because the formation of a household may be a more efficient way to produce or share household goods that single individuals cannot. Some cooperative models impose structure by representing the household decision as an outcome of some specific bargaining processes (Alderman 1995, 5). Manser and Brown (1980) and McElroy and Horney (1981) create a bargaining framework that envisages the household as composed of self-interested individuals whose preferences are different from one another. The Nash formulation of the bargaining problem, which is widely used to model household behavior, entails both conflict and cooperation. At the core of the bargaining model is the "threat point," which represents the level of utility that each individual will attain if they do not cooperate. The threat point is defined in terms of extra-environmental parameters such as demographic, legal, and other macroeconomic conditions external to the household. Furthermore, it is not credible in the context of small daily decisions for either spouse to threaten the other with divorce.

The household modeling approaches greatly depend on different household structures. In this analysis, the Nash household bargaining model will be used to represent Indonesia's household

decision-making process. The reasons why this model is utilized will be evident later in this section.

## **B. Determinants of Household Bargaining Positions**

In most household models, husbands and wives, explicitly or implicitly, are struggling to increase the welfare of the household and their personal welfare. In the household bargaining model, the struggle between husband and wife for household resources is more apparent than in other models. With each household member striving to increase their own utility, the household may experience numerous conflicts about the allocation of household resources. Typically, power relations determine who receives the household resources, and in what quantity he or she receives them. In this section, I will examine what establishes the bargaining positions of husbands and wives within households.

Before I begin the discussion of how bargaining positions are determined, I would like to present an example of the household bargaining process that illustrates the role of power in resolving conflicts. For instance, the household head and spouse may gather together to decide on the amount of education each child will receive in the current year. The individual who can make their “voice” heard by the other individual tends to have the majority of power for allocating particular amounts of educational resources to their children. The strength of one’s “voice” is simply that individual’s bargaining power, which determines the share of the resources allocated to an individual within the household. Due to the severity of their discussion, the household head and spouse may attempt to persuade the other individual by threatening to leave the household, refusing to provide other resources, and not cooperating with future agreements.

If more bargaining power can potentially help an individual to obtain a greater share of household resources, then what determines the amount of bargaining power an individual possesses? Agnes Quisumbing and John Maluccio (1999, 13) provide us with an answer by indicating four important determinants of marital bargaining power. The first determinant is the mobilization of an interpersonal network. By holding membership in organizations, accessing kinships and social networks, and owning other “social capital,” an individual may improve his or her bargaining position. For example, an individual with social relationships may be able to rely on the group’s assistance if he or she decides to end his or her marriage or not to cooperate in the marriage. Mobilization of an interpersonal network strengthens the credibility of an individual’s threats.

The second determinants are the factors that can be used to influence the bargaining process. Some factors that may influence the bargaining process are legal rights, laws, skills and knowledge, bargaining skills, the capacity to acquire information, and education (Quisumbing and Maluccio 1999, 14). Most of these factors are external to individuals, but some are highly correlated with human capital. In some instances, domestic violence may be used to extract resources from spouses or their families (Kabeer 1994).

The third determinant is basic attitudinal attributes. Self-esteem, self-confidence, and emotional satisfaction can empower individuals to pursue their best interest. The Grameen Bank is a successful group-credit program because it empowers women with confidence. Several non-governmental organizations (NGOs) have made individuals aware of laws, political participation, and the use of contraception.

The last determinant is individual control over economic resources. The threat of withdrawing both oneself and one’s economic resources from the household grants the owner of

those resources some power over household resources (Quisumbing and Maluccio 1999, 13). Economic analysis of bargaining power tends to focus on economic resources exogenous to labor supply as a major determinant of bargaining positions.

Among the four determinants of bargaining positions, the effects of controlling certain economic resources on individual bargaining positions have been the most widely tested empirically. For instance, Hoddinott and Haddad (1995) investigate the effect of women's income share on the allocation of household expenditures in Cote d'Ivoire. Thomas (1990) also tests the collective model by examining the effects of unearned income of men and women on nutrient intakes, fertility and child survival, and child anthropometrics. Schultz (1990) analyzes the differential effects of males' and females' unearned income on labor supply and fertility in Thailand. In addition, Quisumbing (1994) examines the intrahousehold distribution of land and education as a function of father's and mother's education and inherited landholdings in the Philippines. Doss (1996) investigates the effects of current assets on the distribution of expenditure among different consumption categories in Ghana. Thomas, Contreras, and Frankenberg (1999) test the effects of maternal and paternal assets at marriage on child health in Indonesia.

### **C. Economic Markets Constrain Household Bargaining Positions**

In the household economics literature, economists believe that individual control over certain economic resources can greatly influence the bargaining positions of husbands and wives. However, few economists have analyzed how individuals are constrained to gain possession of certain economic resources. In this section, I will examine how the labor market, credit market,

insurance market, and social boundaries in developing countries may affect husbands' and wives' economic behavior, which will inevitably alter their bargaining positions.

### The Labor Market

Knowing that labor markets in developing countries are imperfect, how does this imperfection affect the labor decisions of husbands and wives?<sup>1</sup> This question is relevant for two main reasons. The first reason is that certain labor decisions may explain why individuals possess certain economic resources and form certain economic relationships. The second reason is that husbands' and wives' labor decisions reflect certain social constraints, in addition to imperfect labor market constraints.

In recent empirical evidence, developmental economists indicate that males and females in developing countries may work in different sectors of the labor market. Hirata and Humphrey (1991, 678) report that 64.7 percent of Brazilian males continue working in the formal labor sector after a formal sector job loss, while 60.8 percent of Brazilian females move to the informal labor sector after a similar job loss. Joycelin Massih (1990, 229) describes the daily work activities of females in Barbados, Antigua, and Saint Vincent. Massih indicates that more than 50 percent of females in these countries performed no formal work but only household work, which includes domestic chores, childcare, care of domestic pets, care of the aged and infirm, and agricultural production for home use. Carmen Diana Deere and Magdalena Leon de Leal (1982, 74-5) indicate that 97 percent of male temporary agricultural laborers in Colombia receive some kind of payment, while only 3 percent of Colombian female temporary agricultural laborers receive some type of payment.

---

<sup>1</sup> In Debra Ray's *Developmental Economics* (1999, 487-88), there is a clear presentation of the imperfections of labor markets in developing countries.

Two prominent explanations for the labor behavior of husbands and wives are the following: the sectoral comparative advantage theory and the breadwinner theory. The first explanation, pioneered by Gary S. Becker, is the theory of comparative advantages in sectoral labor markets. Becker asserts that females typically work in the household since the biological difference of child-bearing temporarily forces them out of the labor market. Their absence in the formal labor market provides their husbands with relatively more work knowledge and experience. According to Becker's theory of comparative advantage, it is efficient for husbands to completely specialize their time allocation in and investment related to the formal labor market, while wives completely specialize their time allocation in and investment related to the informal labor market.

In contrast to Becker's theory, the breadwinner theory uses social norms to better explain the labor decisions of husbands and wives. Helma Hirata and John Humphrey (1991) begin their argument by asserting that males are typically perceived as breadwinners who are responsible for having steadier incomes and fewer job separations than females. This generally implies that males acquire their jobs in the formal labor market where high wages and fringe benefits, good working conditions, low labor turnover, and a high probability of job mobility exist (Rothboeck and Acharya 1999, 585). This particular financial pressure causes males to continue to work in the formal labor sectors. Unlike males, females lack substantial pressure to be household providers, which allows them to enter and exit the formal and informal labor markets freely.

Although no one complete explanation for husbands' and wives' labor decisions exists, it is clear, given the empirical evidence, that husbands typically decide to participate in the formal labor market, while wives typically participate in the informal labor market. These sectoral segregation patterns may cause husbands and wives who work in different labor markets to potentially

accumulate capital relevant only to their respective sectors. The implication of this scenario is that individual asset portfolios can potentially vary systematically across husbands and wives.

### The Credit Market

In developing countries, the availability of labor income can be quite uncertain, which causes most individuals to smooth their incomes over time through the use of credit. However, credit markets in developing countries have the two fundamentally problematic features of involuntary and strategic defaults on loans, which result from asymmetrical information and inappropriate incentive mechanisms. With the market failures and imperfections that exist in a developing economy's credit markets, it is pertinent that we ask how husbands' and wives' economic behaviors are influenced by imperfect credit markets.

First, I would like to present testimonial evidence to indicate a distinction in husbands' and wives' participation in the formal and informal credit markets. Muhammad Yunus (1995, 16-17) indicates that females in developing countries are limited to informal credit markets based on their access to collateral. Yunus provides us with a typical scenario in Bangladesh about females' access to the formal banking system with the following quote:

One of the allegations that I was bringing against the banking system was that it was designed to be anti-poor. That's why they built the wall of collateral. It was also the allegation that it was anti-women. Banks do not want to lend money to women. If woman wants to borrow from a bank, the manager will ask the woman to bring her husband along, so that he can discuss the business (Yunus 1995, 17).

His observation provides us with evidence of the existence of gender biases in the formal credit. In addition, it indicates that husbands possess collateral, which makes them more welcome than wives. Hence, husbands typically participate in the formal credit market, while wives usually participate in the informal credit market.

Besides the evidence displaying husbands' and wives' participation in different credit markets, other empirical evidence also indicates that husbands and wives own different forms of collateral. Husbands typically possess the property rights for land, houses, tractors, financial accounts, and automobiles (Quisumbing and De la Briere 2000, Dolan, 2001, Quisumbing 2001). Wives in developing countries usually possess jewelry, small animals, clothing, and household durables (Watson and Ebrey 1991, Watson and Ebrey, 1991, Massiah 1993, Kabeer 1994, Guyer 1997, Zongmin 1999, Quisumbing 2000).

Even though the literature about credit markets does not provide direct causal relationships between ownership of certain collaterals and participation in certain credit markets, the empirical evidence clearly indicates that husbands own relatively more formal forms of collateral and participate more often in formal credit markets than wives do. This strong correlation between different forms of collateral and different credit market participation may be a result of being restricted to a particular credit market. If this hypothesis is true, then the gender bias of credit markets can potentially cause husbands and wives to possess different assets.

### The Insurance Market

Poor individuals in developing countries face several sources of unexpected variations in their incomes and consumption levels. As a precautionary measure, individuals would like to acquire insurance to smooth their income and consumption patterns in case credit and labor income is unavailable. However, formal insurance is typically not provided to poor individuals due to the market failures of moral hazard and adverse selection. Formal insurance providers have limited information about their customers and limited enforcement mechanisms. The social dynamics of

informal insurance markets allow mutual insurance groups to form, which minimize the informational barrier between providers and recipients.<sup>2</sup>

In informal insurance markets, individuals tend to insure themselves by having self-insurance—the use of one’s own wealth to smooth uncertain shocks transferred to individuals who maintain strong social relationships with other in income and consumption—and mutual insurance—group-based wealth members (Morduch 1997, 7). The question arises of whether males and females can use the same kinds of assets to smooth their consumption patterns.

Recent literature suggests not. Husbands and wives typically rely on different forms of informal insurance to smooth their consumption patterns (Quisumbing 1994). In developing countries, husbands tend to possess saving accounts, social relationships with formal market employers, various plots of land, and buildings (Doss 1996). On the other hand, wives tend to possess jewelry, communal social relationships, small livestock, clothing, and ceremonial equipment (Quisumbing 2000).

### Social Boundaries

How a group or society distributes available resources among members reflects not only power and authority relations, but also the moral basis of the group, its consensus about distributive justice, and its implicit priorities (Papenek 1990, 163).

The above statement suggests that resource allocation among a group is not merely linked to power, but linked also to entitlements and property rights. These entitlements and property rights are based on social consensus and the process of childhood socialization. In developing countries, a bigger share of household resources may signal an imbalance in power or status. Or a bigger share of household resources may have always been given to a certain person due to social norms.

---

<sup>2</sup> Social pressure rather than legal contracts or laws usually plays a greater role in enforcing insurance arrangements in small communities than in large communities.

In this section, I investigate how entitlements and property rights in developing countries may potentially affect the marital distribution of resources and power between males and females.

In the developmental economic literature, land and dowries have been two resources in which social norms most clearly determine their ownership among husbands and wives. Generally in developing countries, husbands tend to own the majority of land (Doss 1996; Lich 1999). For instance, John Bruce (1993, 46) infers that the vast majority of African tenure systems gives females access to land not in their own right but as their husbands' wives or as daughters or sisters. While females may have a right to own a particular portion of land, they by no means have control of it. Furthermore, females in developing countries continue to possess the majority of their dowries during and after marriage. Nalia Kabeer (1994, 154) suggests that a woman is entitled at the time of her marriage to various kinds of moveable assets (utensils, jewelry, cash) donated by both her own and her husband's family.

Social norms in developing countries shape the way an individual thinks the world works. During childhood, an individual may have been taught that the father should receive the largest portion of food in the family. Or perhaps, one child should be sent to school, while the others stay at home. Individuals learn at an early age that certain individuals are entitled to particular resources because the society has decided that the behavior is appropriate. The society may implicitly or explicitly determine the acceptability of individuals receiving certain property rights due their perception of the ideal society. These specifications of property rights and social norms may affect the ownership of certain assets by males and females, which can potentially influence power relations in the household through external channels.

#### **D. Economic Features and Household Dynamics in Indonesia**

The insights offered by the literature shed light on husbands' and wives' investment strategies and bargaining positions. In this section, I will present an analysis of how key economic and societal features in Indonesia potentially influence economic interactions of husbands and wives. First, I will begin my analysis by briefly describing Indonesia's economy, emphasizing the gender differences in the economy. Second, I will examine the dynamics of a husband and wife within the household.

The economic conditions in Indonesia are typical of many of the developing countries in East Asia and the Pacific countries. Its GNP per capita in terms of U.S dollar was 580 in 1999. In addition, 70 percent of children under age 5 experienced malnutrition, compared to only 13 percent in East Asia and the Pacific in 2000.<sup>3</sup> However, the percent of labor force participation in Indonesia is 2.5 compared to 1.4 percent in other East Asian and Pacific countries. The illiteracy rate in 2000 was 4 percentage points higher in Indonesia than in other East Asian and Pacific countries.<sup>4</sup> Moreover, 19 percent of Indonesian adult females were illiterate in 1999, while only 9 percent of Indonesian adult males were. Females only make up 41 percent of the labor force in Indonesia and more Indonesian males participate in the industrial sector than females do, which reflects differences in sectoral allocations.

In relation to the discussion in the former section, Indonesia's key economic features can play a major role in structuring Indonesian household dynamics by influencing husbands' and wives' "voice." It is reported that females tend to have an equal "voice" in decisions regarding how important household matters will be settled, especially in decisions about the control of

---

<sup>3</sup> The World Bank Organization's definition of child malnutrition is the percentage of children under age 5 whose weight for their age is less than minus 2 standard deviations from the median of the reference population.

household resources (Williams 1990, 35). Linda Williams (1990, 35) reports that Indonesian males and females cooperate considerably in making household decisions. Both males and females are engaged in some economic activities, such as agriculture and handicraft production. Furthermore, Ranta Saptari (2000, 13) indicate that most females' "voice" have limitations in other domains of family decisions. For instance, it is reported that most females lack "voice" regarding their family size (Williams 1990, 34).

Linda Williams (1990) describes marriage under the *adat* as a ritual which symbolizes the passing from both the man's and the woman's state of celibacy to the marital one. The determination of marriage is based on how well it will benefit the two families, not on the preferences of the potential spouses. In addition, marriage tends to be viewed as a duty, for which females must prove themselves worthy as a wife and mother and males must prove themselves worthy as a provider and father. If an individual proves to be worthy and decides to separate, all the possessions brought to the marriage by each spouse remain with his or her respective family. Property acquired during the marriage is typically split so that the wife receives one third of its value, while her husband receives two thirds (Williams 1990, 36).

### **E. Conclusion**

The present review of the literature illustrates how economic institutions that are influenced by gender can possibly affect the economic activities and interactions of husbands and wives. More importantly, the economic environment beyond the household may potentially influence the dynamics within the households by constraining husbands and wives differently. The following sections will provide a theoretical model and empirical analysis which permits formal testing of

---

<sup>4</sup> Data was collected from the World Bank Organization on the access date of 4/10/02. The website URL is <http://www.worldbank.org>.

these assertions. This investigation is useful for an understanding of how economic and social structures affect the intrahousehold decision-making process.

### **III. Theoretical Framework of Household Dynamics**

The bargaining process thus generates intersecting contractual relationships between different household members, specifying their rights and obligations to each other, as the basis of household cooperation (Kabeer 1994, 109).

According to the above statement, a bargaining theoretical framework provides a representation of how household members that are interdependent on one another cooperate as a unit through the establishment of different bargaining relationships. In this section, I formulate how husbands' and wives' ownership of human capital, physical capital, and precautionary savings can potentially influence bargaining positions in the household by changing their interdependence on each other. Beginning with the marital bargaining theory set forth by Manser and Brown and McElroy and Horney, I present my marital bargaining framework that incorporates human capital, physical capital, and precautionary savings into the analysis through individuals' threat points. I also derive the demand functions and comparative statics of husbands' and wives' health expenditure, which provides important theoretical implications for my empirical analysis.

Before I present my marital bargaining model, I would like to provide two important reasons for the inclusion of human capital, physical capital, and precautionary assets in husbands' and wives' threat points. The first reason is that human capital, physical capital, and precautionary assets are major components of each individual's wealth portfolio and threat point. Human and physical capital are viewed as personal investments that increase an individual's future productivity and earnings (Miller and Watts 1967, 375). Alternately, precautionary assets serve as a suitable mechanism to preserve individual's potential earnings in times of financial emergencies.

The second reason is that human capital, physical capital, and precautionary assets as separate determinants of the threat point, allow us to more comprehensively consider how different economic markets and social boundaries may affect husbands' and wives' bargaining positions. With the inclusion of these investments, we allow husbands' and wives' threat points to be influenced by a wider variety of economic and social factors.

Consider a household, composed of a husband and a wife that bargains over the terms of a binding agreement specifying each individual's consumption. I assume that husbands and wives have the same preferences over their own consumption patterns and time allocation between leisure and labor. I also assume that husbands and wives have similar risk preferences.

I denote the levels of human and physical capital of adult  $i$  in a period as  $h_i, k_i$  where  $i = m, f$ . In addition, I denote  $j_i$  as the level of precautionary assets of adult  $i$ . The wealth rate is an increasing strictly concave function of precautionary assets, human, and physical capital:  $\theta_i = \theta(h_i, k_i, j_i)$ .

The components of the wealth portfolio are carefully described by the following definitions and characteristics. First, I define human capital as factors of production that are "embodied" within an individual. Education, work experience, and personal nutrition are typical forms of human capital. Human capital tends to be quite mobile in the sense that it typically moves with you. It is also virtually useless as collateral. Furthermore, human capital has uncontestable asset returns, low convertibility, and steady long-run returns.

Second, I define physical capital as factors of production that are physically used by individuals. Land, tractors, houses, and large animals serve as examples of physical capital. The main traits of physical capital are moderate liquidity, highly contestable asset returns, and usefulness as collateral. Physical capital also has limited mobility and durability.

Last, I define precautionary assets as assets that provide a source of wealth to individuals during financial downturns. I conceptualize precautionary assets to be used if the individual's possessions of human and physical capital are inappropriate for the circumstances. Even though precautionary assets do not directly increase production, they tend to assist in maintaining individual's human capital and physical capital at a productive level in case of an emergency. Jewelry, social capital, small animals, and ceremonial goods are examples of precautionary assets. Precautionary assets are typically liquid, highly mobile and only moderately useful as collateral.

### A. Endogenous Threat Points

In order to construct the marital bargaining model, the derivations of husbands' and wives' threat points are needed first. I begin deriving husbands' and wives' threat points through the maximization of each husband's and wife's utility function subject to their respective budget constraint. Then, I derive each individual's indirect utility function by solving for each individual's optimal level of goods as a function of prices and assets, and plugging them into their respective utility functions. These indirect utilities are simply husbands' and wives' threat points, which represent their utilities if a divorce occurs.

The von Neumann-Morgenstern preferences of the individual are represented as  $U_i(X_i)$  which is the function of private consumption of  $x$  goods of an adult of sex  $i$  where  $i = m, f$ . Neither leisure and work time nor household public goods are considered in this simple model. I also do not restrict the prices husbands and wives face to simply to be equal.

Using the Lagrangian maximization technique, the first-order conditions of each individual's utility functions are shown below:

$$\max_{x_m, x_f} L = U_i(x_i) + \lambda[\theta(h_i, k_i, j_i) - x_i p_i] \quad (1)$$

Husbands

$$\frac{\partial L}{\partial x_m} = \frac{\partial U_m}{\partial x_m} - \lambda p_m = 0 \quad (2)$$

$$\frac{\partial L}{\partial \lambda} = \theta_m(h_m, k_m, j_m) - x_m p_m = 0 \quad (3)$$

Wives

$$\frac{\partial L}{\partial x_f} = \frac{\partial U_f}{\partial x_f} - \lambda p_f = 0 \quad (4)$$

$$\frac{\partial L}{\partial \lambda} = \theta_f(h_f, k_f, j_f) - x_f p_f = 0 \quad (5)$$

Now, we express individual optimal levels of goods as functions of prices and assets, and enter them into each individual's respective original utility. This process lead to male's and female's threat points, which are functions of respective prices and assets.

$$V_m = V_m(p_m, h_m, k_m, j_m) \quad (6)$$

$$V_f = V_f(p_f, h_f, k_f, j_f) \quad (7)$$

The threat points of males and females represent the utility obtained independent of cooperating in the marriage.

## B. Basic Model

The Nash cooperative bargaining model for a two-person household is described as follows:

$$\text{Maximize}_{x_m, x_f} [U_m(x_m) - V_m(p_m, h_m, k_m, j_m)] \bullet [U_f(x_f) - V_f(p_f, h_f, k_f, j_f)]$$

subject to

$$x_m p_m + x_f p_f = \theta_m(h_m, k_m, j_m) + \theta_f(h_f, k_f, j_f) \text{ and } U_i > V_i$$

where

$i = m, f$

$V_i(p_i, h_i, k_i, j_i)$  = individual's threat point

$x_i$  = vector of goods

$p_i$  = market price vector of consumption

$\theta_i = \theta(h_i, k_i, j_i)$  = individual's function of wealth.

### C. Solutions

According to the Lagrangian maximization technique, the first-order necessary condition of the Nash bargaining problem lead to the following solutions:

$$L = [U_m(x_m) - V_m(p_m, h_m, k_m, j_m)] \bullet [U_f(x_f) - V_f(p_f, h_f, k_f, j_f)] + \lambda [\theta_m(h_m, k_m, j_m) + \theta_f(h_f, k_f, j_f) - x_m p_m - x_f p_f]$$

$$\frac{\partial L}{\partial x_m} = \frac{\partial U_m}{\partial x_m} \bullet [U_f(x_f) - V_f(p_f, h_f, k_f, j_f)] - \lambda p_m = 0 \quad (8)$$

$$\frac{\partial L}{\partial x_f} = \frac{\partial U_f}{\partial x_f} \bullet [U_m(x_m) - V_m(p_m, h_m, k_m, j_m)] - \lambda p_f = 0 \quad (9)$$

$$\frac{\partial L}{\partial \lambda} = \theta_m(h_m, k_m, j_m) + \theta_f(h_f, k_f, j_f) - x_m p_m - x_f p_f = 0 \quad (10)$$

To satisfy the traditional second order sufficient conditions, the Hessian bordered matrix needs to be negative definite. In order to determine whether this Hessian bordered matrix is negative definite, we can simply evaluate whether the determinant of this matrix is greater than zero (Silberberg 1990, 175).

$$H = \begin{bmatrix} L^{x_m x_m} & L^{x_m x_f} & -g^{x_m} \\ L^{x_f x_m} & L^{x_f x_f} & -g^{x_f} \\ -g^{x_m} & -g^{x_f} & 0 \end{bmatrix} \quad (11)$$

In the above Hessian bordered matrix, I denote  $g$  to represent the following equation:  $\theta_m(h_m, k_m, j_m) + \theta_f(h_f, k_f, j_f) - x_m p_m - x_f p_f$ . Using Cramer's rule, the calculation for the determinant of the Hessian matrix is illustrated below.

$$|H| = \begin{vmatrix} L^{x_m x_m} & L^{x_m x_f} & -g^{x_m} \\ L^{x_f x_m} & L^{x_f x_f} & -g^{x_f} \\ -g^{x_m} & -g^{x_f} & 0 \end{vmatrix} = L^{x_m x_m} \begin{vmatrix} L^{x_f x_f} & -g^{x_f} \\ -g^{x_f} & 0 \end{vmatrix} - L^{x_m x_f} \begin{vmatrix} L^{x_f x_m} & -g^{x_f} \\ -g^{x_f} & 0 \end{vmatrix} - g^{x_m} \begin{vmatrix} L^{x_f x_m} & L^{x_f x_f} \\ -g^{x_f} & -g^{x_f} \end{vmatrix} \quad (12)$$

Under the assumption of diminishing marginal utilities for males and females  $L_{x_m, x_m} < 0$  and  $L_{x_f, x_f} < 0$  exists, the determinant of the Hessian matrix is positive. Thus, the Hessian matrix is negative definite.

This maximization subject to the full joint budget constraint yields the following demand functions for food, health, education, and etc.,  $X^*$ :

$$X_m = X_m^*(p_m, p_f, h_m, h_f, k_m, k_f, j_m, j_f) \quad (13)$$

$$X_f = X_f^*(p_f, p_m, h_f, h_m, k_f, k_m, j_f, j_m) \quad (14)$$

$$\lambda = \lambda^*(p_f, p_m, h_f, h_m, k_f, k_m, j_f, j_m) \quad (15)$$

These demand functions not only include prices, but also the investments of both individuals. This illustrates how husbands' assets can affect their own demand functions and their wives' demand functions, and vice versa for wives.

Not only does the theoretical bargaining framework tells us what variables belong in the demand expenditure functions, it also reveals the theoretical relationships between the demand expenditure functions and their corresponding wealth-related variables through the mathematical methodology of comparative statics. In this analysis, the comparative statics illustrates theoretically how husbands' and wives' health demand functions change, given a one-unit change in human capital, physical capital, and precautionary assets.

To formally present the theoretical relationships between husbands' and wives' wealth-related variables and their health demand functions, we simply derive the comparative statics for human capital, physical capital, and precautionary assets,  $\partial X^*/\partial \gamma_i$ , where  $i$  denotes either husband or wife and  $\gamma$  denotes human capital, physical capital or precautionary assets.

We begin our derivations of these comparative statics by substituting the husband's and wife's demand functions and the marginal utility of income presented above into the first-order condition equations. This substitution yields the following identities:

$$U_{x_m}(X_m^*, X_m^*, p_m, p_f, h_m, h_f, k_m, k_f, j_m, j_f) + \lambda g_{x_m}(X_m^*, X_m^*, p_m, p_f, h_m, h_f, k_m, k_f, j_m, j_f) = 0 \quad (16)$$

$$U_{x_f}(X_m^*, X_m^*, p_m, p_f, h_m, h_f, k_m, k_f, j_m, j_f) + \lambda g_{x_f}(X_m^*, X_m^*, p_m, p_f, h_m, h_f, k_m, k_f, j_m, j_f) = 0 \quad (17)$$

$$g(X_m^*, X_m^*, p_m, p_f, h_m, h_f, k_m, k_f, j_m, j_f) = 0 \quad (18)$$

Since we are interested in changes in the health demand functions of husbands and wives as husbands' and wives' human capital, physical capital, and precautionary assets change, we differentiate the above identities with respect to each individual's asset. As a result of the differentiation, I can present the below matrix equation where  $\gamma$  denotes human capital, physical capital and precautionary assets and  $i = m, f$ :

$$\begin{pmatrix} L_{x_m x_m} & L_{x_m x_f} & -g_{x_m} \\ L_{x_f x_m} & L_{x_f x_f} & -g_{x_f} \\ -g_{x_m} & -g_{x_f} & 0 \end{pmatrix} \begin{pmatrix} \frac{\partial X_m^*}{\partial \gamma_i} \\ \frac{\partial X_f^*}{\partial \gamma_i} \\ \frac{\partial \lambda^*}{\partial \gamma_i} \end{pmatrix} = \begin{pmatrix} -L_{x_m \gamma} \\ -L_{x_f \gamma} \\ g_\gamma \end{pmatrix}$$

Using Cramer's rule, a change in husbands' health expenditure, given one-unit change in the value of their husbands' assets equals the following expression:

$$\frac{\partial X_m^*}{\partial \gamma_m} = \begin{vmatrix} -L_{x_m \gamma} & L_{x_m x_f} & -g_{x_m} \\ -L_{x_f \gamma} & L_{x_f x_f} & -g_{x_f} \\ g_\gamma & -g_{x_f} & 0 \end{vmatrix} \bullet |H^{-1}|$$

The theoretical relationship of husbands' assets on their health demand expenditure are positive, since  $|H| > 0$ ,  $g_\gamma$  always  $> 0$  and diminishing marginal utilities exist. In addition, a change in wives' health outcome given a one-unit change in the value of their assets also equals

$$\frac{\partial X_f^*}{\partial \gamma_f} = \begin{vmatrix} L_{m^x f} & -L_{m\gamma} & -g_{m^x} \\ L_{f^x f} & -L_{f\gamma} & -g_{f^x} \\ -g_{x_f} & -g_\gamma & 0 \end{vmatrix} \bullet |H^{-1}|$$

Similar to the comparative statics for husbands, the expected signs of wives' wealth related explanatory variables on their health outcome are for the same reasons as husbands.

Guided by our intuition, we can be certain that these mathematical relationships are consistent with household bargaining theory. First, our intuition tells us that an individual's wealth-related variables have positive relationships with his or her health expenditure. A change in the value of an individual's wealth-related variables increases his or her threat point as well as weaken his or her spouse's threat point. With a higher threat point, the individual has more bargaining power, which leads to a higher level of household health expenditure. Second, our intuition indicates that an individual's wealth related variables have inverse relationships with his or her spouse's threat point. For instance, an increase in the value of an individual's wealth-related variable increase his or her threat point, which raise his or her bargaining power. With a higher bargaining position, the individual has a stronger "voice" in the household and acquires a relatively larger share of household health expenditure, and hence lowers his or her spouse's share of household health expenditure.

#### **D. The Empirical Implications**

The theoretical bargaining framework presents us with two major empirical implications. The first implication is that husbands' and wives' health demand functions consist of both of their assets and prices. The second implication is that an individual's health outcome should increase as the value of their assets increases. In addition, his/her health outcome should decrease as the value

of their spouse's asset increases. In the empirical section, I attempt to investigate whether the second theoretical implication typically holds true.

Specifically, the expected signs of these comparative statics correspond directly to statistical relationships between wealth-related variables and health demand functions of husbands and wives in the empirical analysis. In the empirical section, we should expect the marginal effect estimates of husbands' wealth-related variables with respect to their own demand functions to be positive, which corresponds with our comparative statics. In addition, we should expect the marginal effect estimates of husbands' wealth-related variables in relation to their spouses' demand functions to be negative. These relationships between the marginal effects estimates and the comparative statics correspond in a similar matter for wives. Table 1 and 2 provide clear illustrations of the expected relationships between wealth-related variables and health demand functions of husbands and wives. In the empirical section, I will apply my theoretical bargaining framework by empirically testing the effects of husbands' and wives' assets on their share of household health expenditures in Indonesia.

#### **IV. Data Analysis and Empirical Methods**

This section will summarize the data used, model selection, and empirical specifications. I will begin with a description of the data and possible biases in the collection that may affect the results of the econometric analysis. Second, I will describe the model selected to analyze the bargaining positions of husbands and wives in Indonesia. Finally, I will describe the variables I chose to include in the models.

##### **A. Data Analysis**

The present analysis uses a continuing longitudinal socioeconomic and health survey, the Indonesia Family Life Survey, collected by the Rand Corporation. The Indonesia Family Life

Survey (IFLS) is a sample representing about 83% of the Indonesian population living in 13 of the nation's 26 provinces. Moreover, the survey collects data on individual respondents, their families, their households, the communities in which they live, and the health and education facilities they use.

The data currently consists of two waves of the survey conducted in 1993 and 1997. The first wave (IFLS1) was administered in 1993 to individuals living in 7,224 households. Four years later, 94% of the same households were interviewed again in the Indonesia Family Life Survey 2 (IFLS2)<sup>5</sup>.

In the present analysis, Indonesia Family Life Survey 2 is used. In the Indonesia Family Life Survey 2, household-level data is provided containing information on each household's socioeconomic outcomes, nonlabor and labor incomes, and production activities. In order to complement the household-level data and gain a better understanding of intrahousehold dynamics, the household questionnaires also included information about each individual's educational and marital histories, asset ownership and nonlabor income, insurance coverage, health conditions, and household decision-making processes. The total number of household-level observations in the data is 7,237 with over 20,000 individual-level observations.

I use data that pertains to the health outcomes of husbands and wives, husbands' and wives' share of economic resources, individuals' demographics, and regions in Indonesia.

I restrict my analysis to a subsample composed of household heads and spouses. There is one main reason for this restriction which is that the inclusion of other family members complicates the modeling of the marital bargaining process immensely. In my theoretical framework, the exclusion of additional family members from the marital bargaining analysis

allows us to focus on how husbands' and wives' investments affect their own and their spouse's bargaining positions.

In order to construct a sample of homogenous households, my sample consists only of households with one male head and one female spouse. My sample also only reflects households in which husbands are heads of the households. Furthermore, my sample age distribution ranges between the ages of 20 and 65 because extreme cases of health outcomes may be correlated with younger and, particularly, older individuals. In consequence of this process, my sample represents 4,615 households with relatively homogenous health outcomes and household structures.

### Data Biases



Figure 1

The conclusions drawn from my econometric analyses must be considered in light of both the methods of data collection and sampling of individuals. In the Indonesia Family Life Survey, the sample does not fully represent the population distribution of Indonesia. First, only 13 provinces of Indonesia's 26 provinces, which are shown in figure 1, are included in the IFLS2 sample. Second, the Indonesia Family Life Survey 2 sampled more urban and rural households in provinces other than Java, which contributes a large portion of Indonesia's population. We need to

---

<sup>5</sup> The IFLS2 data survey can be accessed on the website: <http://www.rand.org/labor/FLS/IFLS/index.html>.

be a little skeptical about establishing conclusions that pertain to all husbands and wives in Indonesia.

In addition, the Indonesia Family Life Survey 2 may have obtained biased household- and individual-level data by only interviewing the head of the households. In the survey, the household head reports his possession of economic resources and his spouse's possession of economic resources. This may cause the data to be biased because the household head may have based his answers on his perception of economic resources possessed by him and his spouse. The husband may have also exaggerated his possessions relative to his wife's to appear wealthier or more powerful or just simply out of embarrassment. Hence, the actual possession of economic resources for some husbands and wives may not be correctly represented in the sample.

## **B. Empirical Methodology**

In this section, I present the model that will be used in my analysis. A probability analysis of the individual and relative marital health outcomes is performed using the ordered-probit estimation procedure. The use of this econometric method is an attempt to analyze and understand the impact of males' and females' investments on their individual health outcomes and relative marital health outcomes.

### Ordered-Probit Estimation Analysis

#### *Equation 1*

Headhealth Spousehealth Relativehealth = f(head price, spouse price, head human capital, spouse human capital, head physical capital, spouse physical capital, head precautionary assets, spouse precautionary assets)
--

As a result of my health dependent variables having several rankings, the ordered-probit estimation analysis was chosen to estimate how each of the explanatory variables affects the

dependent variables at each health status ranking. For the ordered-probit estimation analysis, the individual and relative health outcomes of husbands and wives serve as the dependent variables representing household health expenditure. In Section III, I demonstrate that husbands' and wives' demand functions not only depend on their assets and prices, but on their respective spouse's assets and prices. The basic demand specifications of husbands' and wives' assets and prices on their health outcomes are represented in equation 1.

Unlike the ordinary least-square coefficient estimation, estimates obtained through the use of ordered-probit estimation procedure cannot be interpreted simply as the direct effect of one unit change in the explanatory variable on the dependent variable. Moreover, the marginal effects of explanatory variables need to be constructed for each ranking in order to interpret the ordered-probit estimation results. The ordered-probit marginal effect estimates indicates how the probability of a particular ranking of the dependent variable changes, given a one-unit change in the value of the corresponding explanatory variable.

In addition to being different from least-square estimates, the calculations of the probabilities of certain outcomes occurring and the marginal effect estimates for an ordered-probit analysis are also different from those calculated in a probit analysis. Intuitively, the probit marginal effect estimates represent the change in the probability of moving from one outcome to another outcome as a result of a unit change in the value of an explanatory variable. However, the marginal effect estimates for an ordered-probit analysis simply represent a change in the probability of being in one outcome given a unit change in the value of an explanatory variable.

The mathematical calculations of the probabilities and marginal effect estimates for an ordered-probit analysis are presented below.<sup>6</sup> Assuming the error to be normally distributed across all observations, we can derive the following probabilities:

$$\text{Prob(Health} = 1) = \phi(-\beta'x)$$

$$\text{Prob(Health} = 2) = \phi(\mu_1 - \beta'x) - \phi(-\beta'x)$$

$$\text{Prob(Health} = 3) = \phi(\mu_2 - \beta'x) - \phi(\mu_1 - \beta'x)$$

$$\text{Prob(Health} = 4) = \phi(\mu_3 - \beta'x) - \phi(\mu_2 - \beta'x)$$

where  $\mu$ 's are unknown parameters to be estimated with  $\beta$ . The marginal effects of the explanatory variables,  $x$ , are calculated using the equation:

$$\frac{\partial \text{Pr ob}(y = j)}{\partial x}$$

where  $j$  represents the health outcome, ranging between 1 and 4.

### Variables Specification

Health outcome is reported as an ordered variable; it is given a value of one if the individual reports to be very unhealthy in the current year, a value of two if the individual reports to be unhealthy, a value of three if the individual reports to be healthy, and a value of four if the individual reports to be very healthy. The relative health outcome is also measured as an ordered variable which has values ranging between -3 and 3. It is simply defined as the difference between the husband's and wife's health outcomes. The relative health outcome is given a value of -3 if the wife's reported health outcome is 4 (the highest value) and the husband's reported health outcome is 1 (the lowest value), a value of 0 if the reported health outcomes of husband and wife are equal

---

<sup>6</sup> Greene (2000) provides a detailed analysis of ordinal estimation procedure, especially ordered probit in Section 19.8 in *Econometric Analysis*.

values, and a value of 3 if the husband's reported health outcome is 4 (the highest value) and the wife's reported health outcome is 1 (the lowest value).

### Measures of assets and other explanatory variables

The aim of the present analysis is to examine the impact of human and physical capital and precautionary assets on married individuals' and their relative marital health outcomes in the household. Therefore, the household assets in the sample are divided into three categories of investment portfolios using the criteria discussed in Section III. The first variable represents the value of physical capital owned by husbands and wives. The calculation of physical capital value is the division of the total reported value of multiple physical assets by the reported share ownership of the physical assets. The physical capital category consists of values for farm assets, nonfarm assets, houses, other buildings, farm land, livestock, and vehicles.<sup>7</sup> The justification for this particular group of assets is that each of these assets has the primary purpose of being used as physical factors of production.

The second variable represents human capital possessed by the household head and spouse, which is measured as the highest level of individual educational attainment. The human capital variable is a discrete variable measured in years ranging between the values of 0 and 16; it is given a value of 6 if the individual completed primary school, a value of 9 if the individual completed junior high school, a value of 12 if the individual completed senior high school, and a value of 16 if the individual completed college.<sup>8</sup> Educational attainment serves as a suitable proxy for human

---

<sup>7</sup> The classification of farm assets is composed of land, plants, animals, tractors, heavy equipment, and small tools. In addition, the classification of nonfarm assets is composed of motor vehicles, boats, other vehicles, nonfarm equipment, supplies and merchandises, and off-season equipment.

<sup>8</sup> In the sample, several individuals repeated a grade and/or participated in a particular school level more than one time without graduating to the next school level. I only assigned a year of education for a completed year of education.

capital because education is typically positively correlated with personal knowledge and experience, nutrition, and skills.

The third variable represents the value of precautionary assets owned by the household head and his spouse, which is computed similarly to the physical capital variable. The precautionary asset category is composed of household appliances, savings, receivables, jewelry, and household furniture. The rationale for the particular construction of the precautionary asset variable is that each of these assets has no productive use and provides a reserve against adverse outcomes. For instance, Guyer (1997) discusses how diamonds can serve as wives' personal jewelry. However, a diamond can also serve as storage of past wealth that will be consumed in the future if necessary.

Prices of husbands' and wives' health expenditures are also major elements in the marital bargaining framework. Health insurance coverage serves as a proxy for the price of health care in my analysis. The reason for this particular proxy of health care price is that the IFLS survey does not provide information about the price of health care. Hence, we assume that an individual who possesses health insurance pays a lower price for health care than an individual who does not possess health insurance. As a raw proxy for health price, I can control for the impact of health care price on individual and relative health outcomes with this dichotomous variable representing insurance.

In the statistical summary table 3, the mean value, standard deviation, and median value of husbands' and wives' health outcomes and assets are provided. The summary table 3 illustrates a general pattern that males in Indonesia on average possess more human and physical capital and precautionary assets than females. The table also indicates that the health outcomes of males and females are, on average, the same. Nevertheless, the percentage of males possessing health

insurance coverage (17.2%) is higher than the percentage of females covered by health insurance (11.5%).

Besides the inclusion of assets and health care prices in my analysis, it is also important to control for inherent differences among individuals, households, and regions. I control for age, rural regions, provinces, and religions. In table 4, I provide a brief description of each variable controlling for age, rural regions, provinces, and religions. Age is a discrete variable with yearly intervals. The regional and religious explanatory variables are dichotomous variables.

Controlling for the age of males and females is an attempt to examine the impact of personal knowledge and skills acquired through life experience on individual and relative health outcomes. Through the processes of learning- by-doing, working various jobs, and living in his environment, an individual obtains knowledge about how to produce and save more efficiently. The level of these tools possessed generally increases as an individual grows older. Therefore, age serves as a measurement for human capital that can be obtained only through life lessons.

On the other hand, age is typically linked to an individual's health outcome. Generally, we expect the health condition of old individuals to be lower than for young individuals because the human body depreciates with time. Thus, it is also reasonable to assume that an individual's health status tends to be inversely correlated with his or her age.

Regional differences can influence individual health conditions and the type and share of investments an individual owns in the marriage. Regions in Indonesia may differ with respect to the levels of wealth, major religions, major ethnicities, laws, farmland sizes, and population distributions based on age and sex. Duncan Thomas (2000) believes that Java, Bali, and Sumatra are quite different from the rest of the Indonesia in his use of IFLS1 because women tend to possess more relative bargaining power through possession of premarital assets. Therefore, in this

analysis, regional differences will be represented as 13 dichotomous variables of the 13 provinces in the original sample. Each dichotomous variable is given a value of one if the household resides in that province and a value of zero if the household resides in other provinces.

Other explanatory variables attempt to examine the effects of household religious beliefs on health outcomes. Certain religions may promote different value systems about ownership of assets and distribution of household economic resources. Furthermore, religion may define males' and females' places in their society, which may lead them to certain investment behavior and health outcomes.

In table 5, the mean value, standard deviation, and median value of each control explanatory variable are presented for husbands and wives. On average, husbands in my sample are four years older than their wives. In the table, we also find that 51.74 percent of the households in this sample reside in Indonesia's urban regions. This finding complies with the original study design criteria of providing an equal representative sample of urban and rural regions. Only about 40 percent of the households also live in the province of Java. Aside from the province of Java, the provinces of North Sumatra and Jakarta each represent approximately 7 percent of the sample of this analysis. Moreover, the most dominant religion for Indonesian households is Islam, distantly followed by Hinduism.

## **V. Empirical Results**

In this section, I present my empirical results of the theoretical bargaining framework using the ordered-probit estimation procedures. The empirical results of individuals' and relative marital health outcomes from the ordered-probit analysis will be presented. The econometric estimation

method attempts to analyze and understand the impact of husbands' and wives' investments on their personal health outcomes and relative marital health outcomes.

At the beginning of my empirical analysis, I test whether the sample should be pooled or divided into rural and urban categories. Using the likelihood test ratio, I cannot reject the null hypothesis that the sample should be pooled at a significance level of .10 for any of my demand specifications. Hence, the empirical results in this section reflect the pooled sample.

#### Ordered-Probit Estimation Results of the Basic Demand Specifications

In the present section, I will present only the marginal effect estimates of husbands' and wives' basic demand specifications. I find that coefficient estimates for both estimation analyses rarely change with respect to their level of significance and their values' magnitude when we control for age, regional differences, and religious differences. Therefore, I provide only the coefficient estimates of husbands', wives', and relative marital full demand specifications along with the basic demand specifications in tables 6-8.

In table 9, the marginal effects of one-unit value change on the probabilities of husbands existing in each health status given their own and their spouse's assets and health care prices are presented. First, the marginal effects of husbands' assets on the probabilities of each health outcome correspond with my expectations of asset-ownership improving their health status. However, only husbands' physical capital has a statistically significant effect on the probabilities of husbands' health status being healthy or unhealthy. The marginal effect of a one-standard deviation change in husbands' physical capital on the probability of being not very healthy is interpreted as a 0.525 percentage points decrease in the probability of husbands being not very

healthy at significant level of .10.<sup>9</sup> In addition, a one standard deviation change in the value of husbands' physical capital significantly increases the probability of husbands being healthy by 0.648 percentage points.

In figure 2, I illustrate graphically how much a one standard deviation increase in the value of husbands' human capital, physical capital, and precautionary assets may cause the probability of husbands being in each health outcomes to differ from the baseline probability of husbands being in each health outcome. The general pattern of husbands' three wealth-related variables is that the probability of husbands being unhealthy decreases as the value of husbands' wealth-related variables increases. In addition, we observe that a one-standard deviation increase in husbands' wealth-related variables corresponds with an increase in the probabilities of being healthy and very healthy. Hence, husbands' wealth-related variables have positive relationships with their own health outcomes.

Second, the marginal effects of wives' assets on the probabilities of each health outcome, except for physical capital, correspond with my expectations of spouses' asset-ownership decreasing their husbands' health status. In table 9, wives' precautionary assets and human capital have statistically significant effects on the probabilities of husbands' health status being healthy or unhealthy. The marginal effect of wives' human capital on the probability of husbands being healthy suggests that a one-standard deviation increase in education for wives causes a 2.8 percentage point decrease in the probability of males being healthy.

In figure 3, I provide a graphical representation of how much a one standard deviation increase in the value of wives' human capital, physical capital, and precautionary assets may cause

---

<sup>9</sup> One U.S. Dollar equals 3570.15 Indonesian Rupiahs in November 20, 1997. The currency exchange was accessed on [www.economists.com/markets/currency](http://www.economists.com/markets/currency) on April 19, 2002.

the probability of husbands being in each health outcomes to differ from the baseline probability of husbands being in each health outcomes. We can observe that one standard deviation increases in the value of wives' human capital and precautionary assets increases the probability of their husbands being unhealthy and very unhealthy and also decreases the probability of their husbands being healthy and very healthy. Both patterns of marginal effects estimates are consistent with my theoretical expectations of a negative relationship between husbands' health outcomes and wives' wealth-related variables. The graph also indicates that wives' physical capital is inconsistent with the theoretical expectations in section IV; however, this result does not have a statistically significant effect on husbands' health outcomes as shown in table 9.

In tables 10, the marginal effect estimates of one-unit change in husbands' and wives' assets on wives' health demand function are presented. The marginal effects of husbands' assets on wives' health outcome probabilities confirm my expectation of spouse's asset-ownership decreasing their wives' health status. However, none of the variables representing husbands' assets and insurance prices have a significant effect on the probabilities on wives' four health outcomes at level of .10.

In figure 4, the graph illustrates how much a one standard deviation increase in the value of husbands' human capital, physical capital, and precautionary assets may cause the probability of wives being in each health outcome to differ from the baseline probability of wives being in each health outcome. The general pattern of these marginal effect estimates of husbands' wealth-related variables on wives' health outcomes is consistent with my theoretical expectations, which indicate that the relationships between husbands' wealth-related variables and wives' health status are inverse.

On the other hand, the marginal effects of wives' assets on the probabilities of each health outcome, except for precautionary assets, does not correspond with my expectations of asset-ownership improving their health status. Only physical and human capital of wives have significant effects on their probabilities of being in each health category. A one standard deviation increase in education for a wife causes a 5.05 percentage point increase in the probability of a wife being not very healthy and a .873 percentage point decrease in the probability of a wife being healthy at significance level of .10. The probability of a wife being healthy decreases .111 percentage points, given a one standard deviation change in their value of physical capital.

In figure 5, the graph illustrates how much a one standard deviation increase in the value of wives' human capital, physical capital, and precautionary assets may cause the probability of wives being in each health outcome to differ from the baseline probability of wives being in each health outcome. The general patterns of human capital and physical capital are inconsistent with my theoretical expectations of wives' human capital and physical capital improving wives' health outcomes. Conversely, the positive statistical relationship between wives' precautionary assets and their health outcomes is supported by my theoretical expectations. We must also keep in mind that these marginal effects are relatively small compared to their effects on husbands' health outcomes.

#### Ordered-Probit Estimation Results of the Relative Health Demand Specification

In tables 11a and 11b, I provide the marginal effects of a one-unit change in the value of individual's assets and prices on the married couples' relative health outcomes. The marginal effects of husbands' assets on the married couples' relative health outcome probabilities confirm my expectation of husbands' asset-ownership decreasing their wives' health status. However, none of the variables representing husbands' assets and insurance prices have a significant effect on the probabilities on relative four health outcomes at level of .10.

On the other hand, the marginal effects of wives' wealth-related variables, except for physical capital and insurance price, correspond with my theoretical expectations of asset-ownership improving her health status relative to their husbands. In addition, only wives' human capital and physical capital have significant effects on the probabilities of the relative health outcomes. When wives have higher health outcomes than their husbands, their marginal effect of human capital estimates increase the probability of wives' having a relatively higher health outcome than their husbands. Even though the marginal effect estimates of wives' physical capital is significant, the general pattern contradicts the theoretical relationship in Section III.

## **VI. Conclusion and Policy Implications**

The present article analyzes how the role of assets in the context of an intrahousehold framework can be a bridge between the literatures of household economics and developmental economics. In the beginning of this article, I presented a literature review that provides further insight to how the dynamics of developing economies are closely related to household dynamics in the context of gender, assets, and economic and social institutions. Guided by the survey of both literatures, I incorporate endogenous threat points in the marital bargaining framework, and specify three important wealth-related variables in the threat points. With this marital bargaining framework, household decision-making processes are linked to the institutional structures of and changes in developing countries because economic and social parameters can influence the nature and use of husbands' and wives' assets, and hence, both their threat points and bargaining positions. I empirically apply my theoretical bargaining framework toward Indonesia by testing whether the three wealth-related variables in the hands of husbands and wives affect both of their shares of household health resources. I find that my theoretical bargaining framework has empirical validity

that is consistent with the household economic literature and various economic policies. More importantly, I find systematic differences in the way that certain assets held by husbands versus wives influences household decision outcomes, which illustrates how economic and social institutions affect household dynamics.

In my empirical analysis, several results are consistent with my theoretical bargaining framework and the past household economic and developmental economic literatures. First, I find that human capital in the hands of wives typically have a statistically significant positive effect on their share of household health expenditure, and a statistically significant negative effect on their spouse's share of household health expenditure. Second, I find that physical capital in the hands of husbands have a statistically significant positive effect on their share of household health expenditure as indicated in table 9. Third, I find that wives' precautionary assets have a statistically significant negative effect on their spouse's share of household health expenditure as indicated in table 9.

Nevertheless, physical capital in the hands of wives is inconsistent with my theoretical bargaining framework by indicating a negative effect on their share of household health expenditure. One possible explanation for this result is that the immobile feature of some physical capital allows only one individual after a divorce to possess them. Thus, an investment in physical capital for wives can lower their threat points relative to husbands if wives possess a certain share of physical capital during the marriage, but not after a divorce. Another possible explanation is that wives might possess the actual assets, but not the returns of the actual assets. In this analysis, I assume that individuals who possess certain assets also receive the return of those assets. However, this assumption may be inappropriate, and the return of wives' assets might strengthen their husbands' threat point and health status.

The present article provide us with two important economic policy implications. The first economic policy implication is that the provision of human capital to wives in the household can possibly increase their marital bargaining position, which strengthen their "voice" in the household. I have illustrated how human capital in hands of wives improve their health status relative to their spouse, but human capital can possibly enhance other aspects of their lives. Moreover, human capital in the hands of wives can possibly lower gender inequality within households by elevating wives' marital bargaining power.

The second policy implication is that effective policies will consider the complexity of the interaction between economic and social institutions and household dynamics in developing countries. To help poor people in developing countries, policymakers must assess how economic, social, political, and cultural institutions constrain and aid husbands and wives. With a clearer assessment, policymakers can advocate appropriate recommendations for an array of issues like gender inequality, poverty, malnutrition, and low educational attainment.

In order for the convergence of these two literatures toward each other to continue, further research needs to occur. My first suggestion of further research is the pursue of how adult children as precautionary assets can be incorporate into the marital bargaining framework. My second suggestion of further research is an investigation of how survey designs can better define the concepts of human capital, physical capital, and precautionary saving and fully incorporate these concepts into a survey. My third suggestion of further research is a dynamic marital bargaining framework that incorporates assets and gender.

## Tables

**Table 1: Expected Signs of Marginal Effect Estimates for Husbands' Health Outcomes**

Variables	Marginal Effects of Husbands' Health Outcomes			
	P=[Health =1]	P=[Health=2]	P=[Health=3]	P=[Health=4]
<b>Husbands</b>				
Insurance Price	-	-	+	+
Precautionary Assets	-	-	+	+
Human Capital	-	-	+	+
Physical Capital	-	-	+	+
<b>Wives</b>				
Insurance Price	+	+	-	-
Precautionary Assets	+	+	-	-
Human Capital	+	+	-	-
Physical Capital	+	+	-	-

**Table 2: Expected Signs of Marginal Effect Estimates for Wives' Health Outcomes**

Variables	Marginal Effects of Wives' Health Outcomes			
	P=[Health =1]	P=[Health=2]	P=[Health=3]	P=[Health=4]
<b>Husbands</b>				
Insurance Price	+	+	-	-
Precautionary Assets	+	+	-	-
Human Capital	+	+	-	-
Physical Capital	+	+	-	-
<b>Wives</b>				
Insurance Price	-	-	+	+
Precautionary Assets	-	-	+	+
Human Capital	-	-	+	+
Physical Capital	-	-	+	+

**Table 3: Summary Table of Husbands' and Wives' Health Outcomes and Assets**

Asset Variables	Husbands			Wives		
	Mean	Standard Deviation	Median	Mean	Standard Deviation	Median
Health Outcome	2.035	0.449	2	2.0296	0.4835	2
Health Price	0.172	0.377	0	0.115	0.3196	0
Human Capital	6.07	4.33	6	5.093	4.04	6
Physical Capital	1.71 x 10 <sup>7</sup>	6.65 X 10 <sup>7</sup>	4.14 x 10 <sup>6</sup>	8,263,329	6.43 x 10 <sup>7</sup>	1,437,500
Precautionary Assets	1,277,646	1.06 x 10 <sup>7</sup>	287,500	882,579.50	3,337,362	250,000

**Table 4: Control Explanatory Variables**

<i>Variables</i>	<i>Specification</i>
age	Discrete variable: Years
drural	Dichotomous variable: 1=rural & 0=urban
dcjava	Dichotomous variable: 1=C. Java & 0=other
dwsumatra	Dichotomous variable: 1=W. Sumatra & 0=other
dnsumatra	Dichotomous variable: 1=N. Sumatra & 0=other
dssumatra	Dichotomous variable: 1=S. Sumatra & 0=other
dlampung	Dichotomous variable: 1=Lampung & 0=other
djakarta	Dichotomous variable: 1=Jakarta & 0=other
dwwjava	Dichotomous variable: 1=W. Java & 0=other
dejava	Dichotomous variable: 1=E. Java & 0=other
dyogak	Dichotomous variable: 1=Yogyakarta & 0=other
dbali	Dichotomous variable: 1=Bali & 0=other
dwns	Dichotomous variable: 1=W. Nusa Tenggara & 0=other
dskali	Dichotomous variable: 1=S. Kalimantan & 0=other
dssulaw	Dichotomous variable: 1=S. Sulawesi & 0=other
dislam	Dichotomous variable: 1=Islam & 0=other
dcath	Dichotomous variable: 1=Protestant & 0=other
dprot	Dichotomous variable: 1=Catholic & 0=other
dbudd	Dichotomous variable: 1=Buddhism & 0=other
dhind	Dichotomous variable: 1=Hinduism & 0=other

**Table 5: Summary Table of Control Explanatory Variables**

Control Variables	Husbands			Wives		
	Mean	Standard Deviation	Median	Mean	Standard Deviation	Median
Age	44.8	10.28	44	39.5102	9.74	39
Rural Regions	0.5174	0.494	1	0.5174	0.494	1
<i>Regions:</i>						
North Sumatra	0.0734	0.2609	0	0.0734	0.2609	0
West Sumatra	0.0477	0.2133	0	0.0477	0.2133	0
South Sumatra	0.0487	0.2153	0	0.0487	0.2153	0
Lampung	0.04152	0.19951	0	0.04152	0.19951	0
Jakarta	0.0785	0.26895	0	0.0785	0.26895	0
West Java	0.1584	0.36515	0	0.1584	0.36515	0
Central Java	0.12815	0.3343	0	0.12815	0.3343	0
East Java	0.14567	0.3528	0	0.14567	0.3528	0
Yogyakarta	0.05183	0.2217	0	0.05183	0.2217	0
Bali	0.058795	0.2353	0	0.058795	0.2353	0
West Nusa Tenggara	0.06144	0.2402	0	0.06144	0.2402	0
South Kalimantan	0.050396	0.21879	0	0.050396	0.21879	0
South Sulawesi	0.05544	0.2289	0	0.05544	0.2289	0
<i>Religions:</i>						
Islam	0.8721	0.33403	1	0.8721	0.33403	1
Protestant	0.04368	0.2044	0	0.04368	0.2044	0
Catholic	0.01848	0.1347	0	0.01848	0.1347	0
Buddhism	0.00912	0.09507	0	0.00912	0.09507	0
Hinduism	0.05472	0.22745	0	0.05472	0.22745	0

**Table 6: Ordered Probit Coefficient Estimates: Dependent variable (Husbands' Health Outcomes)**

Variables	Basic Demand Function		Full Specification of Demand Function	
	Coefficients	Standard Errors	Coefficients	Standard Errors
<b>Husbands</b>				
Insurance Price	0.0698228	0.069511	0.0033831	0.0723096
Precautionary Assets	2.52 x 10 <sup>-10</sup>	2.08 x 10 <sup>-9</sup>	2.11 x 10 <sup>-9</sup>	2.14 x 10 <sup>-9</sup>
Human Capital	0.0059501	0.0070565	0.0056812	0.0073741
Physical Capital	5.40 x 10 <sup>-10</sup> *	3.23 x 10 <sup>-10</sup>	2.41 x 10 <sup>-10</sup>	3.44 x 10 <sup>-10</sup>
<b>Wives</b>				
Insurance Price	-0.0842468	0.0802238	-0.0719903	0.0834904
Precautionary Assets	-1.35 x 10 <sup>-8</sup> **	6.89 x 10 <sup>-9</sup>	-1.72 x 10 <sup>-8</sup> ***	6.99 x 10 <sup>-9</sup>
Human Capital	-0.04194 ***	0.00737	-0.0272757 ***	0.0079652
Physical Capital	6.90 x 10 <sup>-10</sup>	7.65 x 10 <sup>-10</sup>	9.58 x 10 <sup>-12</sup>	7.99 x 10 <sup>-10</sup>
Husbands Age	----	----	-0.0659139 ***	0.0187364
(Husband Age) ^ 2	----	----	0.0008776 ***	0.000199
Wive Age	----	----	0.0091155 ***	0.0044251
<b>Regions</b>				
Central Java	----	----	----	----
West Sumatra	----	----	0.5365905 ***	0.1133922
North Sumatra	----	----	0.3894948 ***	0.107737
South Sumatra	----	----	-0.2397866 **	0.1111334
Lampung	----	----	0.3868673 ***	0.1185429
Jakarta	----	----	0.1192638	0.0970703
West Java	----	----	0.294349 ***	0.0797834
East Java	----	----	-0.590903 ***	0.0797709
Yogak	----	----	-0.0143403	0.1115717
Bali	----	----	-0.165221	0.1976645
West North S	----	----	0.5454089 ***	0.1013027
South Kali	----	----	0.4058542 ***	0.1103375
South Sulaw	----	----	0.2729725 ***	0.1105857
<b>Religion</b>				
Islam	----	----	----	----
Protestant	----	----	-0.0582254	0.1162974
Catholic	----	----	-0.1607014	0.1659442
Buddhism	----	----	-0.0637136	0.2607465
Hinduism	----	----	0.1509591	0.1957637
Observations	4039		4039	
Pseudo R <sup>2</sup>	0.0124		0.088	

\* Significance at a = .10  
 \*\* Significance at a = .10  
 \*\*\* Significance at a = .10

**Table 7: Ordered Probit Coefficient Estimates: Dependent variable (Wives' Health Outcomes)**

Variables	Basic Demand Function		Full Specification of Demand Function	
	Coefficients	Standard Errors	Coefficients	Standard Errors
<b>Husbands</b>				
Insurance Price	-0.0385305	0.0672228	-0.0728237	0.0704543
Precautionary Assets	-4.18 x 10 <sup>-10</sup>	5.42 x 10 <sup>-10</sup>	9.72 x 10 <sup>-10</sup>	6.09 x 10 <sup>-10</sup>
Human Capital	-0.0013736	0.0069323	-0.0058174	0.0072468
Physical Capital	-1.35 x 10 <sup>-10</sup>	2.13 x 10 <sup>-10</sup>	-5.40 x 10 <sup>-10</sup> **	2.73 x 10 <sup>-10</sup>
<b>Wives</b>				
Insurance Price	-0.0583988	0.0822359	-0.0441792	0.0846578
Precautionary Assets	1.26 x 10 <sup>-9</sup>	5.96 x 10 <sup>-9</sup>	-1.30 x 10 <sup>-9</sup>	6.55 x 10 <sup>-9</sup>
Human Capital	-0.0121724 *	0.0071219	-0.0017736	0.0076022
Physical Capital	-1.88 x 10 <sup>-9</sup> ***	6.04 x 10 <sup>-10</sup>	-2.58 x 10 <sup>-9</sup> ***	7.13 x 10 <sup>-10</sup>
Husbands Age	----	----	-0.0186571	0.0165202
(Husband Age) ^ 2	----	----	0.0003981 **	0.0001893
Wive Age	----	----	0.0012604	0.0041275
<b>Regions</b>				
Central Java	----	----	----	----
West Sumatra	----	----	0.2935721 ***	0.0924662
North Sumatra	----	----	-0.0921157	0.0955387
South Sumatra	----	----	-0.3477335 ***	0.1279532
Lampung	----	----	0.0708364	0.0959845
Jakarta	----	----	0.1026428	0.100979
West Java	----	----	-0.0174207	0.074882
East Java	----	----	-0.6496563 ***	0.0798185
Yogak	----	----	0.0746396	0.1061044
Bali	----	----	0.0290298	0.165935
West North S	----	----	0.2337653 **	0.1005759
South Kali	----	----	0.1143229	0.124009
South Sulaw	----	----	0.1170928	0.0960417
<b>Religion</b>				
Islam	----	----	----	----
Protestant	----	----	0.1860277	0.1136616
Catholic	----	----	-0.0041008	0.1446059
Buddhism	----	----	0.1586326	0.2745305
Hinduism	----	----	0.0543007	0.1554543
Observations	4058		4058	
Pseudo R <sup>2</sup>	0.0048		0.0498	

\* Significance at a = .10

\*\* Significance at a = .10

\*\*\* Significance at a = .10

**Table 8: Ordered Probit Coefficient Estimates: Dependent variable (Relative Marital Health Outcomes)**

Variables	Basic Demand Function		Full Specification of Demand Function	
	Coefficients	Standard Errors	Coefficients	Standard Errors
<b>Husbands</b>				
Insurance Price	0.0741868	0.0603346	0.0560741	0.0609322
Precautionary Assets	4.34 x 10 <sup>-10</sup>	8.97 x 10 <sup>-10</sup>	4.88 x 10 <sup>-10</sup>	9.92 x 10 <sup>-10</sup>
Human Capital	0.0026084	0.0066236	0.003647	0.0066984
Physical Capital	4.60 x 10 <sup>-10</sup> *	2.84 x 10 <sup>-10</sup>	4.94 x 10 <sup>-10</sup> *	3.08 x 10 <sup>-10</sup>
<b>Wives</b>				
Insurance Price	0.0000785	0.07233	-0.0044105	0.0730188
Precautionary Assets	-6.45 x 10 <sup>-9</sup>	5.80 x 10 <sup>-9</sup>	-6.38 x 10 <sup>-9</sup>	5.76 x 10 <sup>-9</sup>
Human Capital	-0.020176 ***	0.0068363	-0.014928 **	0.0071776
Physical Capital	1.85 x 10 <sup>-9</sup> ***	3.96 x 10 <sup>-10</sup>	1.73 x 10 <sup>-9</sup> ***	4.18 x 10 <sup>-10</sup>
Husbands Age	----	----	0.0099205 ***	0.0037556
Wive Age	----	----	-0.0047979	0.0039419
<b>Regions</b>				
Central Java	----	----	----	----
West Sumatra	----	----	0.131587	0.0917547
North Sumatra	----	----	0.3202968 ***	0.086823
South Sumatra	----	----	0.1128067	0.1142467
Lampung	----	----	0.19221 **	0.092764
Jakarta	----	----	-7.48 x 10 <sup>-6</sup>	0.0994056
West Java	----	----	0.191425 ***	0.0668154
East Java	----	----	0.0543307	0.0713349
Yogak	----	----	-0.0565479	0.0945612
Bali	----	----	-0.129033	0.1447118
West North S	----	----	0.2013109 **	0.0902778
South Kali	----	----	0.2036517 **	0.1065131
South Sulaw	----	----	0.0762194	0.0867742
<b>Religion</b>				
Islam	----	----	----	----
Protestant	----	----	-0.1881986 *	0.102238
Catholic	----	----	-0.1224774	0.1393428
Buddhism	----	----	-0.1169484	0.2890503
Hinduism	----	----	0.0801656	0.1413447
Observations	4010		4010	
Pseudo R <sup>2</sup>	0.0033		0.0094	

\* Significance at a = .10

\*\* Significance at a = .10

\*\*\* Significance at a = .10

**Table 9: Ordered Probit Marginal Effect Estimates of One-Unit Change in Husbands' and Wives' Assets on Husbands' Health Outcomes**

Variables	Marginal Effects of Husbands' Health Outcomes							
	P=[Health =1]	Z-statistic	P=[Health=2]	Z-statistic	P=[Health=3]	Z-statistic	P=[Health=4]	Z-statistic
<b>Husbands</b>								
Insurance Price	-0.0098608	-1.04	-0.0035993	-0.83	0.0129	0.98	0.00056	0.91
Precautionary Assets	-3.68 x 10 <sup>-11</sup>	-0.12	-1.05 x 10 <sup>-11</sup>	-0.12	4.55 x 10 <sup>-11</sup>	0.12	1.90 x 10 <sup>-12</sup>	0.12
Human Capital	-0.0008694	-0.84	-0.0002484	-0.83	0.001073	0.84	0.0000448	0.82
Physical Capital	-7.89 x 10 <sup>-11</sup> *	-1.67	-2.25 x 10 <sup>-11</sup>	-1.58	9.74 x 10 <sup>-11</sup> *	1.67	4.07 x 10 <sup>-12</sup>	1.52
<b>Wives</b>								
Insurance Price	0.0128596	1.00	0.0023187 *	1.77	-0.0145994	-1.09	-0.000579	-1.09
Precautionary Assets	1.98 x 10 <sup>-9</sup> **	1.96	5.65 x 10 <sup>-10</sup> *	1.81	-2.44 x 10 <sup>-9</sup> **	-1.96	-1.02 x 10 <sup>-10</sup> *	-1.72
Human Capital	0.0061297 ***	5.65	0.0017514 ***	3.61	-0.0075652 ***	-5.62	-0.0003159 ***	-3.09
Physical Capital	-1.01 x 10 <sup>-10</sup>	-0.90	-2.87 x 10 <sup>-11</sup>	-0.88	1.24 x 10 <sup>-10</sup>	0.90	5.18 x 10 <sup>-12</sup>	0.87

\* Significance at a =.10

\*\* Significance at a =.05

\*\*\* Significance at a =.01

Y = Prob (Health=1) = 0.07818514

Y = Prob (Health=2) = 0.10743209

Y = Prob (Health=3) = 0.81196499

Y = Prob (Health=4) = 0.00241778

**Table 10: Ordered Probit Marginal Effect Estimates of One-Unit Change in Husbands' and Wives' Assets on Wives' Health Outcomes**

Variables	Marginal Effects of Wives' Health Outcomes							
	P=[Health =1]	Z-statistic	P=[Health=2]	Z-statistic	P=[Health =3]	Z-statistic	P=[Health=4]	Z-statistic
<b>Husbands</b>								
Insurance Price	0.0044343	0.40	0.0007199	0.47	-0.0049364	-0.41	-0.0001711	-0.41
Precautionary Assets	9.21 x 10 <sup>-11</sup>	0.27	1.74 x 10 <sup>-11</sup>	0.27	-1.23 x 10 <sup>-11</sup>	-0.27	-3.68 x 10 <sup>-12</sup>	-0.27
Human Capital	0.000237	0.21	-0.0000448	0.21	-0.0002697	-0.21	-9.47 x 10 <sup>-6</sup>	-0.21
Physical Capital	1.08 x 10 <sup>-11</sup>	0.20	2.05 x 10 <sup>-12</sup>	0.841	-1.23 x 10 <sup>-11</sup>	-0.20	-4.32 x 10 <sup>-13</sup>	-0.20
<b>Wives</b>								
Insurance Price	0.0125031	0.93	0.0013195 *	1.71	-0.0104721	-0.73	-0.0004466	-0.98
Precautionary Assets	-2.69 x 10 <sup>-10</sup>	-0.20	-5.08 x 10 <sup>-10</sup>	-0.20	3.06 x 10 <sup>-10</sup>	0.20	1.07 x 10 <sup>-12</sup>	0.20
Human Capital	0.0125031 *	1.62	0.0003582	1.46	-0.0021553 *	-1.62	-0.0000757	-1.45
Physical Capital	2.80 x 10 <sup>-10</sup> **	2.20	5.30 x 10 <sup>-11</sup> ***	1.86	3.19 x 10 <sup>-10</sup> **	-2.21	-1.12 x 10 <sup>-11</sup> *	-1.82

\* Significance at a =.10

\*\* Significance at a =.05

\*\*\* Significance at a =.01

Y = Prob (Health=1) = 0.08912828

Y = Prob (Health=2) = 0.11035911

Y = Prob (Health=3) = 0.79785121

Y = Prob (Health=4) = 0.0021644

**Table 11a: Ordered Probit Marginal Effect Estimates of One-Unit Change in Husbands' and Wives' Assets on Relative Marital Health Outcomes**

Variables	Marginal Effects of Relative Marital Health Outcomes							
	P=[Health=-3]	Z-statistic	P=[Health=-2]	Z-statistic	P=[Health=-1]	Z-statistic	P=[Health=0]	Z-statistic
<b>Husbands</b>								
Insurance Price	0.000047	-0.74	-0.0011603	-1.05	-0.0124897	-1.04	-0.0012378	-0.63
Precautionary Assets	-3.61 x 10 <sup>-13</sup>	-0.24	-8.79 x 10 <sup>-12</sup>	-0.24	-9.20 x 10 <sup>-11</sup>	-0.24	-4.24 x 10 <sup>-12</sup>	-0.24
Human Capital	-1.87 x 10 <sup>-6</sup>	-0.35	-0.0000456	-0.37	-0.0004769	-0.37	-0.000022	-0.35
Physical Capital	3.45 x 10 <sup>-13</sup>	-0.84	-8.41 x 10 <sup>-12</sup>	-1.43	-8.80 x 10 <sup>-11</sup>	-1.48	-4.06 x 10 <sup>-12</sup>	-0.83
<b>Wives</b>								
Insurance Price	-9.03 x 10 <sup>-6</sup>	-0.16	-0.0002207	-0.16	-0.0023244	-0.16	-0.0001333	-0.13
Precautionary Assets	5.08 x 10 <sup>-12</sup>	0.67	-1.24 x 10 <sup>-10</sup>	0.88	1.30 x 10 <sup>-9</sup>	0.89	5.98 x 10 <sup>-11</sup>	0.67
Human Capital	0.0000156	0.96	0.0003797 ***	2.70	0.0039748 ***	2.99	-0.0001833	0.96
Physical Capital	-1.35 x 10 <sup>-12</sup>	-0.95	-3.28 x 10 <sup>-11</sup> **	-2.43	-3.43 x 10 <sup>-10</sup> ***	-2.64	-1.58 x 10 <sup>-11</sup>	-0.95

\* Significance at  $\alpha = .10$

\*\* Significance at  $\alpha = .05$

\*\*\* Significance at  $\alpha = .01$

Y = Prob (Health=-3) = 0.00023954

Y = Prob (Health=-1) = 0.12921356

Y = Prob (Health=1) = 0.13797844

Y = Prob (Health=3) = 0.00023876

Y = Prob (Health=-2) = 0.00706447

Y = Prob (Health=0) = 0.71749672

Y = Prob (Health=2) = 0.00728128

**Table 11b: Ordered Probit Marginal Effect Estimates of One-Unit Change in Husbands' and Wives' Assets on Relative Marital Health Outcomes**

Variables	Marginal Effects of Relative Marital Health Outcomes					
	P=[Health =1]	Z-statistic	P=[Health=2]	Z-statistic	P=[Health =3]	Z-statistic
<b>Husbands</b>						
Insurance Price	0.0136315	0.99	0.0013457	0.95	0.0000621	0.70
Precautionary Assets	$9.66 \times 10^{-11}$	0.24	$9.24 \times 10^{-12}$	0.24	$3.98 \times 10^{-13}$	0.87
Human Capital	0.0005005	0.37	-0.0000479	0.37	$2.15 \times 10^{-6}$	0.35
Physical Capital	$9.24 \times 10^{-11}$	1.48	$8.84 \times 10^{-12}$	1.44	$4.16 \times 10^{-13}$	0.24
<b>Wives</b>						
Insurance Price	0.0024601	0.16	0.0002369	0.16	0.0000107	0.16
Precautionary Assets	$-1.36 \times 10^{-9}$	-0.89	$-1.30 \times 10^{-10}$	-0.88	$1.55 \times 10^{-12}$	0.99
Human Capital	-0.0041713 ***	-2.99	0.000399 ***	-2.71	-0.000018	-1.01
Physical Capital	$3.60 \times 10^{-10}$ ***	2.64	$3.45 \times 10^{-11}$ **	2.46	$1.55 \times 10^{-12}$	0.99

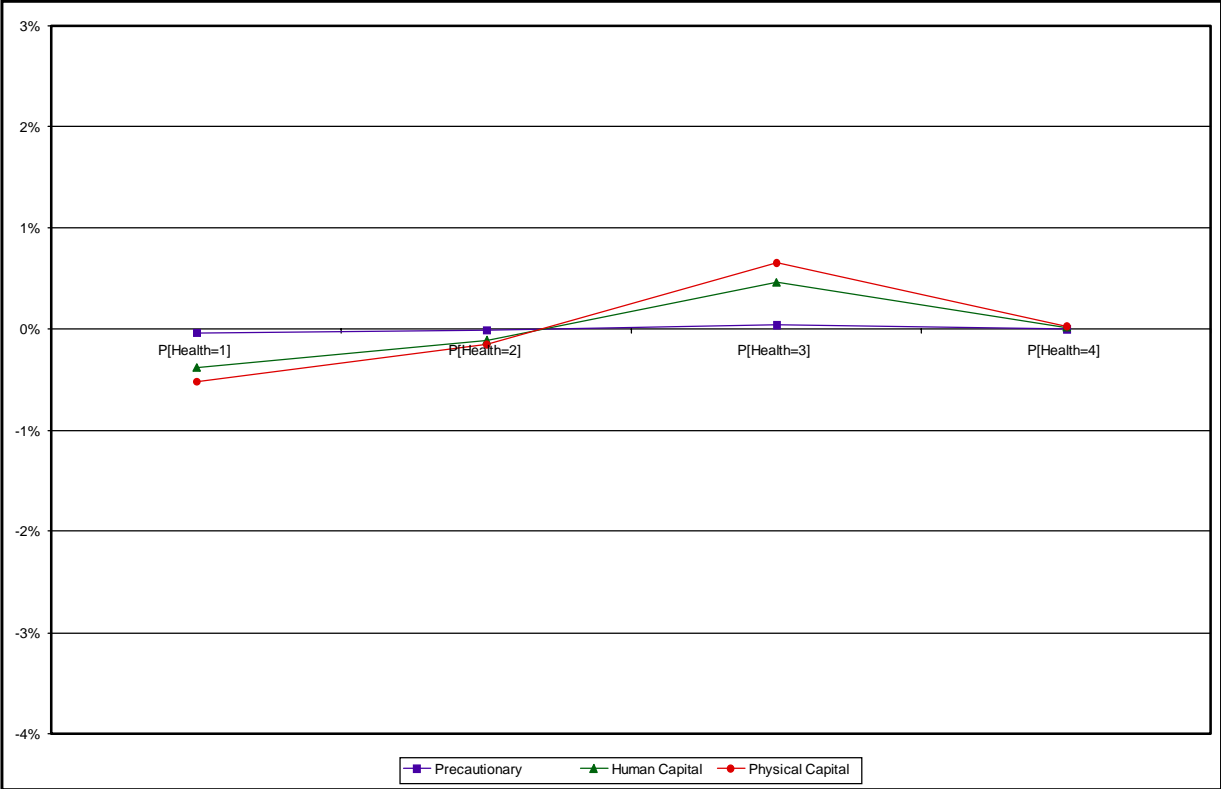
\* Significance at  $\alpha = .10$

\*\* Significance at  $\alpha = .05$

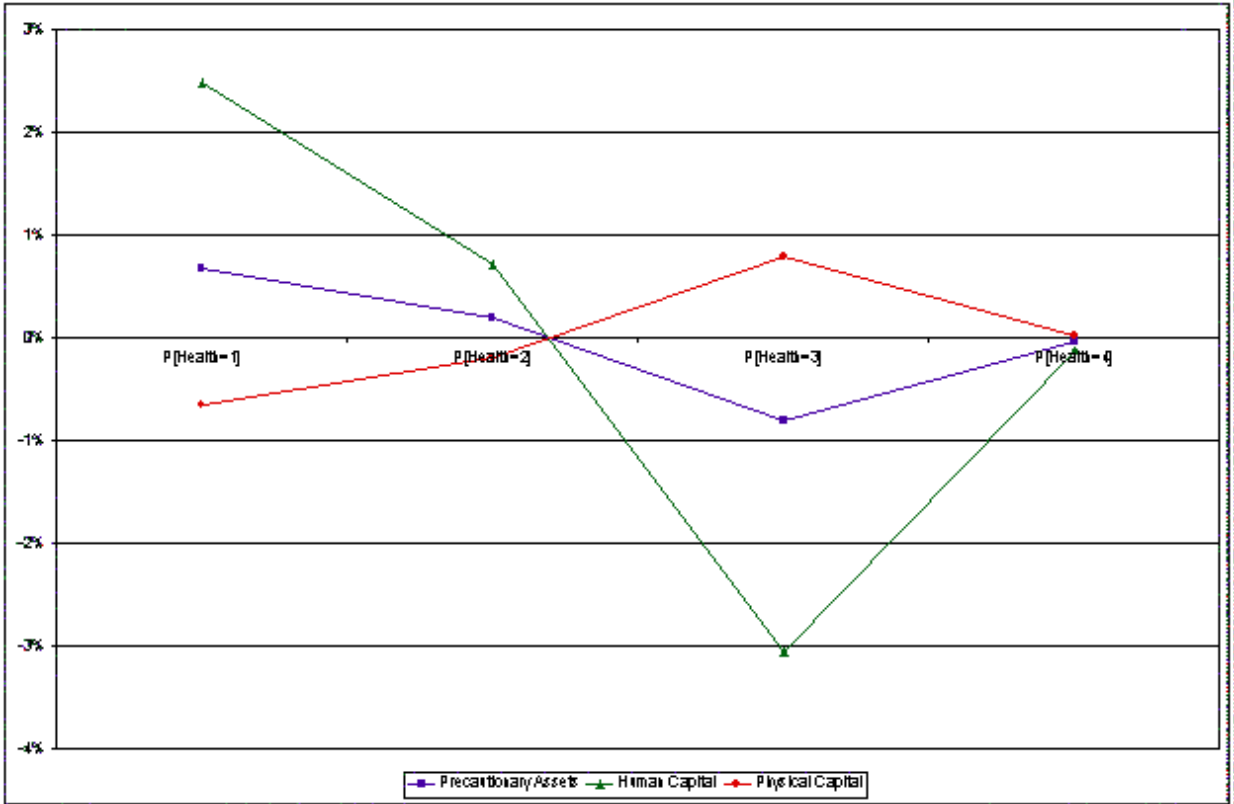
\*\*\* Significance at  $\alpha = .01$

Figures

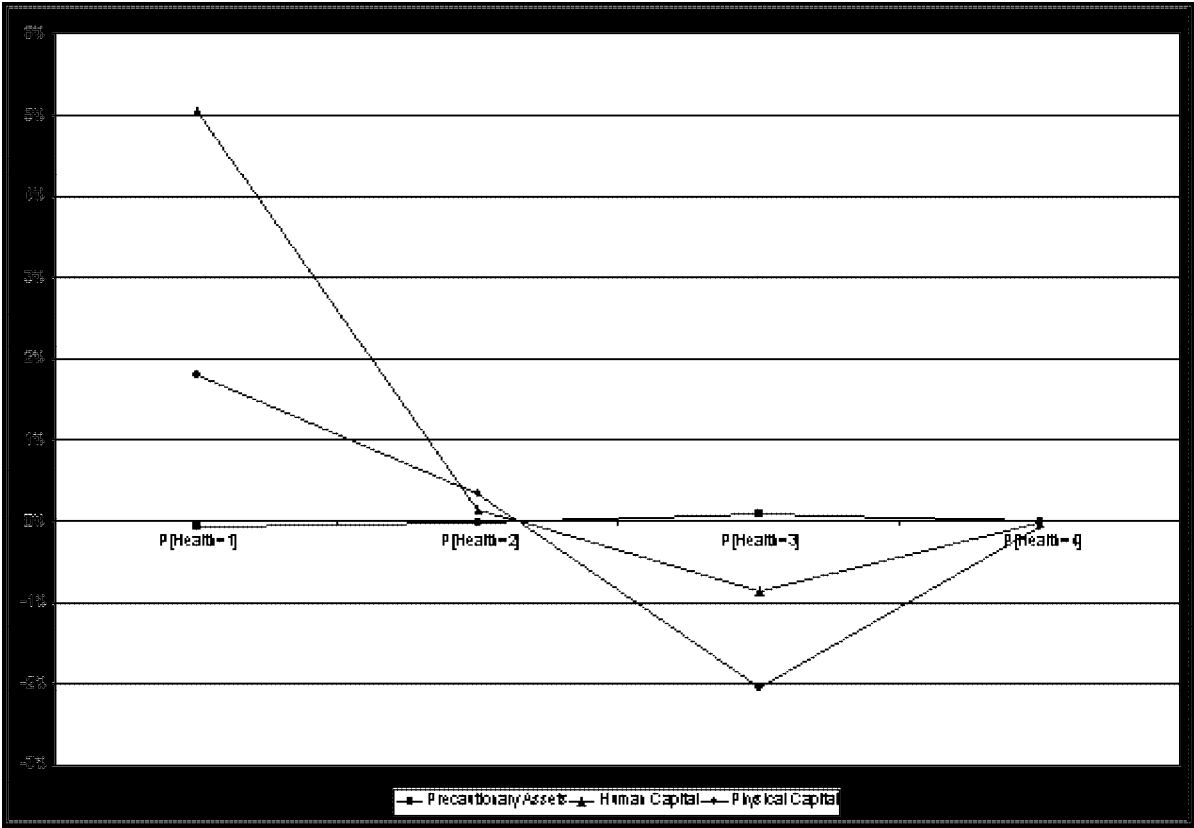
Figure 2: Marginal Effects of One-Standard Deviation Changes in Husbands' Assets on Predicted Probabilities of Husbands' Health Outcome



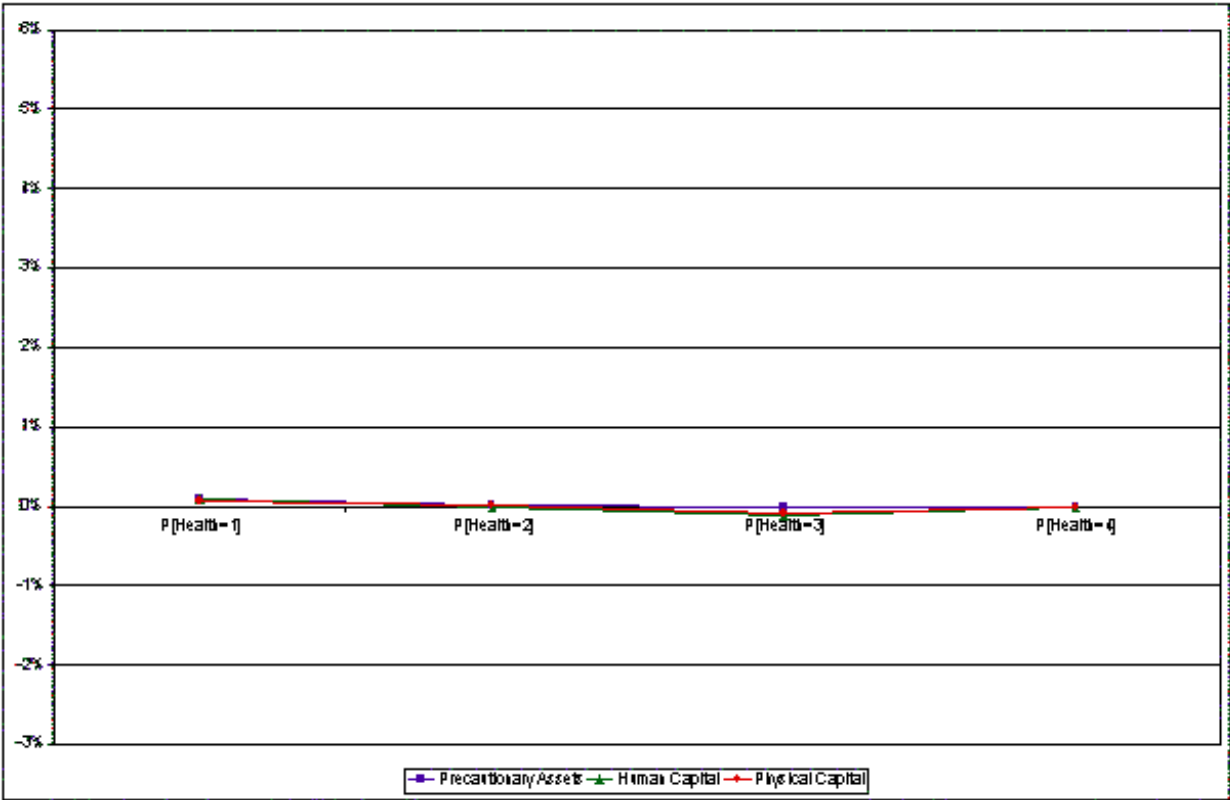
**Figure 3: Marginal Effects of One-Standard Deviation Changes in Wives' Assets on Predicted Probabilities of Husbands' Health Outcome**



**Figure 5: Marginal Effects of One-Standard Deviation Changes in Husbands' Assets on Predicted Probabilities of Wives' Health Outcome**



**Figure 6: Marginal Effects of One-Standard Deviation Changes in Wives' Assets on Predicted Probabilities of Wives' Health Outcome**



## Works Cited

- Alderman, Harold. 1995. "Unitary versus Collective Models of the Household: Is It Time to Shift the Burden of Proof?" *The World Bank Research Observer*, 10 (1): 1-19.
- Becker, Gary S. 1991. *A Treatise on the Family*. Cambridge: Harvard University Press.
- Binmore, Kenneth and Dasgupta, Partha (ed.). 1987. *The Economics of Bargaining*. Oxford: Basil Blackwell.
- Blau, Francine and Ferber, Marianne A. 1992. *The Economics of Women, Men, and Work*. Englewood Cliffs: Prentice-Hall.
- Bruce, John W. 1993. "Do Indigenous Tenure Systems Constrain Agricultural Development?" In Thomas Basset's and Donald Crummey's (ed.) *Land in African Agrarian Systems*. 1993. Madison: The University of Wisconsin Press.
- Dolan, Catherine S. 2001. "The 'Good Wife': Struggles over Resources in the Kenyan Horticultural Sector." *The Journal of Development Studies*, 37 (3): 39-70.
- Doss, Cheryl R. 1996. "Women's Bargaining Power in Household Economic Decisions: Evidence from Ghana." University of Minnesota Staff Paper P96-11.
- Friedman, James W. 1990. *Game Theory with Applications to Economics*. Oxford: Oxford University Press.
- Greene, William H. 2000. *Econometric Analysis*. Upper Saddle River: Prentice Hall.
- Guyer, Jane I. 1997. "Endowments and Assets: The Anthropology of Wealth and the Economics of Intrahousehold Allocation." In Lawrence Haddad's; John Hoddinott's; and Harold Alderman's (ed.). *Intrahousehold Resource Allocation in Developing Countries: Models, Methods and Policy*. 1997. Baltimore: The John Hopkins University Press.
- Haddad, Lawrence; Hoddinott, John and Alderman, Harold. 1997. *Intrahousehold Resource Allocation in Developing Countries: Models, Methods and Policy*. Baltimore: The John Hopkins University Press.
- Hart, Gillian. 1995. "Gender and Household Dynamics: Recent Theories and Their Implications." In M.G. Quibria's (ed.) *Critical Issues in Asian Development: Theories, Experiences and Politics*. 1995. Hong Kong: Oxford University Press.
- Hirata, Helena and Humphrey, John. 1991. "Workers' Response to Job Loss: Female and Male Industrial Workers in Brazil." *World Development*, 19 (6): 671-82.

- Hoddinott, John and Haddad, Lawrence. 1995. "Does Female Income Share Influence Household Expenditures? Evidence from Cote D'Invoire." *Oxford Bulletin of Economics and Statistics*, 57(1): 77-98.
- Judge, George G.; Griffiths, W.E.; Hill, R. Carter; Lutkepohl, Helmut; and Lee, Tsoung- Chao. 1985. *The Theory and Practice of Econometrics*. New York: John Wiley and Sons.
- Kabeer, Naila. 1994. *Reversed Realities: Gender Hierarchies in Development Thought*. London: Verso.
- Manser, Marilyn and Brown, Murray. 1980. "Marriage and Household Decision-Making: A Bargaining Analysis." *International Economic Review*, 21(1): 31-44.
- Massiah, Joycelin. 1993. *Women in Developing Economies: Making Visible the Invisible*. Oxford: Berg Publishers, Inc.
- McElroy, Majorie B. and Horney, Mary Jean. 1981. "Nash-Bargained Household Decisions: Toward a Generalization of the Theory of Demand." *International Economic Review*, 22(2): 333-349.
- Miller, Roger F. and Watts, Harold. 1967. "A Model of Household Investment in Financial Assets." In Robert Ferber's (ed.) *Determinants of Investment of Behavior*. 1967. New York: Columbia University Press.
- Morduch, Jonathan. 1995. "Income Smoothing and Consumption Smoothing." *Journal of Economic Perspectives*, 9(3): 103-14.
1997. "Between the Market and State: Can Informal Insurance Patch the Safety Net?" World Bank Working Paper.
- Nash, John F. 1950. "The Bargaining Problem." *Econometrica*, 18(2):155-162.
1953. "Two-Person Cooperative Games." *Econometrica*, 21(1):128-140.
- Ott, Notburga. 1992. *Intrafamily Bargaining and Household Decisions*. Heidelberg: Springer-Verlag.
- Quisumbing, Agnes R. and Maluccio, John A. 1999. "Intrahousehold Allocation and Gender Relations: New Empirical Evidence." *World Bank Gender and Development Working Paper Series*, No. 2.
- Quisumbing, Agnes and Benedicte de la Briere. 2000. "Women's Assets and Intrahousehold Allocation in Rural Bangladesh: Testing Measures of Bargaining Power." Washington D.C: International Food Policy Research Institute.

- Quisumbing, Agnes; Estudillo, Jonna P.; and Keijiro, Otsuka. 2001. "Gender Differences in Land Inheritance and Schooling Investments in the Rural Philippines." *Land Economics*, 77(1): 130-43.
- Rasmusen, Eric. 1989. *Games and Information: An Introduction to Game Theory*. Oxford: Blackwell Publishers.
- Ray, Debraj. 1998. *Development Economics*. Princeton: Princeton University Press.
- Rothboeck, Sandra and Acharya, Sarthi. 1999. "Gender-Based Segregation in the Indian Labour Market." *The Indian Journal of Labour Economics*, 42(4).
- Rubinstein, Ariel; Zvi, Safra and Thomson, William. 1992." On the Interpretation of the Nash Bargaining Solution and Its Extension to Non-Expected Utility Preferences." *Econometrica*, 60(5): 1171-1186.
- Saptari, Ratna. 2000. "Women, Family and Household: Tensions in Culture and Practice." In Juliette Koning's (ed.) *Women and Households in Indonesia: Cultural Notions and Social Practices*. Richmond: Curzon Press.
- Schultz, T. Paul. 1995. "Investments in Schooling and Health of Men and Women." In T. Paul Schultz's (ed.) *Investment in Women's Human Capital*. 1995. Chicago: The University of Chicago Press.
- Silberberg, Eugene. 1990. *The Structure of Economics: A Mathematical Analysis*. New York McGraw-Hill, Incorporated.
- Tinker, Irene. 1999. "Women's Empowerment Through Rights to House and Land." In Irene Tinker's and Gale Summerfield's (ed) *Women's Rights to House and Land: China, Laos, Vietnam*. 1999. Boulder: Lynne Rienner Publishers.
- Thomas, Duncan. 1990. "Intra-Household Resource Allocation: An Inferential Approach." *The Journal of Human Resources*, 25(4): 635-64.
- Tran Thi Van Anh. 1999. "Women and Rural Land in Vietnam." In Irene Tinker's and Gale Summerfield's (ed) *Women's Rights to House and Land: China, Laos, Vietnam*. 1999. Boulder: Lynne Rienner Publishers.
- Watson, Rubie S. and Ebrey, Patricia B. 1991. *Marriage and Inequality in Chinese Society*. Berkeley: University of California Press.
- Williams, Linda B. 1990. *Development, Demography, and Family Decision-Making: The Status of Women in Rural Java*. Boulder: Westview Press.

Yunus, Muhammad. 1995. "Grameen Bank: Experiences and Reflections." Dhaka: Grameen Bank.