Institutions and the Search for Security in Old Age:

Fertility Behavior, Labor Force Participation,

Savings, Insurance, and Bequests in Rural Thailand

by

Sanjeev Sabhlok

—————————————

A Dissertation Presented to the

FACULTY OF THE GRADUATE SCHOOL OF

UNIVERSITY OF SOUTHERN CALIFORNIA

In Partial Fulfillment of the

Requirements for the Degree

DOCTOR OF PHILOSOPHY

May 1999

UNIVERSITY OF SOUTHERN CALIFORNIA
THE GRADUATE SCHOOL
UNIVERSITY PARK
LOS ANGELES, CALIFORNIA 90007

This dissertation, written by

Sanjeev Sabhlok
....

under the direction of h..is....... Dissertation Committee, and approved by all its members, has been presented to and accepted by The Graduate School, in partial fulfillment of requirements for the degree of

DOCTOR OF PHILOSOPHY
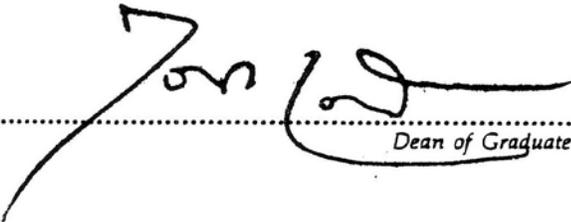
....
Dean of Graduate Studies

Date .....July 6, 1999................

DISSERTATION COMMITTEE

....
Chairperson

....

Harry W. Richardson   John E. Elliott

ACKNOWLEDGMENTS

demographic economics in Spring, 1996, and for offering detailed comments on drafts of this work. Indeed, my entire perspective on economic development is deeply colored by the analyses of Professor Easterlin. I am grateful to Professor Hsiao for suggesting the appropriate econometric models to adopt under the situation of possible self-selection effects and for helping me resolve my concerns on heteroscedasticity in some of my models.

Professor John E. Elliot has been kind enough to offer extremely valuable and encouraging comments during the qualifying exam and at other stages of this work. But I cherish above all, his magnificent perspectives on Classical Economists, some of which I have deeply imbibed in my personal life and others, such as perspectives on Malthus, which I have explored much further during the course of this study. Professor Harry W. Richardson has been a very active member of this research program, despite being an 'outside' member and despite his sometimes problematic health, as member both of my Guidance, and Dissertation, committees. I owe to him a much wider and applied appreciation of microeconomics through the course on urban policy that I took with him.

I am indebted to Professor C. Betts who has accorded me the opportunity to present four stages of this work during the course of the research in the graduate students' seminar organized by her, some of these presentations being requested by me at very short notice. The feedback and questions raised during these seminars— in particular from Prof. Betts herself—have helped enormously in this study. The feedback from Professor Timur Kuran and Vailam Mui during the presentation of some of these results in the Birnkrant Development Seminar at the University in

Fall, 1998 was instrumental in opening my eyes to yet another vast literature of enormous sophistication that has enormous implications for studies of this nature.

Among the students at this department, I wish to specially thank Sunanda Ray and Sripad Motiram for their feedback on Chapter 3. Among others who provided feedback at various stages of this work are Atul Gupta, Dave Hsia, Shailender Swaminathan, and C.V.S.K. Sarma.

Last, but not the least, I wish to cover for a moment the underlying foundation of the household which sustained this work. Without the moral support of my wife, Smita, and the constant company of my two lovely children, Sukrit and Prateeti, this multi-year effort would have been impossible. In particular, the typing required at the last stages of this work was almost entirely done by Smita while I underwent treatment for pain and numbness arising from carpal tunnel syndrome in both hands.

Attempting a Ph.D. at this age is not an easy task. I dedicate this dissertation to my parents who have instilled in me certain qualities of the head and heart without which I would have found no reason, nor the ability, to constantly seek new learning and answers to complex policy questions that raise themselves as we look around us at this amazing world.

TABLE OF CONTENTS

<u>Chapters</u>

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

THE SEARCH FOR SECURITY:

LIFE CYCLE DECISION-MAKING UNDER CONDITIONS OF

RISK AND UNCERTAINTY

BOX

"[Support in old age] depends on how you raise and bring up your children. To have a small number of children but to raise them well is better than to have many children but not to raise them well" (a young man from South Thailand) (cited in Knodel *et al*, 1984).

"[Parents will still be supported well] because education has progressed. Now children get a higher education. Repayment of parents will go according to the level of education ... Two children with education can repay parents better than ten [without education]" (An old man from Northeast Thailand) (*ibid.*)

1.1 Introduction

The fertility transition across the world has been well documented (see, for example, Easterlin, 1996). Essentially, there has been a slow and long transition (decline) in fertility rates across the developed world starting from about 1850, and a relatively quicker transition seems to be taking place across much of the developing world since about 1970. In the years since 1965, Thailand, for example, has seen enormous declines in fertility (Table 1.1), dramatically overturning various early, pessimistic, projections.[1] In fact, Thailand's decline has been one of the steepest that has ever been reached in the

---

[1]   The Institute of Population Studies, Chulalongkorn University had made estimates in CICRED (1974) that Thailand's population in 1990 would be between 58.6 million and 66.4 million, with an expectation of 62.7 million. The actual population turned out to be 56.2 million. The discrepancy in the estimates for 2000 will be much more dramatic.

world. We mention the case of Thailand in particular at the outset since this special case will serve as the place where certain theories—considered in this study—will be tested.

Additionally, many developed countries are seeing fertility stabilize in a close range around two children per woman, for some decades now. Released from the burden of child-bearing, thus, women have increasingly been participating in the labor force in the non-agricultural sector. In this study, we examine if new solutions to the household's search for *security* might be in some way responsible for explaining the underlying demand that has led to these dramatic changes in the life-cycle behavior of the entire human species, in terms of the fertility, labor force participation, savings, bequests, and life-insurance decisions.

Table 1.1   **Basic economic and demographic indicators, Thailand: 1970, 1990, post-1990**

	1970	1990	1993-98
Estimated population (millions)	36.4	56.2	60.0
GDP per capita (in 1987 USD)	487	1299	1792
Infant mortality (per 1000)	73	27	30.8
Total Fertility Rate	5.6	2.6[2]	1.84
Female secondary enrollment (percent)	15	28	
Percentage urban	13	23	

Sources: * Population is from Mason and Campbell (1993). The 1995-98 population is an estimate at the CIA *Fact Book*, http://www.odci.gov/cia/publications/factbook/th.html#people, for July, 1998.
* GDP per capita is from the *Human Development Report*, 1997 (UNDP). The last column is for 1993.
* Estimate for IMR for 1990 relates to 1989, from *Human Development Report*. 1991 (UNDP). The 1998 estimate is from CIA *Fact Book*.
* Estimate for TFR are from Mason and Campbell (1993). The TFR of Thailand in 1964-65 was 6.29 (CICRED, 1974). This has been estimated to be 1.84 in the CIA *Factbook*, 1998, indicating continuation of the decline [http://www.odci.gov/cia/publications/factbook/th.html#people]
* Other statistics are from World Bank (1993: 20-21).

Let us take a broad look at the primary motives that drive human beings. While economists do not usually attempt rankings of motives,[3] research in psychology provides some ideas and a possible basis for such rankings. For example, Maslow (1954) proposed

---

[2]   This is broadly consistent with the data set used in this study, where the 1776 younger women surveyed had 2.58 children ever born (and a desire for 2.56 children) in 1991-92

a pyramid of decreasingly important needs, with physiological needs—being immediate and basic—at the bottom of the pyramid, followed by security and safety, social, self-esteem, and finally, self-actualization needs. We can broadly imagine consumption in the current period to be equivalent to the lower level 'physiological need' of Maslow, and the need to organize 'secure consumption' in the second period to represent the next level, 'security need' of Maslow. Both are very powerful needs. Kahneman and Tversky (1979), and Tversky and Kahneman (1986, 1992), suggested a loss-aversion hypothesis whereby economic agents are assumed to exhibit greater sensitivity to losses than to gains, thus making them exceptionally risk-averse. Such agents do not simply maximize the expected value of Von Neumann-Morgenstern (VNM) utility functions.[4] There could also be evolutionary reasons for the development of and strength of security concerns in human beings. We explore some of these issues in Section 1.2.

Whatever its source, it is plausible to attribute a very significant value to this search for security in the study of human life-cycle behavior and its changes. Since security is not purchasable in the market, therefore it has to be worked for, i.e., *produced*. Stigler and Becker (1977) see households processing raw materials to produce *commodities*, which they define as 'an object of choice.' Similarly, in the face of the ever-widening circle of risk and uncertainty that confronts them as they look into the future, people work very hard to produce the complex commodity of security for their old age. The risks that could jeopardize old-age security (OAS) include labor risk (e.g., being unable to work, including the risk of disability), environmental risk (e.g., shocks to the economy), social risk (fear of isolation and loneliness), and many others.

---

[3]   Economists do employ "risk-aversion" or concavity of the utility function which captures many of these aspects of the strong urge for security in human beings.

Risk can be minimized (it can never be completely eliminated for obvious reasons) by engaging in safer even if less profitable or enjoyable activities, by diversification of effort (possessing more than one skill, different members of the joint family doing different jobs, migration by some members of the family to places outside their place of origin), by diversification of investments (choosing different assets, by storage and accumulation—including the use of animals to transmit perishable output into the future in the absence of asset markets), and by building reciprocal relations within the community as a form of mutual insurance. Another and clearly one of the most important among available strategies is the use of children, of which as many as perceived to be desirable can usually be supplied through domestic production, coupled with education obtained from outside. The decision-maker's determination of the optimal number of children to produce is then a function of the characteristics of the decision-maker's changing environment, the possible characteristics of children, expectation of children's present and future environment, and the expectation of return, and its variance, from various levels of investment in human and alternative forms of capital and insurance.

One should not lose sight of the larger picture of the existence of complex human motivations in the effort to give 'security' a strong theoretical significance. In addition to the basic lists of 'needs' that can be drawn up, which are common to a wide array of households, some households might produce additional, dissimilar commodities, demands for which might change over time. For example, some—but not all—households might have been socially conditioned to demand the commodity of *lineage*,

---

4 See Kreps (1990) for an exposition of VNM functions.

which can be produced out of children (usually sons) and bequests.[5] Due to the possibility of competition between the commodities that a household produces, the effects of the need for security need not be uniform across all households. In other words, interactions of motives need to be taken into account.

For example, let us think of children as inputs to the production of two *commodities,* 'lineage, or success in transmission of last name' and 'security through care in old age.' Some children might supply one, but not the other. Conflicts can arise in the utility from children achieved in this manner, such as when an agent is old and his son is wealthy but the son does not take care of the agent. In such a situation, the agent will have the satisfaction of seeing his (or her) name carried forward to the future, successfully, but will have the dissatisfaction of his son not taking care of him. There is a clear substitution between these two utilities, as can be shown by an example from West (1997). Elders of the Sumo Association, who are themselves retired sumo wrestlers, are required to sell their share in the Association by the time they turn 65. Usually, this share is sold to a top ranking wrestler who can afford the high price of this share. But if the wrestler marries the elder's daughter, then the price of the share is considerably lowered. This can be interpreted as a substitution between the above two commodities. When the future success of an agent's genes (through his potentially exceptionally 'strong' progeny) is assured, then the agent is willing to forego a little of the old age care motive which would have been better fulfilled with earnings from the sale of the share at its market value, with his daughter marrying an ordinary Japanese.

---

[5]   Lineage is a very strong influence on completed fertility in some societies. See Skinner and Jianhua (1999) who show that patrilineal social norms in China lead to strategizing for daugher-lite offsprings.

Therefore, many life cycle decisions can be seen as being driven by the need to smooth a larger 'lifestyle' and not merely 'consumption', nor even merely 'security'. But even security, we see, is a much richer concept than usually considered in the literature. This extension also helps us—at least conceptually—to endogenize many variables that are often assumed to be exogenous, and to throw light on many seemingly unrelated life cycle decisions.

In Section 1.2, we explore the possible strengthening of the security needs of human beings in the past 10,000 years. In Section 1.3, we look at a basket of facts that need explanation. In Section 1.4, an attempt is made to outline a generalized theory of the human life-cycle. Section 1.5 concludes this chapter.

1.2 The evolution of the old age security motive

Given that old age itself was a relatively rare phenomenon to most animal species until rather recently, how do we account for the possibility that concerns for security in old age can have such a far-reaching behavioral impact? Indeed how did this motive emerge in the first place? We try an explanation of this phenomenon in this section.

Three shifts in equilibria of human populations have been identified by Easterlin (1996), who, following the methodology of Kuznets and others, has classified the entire human economic-demographic experience into three epochs. The principal characteristics of these three epochs are shown in Table 1.2. Not mentioned in this Table, but perhaps even more significant, is the fact that the age structure of the population has shifted inexorably toward the elderly over these three successive equilibria. Till the hunting and gathering epoch, there was primarily a unidirectional flow from the parent to the child since the parent was not likely to live to reap the reward for the 'care' bestowed by him or

her on children in his or her youth.[6] At such time children were perhaps demanded primarily for the fulfillment of current consumption and production needs (in the hunt).

Table 1.2 **Distinctive Characteristics of Economic-Demographic Epochs**

	Epoch I	Epoch II	Epoch III
1. Principle occupation	Hunting gathering	Farming	Diverse
2. Principle type of settlement	Nomadic	Village	Urban
3. a. Initial date of epoch	-	8,000 BC	1750 AD
b. Terminal date	8,000 BC	1750 AD	?
c. Duration, years	2 million ?	9,750	247
4. a. Population at start	-	7.5	770
b. Population at end	5-10	770	5,300
c. Years to double population	90,000	1,459	90

Source: Easterlin (1996).   *Note*: Population is in millions.

The agricultural epoch was the first one where the elderly came to exist in substantial numbers due to the shelter and safety provided by closed village communities. While the actual probability of reaching old age was rather slim in individual cases, due to the effects of disease and starvation, these probabilities were significant enough to creep into the consciousness of people. We know that human beings tend—in some situations—to weigh negative probabilities significantly more in their decision making than positive ones.[7] Hence old age security concerns arguably arose and evolved during this epoch, even though old age was achieved by a very few. Additionally, the elderly were

---

[6]   Lindert (1980) and Lee (1995) are among many empirical works which show that there was hardly any positive value of children even in pre-transitional societies, contrary to Caldwell's famous (1982) wealth-flows hypothesis. Further, on the basis of evolutionary biology arguments, Kaplan (1994) shows that usually, "the *overall* intergenerational flow of resources will be downward." Turke (1989) argues, "The perspective on intergenerational transfers that is most parsimonious with respect to an evolutionary theory of life cycles is that the net flow of services and resources will usually be from older to younger generations. In other words, parents are likely to have evolved to invest in offspring throughout the life course, and therefore a system is unlikely to arise in which children more than return the resources and services their parents gave them when they were young." For extensive citations of empirical work, see Nugent and Anker (1990).
[7]   See Kreps (1990) for examples, such as the famous Allias and Ellsberg paradoxes.

able to become economically useful by providing care and education to their grand children, and in return they could then motivate (or negotiate) some additional attention to their needs from their children. Anthropologically, the development of the extended family is closely related to the development of such shifts in an intergenerational role relationship, as pointed out by Entwisle and Winegarden (1984): "The expectation of old age support denotes an intergenerational role relationship that plays an important part in defining extended family structure."[8]

Indeed, it can be argued that many of the widely prevalent social institutions and norms that appear to exist in most traditional agricultural societies such as duty toward parents, marriage outside the village, need for a living son in old age, bequests of land, and even ancestor worship, evolved consciously over time to promote loyalty from children, to reduce risk through diversification, and to foster a strong sense of community across generations. Mechanisms so devised successively enhanced the status of elder members of a society, primarily through control over family property. Each set of mechanisms—different in each society—represented a social equilibrium which then determined the future path of evolution of its institutions. Once such institutions were established, and the probability of living out a complete *natural life-cycle* became a reality to be taken seriously, the utility of a child was much enhanced, with the possibility of a bi-directional flow of care. Parents now

---

8   See Kotlikoff and Spivak, 1981.

arguably had a stronger interest in the survival of their existing children, and also perhaps, in the production of more children.[9]

Such social equilibria or norms do not at all imply the existence of the desire for an equal exchange with children. It is commonly observed that old people continue to support themselves as long as possible, making the dependency period, if any, relatively short, and avoid using their children for economic support unless truly necessary. This points to the existence of norms to support the care of parents in a bad state of nature (which can be characterized as an insurance effect) rather than a norm to support only asset returns from children.[10] There is another aspect to be kept in mind, of differentials between men and women in the strength of the old age security motive. Men tend to have shorter periods of economic inactivity prior to their death in many poor countries than women who tend to be considerably younger than their husbands, are often longer lived and have lesser economic opportunities for self-support.[11] Therefore women are perhaps more likely than men to place a premium on old age security (Dutta and Nugent, 1984). Indeed, the two sexes could arrive at rather different optimal strategies to combat insecurity.

---

[9]   This is indeed the "usual" sense in which the old-age security motive of fertility is used in the literature, to explain the apparently high demand for children in developing societies. Despite this "intent", it was clearly not an easy to increase the number of surviving children, given the data on the very slow doubling of human population during this epoch.

[10]   In general, the trend seems to shift, as economic development takes place, from children as an asset to children as insurance. This bears a close correlation with the completion of asset markets. Indeed, as insurance becomes the key economic motive of parents for having children, one would expect greater use of bequests in motivating long-term care from children (see Zweifel and Struwe, 1996).
This explanation (of children having two major economic characteristics--assets and insurance, with emphasis on insurance against uninsurable contingencies) squares with survey findings in which asset returns from children are cited as an expectation by nearly 60 to 70 percent of the parents in developing countries such as Malaysia and India, and by only 4 to 8 percent in Japan and U.S.A. Later in this study we shall see how parents even in developed countries do rely on children as 'insurers of the last resort.' We must highlight here once again that there are other, not strictly economic factors, involved in the demand for children.

[11]   This is not necessarily true in Thailand where women enjoy a high status.

Finally, the belief expressed in many circles[12] that old age security concerns driving fertility are now largely irrelevant in developed (Epoch III) societies might not be true at all. Instead, what is perhaps happening is that these concerns are being addressed differently given different market conditions (such as more complete asset and insurance markets). Even in the developed world, children still play the role of insurers of the last resort in many cases. The pattern of co-residence of the elderly in the U.S.A., for example, indicates that they do live alone to the extent they can, but as they get less able, their children tend to move closer to them, such that, on becoming widows, a large number of women choose to move in with their children (Silverstein, 1995).[13] Also, statistics show that only 5% of the elderly lived in nursing homes in the USA in 1990 (Bureau of the Census, National Institute of Aging wall poster entitled, "Aging in the United States—Past, Present, and Future.").

1. 3 Some interesting stylized facts of changing human life-cycle behavior

Some facts that are more or less accepted as empirical regularities of human behavior and which we are interested in explaining in this study include:

Fact 1: People do have children despite their being uneconomic.[14]

---

[12] For example, "In developing nations, the desire for large families is especially influenced by parental expectations of economic contributions from their children. A 15-year-old child living in a rural agricultural household may already be contributing more to the household than the costs of raising the child to that age. As nations gain in economic development, however, people typically no longer view their children as an economic advantage, but more frequently cite psychological advantages to having children," in *Asia-Pacific Population Policy*, March 1989. Honolulu: Population Institute, East-west Center.

[13] Silverstein (1995) shows that "Decline in older parents' physical health increased the propensity of parents and children to become temporally close to each other. Among those parent-children pairs who had become closer, the conjunction of declining health and widowhood increased both the degree of non-coresident proximity and the likelihood of transition to coresidence."

[14] The NPV of children has generally been found to be negative in both pre- and post-transition societies. Mueller (1976) analyzed detailed life-cycle data of developing countries and found that children are *net financial burdens* on parents in peasant societies when survivorship is included and a zero discount rate is used. Lee and Miller (1994), while studying intergenerational flows in the 1980s in the US, confirmed that

Fact 2: Populations grew very slowly prior to the last 200 years, taking 90,000 years to double in the hunting and gathering epoch and 1,459 years to double in the agricultural epoch (Table 1.2).

Fact 3: There has been a rapid decline in fertility across many nations over the last 200 years. Also to be noted is that "many of the countries that achieved their fertility decline earlier did so prior to the widespread distribution of modern contraceptive practices."[15]

Fact 4: This fertility decline seems to be tending toward stability at around 2 *surviving* children per woman (though this is difficult to conclude firmly), a pattern that is very typical of the history of mankind (Table 1.2 and Fact 2 above).

Fact 5: The proportion of the elderly and infirm has been increasing rapidly in most populations and each society is arriving at one or more rational mechanisms to support and utilize the services of these 'reproductively irrelevant' people.

Fact 6: People leave bequests, which are costly to children, rather than purchasing annuities. Also, the amount of intergenerational transfers decline with the introduction of public transfer policies (details in Chapter 2).

Fact 7: Many people purchase life-insurance—which is apparently of no direct use to them in their lifetime.

---

as in the post-transitional societies, the present value of children is negative. At the best, the return was seen to be very low—between -1 to 1 percent. Paul Turke (1989) carried out field studies in the Micronesian islands of Ifaluk and Yap and concluded that children tend to be a net economic burden on their parents. Studies of hunter-gather tribes (the Ache in Paraguay, the Piro of Peru, and the Masiguenga of Peru), carried out by Kaplan (1994) also found similar results. "Over the course of a lifetime, resources tend mainly to flow from the old to the young and not the other way around" (Bergstrom, 1996). Studies like those of Cain (1977), Caldwell (1982) which seem to show that children yield positive returns in developing countries, are flawed in many aspects, but we do not discuss these flaws here since that is a separate topic altogether.

15   Leibenstein (1978). Also, see Pritchett (1994), and Paul Demeny cited in Piel (1995).

Fact 8: In the absence of social pension programs, savings in the form of financial assets rise as soon as markets for such assets are created, but decline subsequently with the introduction of social pension programs.[16]

Fact 9: Labor force participation of married women has been rising across the developed and developing world, though the trend, after a particular level of development, is not obvious.[17]

A theory that explains one of these facts need not explain all the others. It would certainly help if explanations for various behavioral phenomena are not very inconsistent with each other. But in reality, we are often faced with great difficulty in explaining even single components of human behavior, such as changes in the fertility rates of a country. Becker (1960) stated, "The inability of demographers to predict western birth rates accurately in the postwar period has had a salutary influence on demographic research." He then started a project with the ambitious goal of overcoming this deficiency. Unfortunately, while there has been a proliferation of theories and models, in the end the prediction of fertility remains almost as elusive as before. While much advance has undoubtedly been made in understanding the economic motivations that drive human fertility (see a summary in Bergstrom, 1996), it appears that we are not much further down the road. The primary reason for that, it appears to this writer, is that the much wider influences on the demand for children have not been accounted for by most theories.

---

[16]   The USA saw a 6% increase in the savings rate, from 16 to 22 percent between 1830 and 1900 while crude birth rate fell from over 50 per 1000 in 1840 to less than 30 by 1900. After the introduction of the social security program, the savings rate has declined drastically as people are more secure about their old age. See Lewis (1983), Easterlin (1996: Chapter 8). For Thailand, data show little trend between 1971-83 in non-Municipal areas. In Municipal areas, the trend in savings is upward (see Bauer *et al*, 1993:86).

[17]   In 1980, 50.2% of married women were participating in the labor force in USA compared with 5.6% in 1900 (Ehrenberg and Smith, 1988). See also United Nations (1982:196).

We will attempt to deal with these stylized facts in different parts of this study hopefully in a way more consistent than has so far been done in the literature.

1.4. A generalized theory of the human life-cycle.

A generalized theory of the human life-cycle[18] will be outlined in this Section. This will be done through synthesis of the life-cycle theory of consumption and savings,[19] the evolutionary theories of human nature (e.g., Turke, 1989, Hamilton, 1964), theories of life-insurance, and the old-age security theory of fertility, among others, particularly by incorporating the institutional effects highlighted in Nugent (1985).

Due to the complexity of life cycle decision making and its interaction with social norms and economic institutions, a narrow focus will simply not succeed in explaining most human and social phenomenon. Consider fertility theory. Because children are a high gestation, long-lasting, desirable asset, which serve multifarious purposes, it is necessary that any 'valid' endogenous model of fertility must also serve simultaneously as a model of savings, labor force participation, migration, bequests, and many other behaviors. This is because children are merely one component of the asset and insurance portfolio of each household. To wish away critical components of the human life cycle would lead to serious specification errors, and ultimately, results in major inconsistencies in the analytic framework.

Another reason why a more general theory is needed to explain the various empirical regularities of Section 1.3 is the continuing attempt to explain human behavior in different ways in different kinds of countries, developing and developed. But what

---

[18]   This 'theory' has many roots, not the least of them being in Becker (1976), Hirshleifer (1978), many evolutionary biologists, and of course Malthus.

appears to be different on the surface could easily be a consequence of two different optimal responses to the same underlying problem in different environmental conditions. Therefore, the two mistakes made commonly by economists, as pointed out by Theodore W. Schultz in his Nobel lecture[20] are being scrupulously avoided here. First, no attempt is being made to create two sets of theory, one for developing and the other for developed nations.[21] Second, economic history (and fertility history) has not been neglected nor its obvious lessons ignored.[22]

The future uncertainty facing a household can be intra-household as well as extra-household. Examples of the former include the variations of physical status and economic outcomes achieved by various members of the household, including divorce, premature death or disability, etc. Examples of the latter can include the level of completeness of markets, the level of health care, and natural and manmade shocks to the environment. Given that uncertainty and risk is always high, and many components of risk get higher as a person grows older, people attempt to combat this risk with a variety of responses. The response basket can include a mix of different things depending on the availability of different strategies and the supporting institutional arrangements, asymmetries of information, constraints of personal capability, and so on.

---

[19]   *cf.* Modigliani and Brumberg (1954) and Ando and Modigliani (1963).

[20]   As reprinted *Journal of Political Economy*, 88 (4), 1980: "Nobel Lecture: The Economics of Being Poor."

[21]   Rendall and Bahchieva (1998) have in fact pioneered the issue of joining two different streams of thought on a vital issue of interest. "The old-age security motive for fertility is conventionally associated with developing countries, where the mechanisms of public and private-market provision for the well-being of the elderly are inadequate or uncertain." They argue for its continued relevance for developed countries.

[22]   "Historical perception is ... lacking with respect to population. We extrapolate global statistics and are horrified by our interpretation of them, mainly that poor people breed like lemmings headed toward their own destruction. Yet that is not what happened looking back at our own social and economic history when people were poor. It is equally false with respect to population growth in today's poor countries," in the Nobel Lecture cited above.

Following Stigler and Becker (1977), a household's overall utility function can be thought of as $U = U(Z_1, Z_2, Z_3, \ldots)$ where Z_i is the ith commodity demanded by the household. One of these commodities is security, S, which is possibly produced by

$$S = f(n, l, s, i, a, m, h, c, e, \ldots)$$

where
- $n =$ number of children, and their sex, in some cases.
- $l =$ labor force participation (in terms of relative gains from labor of different members of the household).
- $s =$ savings in alternative assets (asset allocation problem)
- $i =$ insurance premium paid for insurable loss
- $a =$ quantity of animals used to transmit perishable goods from period to period (applicable to rural households)
- $m =$ migratory movements as a mechanism to diversify risk, e.g., going to work in the nearby city and returning during agricultural season, sending the eldest child to another place to reduce correlations between strategies, etc.
- $h =$ household characteristics such as ability (high ability or low), risk-level of the agents in the household (high-risk, low-risk).
- $c =$ community characteristics including institutional characteristics, such as alternative modes of insurance available
- $e =$ economy-wide characteristics, such as expectations of growth of the economy in the agent's second period of life.

Some of these are choice variables; others are socially determined and hence exogenous for purposes of considering a partial equilibrium. Many of these exogenous variables are not given as 'objective' knowledge but are determined as 'expectations' of a general equilibrium framework, formed through social interaction and observation. In the larger context, these are forms of Nash equilibria or 'folkways', and individuals do impact them through their constant interaction and by upholding or violating these norms. All these variables are thus potentially operational and involved in the production of security. Most 'sensible' households will try to utilize as many of these alternative choices as possible. Take the case of children. If only children were used to insure, both parents and children might be simultaneously affected by a 'bad' state of nature. Hence, diversification of the asset and insurance portfolio remains a central goal for the household.

15

We do not know much about the nature of the above production function; it could differ from one household to another depending on its endowments, abilities, and behavioral habits or tastes (risk-averse, risk-loving). The technology of the society (and its intangibles such as 'culture') in which a household emerges into the world can affect the efficiency of the production function.

Also, recall that S is merely one of *many* commodities demanded by a household, The same raw materials can often be used in the production of a variety of commodities. For example, children could be used to produce L (lineage), E (entertainment or companionship),[23] and so on. Also, it would be possible to use one commodity in the production of another.

Therefore, decisions on saving, the number of children, the amount to invest in children, or migration to a new place of work, and so on, are a component of the complex life-cycle *choice*, driven in considerable part by the need for security. Mathematically, this is an intractable problem.

In order to take into account Maslow's theory, we might wish to consider an additively separable step function of the following form:

---

[23]   Empirical evidence shows that children and economic well-being are identified by people as the chief sources of happiness (Turchi, 1975, citing a survey of mental health, USA, 1957). It is also quite likely that substitutes for children do not exist, particularly on characteristics that impact happiness. If income cannot purchase substitutes for child services, then it can be easily shown that children will be demanded proportionately to increases in income (Turchi, 1975: 219). Clearly this is not what actually happens and hence other, undesirable characteristics of children must be playing a role.

$$U(.) = \begin{array}{ll} U(P(.)) + U(S(.)) + U(Soc(.)) & \text{if } P(.) > P^*, S > S^*, Soc \leq Soc^* \\ U(P(.)) + U(S(.)) & \text{if } P(.) > P^*, S \leq S^*, \\ U(P(.)) & \text{if } P(.) \leq P^* \end{array},$$

where P = physiological needs, S = security needs, Soc = social needs, with the asterisk indicating the minimum fulfillment of a particular need. The problem is that even the simplest formulation of the household's problem then becomes unwieldy.

Ronald Lee (1998) has pointed to the large gap in our understanding of micro-demographic behavior and the macro-economy. [24] Theoretically, if we were able to capture even the partial effects of the need for security on the human being, we would have made much progress, and, in the long run, we could then begin to move out of the household and into the macro-economy. If properly framed, this theory could potentially provide the micro-foundations for a very vast set of observed macroeconomic and social outcomes. It should then be possible to explain the rising savings rate in South East Asia coterminous with the falling savings rates in USA. It should be possible to explain the falling fertility world-wide and the stabilization of fertility at around 2 per woman.

In Chapter 3 we will see the powerful predictive powers of even the ordinary VMN utility functions when social norms are incorporated into the model. As more satisfactory mathematical representations of the above issues are arrived at, these results might even become more wide-ranging.

---

[24]   Some attempts have indeed been made, e.g., Becker and Barro (1988), where they try a very ambitious model. They claim, "despite Malthus' famous precedent, fertility has not been integrated with the determination of wage rates, interest rates, capital accumulation, and other macroeconomic variables."

17

1.5 Conclusion

This chapter outlined what was termed a 'generalized theory of the human life-cycle.' The canvas of this theory is too vast to at this stage to convert into a meaningful mathematical or logical model which takes into account the institutional and strategic interactions outlined above. Despite the unsatisfying specification of the theory, it is important to keep these thoughts in the background while attempting to study what would always be subsets of this model.

This theory is also general in the sense that it does not distinguish between humans living in developed and developing nations. All human beings, everywhere, have to produce this commodity called security. How they diversify their portfolio, and in other ways minimize insecurity to produce this commodity, is the question, and how their production functions are different as well as differently constrained is the pertinent issue to look at. We also note that e*xpected effects* of an action on future security can thus have long-reaching impact on human decisions. That is the essential message of this conceptual model.

In Chapter 2 we work on a more specific component of life-cycle decision-making. Though the focus of this study will be primarily on fertility, an integration with the theories of labor force participation, life-insurance and bequests will be attempted. In Chapter 3, a mathematical model of fertility is proposed which tries to capture the role of old age security needs and social norms in driving fertility decisions. Chapter 4 attempts an empirical test of the mathematical model. Chapter 5 explores empirically, the issue of labor force participation, savings, and bequests. Chapter 6 concludes the study.

CHAPTER 2

AN INTEGRATION OF THE THEORIES OF FERTILITY, LIFE-INSURANCE, AND BEQUESTS

2.1 Introduction

In this chapter we take a bird's eye view of fertility theory and the mechanisms that determine the fertiliy decision. We must deduce the mechanisms of decision making related to fertility from theoretical analysis and empirical testing since we are faced with the following black box (Figure 2.1). The set of variables impacting human fertility can be seen to be enormously more complex than variables that impact other forms of animal life. Yet, for a very long time, fertility theory has been influenced strongly by Malthus who, as a first approximation, essentially applied animal reproduction to human reproduction.

Figure 2.1 **The Black Box of Human Reproduction**
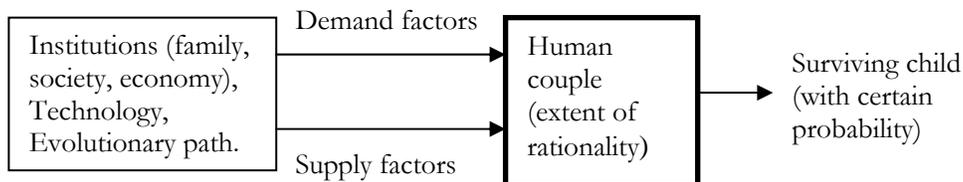
Malthus and many of his succeeding classical economists believed that human beings exercise little or no voluntary control on fertility, thus leading invariably to a constant and stationary state where humans teeter delicately on the verge of subsistence.[25] The only controls on human fertility were thought to be external (i.e., the natural checks,

---

[25] The underlying assumption being that fertility is positively related to income (food), but that food supplies are constrained.

of disease, starvation, natural disasters, etc.) in this perspective. This view continues to be propounded by many, even today, particularly with reference to developing countries.[26] There are other (often differing) views which believe fertility to be a more complex issue influenced much by rational calculation of costs and benefits and carefully engineered social institutions. We examine the debate below, and show how the Malthusian arguments need to be radically overturned and extended in order to come anywhere close to explaining actual human fertility.

2.2 Beyond the stationary state of Malthus

When we look at animal populations on which certain pre-existing natural constraints have been lifted, we usually observe a sudden spurt in population growth till other, binding resource constraints, are reached. Thereafter a new long-term equilibrium sets in, which is akin to the stationary state of the Classical economists described above. Indeed, the basic (Malthusian) model works quite well with fruit-flies in any biology lab.[27] There is no argument on this point.

The question is whether this natural 'law' applies to human beings. Malthus[28] was certain it does: "Elevated as man is above all other animals by his intellectual faculties, it is not to be supposed that the physical laws to which he is subjected should be essentially different from those which are observed to prevail in other parts of animated nature." Indeed, man was seen as a virtual slave to his animal nature, "I am willing to allow that

---

[26]   Even if fertility is not completely exogenous, people in developing countries are somehow assumed to have been socially conditioned to *prefer* a large number of children, and apparently these preferences can be manipulated by family planning propaganda, thus accounting for the enormous popularity of investment in family planning messages across the developing world. This view has been shown to be invalid. See an excellent exposition by Pritchett (1994).
[27]   *Drosophila melanogaster* has long been used in genetics experiments because of its short life cycle and readily observable and manipulable traits (like wing type and eye color).

every voluntary act is preceded by a decision of the mind, but it is strangely opposite to what I should conceive to be the just theory upon the subject, and a palpable contradiction to all experience, to say that the corporal propensities of man do not act very powerfully, as disturbing forces, in these decisions."[29] He rested his case on two critical assumptions and plenty of observation. The fact that human populations had barely increased throughout recorded history was substantial evidence to go by, indicating a stationary state. While he did not have the precise estimates at his disposal, it is a fact that human population 'grew' at 0.0008 percent per annum from about 2 million years ago till about 8,000 BC, and at 0.05 percent per annum from 8,000 BC to 1750 AD.[30] "I think I may fairly make two postulata. First, That food is necessary to the existence of man. Secondly, That the passion between the sexes is necessary and will remain nearly in its present state."

Finally, Malthus had a third assumption, "[T]he patents[31] of one set of men could not be increased in value without diminishing the patents of some other set of men." In other words, he *specifically* denied the possibility of an increase in the size of the cake, or economic growth, and considered the world's income to be fixed and the entire issue of economics to be essentially a zero-sum game. One man's gain was necessarily another one's loss. That Malthus believed that a permanent stationary had already been achieved is also demonstrated by his finding that even the alternative escape route to the stationary

---

[28]   Malthus in *A Summary View of the Principle of Population*, 1830, quoted by Flew (1957).
[29]   Malthus' in *An Essay on the Principle of Population*, 1798. 1st edition, cited in Appleman (1976:88).
[30]   This is based on the figures of population doubling given in Easterlin (1996), the table from which is included in the text below.
[31]   Malthus defines patents as "the sum of money he can afford to spend on food."

state, namely, through increased life expectancy, had been effectively blocked.[32] In essence, both the secular increase in absolute population of the world[33] and a decline in the total fertility rate (TFR) of women, two of the major stylized facts that need explanation, were ruled out by Malthus. Neither would the fertility rate decline nor would there be an increase in population. Fertility was completely exogenous and virtually out of man's control.[34]

It can be logically argued that these conclusions were the best possible ones based on the evidence marshaled by Malthus. It is only a bit paradoxical to note that Malthus was essentially sitting on a cusp of technological change, which began barely 50 years before his book emerged and which completely escaped his notice. With his scientific approach, were that evidence of change been known to Malthus, he might have been hard pressed to argue out his case against Godwin. This means that we cannot turn to Malthus for an explanation of the rapid fertility declines or the high population growth rates that have taken place since his time, which is the so-called fertility transition. Instead, we have to turn to Godwin, whose conclusions Malthus was arguing against in his famous work.

We also turn to Wallace. Both Wallace and Godwin preceded Malthus, and each of them identified a different mechanism that might explain a possible diminution in human fertility. It is interesting to note that these two were in many ways far more correct

---

[32]   "it may be fairly doubted whether there is really the smallest perceptible advance in the natural duration of human life since first we have had any authentic history of man" (Malthus, in Chapter IX of the first edition of his *Essay*, 1798).

[33]   Malthus is well-known for his prediction of oscillations of population around the mean.

[34]   "Childbearing, he suggested, is natural and only some lack of necessities stops people from having children in large numbers and stops those children from surviving in normal proportions. The correct question is not therefore 'why do people have children?' … The correct questions are 'why do not people always have as many children as they can?' and 'why do not those born always survive as long as they normally do?" (Busfield and Paddon, 1977).

than Malthus, though they remain practically unknown in the literature. Indeed, Wallace[35] had preceded Malthus by 45 years even in the postulate on the passion between the sexes but postulated an additional (and exclusively applicable to humans) wealth effect which could counteract this animal nature: that as wealth increases, debauchery would increase, but population would fall: "in a debauched nation, addicted to sensuality and irregular amours, and where luxury and a high taste of delicate living prevails, the number of the people must be proportionately small, as their debauchery will hinder many from marrying, and their luxury and delicacy will render them less able to maintain families." On the other hand Godwin (again a precursor of Malthus) used his argument of strong rationality[36] and a hypothesis that "the passion between the sexes may in time be extinguished" (as cited by Malthus in his essay of 1798), to arrive at the conclusion (perhaps not quite logically): "Myriads of centuries of still increasing population may pass away, and the earth be still found sufficient for the subsistence of its inhabitants."

Given that (a) Malthus did not have any serious economizing basis at all for his fertility theory, except merely the consideration of resource constraints,[37] and (b) was wrong on all the well-known stylized facts of the fertility transition, it is a bit surprising that Becker (1960) should have believed that in some way he was proceeding from where

---

[35]   Robert Wallace (1697-1771) in *A Dissertation on the Numbers of Mankind in Antient and Modern Times* (1753), as reprinted in Appleman (1976: 5).

[36]   "We can apply our reflections and our ingenuity to the remedy of whatever we regret" in William Godwin (1756-1836) in *Of Population: An Enquiry Concerning the Power of Increase in the Numbers of Mankind*, 1820, (in Appleman, 1976: 143).

[37]   Becker (1988) points to an apparently positive relation between fertility rates and levels of per capita income in the Malthus model. This was nowhere stated in Malthus. What Malthus stated was that "The constant effort towards population ... increases the number of people before the means of subsistence are increased." (in the *Essay* (Appelman:24). Fertility is exogenous and constant; it is the survival of children that depends on food income. This excess of population over food reduces part of the population to "severe distress," i.e., further growth in population is constrained. Clearly, arguments for endogenous fertility must be attributed to Godwin and Wallace, and not to Malthus.

Malthus had left off 160 years before.[38] By offering a purely economic (rational) argument for fertility behavior, Becker (1960) was unintentionally following up on Godwin, and not on Malthus. One can go a bit further here. Becker's use of altruistic motives[39] in many of his contributions is completely contrary to Malthus,[40] and amounts in fact to a culmination of the Godwinian ideal of the moral perfectability of man.[41]

We conclude this sally into a historical perspective on fertility theory by noting that arguments both for and against human fertility being related to, and different from, animal fertility, had begun to take shape by the mid-1700's, and that all three of these early thinkers—Malthus, Godwin, and Wallace—had an interesting germ of truth in their views.

a) Malthus was partly right. There has been no perceptible diminution in the "passion between the sexes."[42] However, the availability of cheap contraception has made it possible—for a vast populace—to avoid the pain of rearing an extra,

---

[38]   Becker and Barro (1988) make a similar error about what Malthus has been saying. In a model of two-sided altruism, they argue that their "… analysis contains both the Malthusian and neoclassical models since fertility is endogenous and rates of return on investments in physical capital decline as its stock increases. The endogeneity of fertility also leads to multiple steady states: A 'Malthusian' undeveloped state with high birth rates and low levels of human capital, and a developed steady state with much lower fertility and abundant stocks of human and physical capital." The problem with this argument is that nowhere in Malthus is fertility endogenous, nor is a Malthusian undeveloped state characterized by "high" —in the Hutterite sense—birth rates. Instead, it is characterized by high death rates.

[39]   It is important to note at the outset that altruism as defined in the New Home Economics literature is quite different from that in dictionaries of the English language. The *New Webster's Dictionary* (1992), New York: Book Essentials, Inc., defines **altruism** as: "n. the principle of living for the good of others (opp. to *egoism*).. **altruistic** a. unselfish." Becker (1976) himself says that "an altruist is willing to reduce his own consumption in order to increase the consumption of others."   In economic literature, it means that the utility of a parent is modeled as a function of the utility of the child. Further, it has been shown by Becker (1976) that altruism might be propagated due to the egoistic gain to altruistic people in economic interactions, thus in a critical sense, blurring the distinction between altruism and egoism

[40]   Malthus' was a highly egoistic theory. As Godwin (1820) points out Malthus' view: "We must not preach private charity. For charity, 'if exerted at all, will necessarily lead' to pernicious consequences."

[41]   "The vices and moral weaknesses of man are not invincible: Man is perfectible, or in other words, susceptible to perpetual improvement" (Godwin, cited by Malthus in Chapter XIV, of his Essay, 1798).

[42]   From the fact that the human species has survived so far, it can be deduced that there is an '*instinct*' *to survive* and to pass on one's genes to the future, operating at a level well beyond the mere economic. This 'instinct' or *hardwiring* has evolved as a powerful component of human nature over millions of years, and

unwanted, child while not foregoing these passions. This fact is therefore compatible with the observed secular decline in unintended pregnancies.

b) Wallace is also at least partially right. Wealth counteracts the pursuit of corporal pleasures through marriage, primarily by distracting attention toward other pursuits and by adding complexity to household decision-making which could in some cases, lead to divorce.[43]

c) Finally Godwin is correct. Due to the existence of underlying rational traits in man, decisions regarding the number of children to have—at the margin—are perceptibly being made on the basis of deliberate economizing. In fact, it is perhaps this underlying rationality that has always distinguished man from other animal species and we will try to show a little later in this study that most of the fertility decisions even in pre-transitional societies were consistent with deliberation and rationality.

A common cause of the persisting confusion regarding this issue and of the continued perceived relevance of Malthus is the oft-quoted belief that in many pre-transition societies the number of children is unplanned, particularly since many people in such societies claim that children are gifts from God (Koenig *et al.*, 1992: 358). For example, even Easterlin, who is a strong proponent of rationality in explaining human fertility, by propounding a supply and demand theory of fertility, at the same time argues (Easterlin *et al.,* 1980) that "If reproductive behavior is a matter of deliberate choice, then one would expect to find evidence of deliberate practice of fertility control. In fact, the evidence points to the general absence, rather than presence, of deliberate fertility control

---

there is no reason to believe that it will suddenly stop functioning, or become overpowered, merely from rational economizing.

in less developed countries." In this regard, the index of fertility control, 'm,' developed by Coale, *et al.* (1974) also apparently showed that there was no conscious decision making in favor of fertility control in the pre-transition societies. If this is simultaneously true with the supply-demand framework of Easterlin, then Easterlin must explain wherefrom did the ability to become rational and 'fit' the supply-demand model suddenly arise in the post-transition societies?

In fact, these arguments of absence of human rationality fail the moment we take into account the fact that there was virtually no growth in human population during the entire agricultural epoch (pre-transition era). This is a very significant fact, whose implications have not been well understood in the literature. It shows that, at least as a first approximation, it was perhaps *optimal* to have a large number of children since so few of them would survive (this argument would fit Easterlin's supply-demand framework perfectly). Having less than this number would have led to the elimination of the human population in the villages and tribes in the long run. Indeed there is substantial anthropological literature which shows that human populations can be decimated rapidly in the absence of a critical level of population in the community (e.g., many of the tribes of the Andaman and Nicobar islands of India and elsewhere are rapidly dying out due to demoralization brought about after major reductions in their population. This story has been repeated all across the world). When we add to this fact, arguments and evidence which show the existence of multifarious alternative strategies for birth-control in pre-transition societies, we then begin to see why there was an immediate use of a combination of these methods to control fertility once child mortality started declining, at first in the West and later, in the developing societies. Bourgeois-Pichat (1967),

---

43   Evidence clearly points to an increase in divorce in the richer societies.

Leibenstein (1980), and Demeny (1993) have shown that social methods of control

existed, as a partial substitute for private methods of birth control, from a very long time.

Abernethy (1993) lists about 30 such pre-modern socially-sanctioned methods of limiting

fertility. These included sexual abstinence supported by superstition and taboo, legal and

cultural restrictions on marriage, polygyny, prostitution, primogeniture, ultimogeniture,

infibulation in the female or subincision in the male, abortion by primitive methods,

prolonged lactation, infanticide,[44] and the depersonalization or killing of widows.

To counter these arguments, Easterlin (1996) entertains the *existence* of these

'social' and other 'controls' (such as breast-feeding), but he believes that these were

accidents or coincidences, from which not much rationality can be interpreted, i.e., these

'controls' are *completely inadvertent (unintended)*. He cites surveys which show that people

often attribute exactly the opposite effect on fertility to some of these behaviors than

their real effect. While this is undoubtedly something to keep in mind, it is readily

compatible with arguments of rational social norms, in that only those norms that best

suited the needs of these societies would survive. Every single member of the society

need not be aware of the logic behind these norms. It would suffice if at least some

people of a society knew what was going on.

In addition, we have only to look at what happens in the *real and deliberate* absence

of fertility control. Take the case of the Hutterites. The Hutterites are a small religious

community in USA who view fertility regulation as sinful and high fertility as a blessing.

Their TFRs approach 10 children per woman.[45] In the absence of evidence showing that

Hutterite women and children were particularly blessed with super-normal health and

---

[44]   Infanticide seems to have been a rather prominent method. See Scrimshaw (1983) and Zhao (1997).
[45]   Encyclopedia Britannica online.

energy, it must then hold that pre-transition societies practiced *stringent* forms of social control to achieve TFRs between 6 and 8 for thousands of years, a level which merely helped reproduced the existing population, anyway.

On another plane, too**,** when considering a couple as a unit of decision making, Demeny (1993) states that "It would be utterly condescending, indeed absurd, to propose that populations in developing countries, had they strongly wished to achieve low fertility, would have been incapable or unable to do so, would have been unwilling or unable to adopt some variant of the same methods of fertility control that have proved effective, as measured on the aggregate level, in the West [prior to the fertility revolution]." Among the many arguments operating here, one can run as follows, in the principal-agent framework. If a couple is modeled as an 'agent' of 'society,' and is expected to produce a certain number of children, but the society is unable to observe the actual act of procreation, then couples can plead sterility, health problems, etc., to the society, if they do not want that extra child. Given that opportunism and bounded rationality exists, it is relatively easy for a couple—that does not want more children—to cheat their elders (society) and pretend helplessness about not having more than two or three children. On the other hand, it will be very expensive for the society to formulate an incentive contract with parents that will overcome this opportunism.

And as if all these arguments were not good enough, the argument in favor of a certain degree of rational control is clinched when we consider that models of fertility based on demand and supply, and economic considerations (including the Easterlin & Becker models), have reasonably good predictive power. To claim that some people in some parts of the world were not influenced by economic reasons earlier and therefore were unable to make conscious choices it will have to be shown *why* did fertility suddenly

become amenable to human decision making after having remained exogenous to humans for so many thousand of years.

We will, therefore, only consider models with endogenous fertility in the subsequent portion of this study. Parents are assumed to be maximizing utility and choosing the number of children to have. There is one other, minor, complication that one must mention in passing. In the utility maximizing process the existence of family planning programs is assumed, in this study, to affect this decision only through the supply side, i.e., through the supply of contraception. On the other hand, there exists literature that argues that family planning programs affect the demand for children through a change in the utility function.[46] We assume that this effect, even if it does exist, is very small. Arguments which rely on changes in the utility function take us on to very slippery turf.

2.3 Competing modern theories of fertility

Essentially, two streams of modern economic theory seek to explain the fertility transition. One—that almost always builds utilty-maximizaton models—is the 'New Home Economics Model,' motivated by the work of Becker, and the other—which primarily builds empirical models—is the 'Easterlin Model' (Macunovich, 1996). The basic thrust of both these approaches has been to consider shifts in the opportunity cost of time to parents as economic development takes place,[47] which makes children more

---

[46]   Rutstein (1995) has systematically examined this issue and believes that "family planning programs do more than just act as passive providers of access to contraception… Through increased contacts with persons using contraception, gains in knowledge about contraception and legitimization of the expression of small family values and the use of contraception, through the mass media, cohort experience and official policy, family planning programs *actively affect the fertility desires of couples*"(italics mine).

[47]   The opportunity cost of a child would be the subjective value placed by parents on alternatives uses of the time, energy, and other resources that they devote to the child.

expensive.[48] The Easterlin approach focuses on the supply of children which has been considerably enhanced by changes in medical technology. Also, with increasing income,[49] both the income and substitution effects come into a complex interplay depending on the utility functions of the parents and the nature of change in the price of children. The Old Age Security theory—which is the focus of this study—is not yet acknowledged in the literature as a separate, full-blown theory, capable of explaining a diverse range of circumstances, despite a large number of relevant publications from Leibenstein, Nerlove *et al*, Nugent, Cigno, Appelbaum and Katz, and many others, in this area.

As mentioned, Easterlin (1978, 1980) primarily focuses on changes in the supply side to explain the fertility transition.[50] He also introduced the role of declining costs of fertility regulation, both the physical and psychic components, into this analysis. While relating the issue of early mortality of children (which is definitely a component of future uncertainty facing the household) to the issue of desired fertility, this work does not explicitly allow for the impacts of uncertainty and social norms designed to resolve uncertainty, on fertility decisions of the household.[51]

---

[48] It is critical to point out that children were perhaps *always* expensive relative to the income of parents. Turke (1989) argues, "The perspective on intergenerational transfers that is most parsimonious with respect to an evolutionary theory of life cycles is that the net flow of services and resources will usually be from older to younger generations. In other words, parents are likely to have evolved to invest in offspring throughout the life course, and therefore a system is unlikely to arise in which children more than return the resources and services their parents gave them when they were young."

[49] We must recall that real income is deflated by rising material aspirations (Easterlin, 1996) and hence the marginal effect of increased incomes is not so profound.

[50] We note that the idea that infant or child mortality affects fertility has been questioned by a number of studies (e.g., Palloni & Rafaliamanana, 1999).

[51] Though, elsewhere, he does find that old age security concerns impact migration. In a study (Easterlin, 1976) of farm settlements in Northern United States during the previous centuries, he finds that "older sons may frequently have reached adulthood while their fathers still felt in the prime of life; hence they went west, while the family farm together with the responsibility for the parents in the old age went to younger sons." He cites Greven (1970) to show that a strategic bequest motive was at play. "The lure of such a 'nest-egg' was an important means of parents' control over their children's behavior and fidelity" (*ibid*).

The New Home Economics theory (which is actually a very wide range of inter-related models) is primarily distinguished by a focus on developed countries, the incorporation of altruism and a focus on the demand for quality in children. Becker started off with models[52] of one-sided altruism (parents to children, without reverse altruism). That fails to explain the support that people receive or expect to receive in their old age. If each generation cares only for the subsequent one, no generation will want to pay anything to the previous one (Cigno, 1991:155). This would make it impossible to explain the stylized fact that the proportion of the elderly and infirm is increasing in human society. Given the observed prevalence of a continuing role of children in the support of the elderly even in developed societies,[53] subsequent models of one-sided altruism postulated a strategic motive to retrieve non-monetary 'attention' from children (Bernheim, Shleifer, and Summers, 1985, henceforth referred to as BSS). Even so, most models in the New Home Economics have neglected the role of children as insurers under various incomplete markets conditions.[54] OAS motives are likely to be important even in developed countries if we include the uncertainty attributable to information asymmetries, uninsurable assets, and moral hazard.

Three essential approaches have been postulated to provide for a returns component under altruism in the New Home Economics literature.

(i) *The Rotten Kid theorem*: Becker (1974, 1981) showed why children might care for parents even if the children were bad. The critical thing here is that "under certain circumstances automatic changes in an altruistic parent's transfers to selfish children

---

[52]   Becker (1974, 1981).
[53]   We have already discussed this in Chapter 1. For example, Silverstein (1995) and the wall poster of the Bureau of the Census, National Institute of Aging, entitled, "Aging in the United States—Past, Present, and Future."
[54]   See Doherty and Schlesinger (1983).

provide these children with optimal incentives. Thus the parent has no strategic motive."
In other words, parents must all leave certain bequests to children in order to get back the
care. However, using very reasonable assumptions, BSS (1985) show that this theorem
breaks down. Hence, single-sided altruism would actually hurt parents, who would then
not invest in children, and fertility would unravel in this world. Cigno (1991) also
elaborates on the inadequacies of models of one-sided altruism.

(ii) *Guilt feelings in children.* Continuing in the context of one-sided altruism from
parents to children, Becker (1993) postulates that parents who are concerned about
possible default problems can create a feeling of guilt in their children.

(iii) *Two-sided altruism:* Becker and Barro (1988) and Barro and Becker (1989)
hypothesize the existence of a possibility that transfers from one generation to the next
can be negative, in other words that children can *somehow* be obliged to support their
elderly parents. While strictly speaking, this is not "two-sided altruism," it does help to
write models with this property to solve the problem of old age care (Cigno, 1991:157,
also see Raut, 1996). The problem with this approach is, however, that there is no
evolutionary reason that *homo sapiens*, or any other species, evolved with altruistic notions
toward its old. There are some reasons to be altruistic to one's sibling or one's cousin, but
not to the old (Haldane, 1955). In fact, Hamilton (1964) and Dawkins (1976) show that
for children to devote resources to parents would not be an evolutionarily stable
outcome, since the old parents are well beyond their reproductively useful age.[55] There is
no genetic reason to show why altruistic motives might have suddenly evolved from
children toward the old. Empirically, there is little sign at the aggregate level of such

altruism. The grievance of Generation X against the baby boomers on social security issues does not imply altruism. All studies have shown that the amount of care that parents are receiving from children is diminishing, not remaining constant. In fact, strategies are being used by parents to get care from their children. That is not a sign of innate altruism. If anyone uses altruism in the model, they must explain from where that altruism came in, and why is it so restrictive in its scope.

Having said this, one might add that all is not lost, and there might indeed be some innate goodwill in human beings toward children and others. Wilson (1993) argues, for instance, that we are hard-wired (relatively weakly) to perform our *duties* toward society. To paraphrase him (1993:113), a tiny and remote chance of being honored by one's society is of far higher value than the immediate gain from not looking after one's parents. Utilitarian calculations might become extremely hollow when *honor* is at stake. This argument does not say much about the formation of social norms, for example.

In order to close the gap between altruistic and exchange/ egoistic models, we also see a strange mix, called 'altruistic models with child services' (Davies, 1996). In such models, though, the word altruism is essentially a kind of misnomer, since the parents, while being happy with the consumption of their child (i.e., the utility of consumption of their child figures in their utility function), have exchange motives: expectations of child services (attention) from their children. One finds the entire issue confounded definitionally. Altruism should simply mean what it always has: 'gratuitous' aid. New definitions of this word are not necessary, particularly when children have *uses* like any

---

[55]   Turke (1991) discusses an evolutionary theory of demographic transition, which he has labeled the **kinship hypothesis**. According to Turke, human learning and culture have also evolved by natural selection, implying the coevolution of mechanisms that assure their use in adaptive directions.

other commodity or asset. People can get a variety of satisfactions from the same good or activity.

On the other hand, the 'egoistic' theories of fertility make no special assumptions on the form of the utility function. It is possible in such models to substantially explain the care of parents by children (though self-interest) in a much more satisfying way than by assuming altruism. The OAS theory, for instance, derives sustenance from man-made institutions and societal norms for explaining the practice of care from children to parents. These norms can emerge as long-term equilibria through the need for mutual insurance in the community. These norms exist even in the developed world where the children still continue to act as insurers of last resort.

2.4 The old age security theory of fertility: Leibenstein and beyond

Over four decades have passed since Leibenstein (1957) introduced the issue of the relationship between fertility and expected old age security from children. He identified three components of the demand for children: "(1) the utility to be derived from the child as a 'consumption good,' namely, as a source of personal pleasure to the parents; (2) the utility to be derived from the child as a productive agent, that is, at some point the child may be expected to enter the labor force and contribute to family income; and (3) the utility derived from the prospective child as a potential source of security, either in old age or otherwise." This model should be applicable, in principle, to all countries, and in all epochs. Note that *security* was not very explicitly defined at that time. Limiting our attention to the old-age aspect of security, this was shown to have two components, the pension (asset, or annuity) motive (Neher, 1971) and the generalized

security (or insurance) motive (Nugent, 1990). The second of these components is more like a typical insurance motive but somewhat more general than that since non-cash care is included in that component.

Commenting on the role of the 'pension,' or asset, component, Becker (1960) postulated that "... it is possible that in the mid-nineteenth century children were a net producers' good, providing rather than using income." This can be taken to mean: Since returns on children are negative *now*, therefore the old age security motive might not be a driving force for fertility decisions in *modern* countries. Caldwell (1982) also gave priority to this hypothesized turn-around in the direction of net transfers between generations in his explanation for the transition to lower fertility rates. By implication, children should have been demanded for OAS (pension) considerations in pre-modern societies but not in modern ones. In reality, most empirical studies have found negative returns both in pre- and post-transitional societies, as mentioned in Chapter 1 (see footnote 6). This kind of an argument would therefore discount the OAS concerns in *all* societies. In any case, the OAS theory does not talk only of an asset return. It is far wider than that.

The OAS theory is potentially a much broader theory. It includes the more traditional price and income effects (including supply of children, for example), along with various sources of future uncertainty facing the household, *and* the social institutions which help individuals and households to cope with this uncertainty. For example, the OAST would predict rapid declines in fertility in societies transiting from the agricultural epoch to modern economic growth, which fulfil these conditions:

- low default risk of the returns component ('good' social norms to enforce
repayment)

- low risk of loss of investment in children as insurers (low infant mortality)

35

- rapid growth and completion of asset and insurance markets.

An implication is that formal school education[56] of the mother, *per se*, is *not* critical to the determination of fertility decline, nor is the mere access to contraceptives a major issue.[57] Fertility is influenced, in this framework, by expectational considerations: (1) expected income and care from children, (2) expected loyalty of children, and (3) the rational calculation of risks among the entire basket of choices in an environment of incomplete markets.

The primary reason why these promising theoretical leads have not been extensively explored is the dearth of suitable data for testing these expectational and institutional interactions. Indeed, prior to the data set used in this study, there was practically no study which was based on a specially designed questionnaire to test these complex issues. The current study makes use of a micro-level data set that was specially designed to test some of the key mechanisms relating to the OAS theory of fertility. It comprises 1776 individual households from some 160 communities in rural Thailand. Apart from being rich in expectational and institutional content, the data set enables one to control for many of the variables ordinarily deemed relevant and important from the traditional analyses. The data set also enables one to examine the relative importance of wife and husband characteristics on fertility, in household decision-making, and the relationship between female labor force participation and fertility. It can also be used to test the effects of fertility on martial solidarity (Friedman, *et al*, 1994), among many other things, though on such issues, its ability to throw light is limited by its design.

---

[56]   The role of formal school education has been grossly over-rated in the literature while the role of socialization (learning community norms and practices) has been grossly under-rated. Rutstein (1995) has in fact found that women's education has not been critical to this change in preferences toward lesser children. The OAST allows for rational decision making even by illiterate women or men.

2.5 Some modeling issues in the OAS theory of fertility

We now look a little more in depth on aspects of the OAS theory. As mentioned above, two roles of children, as assets and as insurance, have been considered in the literature.

a) Children as assets (pension motive): In this simplistic view, children are considered as capital assets. The demand for children is an outcome of the couple's solution to their *life-cycle* optimization problem in which the utility of children as assets is weighed against asset alternatives such as savings. Parents evaluate the costs and benefits from children against market returns. The expected net present value of the marginal child determines the demand for children. This model fails on two grounds. (a) In a general equilibrium framework the returns on children and physical capital will be equalized if those, whose returns from children are high, are allowed to borrow from those who do not want to use children for saving (Nerlove *et al*, 1987:120). Therefore there is an indeterminate solution. (b) Emprically, children are seen to have a negative NPV.[58] While children would still evoke a demand in closed asset markets (in developing countries), it would be very difficult for the return on children to dominate *all* other capital assets in a situation of complete and open capital markets. Hence the opening up of capital markets would drive fertility to zero, if this (asset motive) were the only need being served by children.[59]

---

[57]   The cost of fertility regulation, both financial and psychological, is generally insignificant compared with the flows involved in bringing up children and in securing returns from them.

[58]   The NPV of children has generally been found to be negative in both pre- and post-transition societies. See footnote in Chapter 1.

[59]   See also Cigno (1991:153) where he shows "The fact that fertility does not actually fall to zero, even for couples who make little or no contribution to the welfare of elderly parents (and must, therefore, realistically expect the same treatment from their own children), suggests … that *the demand for children is not entirely derived from the demand for old-age consumption.*"

b) Children as insurance: Most OAS models therefore consider children to be a form of insurance which captures Leibenstein's (1957) meaning more accurately. Here, we must add that in the traditional literature, children have been visualized primarily as risky assets which help reduce the variance of returns. But there is another aspect: insurance. The argument of children being primarily used as an insurance mechanism is central to Schnaiberg and Reed (1974) and Cain (1980), among others. This argument has many critics, including Robinson (1980). The fact is that a binary, "either-or" approach will fail to explain the wide diversity of actual findings. However, the role of children as insurers is a reality to be observed in almost all societies.

These arguments can be applied fruitfully to the case of children. Some of the issues to be considered are:

- what are the feasible alternatives available to a peasant to insure himself?

- what are the default rates on these insurance contracts (arising from the death/ bankruptcy of the insurer as well as from the riskiness of the enforcement mechanism)?

In most developing country situations, children often offer the best 'deal' to a peasant, given the strong possibility that no one else will be willing to insure them in old age in the presence of severe asymmetries of information as well as graininess of the potential insurance markets. These reasons are elaborated in Nugent (1985). Foster and Rosensweig (1995, draft) enrich the debate by focusing on the issue of optimal implementable risk sharing contract under imperfect commitment, following up on the work of Thomas and Worrall (1995). By considering the barriers to information and the consequent moral hazard and commitment problems, they hypothesize that the family is

prominent in risk sharing *not* because its members are altruistic but because of the information advantages shared among family members.

The possibility that children are desired as an insurance against uninsurable risk even in developed countries is substantiated by Duncan and Morgan (1983). They studied the views of persons aged 45 and older in United States, in 1979, regarding the sources of help that are potentially available, if needed. "Morgan (1983) points out that there are many more people who feel that potential family help is available if it is ever needed than the number who report actual transfers." Nearly 40% of those 75 and older reported this confidence in their children being a source of informal insurance. Schulz (1995:30) summarizes, "The responses clearly show that many Americans feel that help will be there if they ever need it."

2.6 The critical role of Institutions and Social Norms

Schumpeter (1942:157-58) raised this 'problem' of default of the implicit insurance contract when he stated, "The question that is so clearly in many potential parents' minds: 'Why should we stunt our ambitions and impoverish our lives in order to be insulted and looked down upon in our old age?'" In other words, the reliability of institutions designed to repay a parent for the effort put into a child (or at least, to 'honor' a parent in his or her old age) should constitute a vital part of the decision making process of fertility. There are also issues related to the role of public welfare institutions like social security and pensions in this decision.[60]

We therefore need to incorporate social norms into the theory, in order to ensure the loyalty of children as insurers. Parents invest in children in Period 1 and expect the

returns (insurance) in Period 2.[61] We note that it is not individually rational for the offspring to 'pay up' in the second period and, knowing this, parents would not support a child in the first period, thus unraveling the whole fertility process. The OAS theory thus hinges on the existence and reproduction of mechanisms of enforcement of this implicit contract.[62]

Figure 2.2 **The problem of enforcement of the intergenerational implicit contract**

Time	0	1	2
	Parents supply and invest in children	Children may or may not leave parents. Parents grow old, retire or become disabled	Parents die
	⟵ Period 1 ⟶	⟵ Period 2 ⟶	

Dasgupta (1993) examines the development of social norms transmitted through communal living, role modeling, education, and through experiencing rewards and punishments. This internalization creates a set of beliefs which are then shared by all members of the society, and which can then support various sequential equilibria. Using a near-stationarity of these norms, Dasgupta works out an overlapping generations model of children as insurance. According to him, the "near-stationarity of both kinship lines and the circumstances facing people in traditional societies together imply that mutual insurance arrangements don't always look like mutual insurance agreements. There can be layers of behavioral norms and rules whose compliance sustains a variety of insurance arrangements... Within rural communities there is thus an integral system of mutual insurance against illness, production failure, and general bad luck." Different perspectives

---

[60] See, for example, Weinstein and Ebot (1976).
[61] The duration of each period is stochastic, underlying the entire uncertainty.

on these norms have been studied. Guttman (1996) in a model of children as investment goods shows that if parents were to invest in children then the probability of receipt of returns would be enhanced. Nugent (1985, 1990) shows how social norms are not only sustainable but also economic for a society and a nation.

These problems of enforcement can become exacerbated when children migrate (which, however, is a good risk-diversification strategy). Lucas and Stark (1985) consider the problem of enforcement of the implicit contract in such a situation. The existence of the *last period threat* available to the parents in the case where the migrant does not remit is critical to the Lucas-Stark approach. Arcand *et al* (1995) extend this to develop a two sector general equilibrium, three period, overlapping generations model which incorporates intra-family and inter-generational contracts. According to this model (which resembles the strategic bequest model considerably), parents set up incentive constraints for children who migrate to urban areas to ensure that they 'remit,' on the lines of the principal-agent problem. This yields a mathematical condition in the parameters of the model which is extremely difficult to interpret. Essentially, though, the credible social sanctions, which can differ across cultures, relate to the potential return to the village of the migrant in the final period (to retire or to be buried), the desire by the migrant to wed a woman from his native village, or the eventual bequest of part of the parents' assets to the migrant.

2.7 Strategy in old age security plans

---

[62]   Rosenzweig (1988) explores the role of the family in smoothing consumption through income transfers across extra-village ties and studies implicit contracts in the face of risk.

This brings us to the realm of strategy. Assuming that the institutions were intact at the time of child birth but that these start breaking down subsequently, it might be necessary for parents to work out strategies to make their children meet their otherwise implicit obligations. Alternatively, they might have the unpleasant task of increasing their savings and further cutting down their current period consumption, after already having spent on their children, in order to have enough for their old age. Cox and Jiminez (1995) reject this possibility of strategic interactions, pointing out that in economically backward societies there is not much asset accumulation (i.e., no 'nest-egg') to support such strategies. This would not appear to be quite right, though. In poor societies the marginal utility of even a small amount of assets would be very high and could be manipulated to provide an incentive to children to not renege. Cox and Jiminez might, however, be correct in those developing societies which are seeing very rapid income growth, in that the marginal value of the bequest that parents could offer as incentive would then tend to be very low.

One of the strategies would be to provide aid to children throughout life, in order to build good-will from children. Kotlikoff and Spivak (1981), Cox (1987), and Cox and Stark (1992) have such models of mutual aid. There is no doubt that this behavior is commonly observed, but if continuing help from an older parent is a necessary pre-requisite in order for a child to provide help, then the implicit insurance contract would break down. That is, because the very infirm can hardly be of any aid to their children, yet it is precisely for such contingencies that parents need children (as insurers) the most. Mutual aid is therefore a reasonable short-term strategy, or as a strategy over and above the long-term one, and simply adds to the cost of children, but it cannot substitute an underlying strategy/ social norm.

Aspects of this very important though seemingly intractable issue of the reliability of the intergenerational contract will be captured in the empirical work that follows. In this overall picture, given the enormous complexity and range of the issues, the key questions are necessarily empirical and much depends on the skill of survey design. To illustrate the use of children as a risky asset and insurance, I extend the simple Appelbaum and Katz (1991) theoretical model in the next chapter.

2.8   Explanations for some stylized facts using the old age security theory

2.8.1   Positive Fertility

Most mathematically argued economic models of fertility do rather well in explaining the decline in fertility. But they beg the basic question: Why have children in the first place? Answers to this question are not quite so obvious, given the theoretical framework in which these are placed. Empirical studies have overwhelmingly shown that the monetary net present value of children is negative, or close to zero. When considered as investments alone, therefore, children are 'uneconomic.' Note also that investment in children is irreversible, has a very long duration for the 'construction' of the children into adults, and if you are unhappy with the goods you have produced (since you as parent are the sole 'producer'), then there is no way to recover your costs in the secondary market for children, which is conspicuous by its absence. At the end of it, if a child does die before the parent's death, then there is another huge negative risk in terms of personal disorientation and sense of loss. Investing in children is not only a loss-making enterprise but a highly risky business. So why have children at all? We can show a lower bound to human fertility based on the OAS theory and biological imperatives.

a)   In the first place, it is reasonable to postulate that children provide 'consumption utility' (Leibenstein:1957). Children are utilized for many purposes in a household, including having fun, companionship, etc.

b) Second, we can consider deploying Malthus' first assumption, of biological imperatives. Parents begin by having a great urge—to have at least one child. Strong economic reasons perhaps start operating after the first child.

c) But even by itself, the OAST can lead to n>0 in most cases. It is admitted that children are often uneconomic and also highly risky as assets. Therefore they might not be desired for these properties. There could still be a positive demand for them if markets are incomplete, and under situations described by Nugent (1985), as a means of transferring income across the two basic life periods (working, retired). Apart from these conditions, there is the need to insure against otherwise un-insurable risk (e.g., disability), to provide which children are best equipped, since they know far more about their parents than insurance companies can get to know (i.e., there is information symmetry). Finally, children are used for providing physical care to parents when old.

Due to these advantages of having children, not merely one child would do, in most cases. The risk of loss of a child is always real, even though it is getting smaller and smaller in most societies. The study of human behavior under uncertainty reveals many unexplained 'paradoxes' such as the Allais and the Ellsberg paradoxes (Kreps, 1990:116). It has been proposed as a possible solution of these paradoxes that people re-scale probabilities and give proportionately more weight to small probability events. It is possible, therefore, that the risk of a very bad situation (sudden and accidental loss of child in an automobile accident) might prevail over the rational calculation of risks.

Therefore, people would often have a second child to fully insure themselves against the loss of one child.

That such a strategy would be optimal was deduced by Doherty and Schlesinger (1983) in a slightly different context. They found that, "The portfolio of assets held by an individual ... is exposed to risks of an insurable nature together with risks for which no market for insurance contracts exists." Personal labor abilities are among the category of risks for which no insurance exists for the most part even in developed countries. "The interaction between these portfolio elements have significant implications for insurance strategies. Diversification ... may provide a substitute for conventional insurance purchases, and results derived under the assumption of complete markets may turn out to be incorrect.... Depending on the signs and magnitudes of the correlations among the assets held, we may find individuals insuring some risk fully and retaining others." The apparently complex behavior where the utility function is non-risk averse for a part of the domain might in fact be optimal and 'all or nothing' strategies might be an appropriate solution. Specifically, it may be "more economically efficient to over-insure asset A than to purchase insurance directly on asset B." This is a very significant result, showing how parents might choose to 'purchase' more children in their portfolio than actuarially 'reasonable,'[63] and then follow a strategy of allowing them to migrate to different places, in order to receive the negative correlation between individual elements of the portfolio.

2.8.2 Why do the wealthy not have many children?

In the simpler altruistic models of New Home Economics, the utility of parents is a function of the utility of the function of children. There is nothing to seriously bound

fertility, in such a model. As incomes increase, people can afford more children, not less. If children are becoming costlier in terms of educating them, at a more rapid rate than the growth of incomes of the parents, we might expect a tussle between the quantity and quality of children. However, what tussle could possibly be there in the minds of billionaires? The budget constraints of the very wealthy are never binding in terms of either opportunity costs of wives, or in terms of cost of the quality of children desired. These people should, were they truly altruistic, thus obtaining additional satisfaction from the consumption of their children, demand (and supply) 10-17 children. But most of the rich people do not display a tendency to produce such a multitude of children.

The OAS theory shows that the demand for children can decline with increasing parental income, since children are desired—after perhaps one or two—primarily for their role as insurers, and providers of physical and emotional old age care rather than as assets. The very rich do not need this insurance, and therefore will have only as many children as they can truly 'enjoy.' There is rapidly declining marginal 'consumption' utility from each successive child. Not only is the NPV of children negative, alternative investments yield decent returns without the huge effort (including psychological) required to rear children. It is at this level of wealth that the deductions of Wallace (see Section 2.2) regarding the very 5wealthy ring true.

2.8.3   Struggle to double human population

Over the entire history of the human species, human populations have faced an uphill challenge to sustain themselves, let alone expand their numbers. For nearly a million years, during the hunting and gathering epoch, it took 90,000 years to double population,

---

[63]   Meaning thereby that they would not mind a negative return on the asset.

and later, during the agricultural epoch, it required 1,459 years. The OAS theory which is essentially a model of *optimal* fertility under *future* uncertainty and risk, would suggest that the human species had discovered, through trial and error, that having 6-8 children per woman was the only way to *at least* sustain the population. We have been conditioned in the past decades to imagine women with 7-8 children in their village homes as being somehow dumb and 'over-reproductive.' When death rates were so high that possessing even one live child in old age was quite a privilege, there was—at a very basic level—not much reason to control fertility, or, at least not radically.

In other words, what Malthus discovered—the "passion between the sexes"—in a profligate sense, was not something deplorable, *needing* natural checks. Indeed, it was perhaps the 'best' solution to survival of the poor in their old age, *given* the prevalence of natural checks which were always working against the survival of members of the households. On the other hand, if people were to be altruistic toward children, then they could at least have had 10 children and population would have doubled much faster.

2.8.4   Fall in Fertility

What about the fall in fertility? What does the OAST have to say in this regard, and how does it compare with other theories? Numerous mechanisms operate here since the evaluation of future uncertainty is a rather complex issue.

(a) Opening up of the market for alternative assets would lead to a diversification in investment. Children are a prime (though not the only[64]) insurer under conditions of incompleteness in asset and insurance markets, including in developed nations. As

markets become more complete, consequent to economic development, prudence would dictate diversification and substitution across the portfolio, in particular, children would become less and less important, exerting a downward pull on fertility.

(b) The other factor affecting fertility in the downward direction would be the breakdown of institutions. There is no assumption made in the OAS theory that children are altruistic and will always take care of their parents through an innate biological urge. There is thus a provision in the OAS theory for the breakdown of the social institutions of the agricultural epoch, given the opportunism of people. Under situations of high opportunity, children can decide, egoistically, one fine day, to move away and to take less care of their parents than their parents gave to their grandparents (as would be a solution under a stationary state). In fact, high levels of physical and social mobility and a breakdown of the joint family norm, a commonly observed fact of the industrial epoch, are supported by the OAS theory but not by altruistic models. The fact that old age security institutions have actually been weakening is also clear (see, for example, Hermalin, 1995).

Essentially, we see that the reliability of children as insurers becomes suspect under situations of high mobility. This might lead parents to resort to strategic moves to attract the return from children. One way would be to have more children but to attract them with a bequest offered to the children who return 'most faithfully'. In other words, an expected breakdown of norms would lead to a slight increase in the children demanded.

---

[64] Lin and Nugent (1995) point out many other diversification strategies, including crop diversification, extended family, marriages across villages, linkages of mutual help between households in the community, etc. The *Jajmani* system in India is a typical example of community-wide linkages.

Of course, were alternative insurance (of previously uninsurable assets) and efficient old age care available, there would be a major shift away from children. Note that if social norms are high, the opening of even the simplest of capital markets[65] would serve to shift resources away from children, since most savings help diversify against old age risk to income. Hence we expect to find very close relationships, initially, between opening of capital markets, and a fall in fertility.[66]

2.8.5   Bequests

We touch upon the highly controversial issue of the causes of bequests now. If parents are assumed to be egoistic, then why would they leave a bequest to their children? Would it not be optimal for parents to consume everything they have saved (as per the pure life-cycle hypothesis) and to leave nothing behind?

First, a look at the nature and magnitude of bequests. Kotlikoff and Summers (1981) find that as much as four-fifths of U.S. wealth accumulation is due to intergenerational transfers. Bernheim (1991) finds that private savings are strongly influenced by the desire to leave a bequest. Brittain (1978), Mirer (1979) and Bernheim (1984) have also found that the savings behavior of retirees is inconsistent with strong forms of the life-cycle hypothesis. However, Modigliani (1988) and Gale and Scholz (1994) find that barely 20-30% of wealth accumulation takes place through bequests.

---

[65]   It is not obvious that children are the principal mechanism to smooth consumption even in rural societies. Simon (1980) cites various studies of Indian peasants that show "that poor Indian farmers save very respectable proportions of their incomes—cash savings of perhaps 12% gross and 8% net. And when non-monetary saving is included—as it should be—'the gross savings-income ratio among rural households would rise to 20% or so.'" This shows that even in the absence of asset markets, children are not the only asset.

[66]   The World Bank (1993:244) while testing for Granger causality, found that GDP growth rates have 'caused' higher savings in Thailand. The path through which this operates was not examined. It might be the OAS motives through which this operates.[66] Andrew Mason and Burnham Campbell (1993) project that "Demographic and growth factors will raise household saving rates to near the record 1970 values by 2005... The gradual increase in the saving ratio together with rising income combine to push up the

Tobin (1967) and Davies (1981) used simulation results to indicate that pure life-cycle motives are sufficient to account for the bulk of U.S. capital. Further, Abel (1985) and Hurd (1987) and others consider the bequests to be accidental, anyway, and suggest that we do not read too much into the existence of these things. Nevertheless, it appears that bequests are indeed somewhat of a puzzle.

For example, in almost all societies, bequests are taxed at a much higher rate than ordinary transfers of income to children. If parents were driven by altruistic intentions and did wish to leave a bequest, why would they impose this tax burden on their children? It would be optimal for them to simply convert their wealth into an annuity, and transfer the annuity remaining after their death through a 'next-of-kin' clause in the annuity. Instead, parents almost invariably continue to hold on to their bequeathable assets and at the most 'will' it away, with some deliberation and premeditation.

The question can be somewhat better resolved if we consider the strategic use of bequests. It has been found that rich parents receive more visits from their children than poorer parents (BSS, 1985). It is of course possible that poor children have less leisure and cannot afford these visits. But what drives children to their parents who would have given these assets away to them anyway, and who are rich enough to not need the attention of their children?

The BSS study finds strategic bequests widely used. They find that "contact between parents and children is much higher in families where the elderly parent has a substantial amount of bequeathable wealth to offer." This is inconsistent with altrusim. If parents were to be altruistic, then why would they want to use 'manipulation' to get this

---

absolute amount of domestic resources applied by households for investment purposes by substantial amounts." I examine the change in savings behavior in a separate paper.

return (care) from children? Evidence from existence of large numbers of 'dead-beat' fathers shows that altruism even toward one's children might not be quite as strong as one might 'like it to be.'

Summarizing,

(a) Bequests do exist and need an explanation if a life-cycle view is taken of human behavior,

(b) Bequests as commonly observed, are inefficient from the point of view of the children who receive them,

(c) However, parents might be in some way better off by withholding the bequests till the last minute possible.

The OAS theory would look at these issues at various levels. The OAS theory would expect that most people would *not* give away their assets while they were still alive.

(i) Most bequests by poorer and middle-income parents take the form of land and property in which they actually reside.[67] There is a high level of risk involved in either giving away these assets prematurely to their children or in liquidating them and in converting them into annuities. Apart from the difficulty of finding reliable annuity markets, purchasing annuities would not make sense since there is a substantive inflation risk associated with annuities, while real estate is generally moves automatically upward with inflation. At the same time, possessing ownership over the lump sum asset provides power and prestige as well as strategic control over the behavior of children. Parents would be expected in this model to be equally concerned (or not concerned) about their children. They would therefore not normally discriminate if they were to receive the

---

[67] As far as the *very* rich are concerned, it is unlikely that they could consume the wealth they have accumulated even if they decided to spend it freely during their old age.

returns satisfactorily from the children in proportion to what the children could give them. In other words, given relatively strong social institutions for the 'repayment' of the investment in children, we would find equal distibution of bequests. However, as social norms break down, one would expect to find greater use being made of bequests as a tool to leverage attention, with the child who gives most attention securing a bulk of the 'prize.'

ii)   Parents who possess assets to bequest would be interested in exhausting resources without using up their principal bequeathable asset. They would therefore set up an implicit 'exchange' model: Children who provide them with an annuity equal to what their estate would be worth, would receive the estate in return, or in porportion to the amount of such annuity that they provide. This way, they could consume their wealth and yet not lose control over it.[68]

iii) Bequests would reduce with the introduction of a public transfer system to the parents, since they would need less use of wealth for strategic purposes and would consume more of it. Altruistic models would find it difficult to predict (or explain) such possible declines.

iv) Finally, yet another aspect enters into the story on bequests. That is the 'solution to problem 4001' of Galton.[69] The issue here is of the use of land and family house as a mechanism to transmit one's surname. Do people care for their surname? Apparently they do, as has been noted from ancient times in many societies.[70] This means that in addition to the possibility that bequests could be accidental, there might be a 'real' motive to leave behind the family land and property in order to preserve the 'honor' of

---

[68]   This was perhaps first proposed by Cigno (1995).
[69]   See Chu (1998: 46).

the family (alternatively, the incentive to be *not* known as the person who sqaundered the family 'heirloom' and reduced the probability of survival of the family surname).

In the end, we would tend to agree with Hurd (1989) who said, "there is no evidence of the bequest motive (p.781)." Instead, the kind and level of bequests can be better visualized as part of a rationaly determind social norm, designed to ensure care for parents.

---

[70]   Chu (1998) has cited many instances of this, in his study of lineage and primogeniture.

2.8.6 Life Insurance and Marital Solidarity

The question here is why would anyone who is completely egoistic want to hold a life-insurance policy for his/her family? It is one thing to hold insurance against accident, but why insurance against possible loss to others due to one's death? A possible answer to this question would lie in the need to build marital solidarity, during a person's life time. Marital soilidarity would help ensure a common understanding of future security goals, and also provide various other satisfactions. One of the best ways to do it would be to take a life insurance. The provision of a life-insurance policy can do wonders for that sense of loyalty. Further, most insurance policies have a strong savings component anyway, leading to, essentially, a self-interested outcome. Finally, it is possible for the insurer to set up a similar 'exchange' model with the spouse/ children as mentioned above, such that the insurer receives an 'annuity' of services equal to the value of the insurance premium less the savings component.

Finally, the need to preserve one's lineage (surname or honor) might also drive people to take life-insurance. In other words, we do not need to incorporate altruism into a model to drive an explanation for the purchase of life-insurance by many people.

2.9 Conclusion

"From a comparison of these theoretical predictions with the findings of a number of empirical studies, it would appear that self-interested concern for one's old age, rather than any great love for future members of one's dynasty, is or has been so far the dominant force driving fertility and intergenerational transfers worldwide" (from the

abstract of Cigno, 1992). This conclusion is generally supported by the arguments relating to fertility, bequests and life-insurance that were examined in this chapter .

Thus, the OAS theory promises an ability to explain a large basket of seemingly unrelated empirical regularities. In the next chapter we propose a mathematical model which will try to capture the logic of the arguments with reference to fertility, savings, labor force participation and bequests.

CHAPTER 3

A THEORETICAL MODEL

OF THE PROVISION OF OLD AGE SECURITY

BY CHILDREN

3.1 Introduction

We know by now that the search for future security plays a very important role in the life-cycle of a human being. The problem is that models of fertility and its fertility timing which take into account issues of future risk and uncertainty are acknowledged to be non-trivial. As Cigno (1991: 127) points out with reference to fertility theory, "Constructing a formal model of rational behavior that takes account of ... uncertainty is ... extremely difficult ... The relatively few attempts at constructing such a model are based on drastic simplifications that remove much of the economic content." He cautions against attacking the problem in its full generality, since that is extremely complicated and does not yield interpretable results (p.109).

This is not to say that the problem has never been considered before, nor that meaningful implications cannot be derived from a rich theory. Indeed, there is a tradition of consumption-portfolio models which can be suitably adopted to provide meaningful insights. However, the crucially important role of social norms and other intangible factors has not been dealt with in these models. For example, the results of Sandmo (1969:589-91) could be adapted to state, "The demand for the risky asset (children) will increase with a shift in the probability distribution of its yield that increases the mean with

no change in dispersion. This implies that the demand for children will increase if the social norms regarding returns from children improve." Unfortunately, this is too simplistic and not what empirical results would indicate (see Chapter 4). One of the models that is closest in spirit to the results we have in mind is that of Dardanoni (1988), as will be shown a little later.

In this chapter we extend a model by Appelbaum and Katz (1991) to explore some of the essential features of the Old Age Security Theory of fertility and its impact on the demand for children. Due essentially to the mathematical complexities involved, the model proposed in this chapter falls considerably short of doing full justice to the generalized theory of security which was proposed in Chapter 1. Its value lies essentially in pinning down the possible ranges of risk aversion that people operate in.

3.2 The model with missing capital markets

There are three time periods in this model. At time 0, a child is born and educated. At time 1, the child marries and puts the education to work in eking out a livelihood. She also becomes a parent in this period by choosing the number of children (n_1) that she wants. At time 2, any children born at time 0 become old. As a matter of notation, subscripts would usually represent the time period in this chapter. Consider a couple (two agents who marry each other at time 1) which decides upon the number of children they will have.

A critical concern of these potential parents at time 1 is their need for security (survival and care) in time 2. The members of the couple do not expect to have enough

strength to labor and earn sufficiently in their old age.[71] Therefore they need a method to transfer some of their (perishable) income from their first working period to the second. In this society, no capital markets exist; children are the only means of transferring income across time periods. Hence, if personal earnings are inadequate for providing sustenance in the second period, the decision to have children essentially reduces to *how many* children to have.

For each member of the couple, the income stream is a function of (1) the total investment in their education (by their parents, $C_0(n_0)$), (2) the number of children chosen by this couple (n_1), (3) the growth of the economy in that period (g_1)[72] and (4) the idiosyncratic shocks to the production function due to alternative states of nature (s_1).[73] Thus, the production function of labor income of parents and children looks like, respectively,

$$Y \equiv Y\ (C_0(n_0),\ n_1,\ g_1,\ s_1)$$

$$X \equiv X\ (C_1(n_1),\ n_2,\ g_2,\ s_2)$$

where it is assumed that $Y_{C_0} > 0, Y_{n_1} < 0, \dfrac{\partial^2 Y}{\partial n_1^2} > 0, Y_{g_1} > 0$ and similarly for $X(\cdot)$. The cost function represented by C_0, C_1, is the net cost of rearing n_0 and n_1 children, respectively where $C' > 0, C'' > 0$. In other words, the returns from children in their childhood (e.g. through child labor) are accounted for in the cost of rearing the children.

---

[71] This is termed as "income risk" by Yaari (1965).
[72] This represents the employment opportunity set., and shocks in this represent aggregate uncertainty. This variable takes into account economy-wide institutions, community variables impacting on income and natural conditions.
[73] For example, a businessman could succeed or fail depending on personal traits that are not known with complete certainty today.

We assume net costs to be positive,[74] since a negative cost would potentially lead to unbounded population growth close to that observed in the Hutterites, but evidence points to a maximum TFR of 6 to 8 in the absence of capital markets, rather than the much larger potential natural bound on fertility.

A bequest B is received (physical capital stock, e.g., land) from the parents of the couple in their first working period (time 1). It is assumed at first that the bequest cannot be consumed and is 'passed through,' untouched, to the children of this couple at time 2.[75] We assume that there exists a 'societal norm'—λ, representing a long-term equilibrium, that if the physical stock B is passed on untouched across generations, equally to each child, then the children (in whose interest it is to abide by these norms) would return a certain fraction λ of their income to their parents in their parents' old age.[76] The variable λ has been modeled earlier in somewhat similar fashion in the context of a model with altruism by Chakrabarti *et al.* (1993). In that model, children are assumed to be partially altruistic (which dispenses with the social norms requirement) and there exists a situation where children might default completely. In that model, too, two factors are at play, (1) the probability of receipt of the "gift" (modeled here as "return") from the children and (2) the level of the gift (modeled here as insurance in two states of nature). Chakrabarti *et*

---

[74] Also, Bulatao and Lee (1983) reviewed various studies on net child costs and concluded that average child (boys and girls combined) would *not* provide net flows to parents before leaving the parental residence.

[75] This assumption is not at all far-fetched. For example, Niraula (1995) documents the social norm in Nepal whereby "intergenerational transfer of property through inheritance from the older to the younger generation, especially among sons, together with the Nepali normative prescription that sons care for their aged parents, provides a mechanism for old age support." Later we will consider cases where the amount of B passed on to children can vary as a function of the care received.

[76] This model can therefore be viewed as a life cycle model with bequest motive, such as those of Menchik and David (1983), Kotlikoff and Summers (1981) and Modigliani (1986), with the difference that bequest is socially determined. Indeed, the assumption is consistent with Hurd's statement that "there is no evidence of the bequest motive (p.781)."

al. are concerned with the efficiency of the investment in children. They find that if $\lambda <$ 1, then parents will under-invest in children.

The actual amount returned would depend on the idiosyncratic (personal) state of nature realized in the parents' old age. If there is a good state of nature (with probability ψ), then $\lambda \eta_1$ would be returned, and in the bad state, $\lambda \eta_2$ would be returned, where $\eta_1 < \eta_2$. Thus, children not only serve as assets, they also provide insurance. It is to be noted clearly that these are risks *of a personal nature* such as health status and status of personal ability, and there is no correlation of these states with the personal health states of children who are expected to be entirely healthy if they survive.

Agents have a VNM expected utility representation of preferences over consumption in the two periods, $U(Z_1, Z_2)$, where Z_1 is the consumption in first period and Z_2 in the second.[77] $U(\cdot)$ is assumed to be additively separable and concave (i.e., it is twice differentiable with a negative semi-definite Hessian), enabling us to ignore the second derivatives. Each parent is assumed to arrive at the solution independently and the final number of children supplied by the household is left to the husband and wife to negotiate. It is assumed purely for the sake of simplicity that both husband and wife face the same problem with the same parameters and hence arrive at exactly the same solution.[78]

Decisions at time 1 are taken after resolution of all uncertainty in income streams. Therefore $Z_1 = \pi Y_1 - C_1(n_1)/2$ where π (where $0 < \pi < 1$) is the proportion of Y_1 that is

---

[77]   We hold on to this representation primarily due to its simplicity, despite substantial literature on alternative representations.

transferable to the parents of each member of the couple. Note that as m_1 increases, Z_1 declines monotonically. The only direct ways which might increase Z_1 are a decrease in m_1, a decrease in C_1 or an increase in Y_1. We will show later that some other, more indirect methods, exist to increase Z_1, too.

Income streams for the next period (time=2) possess risk and uncertainty. The income of each child can thus be treated as a random variable $X_{j,}(\cdot)$, with a subjectively estimated mean $\overline{X}(\cdot)$ and variance δ^2. Another variable, with the same distribution as $X_j(\cdot)$ is $\overline{X}(\cdot) + \delta\varepsilon_j$ where ε_j are identically and independently distributed normal[79] random variables with $E(\varepsilon_j) = 0$ and $E(\varepsilon^2) = 1$. Therefore, $E(\overline{X} + \delta\varepsilon_j) = \overline{X}$ and Var $(\overline{X} + \delta\varepsilon_j) = E(\overline{X} + \delta\varepsilon_j - \overline{X})^2 = E(\delta\varepsilon_j)^2 = E(\delta^2\varepsilon_j^2) = \delta^2$ We write $X_j(\cdot) \underset{d}{=} \overline{X}(\cdot) + \delta\varepsilon_j$, showing that the distributions of the two random variables are equal. Note that $X_j \neq \overline{X} + \delta\varepsilon_j$,[80] or a strict equality is not meaningful. Since we are concerned with analyzing risk, we shall construct, as needed, random variables with the same moments as the ones in which we are interested. Not all children survive. Let ξ be the expectation of the proportion surviving into the second period.

The (own) labor income stream of the members of the couple in period 2 is clouded by multiple factors of risk and uncertainty. We assume, however, that there will be a good (personal) idiosyncratic state with probability ψ and another—bad—with probability $(1-\psi)$, where average earnings will be $\overline{Y}_g(\cdot)$ and $\overline{Y}_b(\cdot)$ respectively. Therefore

[78]   But in more realistic cases the parameters would be different. It is realistic to expect in such cases that the member of the couple with lower demand, would prevail.
[79]   While we assume a normal density here, the literature permits any spherical distribution in portfolio analysis of the mean-variance type (see discussion in Diamond and Rothschild, 1989:141).

the expected (own) labor income is $\psi \overline{Y}_g(\cdot) + (1-\psi)\overline{Y}_b(\cdot)$. We also assume that all other risks in future income, arising from a host of factors relating to the community, family, and natural and other shocks to the economy, are known to have a normal distribution around this mean with expectation zero and variance γ^2, so that $Y_{si} \underset{d}{=} \overline{Y}_{si} + \gamma \varepsilon_i$, $i = 1, 2$, where $E(\varepsilon_i) = 0$ and $E(\varepsilon^2) = 1$. [81]

The random consumption stream of each parent in period 2 can thus be represented by

$$Z_2 \underset{d}{=} \psi \overline{Y}_g(\cdot) + (1-\psi)\overline{Y}_b(\cdot) + \frac{n_1 \xi}{2}\left[\psi(\lambda\eta_1)\overline{X}(\cdot) + (1-\psi)(\lambda\eta_2)\overline{X}(\cdot)\right] +$$

$$\left[\gamma^2 + \frac{n_1 \xi \lambda}{2}\{\psi\eta_1 + (1-\psi)\eta_2\}\delta^2 + 2Cov(\Psi, \Omega)\right]^{\frac{1}{2}} \varepsilon$$

where the square of the multiplier of ε is the variance of Z_2 and the other terms are the mean consumption in period 2, and where $\Psi \underset{d}{=} \psi \overline{Y}_g(\cdot) + (1-\psi)\overline{Y}_b(\cdot) + \gamma\varepsilon$ and

$$\Omega \underset{d}{=} \frac{n_1 \xi}{2}\left[\psi(\lambda\eta_1) + (1-\psi)(\lambda\eta_2)\right]\overline{X}(\cdot) + \left\{\frac{n_1 \xi}{2}\left[\psi(\lambda\eta_1) + (1-\psi)(\lambda\eta_2)\right]\right\}^{\frac{1}{2}} \delta\varepsilon$$

We now write $Z_1 = \alpha_1(n_1)$ and $Z_2 = \alpha_2(n_1) + \beta_2(n_1)\varepsilon$ where $\alpha_2(n_1)$ is the mean of the distribution of consumption in period 2. With this knowledge of the distributions, each member of the couple solves, at time 1:

$$\max_{n_1 \geq 0} \quad EU(Z_1, Z_2) \text{ or,}$$

$$\max_{n_1 \geq 0} \quad EU(Z_1) + \frac{1}{1+r}EU(Z_2)$$

---

[80]   This notation is from Rothschild, M., and J.E. Stiglitz (1970).

where U is additively separable and $(1+r)^{-1}$ is the discount placed on future consumption. clearly the greater the impatience (r), the greater is the weight placed on consumption in the first period.

The Kuhn-Tucker conditions for this problem are:

$$E\left[U'(Z_1)\frac{\partial Z_1}{\partial n_1}\right] + \frac{1}{1+r}E\left[U'(Z_2)\frac{\partial Z_2}{\partial n_1}\right] \leq 0,$$

$$n_1 E\left[U'(Z_1)\frac{\partial Z_1}{\partial n_1}\right] + \frac{1}{1+r}E\left[U'(Z_2)\frac{\partial Z_2}{\partial n_1}\right] = 0, \quad n_1 \geq 0$$

For an interior solution to this problem ($n_1 > 0$) to exist, we must have

$$EU'(Z_1)\frac{\partial Z_1}{\partial n_1} = -\frac{1}{1+r}EU'(Z_2)\frac{\partial Z_2}{\partial n_1}$$

Now, α_1 and Z_1 are non random and hence independent. Also, α_2 and Z_2 are independent. Therefore, $EU'(Z_1)\dfrac{\partial Z_1}{\partial n_1} = \dfrac{\partial \alpha_1}{\partial n_1}EU'(Z_1)$ and

$EU'(Z_2)\dfrac{\partial \alpha_2}{\partial n_1} = \dfrac{\partial \alpha_2}{\partial n_1}EU'(Z_2)$. But β_2 and Z_2 are possibly correlated. Therefore

$$EU'(Z_2)\frac{\partial Z_2}{\partial n_1} = EU'(Z_2)\frac{\partial(\alpha_2 + \beta_2\varepsilon)}{\partial n_1}$$

$$= \frac{\partial \alpha_2}{\partial n_1}EU'(Z_2) + EU'(Z_2)\frac{\partial(\beta_2\varepsilon)}{\partial n_1}$$

In other words,

$$EU'(Z_2(n_1))\frac{\partial(\beta_2(n_1)\varepsilon)}{\partial n_1} = E\varepsilon U'(Z_2(n_1))\frac{\partial\beta_2(n_1)}{\partial n_1} = \frac{\partial\beta_2(n_1)}{\partial n_1}E\varepsilon U'(Z_2(n_1))$$

---

[81]   In other words, there are some discrete states of the nature in period 2 whose probabilities can be very specifically predicted, while there is a continuum of states whose density is known.

We know that $EXY = EX \, EY + Cov \, (X,Y)$ where X, Y are not independent. In this case, ε and Z_2 are not likely to be independent. Therefore

$$\frac{\partial \beta_2}{\partial n_1} E \varepsilon U'(Z_2) = \frac{\partial \beta_2}{\partial n_1} \left[EU'(Z_2)E(\varepsilon) + Cov\{U'(Z_2),\varepsilon\} \right]$$

$$= \frac{\partial \beta_2}{\partial n_1} \left[Cov\{U'(Z_2),\varepsilon\} \right], \text{ since } E(\varepsilon) = 0$$

Therefore the Kuhn-Tucker condition for an interior solution can be written as

$$\frac{\partial \alpha_1}{\partial n_1} EU'(Z_1) = -\frac{1}{1+r} \left[\frac{\partial \alpha_2}{\partial n_1} EU'(Z_2) + \frac{\partial \beta_2}{\partial n_1} Cov\{U'(Z_2),\varepsilon\} \right]$$

Now, $Cov\{U'(Z_2), \varepsilon\} = E[U'(Z_2) \varepsilon] < 0$ since $U'' < 0$,[82]

and $\dfrac{\partial \alpha_1}{\partial n_1} = \dfrac{\partial Y_1}{\partial n_1} - \dfrac{1}{2}\dfrac{\partial C_1}{\partial n_1} < 0$ always. At quick glance, we observe that $\dfrac{\partial \beta_2}{\partial n_1}$ can take

positive and negative values, depending largely on the sign of the covariance of the means of the income stream of parents (Ψ) and the return expected to be received from their children (Ω). Given the above, we find that interior solutions exist if:

i) $\dfrac{\partial \alpha_2}{\partial n_1} > 0, \dfrac{\partial \beta_2}{\partial n_1}$ is greater or less than 0

ii) $\dfrac{\partial \alpha_2}{\partial n_1} < 0, \dfrac{\partial \beta_2}{\partial n_1} < 0$

iii) $\dfrac{\partial \beta_2}{\partial n_1} > 0, \dfrac{\partial \alpha_2}{\partial n_1} > 0$

iv) $\dfrac{\partial \beta_2}{\partial n_1} < 0, \dfrac{\partial \alpha_2}{\partial n_1}$ is greater or less than 0

---

[82]   This is easy to see. ε varies from $-\infty$ to $+\infty$, while $U'(\cdot)$ varies from $+\infty$ to 0. Hence most of the 'weight' is in the negative values of the product.

From (i) and (iii) we see that a tolerance of increasing variance (or uncertainty) in period 2 through increased number of children necessarily requires a strictly increasing mean consumption in that period. The interesting and perhaps more significant case is when the estimated mean consumption in period 2 begins to decline as the number of children increases (cases (ii) and (iv)). For a purely riskless asset it would make no sense to invest once its marginal return becomes negative. However, given the risky nature of incomes in the second period, the possibility of gaining security from a negative covariance in these incomes ensures that, having children makes sense even in the range of declining mean consumption, provided the variance of that consumption is also declining.

The optimum requires that the marginal cost of an additional child—in terms of reduction in the mean income—is offset by the marginal benefit from that child in terms of reduced variance, i.e.,

$$\frac{\partial \alpha_1}{\partial n_1} EU'(Z_1) + \frac{1}{1+r}\frac{\partial \alpha_2}{\partial n_1} EU'(Z_2) = -\frac{1}{1+r}\frac{\partial \beta_2}{\partial n_1} Cov[U'(Z_2),\varepsilon]$$

3.2.1   Comparative Statics

Let us assume that parents are operating in the range where $\alpha_2'(n_1)<0$, $\beta_2'(n_1)<0$. We already know $\alpha_1'(n_1)<0$. In this range, the behavior of various parameters can be verified[83] to be the following:

$$\frac{\partial n_1}{\partial \lambda}<0, \frac{\partial n_1}{\partial \xi}<0, \frac{\partial n_1}{\partial \psi}< or >0, \frac{\partial n_1}{\lambda \eta_1}<0, \frac{\partial n_1}{\partial \eta_2}<0, \frac{\partial n_1}{\partial C_1}<0, \frac{\partial n_1}{\partial g_1}<0$$

---

[83] $\dfrac{\partial n_1}{\partial \lambda}=\dfrac{\partial \alpha_2}{\partial \lambda}\left[\dfrac{\partial \alpha_2}{\partial n_1}\right]^{-1}$, etc.

The explanation for these somewhat counter-intuitive signs is that parents are operating in a declining range of $\alpha(\cdot)$ since they are looking for reduced variance. Anything that helps them get higher 'guarantee' of return would make them better off with lesser children, in this range. If these marginal effects find any support in the empirical study it would be a confirmation that decision making on the number of children to supply is made essentially in this range. These results are similar in spirit to Dardanoni (1988:436) who considers the general theory of optimal choices under uncertainty. Paraphrasing, we can say that the individual perceives a decline in the riskiness of Z_2 as being equivalent in utility terms to an increase in its mean. This helps the individual to cut down n_1 in order to increase first period consumption.[84] Of course, the results of this model are much more relevant to the specific nature of the problem of fertility at hand, particularly in the context of the institutional factors that have rarely been examined before.

3.3 The model with capital and insurance markets

Now, introduce a riskless capital market. The perishable output can now be converted into a non-perishable good S that provides utility to someone else in the economy who then returns it back in the next time period along with some interest, The saving of capital S in the first period yields a fixed return of $S\,(1+\tau)$ in the second period. Given this situation of (usually) a positive return from the riskless asset, we find that children are dominated as assets almost in all cases, since the asset returns from children are almost always negative. However, there does exist a positive probability that the returns from

---

[84] Note that in each case of declining $n_1{}^*$, parents are able to smooth consumption better since they can then increase their first period consumption a little more 'safely.'

children could exceed riskless rate of return from savings. It is very reasonable to expect—in most cases—a high spread of the possible returns from children with the riskless return somewhere in-between. That would yield a positive demand for both the riskless asset and children. As a consequence there would be a division of the investible resources in time period 1 between competing assets, leaving lesser resources to invest in children, thus diminishing the number of children demanded. But clearly, the effect of riskless capital markets would be to shift investments radically away from children since asset returns from children are so poor.

As is more likely, however, it would be the availability of alternative *risky* assets that would compete against investment in children. Even apparently riskless assets might be susceptible to inflation risk, risk of theft, etc. If S now has its own variance, say, σ^2, then we know that in the second period there would be three co-variance terms in the consumption of the parents.[85] The rest of the analysis would be very similar to that shown in the basic model above. In both these cases of competing capital assets, we find that $\dfrac{\partial n_1}{\partial \tau} < 0$, in other words, as the returns from other assets increase, the number of children demanded declines. The only question is whether returns from savings stochastically dominate the returns from children. The only thing that can be said from common observation is that the dispersion of returns from children is perhaps much higher than from savings, though the mean return from children is perhaps dominated by returns from savings.[86] Based on this riskiness and the possibility of negative covariance with returns from savings, a positive but low demand for children could still exist.

---

[85]   Cov (A,B,C) = Var A + Var B + Var C + Cov (A,B) + Cov (B,C) + Cov (A,C)
[86]   We recall studies which show a very low or negative NPV from children even in developed societies.

But note that children do not merely serve as a risky asset and hence help in diversification of the asset portfolio, but also serve as insurers. Clearly, at least some of the demand for children is motivated by this provision of insurance by children in the absence of insurance markets. Now, if the formal insurance markets open up, the need for children to be the only insurers would commensurately decline, further diminishing the demand for children. That would also be a consequence of social security and pension programs which 'cover' the parents against contingencies. It is always going to be the case, however, that children are the most efficient insurers since they possess information advantages that formal markets do not. In fact, as Nugent (1990) points out, the possible benefits of social security systems in terms of reduced fertility might be offset by the inefficiency of much higher personal costs to parents of public insurance, thus increasing fertility through decreased disposable income (see also Kotlikoff and Spivak, 1981).

Also note that children would always remain the insurers of last resort for those assets (including personal ability) that are not insurable in the formal sector. In other words, there would—in most cases—still be an interior solution to the problem.

3.4 Role of old age care

With these reasons (risky asset, insurance), the demand for children would fall rather steeply in the presence of efficient capital and insurance markets. But there is still positive demand for children world-wide. Not modeled in the above equations but very significant in terms of taking decisions on the number of children to have is a component of the returns from children that *only* they can supply, namely, physical and emotional care in old age (ω), thus expanding the social norms set to (B, λ, η_1, η_2, ω). The need for old age care

arises in situations when people are physically incapacitated for a substantial duration of time, maybe until death. Even if the person has the ability to purchase *medicine*, it might not be possible to convert that medicine into *health* by putting that medicine into one's body, unaided. Purchase of nursing care might not be an optimal solution both in terms of cost and effectiveness. Sloan and Norton (1997) find adverse selection to be the primary cause why markets for private long-term care insurance (as compared with private acute-care insurance) are practically non-existent in the U.S. Taking such insurance, if available, would reduce the cost of institutionalizing parents to the children, but if parents prefer attention from children, then it would not be optimal to purchase such insurance. This shows a very strong preference for care from children even in developed societies. Indeed, as mentioned earlier, nearly 95% of the infirm elderly in the U.S. continue to be taken care of by their own children, friends, or relatives. In particular, old age homes will always remain imperfect substitutes for children, even when the social norms are relatively weak. Thus, even if income and insurance risks were reduced as a result of economic growth and completion of insurance markets, there would remain many important needs fulfilled primarily by children (and here we are not even talking of lineage needs).

The social norms (B, λ, η_1, η_2, ω) are compatible with underlying biological reasons. The Hamilton (1964) kin rule argues that one 'cares' about people in proportion to the genetic relationship one has with them. The coefficients of the relationship between kin are given below:

Parent - child	1/2
Full siblings	1/2
Half siblings	1/4
Grandparent-grandchild	1/4

Aunt or Uncle-nephew or niece	1/4
First cousins (under monogamy)	1/8

While siblings can be a good source of old age care, one knows that siblings, cousins, etc., will have their own families to 'look after' when old and siblings have the same expected life span, thus making it improbable that they will be capable of looking after each other when infirmity sets in. The solution of supplying one's own children therefore strictly dominates that of relying upon siblings or having other people's children. In terms of preference among the above relationships for being looked after in old age, therefore, the decay in the relationships is much more rapid—after the parent-child relationship—than Hamilton's law, based purely on the laws of genetics, would allow for.

The fact that social norms are breaking down, and yet there could be a positive demand for children, is seen in the table below which shows that there are *at least* 24 states of nature possible in the 2nd period. For example, there are the states in which, in the absence of capital markets, and even with a negative NPV, children *could* provide positive amounts of capital for the agent in old age when the agent has very low income. Even if the probability of being in the low income state tends to zero, as in developed nations, people may demand children for at least three things: providing insurance of assets not otherwise insurable, providing care when ill, and providing companionship and the higher level social needs.

	Own savings/ personal pension	Unanticipated losses to wealth/ health	Whether children contribute to making up loss	Whether children provide additional annuity	Physical care / companionship from children/ care when ill
1	Low	Yes	Yes	Yes	Yes
2	Low	Yes	Yes	Yes	No
3	Low	Yes	Yes	No	Yes
4	Low	Yes	Yes	No	No
5	Low	Yes	No	Yes	Yes

6	Low	Yes	No	Yes	No
7	Low	Yes	No	No	Yes
8	Low	Yes	No	No	No
9	Low	No	NA	Yes	Yes
10	Low	No	NA	Yes	No
11	Low	No	NA	No	Yes
12	Low	No	NA	No	No
13	High	Yes	Yes	Yes	Yes
14	High	Yes	Yes	Yes	No
15	High	Yes	Yes	No	Yes
16	High	Yes	Yes	No	No
17	High	Yes	No	Yes	Yes
18	High	Yes	No	Yes	No
19	High	Yes	No	No	Yes
20	High	Yes	No	No	No
21	High	No	NA	Yes	Yes
22	High	No	NA	Yes	No
23	High	No	NA	No	Yes
24	High	No	NA	No	No

3.5 Conclusion

The model presented in this chapter throws considerable light on the role that children play both in the absence and presence of capital and insurance markets. If we add to these effects, the physical and emotional care concerns, the sheer pleasure of having children, the companionship that people claim to have from children (the consumption utility of Leibenstein), we would be hard pressed to arrive at corner solutions to the demand for children which has been the fate of many other simpler models. This model is also highly compatible with the stylized facts presented in Chapter 1 and explains many aspects simultaneously.

Some extensions of this model would include the following:

i)   The effect of the pension system on fertility could be studied by subtracting a tax, μ, from income in the first period, and adding P_g, government pension, to income in the second period. Some agents might lose and others gain, from this pension,

subject to an overall inefficiency loss (i.e., $P_g/(1+r) - \mu < 0$ in all cases). The agent, at the time he/she is planning to have children, might not know to which category he/she shall belong. This will introduce another uncertainty into the second period returns. Alternatively, one could introduce aspects of adverse selection in terms of increasing the costs of insurance (and hence the tax rate) for peasants.

ii)   Strategic bequests could also be introduced into this framework. Instead of taking $(B, \lambda, \eta_1, \eta_2)$ as exogenous, we could form a bilateral strategy game between parents and children in which the solution set $(B^*, \lambda^*, \eta_1^*, \eta_2^*)$ is obtained through simultaneous solution to the strategic reaction functions.

iii) This model is also highly amenable to the differential effects of children on labor force participation between men and women. It could be postulated that,

$$\frac{\partial Y_m}{\partial n_1} < \frac{\partial Y_f}{\partial n_1},$$ in absolute terms, where the subscripts m and f represent the male

and female member of the couple. This means that the loss in income by females would be larger than that of males as the number of children in a family increases (due to the larger time invested in child-rearing). This implies that women would be likely to participate in disproportionately large numbers in the work force and have much higher relative increases in income, as the demand for children declines.

iv)   It would be interesting to see the effects of differential longevity on the demand for children as originating from men or women. Though this is essentially a two period model, a parameter ϕ can multiply Y_f in the second period, where $\phi < 1$, to

indicate that the income of the women would run out earlier than that of their husbands. This would indicate a greater preference for returns from children, indicating a higher demand for children by women to fulfil their security needs. Alternatively, the discount (r) for second period consumption can be thought of as being raised.

v)   It is obvious from this model that one of the good strategies for parents is to send their children to different places of work to capture negative covariances in income streams. In other words, parents gain from the migration of their children but on the other hand, by using that strategy, they risk the breakdown of the social norm λ. If λ is strong , then it is indeed best to send one child away and to keep one child with them.

The central thrust of the argument in this chapter has been that much of fertility behavior can be explained by such things as uncertainty, risk, and the fragility and health needs of human life. The alternative of postulating additional motives such as altruism seem to lead to more puzzles than what they set out to explain.

So far, for the most part, the old age security theory has been used primarily to explain the higher level of fertility in developing countries, in comparison to the developed countries. This study is perhaps the first to show that the old age security theory can not only explain high fertility in pre-transition societies, but also explain how demand for children (and hence its supply) could fall rapidly in either a developed or less developed country as its markets for financial and insurance open up and expand with modern economic growth, subject to interactions with the effects of the strength and nature of the implicit contract across generations. The story here is much richer than any

other story of fertility in the literature, due to the expectational and institutional content

being explicitly accounted for.

CHAPTER 4

EMPIRICAL TEST OF

THE OLD AGE SECURITY THEORY OF FERTILITY

4.1 Introduction

In this chapter we make use of a specially designed data set to test the predictions of the Old Age Security Theory of fertility examined in Chapters 2 and 3. The study takes us to rural areas of Thailand. This data set on rural Thailand is part of a 2-country data set, work on which was initiated by the International Labor Organization (ILO).[87] In June 1988, Richard Anker of the ILO and Jeffrey B. Nugent of the University of Southern California started discussions that would lead to a joint research project on the relationship between old age security and fertility.[88] The two primary objectives of the project were largely based on the traditional understanding of the Old Age Security Theory of fertility: (1) to see if the old age security motive is an important factor in causing the fertility decline to end well above replacement level, i.e., stabilize at approximately 3-4 births; and (2) to see if the availability of alternative sources of support besides children effect fertility. This study focuses on Thailand where fertility seems to be tending toward 2.0 or thereabouts (The CIA *Factbook*, 1997, estimates TFR to be 1.86, indicating continuation of the decline. See http://www.odci.gov/cia/publications/factbook/th.html), contrary to Anker's original expectations of a possible stabilization above the replacement level.. So far, based on the theory and results obtained from this study, it would appear that the answers to these

---

[87]   The other country is Costa Rica.

questions are no, and yes, respectively, particularly since the first objective seems to have been framed incorrectly, given the data we have at hand now.

In Section 4.2 we lay out the relevant overview of overall statistics from Thailand. Section 4.3 describes the data set. Section 4.4 discusses the empirical model, variables, and methods used in this study. In Section 4.5.1 we present the descriptive statistics, and in Section 4.5.2 the inferential statistics. Section 4.6 concludes the chapter.

4.2 An overview of Thailand

There were approximately 8 million people in Thailand at the time of the first census in 1911, and now, in 1998, there are around 58 million (implying an annual growth rate of 2.33% over these years). The population growth rate has declined from over 3% per annum in the decade of 1960-1970 to about 1.8% now (Table 4.1). Due to population momentum, the size of Thai population will continue to grow for some decades. At the same time as a result of rising life expectancy and the decline in fertility, the relative share of the over-60 population is increasing.

Table 4.1 **Population statistics and projections for Thailand: 1960-2010**

	1960	1970	1980	1990	2000
Population (millions)	26.3	36.4	46.7	56.2	64.4
Growth rate (%)	-	3.2	2.5	1.9	1.4
Total fertility rate	6.6	5.6	3.6	2.6	2.0
Life expectancy					
Male	56.0	58.0	60.0	62.6	66.0
Female	62.0	64.0	66.0	68.1	70.2
Age Distribution (%)					
Under 15	43.2	45.1	40.0	33.4	27.4
15 to 59	52.2	50.0	54.6	60.6	65.0
60 and older	4.6	4.9	5.4	6.1	7.5

Source: Mason and Campbell (1993)

---

[88]   Their preliminary findings are in Nugent and Anker (1990).

The Northeast is the most populous region, followed by the Central Region (excluding the Bangkok Metropolis), the North and the South. Thailand's population is relatively homogeneous. About 80 percent of the total population is ethnic Thai of which more than 95 percent are Buddhists. The major minority groups are the Chinese—located mostly in Bangkok and urban areas, and the Malays, who live primarily the Southern provinces. Among other minorities are indigenous tribes like the Karen, the Semang, and the Lawa. Then there are the Khmer, Soai, and Indians who constitute a small immigrant group. Finally, there are about half a million refugees from Myanmar, Vietnam, Laos, and Cambodia."[89]

About 93 percent of the population aged 6 years and over is literate as per the 1990 census. Literacy is above 90 percent for all regions except for the Northern region, where literacy is marginally lower at 88.6 percent. About 74 percent of the population is active in the labor markets today, with a majority (67.3 percent) employed in the primary sector (agriculture, animal husbandry, forests, fishing, hunting. About 71% of eligible women are in the market, and 79% of the males (Bauer *et al*, 1993).

The demand for modern contraceptive methods has been rising rapidly. According to the Executive Summary of the Thailand National Contraceptive Prevalence Survey, 1996,[90] the contraceptive prevalence rate in Thailand in 1996 had reached 72.2 per cent, from less than 10 percent before 1970.

In Thailand, daughters frequently co-reside with parents after marriage, and the youngest daughter is normally responsible for caring for elderly parents. This system has not yet weakened. Phillips (1992) points out the strong value of filial obligation in the

---

[89]   Britannica Online (from the www site).

Thai culture which continues to be cultivated through Buddhist teachings which advocate care and support of the elderly. Knodel (1993) believes that "in Thailand the impact of smaller family sizes *per se* will probably be relatively moderate with respect to this crucial aspect of the familial support system [i.e., support for the elderly]. Reductions in the average number of coresident children in the elderly's households will be more pronounced but probably have limited significance in the context of the traditional Thai preference for a stem family household structure where only one married child eventually remains to care for the parents." World Bank (1994:51) discusses in some detail these systems of care for old parents in Thailand.

It is worth mentioning here the basic results of a somewhat similar study to this one, entitled, "Analytical report : Determinants of desire for more children," published in 1996 by the Social Statistics Division of the National Statistical Office of Thailand. The study used data from the Social Attitudes Towards Children Survey, 1993 and found that (a) couples are most likely to prefer to have one child of each sex., (b) the majority of couples feel a strong need to limit their children to a small number rather than to continue having children until they achieve their desired sex composition of children, (c) couples with higher socioeconomic status, as measured by occupation and household's income, were more likely to want more children than those with lower socioeconomic status. The data and methods of the current study are somewhat different, and results are also somewhat different.

---

[90]   As per summary by Apichat Chamratrithirong, Pramote Prasartkul, Varachai Thongthai and Philip Guest, distributed in the PAA Conference, Chicago, 1998.

4.3 Description of the data

The Old Age Security Survey (OASS, 1991-92) was implemented by the Institute for Population and Social Research, Mahidol University, Thailand, under the project sponsored by the International Labor Organization. The survey was locally designed based on the structure outlined in Nugent and Anker (1990). Among the many persons involved in this implementation of the survey and its subsequent analysis were Apichat Chamratrithirong, Kritya Archavantikul, Kerry Richter,Antony Pramualratana, Nittaya Piriyathamwong, Wathinee Boonchalaski, Antony Pramualratana, and Vaachai Thongthai. The final components of the coded data set were received in mid-1998. The survey was carried out in Central and Northeast Thailand. Southern Thailand was excluded to avoid complicating the study with problems of heterogeneity of the preferences arising from differences in race, religion, and cultures in that region. The Northern region was excluded for logistic reasons.

The *dual random sampling* procedure was followed in selecting villages and households within this geographical area. In each of the two broad regions, two provinces were selected randomly. Thereafter districts were randomly selected within each province, tambols (sub-districts) within each district and villages within each tambol. A total of 160 villages were surveyed. Within each sample villages all households were surveyed to identify their potential eligibility for the survey, and the required number was then randomly selected from the list of eligible households.

Table 4.2 **Basic statistics of the four provinces surveyed**

Region	Central		NorthEastrern	
Province	Kanchanaburi	Chai Nat	Khon Kaen	Nong Khai
Population (1993)	724,675	348,333	1,637,029	853,706
Total Area (sq.km)	19,586	2,470	10,914	7,360
Population/sq.km	37	141	150	116
% in Urban Centers	7.54%	5.66%	10.39%	2.98%
Growth Rate (%/yr)	0.03%	2.62%	*.**%	2.01%
Perc. Male/Female	51.13/48.87	48.60/51.40	50.33/49.67	50.47/49.53
% of Women using birth control	60.7%	67.0%	74.2%	63.3%

Source: 1993 *Thailand Population Data Sheet*, Institute of Population Studies, Chulalongkorn University

The objective was to collect data for two categories of respondents: the young (who had not yet completed their fertility), and the elderly (who had completed their fertility). Finally, sample households were selected randomly from this list. The survey therefore covered:

(a) *Currently married women aged 28-39 with at least one living child, with a leeway of plus or minus two years of reported age.*[91] This age range was chosen to assure that respondents were still in their childbearing years, and perhaps still making decisions regarding future childbearing. Women with at least one living child were selected because this guaranteed that the women interviewed were fecund.[92] Husbands of the women respondents were chosen to compare response differences between themselves and their wives. As many husbands of the women respondents as possible were reached. The final sample comprises 1776 young women (about 11 per village) and 1321 of their husbands.

(b) *Men and women 60-74 years of age, ever-married and with at least one living child.* The upper limit was placed on the age range to ensure the ability to converse coherently during the interview. The objective for this interview was to inquire about actual

---

[91] Reported age in Thailand is fairly accurate, as discussed in Knodel and Chayovan (1991).

support received by the old for comparative purposes to the expectations of younger respondents. The sample size of older people is 643 of which 320 are male and 323 female.

In addition to the survey of individuals and households, there was a community level questionnaire which was addressed to the village headman in each of the 160 villages. This questionnaire attempted to assess the markets for assets (e.g., rental markets for land, markets for savings) and insurance, the social norms, the extent of family planning and other health services, the level of socio-economic development, the existence of institutions catering to the elderly, and access to communication and transportation.

4.4 Empirical model, variables, and methods

4.4.1 Empirical model

As seen in the Chapter 1, the number of children desired is a component of the joint solution to the problem of maximizing the utility of a variety of commodities, including *security*. Based on Chapter 3, however, we can convert this problem into a more tractable one. The number of children desired, n_i, by the ith agent, would take the form:

$n_i = \alpha + \beta_c x_c + \gamma_h x_h + \delta_i x_i + \varepsilon_I$ where

$x_c =$ Community variables representing the effect of the market for assets (savings, rental markets for land, etc.) and the living conditions of the elderly in the community

$x_h =$ Household variables representing the wealth, production structure, and mutual aid across generations, as well as communication between the husband and wife.

$x_i =$ Individual variables representing the characteristics of the wife/ husband and their individual expectations for old age care, as well as their perceptions of the risk of default in the intergenerational insurance contract

---

[92] This truncates the sample to some extent since there might exist fecund couples who chose not to have children at all, and were therefore not part of the survey.

81

4.4.2 Variables

The dependent variable is desired fertility (DF). This is measured as the sum of children ever born, the number of additional children desired, if any, and the number of adopted children, less the number of children who have died, if any, less one child if it is felt that the respondent will be better off with one less child.[93] DF thus represents the number of living children desired in the household at the end of the woman's fertile period, and allows that infant and child mortality is controlled for in the definition itself.[94] We note that this definition and the way of measuring desired fertility is superior to the one used in the World Fertility Surveys of the late-1970s[95] in certain ways. For example, in Section 5 of the World Fertility Survey, questions were asked about how many *total* children the women wanted, and how many *more* children they wanted to have, but there was no question on whether they would be better off with fewer children.

The definition of desired fertility can be subject to many possible errors of measurement, though. For example, it is possible that people rationalize the number of children they have had, and that they express a desire for children close to or equal to, the number that they have actually had (called ex-post rationalization; see Pritchett, 1994). One way to minimize this problem is to ask retrospective questions about the wantedness of previous children. This has been done in this survey.[96] Additionally, it

---

[93] A total of 433 out of the 1776 women surveyed stated that they would be better off with one less child. Only 19 of these finally desired less than one child (i.e., no child at all).

[94] DF could also mean the total number of children that "need" to be produced over the woman's fecund life-span in order to achieve a desired number of live children in the old age period of the respondent. This definition is precisely the same as used in theoretical model of Chapter 3, in which child mortality (ξ) is taken into account while solving for n_1.

[95] See *Basic Documentation*, No. 1, March 1975, World Fertility Survey, London

[96] This question is not without its problems. The way it is currently administered (to women who have at least one child), the question implies that desire for children is determined *after* the experience of having at

is possible to test for the strength of the ex-post rationalization by finding out the difference between DF and the number of surviving children (SURCHILD). If a substantial number of women express a desire which is different from the number of children they already have, then ex-post rationalization can be excluded as a major distortion in the data. Table 4.3 shows that this is perhaps the case, with only 49.2% of the sampled women stating the same number of children desired as the number of surviving children that they already had (DF_SUR).[97]

A further test of this would be to compare the responses of sterilized and non-sterlized women in this matter. It is seen that many more sterilized than the non-sterile women reported the number of surviving children as the number that they actually desired. This is more indicative of the fact that the sterile women are older,[98] and have mostly completed their fertility (and hence desire fewer additional children than non-sterile women), than of any strong ex-post rationalization effect, since nearly half of the sterile women reported desired fertility *different* from the number of surviving children.

---

least one child. More relevant would be to ask: "Was any pregnancy unwanted?" and its cause studied, such as failure in contraception. In the current study, 30.8% of the 1776 women (who had 2.62 surviving children compared to the sample mean of 2.47) reported that they would be better off with one less child, compared with 31.9% of the 1321 husbands. A very important piece of information is that the level of 'agreement' between husbands and wives on this report of being better off with one less child is very poor (about 50%), indicating that many of these cases could represent *children born out of disagreement between men and women* (i.e., the "optimal" solutions of the two members of the couple are different in a significant number of cases).

[97] On the other hand, this leads to questions about the stability of desires, and the time of their formation. Ideally, many more questions would explore the likely problems with this measure.

Table 4.3   **Extent of ex-post rationalization of desired fertility by younger women**

DF_SUR	Frequency			Percent		
	Full sample	Sterile	Non-sterile	Full sample	Sterile	Non-sterile
-1	424	233	191	23.9	28.3	20
0	873	444	429	49.2	53.9	45
1	412	117	295	23.2	14.2	31
2	55	22	33	3.1	2.7	3.5
3	7	3	4	0.4	0.4	0.4
4	4	3	1	0.2	0.4	0.1
8	1	1		0.1	0.1	

Another important question relates to the formation of these desires and its stability at the time of measurement. In other words, at which age can DF be stated to have 'stabilized' in a person's mind? Since children need a lot of 'time to build,' and fertility decisions can be taken any time across the fertile period of a woman, the decision to have children is a staggered one, taking place across time. It is possible to argue that the 'final' desires for children are formed by continuously evaluating the costs and benefits of children during the fertile period. But we also know that most decisions for having children are likely to be clustered toward the beginning of the marriage, indicating that the desire expressed at an average age of 33.5, as in the case of this sample,[99] would be rather stable. Indeed, on the average, 6.65 years have passed since having the last child by women in the sample, indicating that most such women have borne their last child at the age of about 27 years. It can be reasonably expected that the reporting of the number of children *desired* would be very stable, in such a situation. Finally, even if the number were not totally stable, it is possible that the women who are likely to change their desires later could do so in either direction (positive, negative), thus canceling out the their

---

[98]   See details of sterile women in Table 4.8.
[99]   Data on age of women is in Table 4.4.

biases. In other words, DF, as defined, can be presumed to meaningfully represent the demand for children.

While one cannot deduce more than this from the current study about the robustness and consistency of the measure of desired fertility, there is supporting evidence from a longitudinal study of Thailand by Wongboosin (1985: 94). Desired family size (which is similar to the variable "desired fertility" in this study) was found in that study to be sticky, i.e., there was little change in the mean desires of a cohort over a period of four years. Wongboosin concluded, "desired family size is quite constant over time" (p.95). In other words, except for minor random variation, one would be safe in concluding that the desired fertility measure of this study does represent the "optional family size," n, of the theoretical model.

Since the women in the younger age group had a mean age of 33.5 years, and it is usual to have one's children early in marriage in rural communities, at this age many of the sampled women would likely be nearing their completed fertility. Hence CEB (children ever born) and especially SURCHILD (number of surviving children) are being considered alternative (though not quite as precise as DF) measures for desired fertility. The meanings of variables used in this study are given below. These are in alphabetical order.

The definitions of several of these variables are necessarily complex, and a detailed description would require simultaneous examination of the questionnaire. For example, a subjective classification had to be made of the various occupations that a respondent projected for her child, based on the security of return from that job (EXPOCCCS). This classification should ideally have been done through a survey administered in Thailand itself, whereby we could find out how various jobs are ranked in

terms of security in that society, but instead, the index had to be constructed from responses to several different questions in the questionnaire and personal judgment of the security of occupations.

Another complex issue was the determination of the perception in a woman (or her husband) that a child would uphold the intergenerational contract (SURECHIN), which is equivalent to the λ of the theoretical model of Chapter 3. Once again, an index was created by weighing various choices and concerns expressed by respondents to different questions. Wherever possible, statistical analysis was conducted to determine the sensitivity of the results to different sets of assumptions in these responses. The SAS program definitions of some of the more complex variables are given in Appendix I. In indication (*) is made against variables, further details of which are found in Appendix I.

List of variables used

AGE   Completed age of wife

MAGE   Completed age of husband

AGEDIFF   Age difference between husband and wife

CEB   Children ever born in the household

CHLDSIMP   Importance of children as a means of support in old age

CIMIMP   Wife's response: Care when ill is the most important care expected
                    from children in old age

DC   Number of deceased children in the household

DF11   Desired fertility of wife, comprising surviving children (including
                    adopted children) plus additional children desired, less one

children in case it is reported that the respondent will be better off with one less child.

DFH   Desired fertility of husband, comprising surviving children (including adopted children) plus additional children desired, less one children in case it is reported that the respondent will be better off with one less child.

DOEDUC   Wife's response: The way to get loyalty from children in old age is to give them the highest education

DOEDUCH   Husband's response: The way to get loyalty from children in old age is to give them the highest education

DOWHINH   Wife's response: The way to get loyalty from children in old age is to withhold inheritance from them when old

DOWHINHH   Husband's response: The way to get loyalty from children in old age is to withhold inheritance from them when old

ETALKED   Wife's response: Have you every talked to your husband about the number of children you want to have?

ETALKEDH   Husband's response: Have you every talked to your wife about the number of children you want to have?

EXPOCCCS   Wife's response: Expected occupation of current children, classified on the basis on security of the occupation (*)

FLANDOWN   Land owned by family as measured in rai

FPMETHOD   Wife's response: Are you currently using some family planning method?

HCIMIMP	Husband's response: Care when ill is the most important care expected from children in old age
HELECT	Household has electricity: an index which takes account of the number of years the house has had electricity (*)
HELPFROM	Wife's response: Whether any help has been received from parents/ in-laws
HMMIMP	Husband's response: Financial help is the most important care expected from children in old age
HPRIM	Husbands education: 1 if primary schooling
HSECH	Husband's education: 1 if secondary schooling or higher
INHEREXP	Wife's response: Expectation of receipt of inheritance in the future
INHERITH	Husband's response: Expectation of receipt of inheritance in the future
LIVALONE	Whether any elderly are living without children in the village
MMIMP	Wife's response: Financial help is the most important care expected from children in old age
RC	Cost of fertility regulation, as measured through ease of access to family planning and related health services (*)
RENTMKT	Does the community have an active market for renting land
RPENSION	Respondent currently receives pension
SAVINGS	Wife's response: Do you have any savings?
SAVPSUP	Wife's response: Expectation that savings, pension, insurance will be an important means of support in old age

SAVPSUPH	Husband's response: Expectation that savings, pension, insurance will be an important means of support in old age
SPENSION	Husband currently receives pension
SURCHILD	Number of surviving children in the household, of those ever born.
SURECHIN	Wife's response: Index of surety of returns from child in old age (*)
SURECHNH	Husband's response: Index of surety of returns from child in old age
SVACCESS	An index measuring the level of access to savings institutions (*)
WDEBTS	Wife's response: Do you have any debts?
WPRIM	Wife's education: between 0-6 years
WSECH	Wife's education: secondary or higher
YRSSLC	Numbers of years since last child born in the household.

Table 4.4 gives the means as well as the brief descriptive explanations of some of these variables.

4.4.3   Estimation Methods

Only 19 of the values of the dependent variable are left-truncated at zero. Such a truncation would suggest that Tobit estimates would be appropriate yet, since only about 1% of the values are so truncated, OLS may be regarded as an alternative estimation technique for DF. CEB and SURCHILD, however, are estimable by OLS. Experimentation with separate estimation for different parts of the sample revealed a somewhat puzzling difference in behavior between sterilized and unsterilized women. As discussed in detail below, this led to extensive testing for self-selection using a two-stage Type 4 (Amemiya, 1985) Tobit model. Apart from this, as usual, many

alternative specifications of variables were used and also alternative models, to confirm the robustness of the results.

In all these models, multi-collinearity has been verified to not exist in the right hand variables. Endogeniety is not such an easy thing to remove, though. Decisions of children to have, saving, insurance, labor force participation, and bequests are taken simultaneously (see Chapters 1 and 3). Therefore, these variables have been excluded from the right hand side. Education is completely exogenous to the decision-maker, and hence it is a better proxy of the opportunity cost of time of the women than the direct use of variables for labor force participation.

Table 4.4 **Sample size and means of *some* of the variables used in this chapter**

Variable	Brief Definition	Sample Size	Mean
Community Characteristics			
LIVALONE	Whether any elderly living without child	1776	0.2061
RENTMKT	Active market for renting land	1755	0.7311
SVACCESS	Access to savings institutions	1766	4.7724
RC	Cost of fertility regulation	1776	0.6036
Household characteristics			
HELECT	HH has electricity: index	1776	1.2314
FLANDOWN	Land owned by family	1775	15.2000
AGEDIFF	Age difference between husband and wife	1776	3.4319
HELPFROM	Help from parents/ in-law	1776	0.6171
FPMETHOD	Use Fam. Plan. Method by hhld?	1776	0.8767
Wife characteristics and expectations			
DF11	Desired fertility of wife	1776	2.5569
CEB	Children ever born	1776	2.5828
SURCHILD	Surviving children	1776	2.4764
AGE	Age of wife	1776	33.5298
DC	# of deceased children	1776	0.1182
WPRIM	Wife: educn = between 0-6 yrs	1776	0.8671
WSECH	Wife has secondary or higher edn	1776	0.0856
EXPOCCCS	Expected occ of chld based on security	1578	2.5294
YRSSLC	years since last child	1763	6.6529
DOWHINH	Strategic: withhold inheritance	1776	0.1886
DOEDUC	Human Resource: Give highest education	1776	0.0490
SAVINGS	Have savings?	1776	0.7635
RPENSION	Respondent gets pension	1776	0.0000
SPENSION	Husband gets pension	1776	0.0006
WDEBTS	have debts	1776	0.5405
INHEREXP	Expectation of receipt of inheritance in	1776	0.3446
MMIMP	Financial help is most imp	1776	0.1492
CIMIMP	Care when ill most imp	1776	0.3750
CHLDSIMP	Importance of children as support	1776	0.5709
SAVPSUP	Savings, pension, insurance as support	1776	0.0794
SURECHIN	Index of surety of return from child	1508	7.3342
Husband characteristics and expectations			
DFH	Desired fertility of husband	1321	2.4936
HPRIM	Husband: 1 if prim. sch.	1776	0.8305
HSECH	Husband: 1 if sec or higher	1776	0.1458
HMMIMP	Husb: Financial help is most imp	1321	0.1105
HCIMIMP	Husb: Care when ill most imp	1321	0.3883
SAVPSUPH	Husb: Savings, pension, insurance as sup	1321	0.1007
SURECHNH	Index of surety of return from child	1051	7.1028
DOWHINHH	Husb: withhold inheritance	1321	0.2528
DOEDUCH	Husb:give highest educ	1321	0.0727
INHERITH	Husb: expect inheritance	1321	0.3005
Communication between spouses			
ETALKED	ever talked # of chld w/ hus.	1776	0.7173
ETALKEDH	Husb: ever talked # of chld w/ wife	1321	0.7002

4.5　Results

Key findings are discussed in this section.

4.5.1　Descriptive Statistics

Table 4.5 presents the measures of fertility and fertility-related variables in different age groups of Thai women. The sample of older women in 1990 was among the last whose reproductive span mostly preceded the dramatic fertility decline that started in the 1970s. Older women reported having 5.48 surviving children on the average, which is in keeping with the fact that only 4% of them ever used contraception. Women's education has considerably increased for women of succeeding cohorts. Age at marriage appears to have declined marginally over the years.

In keeping with the life-cycle hypothesis, the amount of debt (WDEBTS) is seen to decline in the second period of life. While comparable data of savings of the now older women when they were young is not available, given the usual life-cycle fact that savings are made primarily after child-bearing years, the existence of relatively high levels of savings by younger women would suggest an increase in savings over successive cohorts (SAVINGS). However, it appears that land holdings (FLANDOWN) are showing a decline over the cohorts. A few other things like mobility (having lived in urban areas, etc.), have not changed considerably. The land holdings of the older women are high compared to that of the younger women; many of these holdings will be used as bequests.

A surprising thing here is that 63.4% of the women in the age group 35-39 report their, or their spouse, having received their expected inheritance, with 10.7% (6.8% of the total women in this age-group) of these reporting this receipt after the death of their parents/ in-laws. In other words, 56.6% of these women report having received their bequests from living parents. At the same time, 70% of women in the older sample report

having not yet entirely given away their bequests. These two reports are entirely consistent if there is some tendency to first give the 'share' away to those who will *not* be required to keep the parent in old age, generally the elder son or daughter in Thai society. We examine the details of bequest behavior in Chapter 5.

Note that 'Care when ill' (CIMIMP) is rated higher than financial return (MMIMP), when considering the 'returns' component of children.

Table 4.6 presents the means of fertility variables for the sample of older women by their characteristics. From this Table it would appear that wife's education has a small negative influence on fertility (measured through the proxy of number of *living* children), though the differences are not statistically significant in most cases. Widowed older women seem to have had fewer children, perhaps because some of them became widowed during their child-bearing years.[100] Those without any savings at all tended to have more children than those with savings, indicative of a substitution between children and savings. When the husband has no education, SURCHILD tends to be noticeably higher than otherwise. However, in the absence of significant numbers (N), not much can be read into this.

---

[100]   The average age of the 323 older women in the sample was 65.94 years. The 141 widows wewe 67.14 years old, on average. The husbands of these widows had passed away 20.22 years ago, on average, with std. deviation of 22.2 years, thus putting their age at widowhood at 47 years, approximately, with a substantial number having got widowed between 25-47 years of age.

Table 4.5 Measures of fertility and fertility-related variables in different age-groups of rural Thai women

Age Groups		Younger generation						Older generation	
		26-29		30-34		35-39		60-74	
AGE	Age of wife	310	27.997	732	32.072	734	37.320	323	65.941
EDU	Years of education	310	4.871	732	4.454	734	4.026	323	2.077
WQ8	Age at marriage	310	19.887	732	20.370	734	20.781	323	21.232
DF11	DF: both: unable included + adopt	310	2.177	732	2.433	734	2.841		
CEB	Children ever born	310	1.923	732	2.413	734	3.031		
SURCHILD	# of surviving children	310	1.858	732	2.327	734	2.887	323	5.483
DC	# of deceased children	310	0.081	732	0.094	734	0.158		
FPMETHOD	Whether family planning ever used?	310	0.861	732	0.872	734	0.888	323	0.040
HELECT	HH has electricity: index	310	1.142	732	1.220	734	1.281		
FLANDOWN	Land owned by family	310	11.590	732	14.881	733	17.045	323	20.610
WURBLIV	if ever lived >6 mos. in a city	310	0.113	732	0.117	734	0.120	323	0.080
AGEDIFF	Age difference between husband and wife	310	3.648	732	3.541	734	3.232	180	2.878
WPRIM	Wife has only primary education	310	0.771	732	0.827	734	0.872	323	0.582
WSECH	Wife has secondary or higher edn	310	0.174	732	0.096	734	0.038	323	0.006
EXPOCCCS	Expected occ of chld based on security	254	2.643	651	2.629	673	2.390		
YRSSLC	years since last child	306	3.935	727	5.660	730	8.781		
DOWHINH	Strategic: withhold inheritance	310	0.113	732	0.197	734	0.213		
STRAT	Use of bequests for strategic purposes							273	0.253
DOEDUC	Human Resource: Give highest education	310	0.035	732	0.049	734	0.054		
HELPFROM	Help from parents/ in-law	310	0.755	732	0.687	734	0.489		
ANYHELP	get any help from children							320	1.000
SAVINGS	Have savings?	310	0.674	732	0.770	734	0.794	323	0.796
RPENSION	Respondent gets pension	310	0.000	732	0.000	734	0.000	323	0.000
SPENSION	Husband gets pension	310	0.000	732	0.001	734	0.000	323	0.006
WDEBTS	have debts	310	0.461	732	0.542	734	0.572	323	0.365
INHEREXP	Expectation of receipt of inheritance in	310	0.426	732	0.384	734	0.271		
INHERITD	Received inheritance (either spouse)	310	0.481	732	0.564	734	0.638		
NOTINHR	Not given most / all of inheritance							323	0.700
MMIMP	Financial help is most imp	310	0.097	732	0.154	734	0.166		
RECMONEY	Receive money from children							323	0.907
CIMIMP	Care when ill most imp	310	0.423	732	0.370	734	0.360		
ILCHPREF	Prefer children to take care when ill							323	0.842
CHLDSIMP	Importance of children as support	310	0.526	732	0.572	734	0.589		
CHLDCARE	Actual care being received from children							323	0.920
SAVPSUP	Savings, pension, insurance as support	310	0.081	732	0.078	734	0.080	323	0.053
SURECHIN	Index of surety of return from child	248	7.323	634	7.278	626	7.396		

Table 4.6 **Means of fertility variables by characteristics of older women**

		Full Sample		Husband (no school) SNOSCH		Husband (Primary) SPRIM		Husband (sec. or more) SSECH	
		N	*SURCHILD*	**N**	*SURCHILD*	**N**	*SURCHILD*	**N**	*SURCHILD*
Total Sample		**323**							
Characteristics									
Wife's education									
NOSCH	0	190	5.600	16	5.812	83	5.940	5	7.000
	1	133	5.316	25	6.560	46	5.174	3	4.333
PRIM	0	135	5.289	26	6.346	47	5.191	3	4.333
	1	188	5.622	15	6.133	82	5.939	5	7.000
SECH	0	321	5.495	40	6.400	128	5.664	8	6.000
	1	2	3.500	1	1.000	1	6.000	0	0.000
Husband's education									
SNOSCH	0	141	5.674						
	1	41	6.268						
SPRIM	0	53	6.151						
	1	129	5.667						
SSEC	0	176	5.807						
	1	6	5.833						
SUNIV	0	180	5.800						
	1	2	6.500						
Other characteristics									
WIDOW	0	182	5.769	41	6.268	128	5.633	8	6.000
	1	141	5.113 **	0	0.000	1	10.000	0	0.000
URBLIV	0	317	5.473	35	6.400	120	5.658	5	7.000
	1	6	6.000	6	5.500	9	5.778	3	4.333
SAVINGS	0	66	5.636	17	6.059	18	6.278	0	0.000
	1	257	5.444	24	6.417	111	5.568	8	6.000
DEBTS	0	205	5.415	27	6.444	74	5.554	6	5.500
	1	118	5.602	14	5.929	55	6.000	2	7.500
MARRIED	0	158	5.051	5	5.800	11	4.545	0	0.000
	1	165	5.897 ***	36	6.300	118	5.771	8	6.000

Significance: * = 10%, ** = 5%, *** = 1%

Note: Only 182 of the 323 older women reported their husband's education

Table 4.7 provides a comparison of the means of fertility measures of young wives according to different characteristics of these women and their husbands. Clearly, education is significantly related to lower fertility. Also, families with closer inter-

generational bonding (i.e., those with a stronger tradition of mutual aid) tend to have significantly fewer children than those without such intergenerational bonding.

Table 4.7 **Means of variables by characteristics of young wives**

		N	DF 11		CEB		SURCHILD	
WURBLIV	0	1567	2.558		2.597		2.485	
	1	209	2.545		2.474		2.406	
WNOSCH	0	1692	2.543		2.561		2.455	
	1	84	2.833	**	3.011	***	2.893	***
WPRIM	0	236	2.462		2.364		2.301	
	1	1540	2.571		2.616	***	2.503	***
WSEC	0	1676	2.572		2.610		2.500	
	1	100	2.300	***	2.110	***	2.070	***
WUNIV	0	1724	2.568		2.606		2.497	
	1	52	2.173	***	1.807	***	1.788	***
HNOSCH	0	1739	2.548		2.564		2.462	
	1	37	2.973	*	3.486	***	3.162	***
HPRIM	0	301	2.346		2.282		2.206	
	1	1475	2.600	***	2.644	***	2.531	***
HSEC	0	1593	2.588		2.637		2.523	
	1	183	2.290	***	2.115	***	2.071	***
HUNIV	0	1700	2.574		2.605		2.496	
	1	76	2.171	***	2.079	***	2.039	***
ANYHLPT	0	66	3.182		3.303		3.152	
	1	1710	2.533	***	2.555	***	2.450	***
HELPFROM	0	680	2.651		2.784		2.666	
	1	1096	2.498	***	2.458	***	2.359	***

Significance: * = 10%, ** = 5%, *** = 1%

As mentioned above, some important differences in fertility behavior between sterilized and unsterilized women were observed Table 4.8 identifies these differences and some key differences of such women and their households. A woman is considered sterile who is either sterilized herself, or whose husband is sterilized. As indicated in the row labeled N, 46.3% of the sample of 1776 women (i.e., 823) belong to this group (STERILED). Notice that the sterile women are about 1.48 years older than the non-sterile women, with 40.9% of them being in the age group 36-42.[101] In addition, those who are sterilized have been married for 14.5 years on average while the non-sterilized women have been married for only 11.7 years. Those who have been sterilized have, on average, married younger, had children when younger, had more children than the other group, are a little bit poorer, have lesser trust in their children's ability to take care of them without use of strategic behavior, have saved more than the other group, and feel that having less children would have been better.

The critical issue is that the sterile women have a significantly higher reliance on children for old age care (SONSUPP, DAUSUPP), and yet feel less sure about the reliability of this support (SURECHIN, DOWHINH). At the same time, some of the sterile women seem to desire additional children, an issue deserving further scrutiny.

---

[101]   Only 25.6% of the unsterilized women are in the age group 36-42.

Table 4.8 **Key differences between the sterile the non-sterile women (younger women)**

Variable	Label	Mean: Sterile	Mean: Non-sterile
Characteristics not necessarily significantly different			
N	Size of the sample	823	953
AGE	age of wife	34.3244	32.8437
SURECHIN	Index of surety of return from children	7.3046	7.3596
Household characteristics			
CEB	children ever born	2.9222 ***	2.2484
LC	living children (surviving children)	2.8165 ***	2.1549
CEBLAST5	Children born last 5 years	0.3232 ***	0.4673
YRSSLC	years since last child	7.3525 ***	5.8634
FPMETHOD	Use Fam. Plan. Method by hhld?	1.0000 ***	0.8143
YRSSBFP	yrs since began fam. planning	6.3608 ***	3.8694
OLDMALHH	old male househead	0.0704 **	0.1063
PARINHH	par in household	0.1373 **	0.2061
NCHILINH	# of total chld in hh	2.1664 ***	1.9513
NADULINH	# of total adult in hh	3.0097 ***	2.8271
NMEMBHH	# of total member in hh	3.7120 ***	3.4136
OWNHOUSE	h owned by someone in hh	0.2162 ***	0.4478
Individual characteristics			
AGE	6.268		
AGEGRP		2.3705 ***	2.1024
AGEGRP1	Dummy for 26<=age<=30	0.1725 ***	0.3252
AGEGRP2	Dummy for 31<=age<=35	0.4179	0.4187
AGEGRP3	Dummy for 36<=age<=42	0.4094 ***	0.2561
WAGEFM	age at first union	19.845 ***	21.0333
WYEARSM	years married	14.473 ***	11.6594
AGEDIFF	Age difference between husband and wife	3.9428 ***	2.9373
AGEFC	age when got first child	21.088 ***	22.5109
SAVINGS	Have savings?	0.79708 ***	0.7286
FUNFUND	funeral fund savings	0.5917 ***	0.5186
WDEBTS	have debt	0.5650 *	0.4999
Expectational charactersitics/ desires			
EDUSEXPL	expect sons up to grade 9	0.0230 ***	0.0768
EDUSEXDC	expect highest sons can	0.0279 ***	0.0653
NADDSDES	If able, No. added sons desired	0.0449 ***	0.1396
NADDDDES	If able, No. added daughters desired	0.0619 ***	0.1869
NADDSHDS	No. added sons desired by husb.	0.1190 ***	0.2074
NADDDHDS	No. added daug desired by husb.	0.1093 ***	0.1946
DOWHINH	Strategic: withhold inheritance	0.2077 **	0.1690
WFINLESS	Financ. better if less kids	0.3778 **	0.3252
LESSCBET	less child better	0.3390 ***	0.2778
DF11	DF: both: unable included + adopt	2.7642 ***	2.3470
EXLIVWD	expect to live with daug	0.7095 ***	0.6440
EXLIVWS	expect to live with son	0.5504 ***	0.4930
INHEREXP	Expectation of receipt of inheritance in	0.3183 **	0.3752
GIVEINH	expect to give inheritace	0.9295 **	0.9539
MMIMP	Financial help is most imp	0.1640 **	0.1242
SONSUPP	son exp to support in old age	0.7873 ***	0.6773
DAUSUPP	daug exp to supp in old age	0.8031 ***	0.6991

Significance: * = 10%, ** = 5%, *** = 1%

Gender preference:

An issue of considerable interest is whether there is any gender preference in Thailand, i.e., is a female or male child preferred to the other sex. The literature has generally indicated little sex-preference in the children in Thailand. Data generally seem to vindicate this. 476 of the 1776 women had an equal number of boys and girls, 658 had more girls than boys, and 642 had more boys than girls. If parents had a "balanced" offspring set, then they desired far fewer children (2.195) than if they had an "imbalanced" set (2.689). However, those who had more children of one sex desired a very similar number of more children. Those with more boys than girls had a desired fertility of 2.693 while those with more girls than boys had a desired fertility of 2.685. The difference in these desires is statistically insignificant. Those with more female children (658) desired 0.223 more sons, while those with more male children (642) desired 0.283 more daughters. In that sense, there appears to be a very small preference for daughters, which lends some credence to the old age security hypothesis since very often younger girls look after their parents. However, since the difference is so small, and the overall impact on desired fertility is insignificant, we shall exclude this effect in the subsequent analysis.

4.5.2   Inferential Statistics

While descriptive statistics are suggestive of possible relationships, such statistics do not control for factors which theory might deem relevant and important, nor do descriptive statistics indicate causality. Causality, therefore, is better studied through a multivariate analysis dictated by theory. Documented below are some of the more important results of such multivariate analysis.

It is an implicit assumption in much of the literature that it is the women's desires which critically influence completed fertility in a household. To test the validity of such an assumption, we regress *completed fertility* on the desired fertility of the two partners. Completed fertility is proxied by the sum of number of children ever born and adopted children. This is the ideal proxy for households where women (or men) have chosen to become permanently sterile. Table 4.9 presents the results of an attempt to determine which spouse actually influences fertility decisions.

Table 4.9   **Determining which spouse influences the fertility decision**

	Model 1		Model 2		Model 3		Model 4		Model 5	
Sample size	610		610		610		610		610	
Adjusted R²	0.5176		0.8017		0.8176		0.6455		0.7328	
INTERCEP	1.1860	***	0.7227	***	0.5933	***	0.7988	***	0.9014	***
DF11	0.6457	***								
DFH			0.8473	***	0.8892	***				
DFDIFF					0.1618	***				
DFMAX							0.7248	***		
DFMIN									0.8549	***

Notes: 1) Sample is restricted to STERILED, and to the husbands who have 'matching' wives.
2) Dependent variable is COMPFERT, which is the sum of children ever born and adopted children.
3) DFDIFF = DF11-DFH, DFMAX = max(DF11,DFH), DFMIN = min(DF11,DFH)

The correlation between DF11 (wife's desired fertility) and DFH (husband's desired fertility) of 0.7019 makes it difficult to use both these variables in the same model. Hence the difference between the two is used (DFDIFF). The correlation between DFH and DFDIFF is -0.3262. Model 3 shows that higher desires of wives (for children) have a positive influence on completed fertility. Model 4 considers the effect of the maximum of these two, and Model 5 considers the effect of the minimum. Completed fertility appears to be a *joint decision*, with husbands being more influential than wives, and the one who desires lesser fertility in a household (generally the husband) being able to influence completed fertility the most, at least in rural Thailand (Models 1,

2). Given this result, we must apply an equally rigorous analysis to understanding the desired fertility of husbands as of the wives. Table 4.12 presents the results of such an analysis for husbands after we first discuss the results for the wives.[102]

Due to the differences in characteristics of the women described in Table 4.8, the question arose: Are women who sterilize themselves intrinsically different from women who use reversible methods of contraception? Do women take a decision in the first stage to sterilize themselves (in the future), and then form their desire for children? This issue is of interest and was examined in detail.

To investigate this, a two-stage Type 4 Tobit model was implemented.[103] In particular, a Probit model was estimated in the first stage based on the entire sample. Among the results obtained were the inverse-Mills ratios. In the second stage, two separate Tobits were run, for sterilized and unsterilized women. Details are presented in the Appendix. Using the LR test, it was found that self-selection might indeed be involved. This issue is therefore an interesting (and unanticipated) one, and needs a robust explanation.

On a theoretical plane it was felt that self-selection is improbable when we consider the *mechanics* of the process of fertility. Stage 2 (desired fertility) would seem to come first. In any case, Stage 2 precedes the decision to sterilize (Stage 1). It is very difficult to show why this order might be reversed in the minds of women, as implied by the self-selection hypothesis. Further, there is a clear age difference between the two sub-sets. As the unsterilized women grow older, there would be a significant probability of

---

[102] In the main, the survey was designed to capture the views and expectations of the wives to a much larger extent than those of their husbands. Therefore, this study has necessarily to be limited, essentially, to the wives' demand for children.
[103] Details in Amemiya (1985). See model in Appendix II of this study.

their wanting to seek sterilization. The unsterilized women are also slightly richer, which means that they can afford the (more expensive) temporary family planning methods. This might explain a bulk of the difference in the two groups.

We can relate this issue to the results of Table 4.9, too. Since husbands seem to (in general) want fewer children than their wives, and they seem to exert considerable influence on the completed fertility of the household, it is possible that women are being 'forced' to sterilize themselves before they have fulfilled their desires for children. It is plausible that, under such circumstances, given that they cannot now have more children, even though they may think they need them for their old age security, these women are now forced to save more for their old age.

Given these considerations, therefore, the results of the two-stage Tobit are not presented here. This unanticipated difference in expectational variables between the two groups is of considerable interest, however, and future researchers might find it worthwhile to investigate this further. For the rest of this study, we control for such differences in behavior between sterilized and unsterilized women though the use of interaction terms.

Table 4.10 displays the results of a multivariate analysis of wife's desired fertility, DF11. The results for both the Tobit and OLS regressions are displayed. The results are consistent in both cases, and hence we can use the Adjusted-R^2 of the OLS model to form a qualitative judgment of the predictive power of the model. The explanatory power would seem to be reasonably high for cross-sectional analysis. Wealth (proxied through HELECT), the social norms or old-age care in the community (proxied through LIVALONE) and expectational variables (EXPOCCCS, CHLDSIMP, INHEREXP, MMIMP, DOEDUC AND DOWINH) seem to predominate in terms of the magnitude

102

of their marginal effects on the desired fertility. As expected, there is virtually no effect of education, the cost of fertility regulation, the help received from parents (mutual aid), and the number of deceased children. The coefficient for 'care when ill' is also not very significant, though it is of the 'correct' sign. This shows that results obtained from descriptive statistics, which do not control for relevant factors, can often be misleading. Note also the differential effect of being sterilized on the LIVALONE, AGE and SVACCESS (as revealed by the interaction terms).

Some of the key findings that emerge from this analysis are:

* The existence of alternative means of accumulating savings and capital (e.g., access to banks and cooperative societies, rental markets for land: SVACCESS, RENTMKT) reduces desired fertility, the significance of the effect of local rental markets (not its magnitude) being somewhat more important than savings markets, probably since land retains its value to a greater extent than financial assets.

* Old age security concerns dictate a large part of the demand for children. If children are considered important as the means of support in old age (CHLDSIMP), then more children are demanded, though this effect is somewhat muted, perhaps being too general in nature.

• The returns component from children is crucial in determining the demand for children. Despite stating that care when ill is most important to them (Table 4.5), parents actually seem to behave in fertility as if the cash component were more significant (MMIMP). It appears that the 'capital asset effect' and 'insurance effect' of children play a significant role in determining the demand for children.

People look upon children as instruments to provide them with an 'annuity,' and perhaps, insurance coverage, in times of need.

- Parents seem to behave like good bankers and tuck their investments (children) into the less risky occupations (EXPOCCCS). The more secure the child's expected occupation, the lower the variance of expected returns from them, and the fewer children demanded. Of course, this expectation is a function of how much the parent is willing to spend on the child. It would appear that there is a strong influence of macroeconomic growth through the EXPOCCCS variable (see also Table 4.5 where the changes in this variable capture changes in the macroeconomy). Given the statistics of rapid growth of the economy presented in Table 4.1, it is possible that this past growth leads to expectations of rapid future growth of the economy. Given that education is available relatively cheaply,[104] the opportunity set of the children is felt to be increasing, and investment in education felt to be worthwhile. This reflects the typical switch from quantity to quality, driven in this case by strong expectations of higher and more secure returns (both monetary and non-monetary) in old age.

* The more sure that women are about the likelihood of returns from children SURECHIN),[105] the smaller is the number of children demanded. If parents feel that they can secure loyalty through providing higher levels of education to their

---

[104] "It is the policy of the government to provide primary education free to all children, and more than 90 percent of all primary students attend public schools... [T]he majority of secondary students are enrolled in public schools... Furthermore, all major universities in Thailand are public institutions" (Phananiramai and Mason, 1993). Between 1935-1960, 4 years of education was compulsory; from 1978, 6 years became compulsory. From Table 4.5 we see that this 'compulsion' did not necessarily translate into actual education.

[105] Am important question relates to the formation of this 'sense of surety.' This issue needs theoretical and empirical investigation. As a preliminary indication, it is seen that being highly educated seems to significantly lower the sense of reliability of children.

children (DOEDUC), they prefer to have fewer children (since investment in education has at least some opportunity costs). But, if they feel that their children are likely to be disloyal and will perhaps have to be 'forced' to repay through use of inheritance in a strategic manner, such as withholding it (DOWINH), then they demand more children. This means that up to a point where social norms are weaker, parents will tend to have more children if children are their primary providers of security in old age.

* Women are more in need of old age security through children if their husbands are much older than them (AGEDIFF), which indicates that they are accounting for the longer period of life that they might have to live as widows.

* If the household is particularly dependent on land (i.e., has higher holdings of land), then children are valued also as farm labor (production utility). The variable FLANDOWN has a small, positive and significant marginal effect on the desire for children. Its absolute effect on fertility is very small, though, and arises from the fact that children today are required to attend school and hence be less available for farm labor on a regular basis than they used to be.

Table 4.10   Multivariate analysis of wife's desired fertility

Assumption: Wife makes fertility decision independently

Tobit:
Dependent Variable=DF11
Noncensored Values= 1294
Left Censored Values= 19
Right Censored Values=   0
Observations with Missing Values= 463

OLS:
F Value   Prob>F
14.449   0.0001

R-square   0.2121
Adj R-sq   0.1974

Variable	Label	TOBIT		OLS	
		Estimate	Pr>Chi	Estimate	Prob > |T|
INTERCPT	Intercept	0.3819	0.3052	0.4264	0.2501
Community variables					
LIVALONE	Whether any elderly living wi	-0.2553 **	0.0108	-0.2436 **	0.0146
LIVINT	livalone * steriled	0.3347 **	0.0207	0.3211 **	0.0260
RC	Cost of fertility regulation	0.0021	0.9463	0.0015	0.9614
RENTMKT	Active market for renting lan	-0.0713 **	0.0450	-0.0716 **	0.0435
SVACCESS	Access to savings institution	-0.0256 **	0.0362	0.0247 **	0.0429
SVACCINT	svaccess * steriled	0.0156	0.3603	0.0148	0.3833
Household variables					
HELPFROM	Help from parents/ in-law	0.0351	0.5757	0.0301	0.6299
HELECT	HH has electricity: index	-0.1162 **	0.0174	-0.1137 **	0.0197
FLANDOWN	Land owned by family	0.0043 ***	0.0005	0.0042 ***	0.0005
Individual characteristics and expectations					
AGE	Age of wife	0.0914 ***	0.0001	0.0906 ***	0.0001
AGEINT	age * steriled	0.0058 *	0.0660	0.0058 *	0.0659
AGEDIFF	Age difference between husban	0.0379 ***	0.0001	0.0371 ***	0.0001
YRSSLC	years since last child	-0.0584 ***	0.0001	-0.0581 ***	0.0001
DC	# of deceased children	-0.0747	0.3107	-0.0684	0.3512
WPRIM	Wife: educn = between 0-6 yrs	-0.0344	0.8211	-0.0370	0.8074
WSECH	Wife has secondary or higher	-0.0535	0.7787	-0.0556	0.7691
EXPOCCCS	Expected occ of chld based on	-0.1249 ***	0.0001	-0.1240 ***	0.0001
CHLDSIMP	Importance of children as sup	0.1338 *	0.0997	0.1327	0.1016
INHEREXP	Expectation of receipt of inh	-0.2104 ***	0.0010	-0.2118 ***	0.0009
CIMIMP	Care when ill most imp	0.0723	0.2653	0.0683	0.2915
MMIMP	Financial help is most imp	0.1515 *	0.0716	0.1459 *	0.0818
SURECHIN	Index of surety of retun from	-0.0283 *	0.0609	-0.0293 *	0.0512
DOEDUC	Human Resource: Give highest	-0.2280 *	0.0787	-0.2281 *	0.0776
DOWHINH	Strategic: withhold inheritan	0.1734 **	0.0232	0.1702 **	0.0256

Significance: * = 10%, ** = 5%, *** = 1%

*   AGE has a small but positive effect on desired fertility even among the sample of younger generation women. This is indicative of the greater 'use' of children by older women for production and old age security: when they wanted their children, the markets are likely to have been less complete, the economic potential of children was lower, the mortality rate of children higher, and the likelihood of

106

widowhood larger. Hence older women desire more children. Note also the joint effect of being sterilized and older (AGEINT). Sterilized women are not only older, but they have higher desired fertility than non-sterile women, for reasons discussed elsewhere.

One of the questions that can be raised here is: why is the 'well-known' effect of education variables insignificant? This is an interesting question. It appears that education has a significant effect on the desired fertility in the absence of other control variables (Table 4.11), but that this effect disappears as soon as theoretically relevant controls are introduced. However, the very low R^2 in this Table must be kept in mind. As far as a theoretical explanation for this is concerned, it can be seen (Chapter 3) that the effect of education is directly felt on income earning potential, but in terms of rational determination of the optimal solution, the level of education should not have any effect. A person can take rational decisions in terms of costs and benefits *irrespective* of the level of literacy. This has been explained at length in Chapter 2. That is all that is needed here, and therefore, education, per se, should have no influence on decision making.

At the same time, we should keep in mind that some limitations arise from the nature of the analysis which uses cross-sectional data. We get an aggregated view of the process of the formation of these desires, but are unable to understand the specific longitudinal sequence of events that shape individual decisions on the number of children to bear. Panel data would be needed in order to better understand the formation of fertility desires. It is possible that education might then be seen to have both direct affects (on the utility function) as well as indirect effects (through education).

A step-wise regression was carried out, in which appropriate controls (EXPOCCCS, HELECT, AGE) were introduced to determine the reason why education

does not have a direct effect on desired fertility. The results (Table 4.11) suggest that the direct effect of education is "knocked off" as a result of (a) investment costs of children, (b) opportunity costs of the household. Richer houses have less time to devote to child-rearing, and (c) the age of the women. If we regress HELECT and EXPOCCCS on WPRIM and WSECH, it is seen that we have a significant (but very small) R^2 on both these regressions, implying that education influences the household income and expectations from children (on the latter, WSECH was very strongly significant). Thus, the effects of education are being captured elsewhere, through the channels of opportunity costs and higher expectations (implying higher costs) from children. In this connection, it is not possible to rule out an alternative "order" of the step-wise regression, which might have greater explanatory power. Essentially, it does not appear likely that education makes women "rational," enabling them to make economic calculations. On the other hand, education does appear to have some indirect effects on the demand for children.

Table 4.11 **Wife's desired fertility as predicted by education**

a) *Desired fertility as predicted <u>purely</u> by education vqriables:*

Tobit:
Dependent Variable=DF11
Noncensored Values= 1557
Left Censored Values= 21
Right Censored Values= 0

OLS:

	F Value	Prob>F
	7.543	0.0005
R-square	0.0095	
Adj R-sq	0.0082	

		TOBIT		**OLS**	
Variable	**Label**	**Estimate**	**Pr>Chi**	**Estimate**	**Prob > |T|**
INTERCPT	Intercept	2.8946 ***	0.0001	2.9000 ***	0.0001
WPRIM	Wife: educn = between 0-6 yrs	-0.3092 **	0.0428	-0.3093 **	0.0280
WSECH	Wife has secondary or higher	-0.6321 ***	0.0002	-0.6307 ***	0.0002

b) *Added control for EXPOCCCS:*

Tobit: Dependent Variable=DF11
Noncensored Values= 1557
Left Censored Values= 21
Right Censored Values= 0

OLS:

	F Value	Prob>F
	18.435	0.0001
R-square	0.0339	
Adj R-sq	0.0321	

		TOBIT		**OLS**	
Variable	**Label**	**Estimate**	**Pr>Chi**	**Estimate**	**Prob > |T|**
INTERCPT	Intercept	3.1744 ***	0.0001	3.1779 ***	0.0001
WPRIM	Wife: educn = between 0-6 yrs	-0.1847	0.1931	-0.1853 **	0.1869
WSECH	Wife has secondary or higher	-0.4174 **	0.0161	-0.4170 ***	0.0151
EXPOCCCS	Expected occ of chld based on	-0.1606 ***	0.0001	-0.1597 ***	0.0001

c) *Added control for HELECT:*

Tobit: Dependent Variable=DF11
Noncensored Values= 1557
Left Censored Values= 21
Right Censored Values= 0

OLS:

	F Value	Prob>F
	15.793	0.0001
R-square	0.0386	
Adj R-sq	0.0362	

		TOBIT		**OLS**	
Variable	**Label**	**Estimate**	**Pr>Chi**	**Estimate**	**Prob > |T|**
INTERCPT	Intercept	3.2465 ***	0.0001	3.2490 ***	0.0001
HELECT	HH has electricity: index	-0.1269 ***	0.0057	-0.1255 **	0.0058
WPRIM	Wife: educn = between 0-6 yrs	-0.1209	0.3991	-0.1222	0.3893
WSECH	Wife has secondary or higher	-0.3318 *	0.0591	-0.3321	0.0563
EXPOCCCS	Expected occ of chld based on	-0.1519 ***	0.0001	-0.1511 ***	0.0001

d) *Added control for AGE:*

Tobit: Dependent Variable=DF11
Noncensored Values= 1557
Left Censored Values= 21
Right Censored Values= 0

OLS:

	F Value	Prob>F
	31.820	0.0001
R-square	0.0919	
Adj R-sq	0.0890	

		TOBIT		**OLS**	
Variable	**Label**	**Estimate**	**Pr>Chi**	**Estimate**	**Prob > |T|**
INTERCPT	Intercept	0.7201 **	0.0162	0.7443 ***	0.0121
HELECT	HH has electricity: index	-0.1678 ***	0.0002	-0.1662 **	0.0002
AGE	Age of wife	0.0726 ***	0.0001	0.0719 ***	0.0001
WPRIM	Wife: educn = between 0-6 yrs	-0.0614	0.6598	-0.0634	0.6463
WSECH	Wife has secondary or higher	-0.0997	0.5635	-0.1020	0.5503
EXPOCCCS	Expected occ of chld based on	-0.1267 ***	0.0001	-0.1260 ***	0.0001

Similarly, another question that can be raised is about apparent absence of any effect of the cost of fertility regulation, or access to family planning services. It is seen (Table 4.12), as in the case of education, that RC (cost of regulation of fertility) has an effect on desired fertility, when considered in isolation. The greater the cost (and thus the lower the access), the greater the desired fertility. Here also, the R^2 is very low. This indicates possible shifts in preferences for children due to the presence of family planning services. But theoretically, this 'relationship' makes no sense since desires for children are an optimal solution to a very *long term* investment problem, in which the cost of fertility regulation is a very small cost. It is seen, indeed, that on the introduction of other control variables which capture long-term effects, the effect of RC on desired fertility disappears.

Table 4.12   **Wife's desired fertility as predicted purely by cost of fertility regulation**

Assumption: Wife makes fertility decision independently

Tobit:				OLS:		
Dependent Variable= DF11				F Value	Prob>F	
Noncensored Values= 1752				9.679	0.0019	
Left Censored Values= 24				R-square	0.0054	
Right Censored Values= 0				Adj R-sq	0.0049	

		TOBIT		OLS	
Variable	**Label**	**Estimate**	**Pr>Chi**	**Estimate**	**Prob > |T|**
INTERCPT	Intercept	2.5040 ***	0.0001	2.5098 ***	0.0001
RC	Cost of fertility regulation	0.0784 ***	0.0020	0.0778 ***	0.0019

Alternative specifications of the dependent variable

To test for robustness of these results, we consider alternative specifications of the dependent variable, CEB (children ever born) and SURCHILD (surviving children). Table 4.13 presents the results. Given the greater continuity of these variables, not surprisingly, the adjusted R^2 of 0.42 and 0.35 respectively are higher than those for DF in Table 4.10.

We note an underlying consistency between Tables 4.10 and 4.13. The effects of most critical variables are in the same direction and significance is also similar, such as LIVALONE, RENTMKT, HELECT, AGE, AGEDIFF, EXPOCCCS and INHEREXP. However, there are some important differences:

* RC is very slightly more relevant here than in the case of desired fertility. However, it does not appear to affect actual fertility. This can be attributed at least partially to the fact that access to a minimal level of family planning services is almost universal, and its variation in terms of access does not significantly make it more 'costly' in terms of life-cycle optimization. We see that nearly 87% of the women report using a family planning method (FPMETHOD, see Table 4.5), which, at the average age of 33.5 years, signifies a very high level of usage.

Table 4.13 **Multivariate analysis of the demand for children based on alternative specifications of the dependent variable**

Assumption: Wife makes fertility decision independently

OLS on CEB:			OLS on SURCHILD:	
F Value	Prob>F		F Value	Prob>F
41.844	0.0001		31.665	0.0001
R-square	0.4381		R-square	0.3711
Adj R-sq	0.4276		Adj R-sq	0.3594

		CEB		SURCHILD	
Variable	**Label**	**Estimate**	**Prob > |T|**	**Estimate**	**Prob > |T|**
INTERCEP	Intercept	-0.4552	0.1384	-0.4442	0.1431
LIVALONE	Whether any elderly living without child	-0.1453 *	0.0784	-0.1647 **	0.0435
LIVINT	livalone * steriled	0.1817	0.1280	0.1919	0.1036
RC	Cost of fertility regulation	-0.0113	0.6567	-0.0084	0.7377
RENTMKT	Active market for renting land	-0.1117 ***	0.0001	-0.1142 ***	0.0001
SVACCESS	Access to savings institutions	-0.0107	0.2892	-0.0103	0.3029
SVACCINT	svaccess * steriled	0.0108	0.4414	0.0088	0.5268
HELPFROM	Help from parents/ in-law	-0.0384	0.4582	-0.0484	0.3435
HELECT	HH has electricity: index	-0.1222 ***	0.0025	-0.1250 ***	0.0017
FLANDOWN	Land owned by family	0.0025 **	0.0145	0.0024 **	0.0156
AGE	Age of wife	0.1214 ***	0.0001	0.1206 ***	0.0001
AGEINT	age * steriled	0.0108 ***	0.0001	0.0110 ***	0.0001
AGEDIFF	Age difference between husband and wife	0.0418 ***	0.0001	0.0420 ***	0.0001
YRSSLC	years since last child	-0.0717 ***	0.0001	-0.0726 ***	0.0001
DC	# of deceased children	0.8133 ***	0.0001	-0.0714	0.2339
WPRIM	Wife: educn = between 0-6 yrs	-0.1886	0.1337	-0.1705	0.1699
WSECH	Wife has secondary or higher edn	-0.3142 **	0.0455	-0.3008 *	0.0526
EXPOCCCS	Expected occ of chld based on security	-0.1584 ***	0.0001	-0.1566 ***	0.0001
CHLDSIMP	Importance of children as support	-0.0032	0.9619	0.0058	0.9302
INHEREXP	Expectation of receipt of inheritance in	-0.1807 ***	0.0006	-0.1845 ***	0.0004
CIMIMP	Care when ill most imp	0.0248	0.6441	0.0393	0.4582
MMIMP	Financial help is most imp	0.0899	0.1954	0.0990	0.1489
SURECHIN	Index of surety of retun from child	-0.0062	0.6203	-0.0052	0.6705
DOEDUC	Human Resource: Give highest education	-0.1524	0.1545	-0.1639	0.1211
DOWHINH	Strategic: withhold inheritance	0.1267 **	0.0448	0.1129 *	0.0702

Significance: * = 10%, ** = 5%, *** = 1%

* The higher is DC (number of deceased children), the higher the number of children ever born. This is clearly a strong replacement effect at work, and

supports the traditional view (as well as the theoretical results of Chapter 3) that high infant mortality usually leads to higher number of children born.

* The role of expectational variables is somewhat weaker, overall, in predicting CEB and SURCHILD, than for DF, even though the sign of the coefficients is the same in most cases.

* Education surfaces, for the first time, in explaining CEB and SURCHILD.

Since we do not have data on completed fertility, as well as information on 'unwanted' children due to failure in contraception, we should not be relying on these models to estimate the desired fertility of the theoretical model of Chapter 3. However, these results do make sense and have very strong predictive power.

Role of husband's education and expectations on the wife's demand for children

We have seen that the husband plays an influential role in the completed fertility outcome of a household. Does this influence transmit to the wife indirectly or directly? The wife might be influenced indirectly through the education and expectations of the husband. When these variables (HPRIM, HSECH, HMMIMP, HCIMIMP, DOWHINHH, DOEDUCH) are included in the model (Table 4.14), due to missing observations, we lose another 343 observations, with only 956 (i.e., 53.8% of the total) observations now being put to use. In fact, the loss of data prevents the inclusion of some other expectations of the husband which might play some role.

In order to properly compare Table 4.14 with Table 4.10, we run the basic model for the sample where both husbands and wives have been surveyed. The results are presented in Table 4.15.

Table 4.14   **Role of husband's education and expectations on the wife's**

demand for children *Assumption: Wife is influenced by husband, indirectly*

Tobit:		OLS:	
Dependent Variable=DF11		F Value	Prob>F
Noncensored Values= 956		10.536	0.0001
Right Censored Values= 0			
Left Censored Values= 14		R-square	0.2387
Observations with Missing Values= 806		Adj R-sq	0.2160

		Tobit		OLS	
Variable	**Label**	**Estimate**	**Pr>Chi**	**Estimate**	**Prob > |T|**
INTERCPT	Intercept	-0.1334	0.7661	-0.0772	0.8635
LIVALONE	Whether any elderly living wi	-0.3047 **	0.0113	-0.2925 **	0.0152
LIVINT	livalone * steriled	0.4653 ***	0.0073	0.4516 ***	0.0094
RC	Cost of fertility regulation	0.0340	0.3438	0.0329	0.3608
RENTMKT	Active market for renting lan	-0.0558	0.1905	-0.0566	0.1857
SVACCESS	Access to savings institution	-0.0241	0.1002	-0.0231	0.1173
SVACCINT	svaccess * steriled	0.0255	0.2044	0.0245	0.2240
HELPFROM	Help from parents/ in-law	0.1570 **	0.0349	0.1495 **	0.0452
HELECT	HH has electricity: index	-0.1454 **	0.0119	-0.1417 **	0.0145
FLANDOWN	Land owned by family	0.0045 ***	0.0006	0.0045 ***	0.0006
AGE	Age of wife	0.1025 ***	0.0001	0.1011 ***	0.0001
AGEINT	age * steriled	0.0042	0.2418	0.0043	0.2409
AGEDIFF	Age difference between husban	0.0502 ***	0.0001	0.0494 ***	0.0001
YRSSLC	years since last child	-0.0564 ***	0.0001	-0.0558 ***	0.0001
DC	# of deceased children	-0.1389	0.1440	-0.1260	0.1855
WPRIM	Wife: educn = between 0-6 yrs	-0.0479	0.7878	-0.0465	0.7946
WSECH	Wife has secondary or higher	-0.0147	0.9477	-0.0106	0.9622
EXPOCCCS	Expected occ of chld based on	-0.1053 ***	0.0011	-0.1037 ***	0.0014
CHLDSIMP	Importance of children as sup	0.1377	0.1518	0.1388	0.1498
INHEREXP	Expectation of receipt of inh	-0.1695 **	0.0260	-0.1688 **	0.0271
CIMIMP	Care when ill most imp	0.0926	0.2375	0.0882	0.2615
MMIMP	Financial help is most imp	0.1829 *	0.0627	0.1788 *	0.0699
HCIMIMP	Husb: Care when ill most imp	-0.0571	0.4476	-0.0588	0.4347
HMMIMP	Husb: Financial help is most	-0.1028	0.3648	-0.1049	0.3563
SURECHIN	Index of surety of retun from	-0.0339 *	0.0604	-0.0355 *	0.0501
DOEDUC	Human Resource: Give highest	-0.2777 *	0.0891	-0.2804 *	0.0873
DOWHINH	Strategic: withhold inheritan	0.2332 **	0.0107	0.2312 **	0.0118
DOEDUCH	Husb:give highest educ	-0.2157	0.1045	-0.2215 *	0.0966
DOWHINHH	Husb: withhold inheritance	0.0087	0.9175	0.0057	0.9457

Significance: * = 10%, ** = 5%, *** = 1%

Table 4.15 **Multivariate analysis of wife's desired fertility, using observations in which both husband and wife have been surveyed**

Assumption: Wife makes fertility decision independently

Tobit:		OLS:	
Dependent Variable=DF11		F Value	Prob>F
Noncensored Values= 956		12.110	0.0001
Right Censored Values= 0			
Left Censored Values= 14		R-square	0.2352
Observations with Missing Values= 806		Adj R-sq	0.2158

		Tobit		OLS	
Variable	Label	Estimate	Pr>Chi	Estimate	Prob > |T|
INTERCPT	Intercept	-0.1481	0.7406	-0.0915	0.8378
LIVALONE	Whether any elderly living wi	-0.2916 **	0.0153	-0.2788 **	0.0203
LIVINT	livalone * steriled	0.4536 ***	0.0089	0.4393 **	0.0114
RC	Cost of fertility regulation	0.0306	0.3948	0.0293	0.4149
RENTMKT	Active market for renting lan	-0.0543	0.2027	-0.0549	0.1977
SVACCESS	Access to savings institution	-0.0243 *	0.0969	-0.0232	0.1137
SVACCINT	svaccess * steriled	0.0258	0.1996	0.0248	0.2183
HELPFROM	Help from parents/ in-law	0.1545 **	0.0378	0.1467 **	0.0487
HELECT	HH has electricity: index	-0.1530 ***	0.0081	-0.1495 ***	0.0098
FLANDOWN	Land owned by family	0.0045 ***	0.0006	0.0045 ***	0.0006
AGE	Age of wife	0.1023 ***	0.0001	0.1009 ***	0.0001
AGEINT	age * steriled	0.0042	0.2527	0.0042	0.2510
AGEDIFF	Age difference between husban	0.0486 ***	0.0001	0.0478 ***	0.0001
YRSSLC	years since last child	-0.0564 ***	0.0001	-0.0557 ***	0.0001
DC	# of deceased children	-0.1425	0.1344	-0.1296	0.1729
WPRIM	Wife: educn = between 0-6 yrs	-0.0537	0.7623	-0.0529	0.7656
WSECH	Wife has secondary or higher	-0.0208	0.9260	-0.0174	0.9379
EXPOCCCS	Expected occ of chld based on	-0.1079 ***	0.0008	-0.1063 ***	0.0010
CHLDSIMP	Importance of children as sup	0.1279	0.1832	0.1290	0.1800
INHEREXP	Expectation of receipt of inh	-0.1768 **	0.0200	-0.1764 **	0.0205
CIMIMP	Care when ill most imp	0.0866	0.2634	0.0820	0.2898
MMIMP	Financial help is most imp	0.1690 *	0.0843	0.1644 *	0.0935
SURECHIN	Index of surety of retun from	-0.0315 *	0.0803	-0.0331 *	0.0666
DOEDUC	Human Resource: Give highest	-0.3474 **	0.0278	-0.3519 **	0.0261
DOWHINH	Strategic: withhold inheritan	0.2394 ***	0.0068	0.2365 ***	0.0076

Significance: * = 10%, ** = 5%, *** = 1%

The first point to note is that the explanatory power of some of the community variables (RENTMKT, SVACCESS) reduces distinctly in these truncated models. One possibility is that the husbands who could not be surveyed were not missed out at random, but that there are some special characteristics of villages where husbands were more likely to be absent at the time of the survey. Some likely indicators were examined

(Table 4.16) and it does appear that villages from which husbands were more likely to be missing were on average slightly closer to cities, had greater access to banks and other institutions, and better markets for rental lands. In other words, it is likely that at least some of the husbands were missing because they had found work in the nearby cities. Note that there is not much difference in terms of access to family planning services. It is important to remember, therefore, when comparing Tables 4.14 and 4.15 with Table 4.10, that the truncated sample represents a different opportunity set compared to the complete sample.

Table 4.16 **Possible self-selection of husbands surveyed**

| | Husbands | |
Variable	Present	Absent
URBDIST	17.8	17.0
SVACCESS	4.70	4.97
RENTMKT	0.71	0.78
RC	0.61	0.58

Now we analyze the rest of the Table 4.14. The results are broadly in keeping with the observations made in Table 4.10 except for mutual aid (HELPFROM) which seems to take on greater power in explaining the desire for children in this truncated sample. However, the direction of this effect is contrary to the effect observed in Table 4.7. In other words, the greater the level of bonding between generations, the higher the demand for children. Two effects operate with respect to this variable. On the one hand, the greater level of bonding indicates that children would be more likely to help their parents in the future, which would tend to reduce the demand for children. On the other hand, greater help received from parents of the couple would help reduce the cost of rearing children, and thus increase the demand for children. In the present case, the latter seems

to be prevailing. Note also that husbands' education and expectations exert a very

marginal role on the wife's desires; in other words, each member of the couple is likely to

be making up their own minds about the children they need to have.

Instead of an indirect influence, there might be a more direct influence by the

husband on the wife. The survey canvassed the following question to the husbands,

"Have you ever talked with your wife about the number of children you would like to

have?" The mean reply to this was 1.3 (where 1 is talked and 2 is not talked), implying

that such communication is relatively common. By adding this variable, ETALKEDH, to

the models in Table 4.14, we get Table 4.17. In terms of predictive power, this model is

marginally better than the previous one. We also notice that communication between

husband and wife has a strong and significantly negative effect on the desires of a woman

for children. This is a very interesting finding and once again confirms that women, due

to stronger old age security needs, usually desire more children than their husbands, who

are able to influence them against having children in many cases.

The OAS survey has relatively limited data on husbands. For example, there is no

counterpart for EXPOCCCS. We use HFN60ADQ as a poor substitute for this in

Model 1 of Table 4.18. In the next model we use EXPOCCCS (from their wife's

expectations) to try to capture some information related to future expectations from

children. It would appear that there is some role for old-age security concerns

including concerns with the reliability of the returns component (LIVALONE), in the

minds of men. At the same time, strategic motives are less important, and in general,

husbands seem to be less concerned with returns than their wives were. They have a

lower expectancy of life at a given point of time than their wives and therefore

perhaps feel less of a need for children to care for them in old age.

Table 4.17 **Effect of conversations with husband on the wife's demand for children.** *Assumption: Wife is influenced by husband directly*

Tobit:	OLS:	
Dependent Variable=DF11	F Value	Prob>F
Noncensored Values= 956	9.641	0.0001
Right Censored Values= 0		
Left Censored Values= 14	R-square	0.2537
Observations with Missing Values= 806	Adj R-sq	0.2274

		Tobit		OLS	
Variable	**Label**	**Estimate**	**Pr>Chi**	**Estimate**	**Prob > |T|**
INTERCEP	Intercept	0.0834	0.8540	0.1333	0.7691
LIVALONE	Whether any elderly living wi	-0.3234 ***	0.0070	-0.3104 ***	0.0098
LIVINT	livalone * steriled	0.4831 ***	0.0052	0.4687 ***	0.0069
RC	Cost of fertility regulation	0.0329	0.3583	0.0318	0.3752
RENTMKT	Active market for renting lan	-0.0616	0.1475	-0.0621	0.1453
SVACCESS	Access to savings institution	-0.0227	0.1206	-0.0216	0.1403
SVACCINT	svaccess * steriled	0.0276	0.1690	0.0265	0.1878
HELPFROM	Help from parents/ in-law	0.1550 **	0.0366	0.1475 **	0.0473
HELECT	HH has electricity: index	-0.1414 **	0.0140	-0.1378 **	0.0171
FLANDOWN	Land owned by family	0.0045 ***	0.0006	0.0045 ***	0.0007
AGE	Age of wife	0.1003 ***	0.0001	0.0990 ***	0.0001
AGEINT	age * steriled	0.0036	0.3179	0.0037	0.3138
AGEDIFF	Age difference between husban	0.0491 ***	0.0001	0.0484 ***	0.0001
YRSSLC	years since last child	-0.0565 ***	0.0001	-0.0559 ***	0.0001
DC	# of deceased children	-0.1453	0.1252	-0.1321	0.1636
WPRIM	Wife: educn = between 0-6 yrs	-0.0460	0.7951	-0.0446	0.8018
WSECH	Wife has secondary or higher	-0.0093	0.9667	-0.0053	0.9810
EXPOCCCS	Expected occ of chld based on	-0.1042 ***	0.0012	-0.1026 ***	0.0015
CHLDSIMP	Importance of children as sup	0.1220	0.2033	0.1235	0.1992
INHEREXP	Expectation of receipt of inh	-0.1586 **	0.0367	-0.1582 **	0.0378
CIMIMP	Care when ill most imp	0.0988	0.2060	0.0942	0.2290
MMIMP	Financial help is most imp	0.1760 *	0.0722	0.1721 *	0.0800
HCIMIMP	Husb: Care when ill most imp	-0.0478	0.5238	-0.0498	0.5074
HMMIMP	Husb: Financial help is most	-0.1026	0.3639	-0.1047	0.3555
SURECHIN	Index of surety of retun from	-0.0323 *	0.0722	-0.0340 *	0.0598
DOEDUC	Human Resource: Give highest	-0.2698 *	0.0973	-0.2727 *	0.0952
DOWHINH	Strategic: withhold inheritan	0.2235 **	0.0142	0.2216 **	0.0155
DOEDUCH	Husb:give highest educ	-0.1938	0.1438	-0.2003	0.1323
DOWHINHH	Husb: withhold inheritance	0.0260	0.7556	0.0226	0.7873
ETALKEDH	Husb: ever talked # of chld w	-0.2183	0.0045	-0.2120	0.0060

Significance: * = 10%, ** = 5%, *** = 1%

Table 4.18 Multivariate analysis of husband's demand for children

Assumption: Husband makes fertility decisions independently

	Model 1:	N: 1034		Model 2:	N: 922
	F Value	Prob>F		F Value	Prob>F
	15.703	0.0001		14.750	0.0001
	R-square	0.2365		R-square	0.2558
	Adj R-sq	0.2214		Adj R-sq	0.2385

		Model 1		Model 2	
Variable	Label	Estimate	Prob > |T|	Estimate	Prob > |T|
INTERCEP	Intercept	0.1252	0.7606	0.3505	0.4439
LIVALONE	Whether any elderly living without child	-0.1540 **	0.0480	-0.1397 *	0.0921
RC	Cost of fertility regulation	0.0472	0.1387	0.0402	0.2515
RENTMKT	Active market for renting land	-0.0978 **	0.0113	-0.0850 **	0.0418
SVACCESS	Access to savings institutions	-0.0037	0.7091	-0.0048	0.6511
HELECT	HH has electricity: index	-0.1303 **	0.0129	-0.1182 **	0.0334
FLANDOWN	Land owned by family	0.0034 ***	0.0016	0.0044 ***	0.0003
MAGE	Husband's age	0.0746 ***	0.0001	0.0730 ***	0.0001
AGEDIFF	Age difference between husband and wife	-0.0376 ***	0.0007	-0.0392 ***	0.0009
DC	# of deceased children	0.7792 ***	0.0001	0.7603 ***	0.0001
HPRIM	Husband: 1 if prim. sch.	-0.1818	0.4319	-0.1062	0.6745
HSECH	Husband: 1 if sec or higher	-0.3093	0.2145	-0.1784	0.5125
HFN60ADQ	Husb: living std adequate in 60	-0.0631	0.5956	-0.0478	0.7012
CHLDSIMP	Importance of children as support	0.0968	0.1472	0.0930	0.1890
INHERITH	Husb: expect inheritance	-0.1626 **	0.0219	-0.1478 *	0.0508
SAVPSUPH	Husb: Savings, pension, insurance as sup	-0.1074	0.3929	-0.0245	0.8557
HCIMIMP	Husb: Care when ill most imp	-0.0322	0.6327	-0.0135	0.8511
HMMIMP	Husb: Financial help is most imp	0.0901	0.3840	0.0530	0.6359
SURECHNH		0.0127	0.3041	0.0157	0.2327
DOEDUCH	Husb:give highest educ	-0.2158 *	0.0787	-0.1878	0.1411
DOWHINHH	Husb: withhold inheritance	0.1248	0.1024	0.1099	0.1713
EXPOCCCS	Expected occ of chld based on security			-0.1214 ***	0.0001

Significance: * = 10%, ** = 5%, *** = 1%

Model 1: When HFN60ADQ is used to proxy future economic expectations.
Model 2: when wife's EXPOCCCS is added to capture greater information on future economic expectations from children

4.6 Conclusion

In this chapter, we were able to test some of the key implications of the Old Age Security model of fertility. It was possible to do this because of the extensive and specially designed data set from Thailand. The data set lends strong support to the basic

mathematical model, and indicates that people are operating in the range of $\alpha_2' < 0$, where the variance of expected returns is declining with the number of children.

In particular, expectations and social norms, as well as access to markets, are seen to pay an exceedingly important and complex role in the determination of the fertility decision. People are seen to be optimizing based on the specific parameters of their situation, and the same results (of desired fertility) could easily be obtained from a different mix of variables. If the results of this study are anything to go by, it would appear that fertility declines in many developing countries would be much more rapid if the opportunity set of children were expanding. This would happen with much greater emphasis on economic development, in particular, by opening, broadening and deepening various asset and insurance markets.

CHAPTER 5

WOMEN'S LABOR FORCE PARTICIPATION

AND SAVINGS DECISIONS,

EFFECT OF LIFE-INSURANCE ON MARITAL SOLIDARITY,

AND THE USE OF BEQUESTS STRATEGICALLY

5.1 Introduction

In this chapter we investigate some of the implications of the theoretical model of old age security with regard women's labor force participation, savings and life-insurance behavior. While a comprehensive study would need much more information and time, preliminary tests indicate that the theory offered in Chapter 1 would be more in tune with actual decision making, but that some of the critical implications of the model in Chapter 3 do hold.

There are a considerable number of definitional issues involved when we come to empirical tests. What, for example, constitutes the relevant decision to participate in the labor force? What would be taken as the decision to save? Does a person with at least some nominal savings qualify as a 'saver,' or is that person supposed to have a significant level of savings relative to income in order to qualify? We have made certain decisions regarding these issues based on the questionnaire, but the results must necessarily be taken as indicative, rather than conclusive. It is also important to point out that the data set is not as rich in some of these areas as it is on the issue of fertility and old age security desires. Despite the limited goals of this chapter, it will be shown that to a substantial extent, the results do seem to vindicate the theoretical model.

5.2 Labor Force Participation

The level and type of female labor force participation has enormous significance for the economic development of nations. It would be of great interest therefore to find out what motivates that decision at the household level. It is necessarily true that 'the extent to which women have participated in the labour force has been influenced by economic, cultural and demographic factors." [106] However, which factors influence in which direction, is not quite obvious. Some writers have postulated a 'U-shaped' relationship between female labor force participation and the level of economic development (Psacharopoulus and Tzannatos, 1989).

A second question of interest is the relationship of labor force participation with fertility. In developed nations, an inverse relationship has generally been found between these variables (De Jong and Sell, 1977). In other words, working women generally have lower fertility than non-working women. We must note that such relationships have not been easily established in the case of developing countries. For example, in Thailand, a positive relationship was established by Ware in 1977.

Using the data set described in the previous chapter, an attempt was made to assess these two types of relationships. We are faced with a serious definitional problem at the outset. The decision to classify one activity as being in the labor force and another as not being in the labor force is almost arbitrary and varies across countries.[107] If we merely take the response of the married women in terms of whether they worked in the

---

[106] United Nations (1982:196).
[107] For example, the National Statistical Office of Thailand, Round 2, Labor Force Survey, 1984, adopts a very liberal definition whereby "a labor-force participant is any individual 11 years of age or older who is employed or unemployed during the survey week. The employed include those who worked for payment,

past 12 months, we find that nearly 98.6% of the women surveyed worked somewhere. In order to overcome the problem of lack of heterogeneity, we consider two types of labor force participation, WW1 and WW2, defined as follows:

WW1 When a woman reported having worked in the family farm, in farming for others, in animal husbandry and making milk products, in poultry raising, and in sewing clothes, she was considered in category 1 (primarily home-based and farm-related activities)

WW2 When a woman reported having worked in her own grocery shop or petty trade, in her own business, in non-agricultural wage or salary based employment, as a professional such as lawyer, doctor, etc., or any other activity for earning money not classified above, then she was considered in category 2 (activities primarily based away from home)

Clearly, there might be an overlap of categories in which a woman is found, if she worked in more than one occupation. In fact, 26.5% of the 1776 women surveyed belonged to both categories. 93.97% of the sample reported belonging to category 1, and 31.19% to category 2. While much more analysis will be needed to determine the explanatory variables of various sub-categories, we were able to determine, broadly, the important explanatory variables for these two categories (Table 5.1)

Table 5.1   **Multivariate analysis of wife's labor force participation**
Assumption: Wife makes labor force participation decision independently

Probit		**Probit**	
Dep. Variable=WW1	N: 1776	Dep. Variable=WW2	N: 1776
Level Count		Level Count	
1 1634		1 549	
0 107		0 1192	
Observations with Missing Values= 35		Observations with Missing Values= 35	

---

unpaid family workers, persons temporarily absent from their jobs because of illness or vacation, or persons waiting to be recalled to a job within 30 days." (see Bauer, _et al._, 1993:90).

| | | Dependent Variable | | | |
| | | WW1 | | WW2 | |
Variable	Label	Estimate	Pr>Chi	Estimate	Pr>Chi
INTERCPT	Intercept	2.6977 ***	0.0001	-0.6823 *	0.0559
RENTMKT	Active market for renting lan	-0.1877 ***	0.0014	0.0310	0.4175
SVACCESS	Access to savings institution	-0.0398 **	0.0120	0.0490 ***	0.0001
HELECT	HH has electricity: index	-0.2830 ***	0.0017	0.0535	0.3093
FLANDOWN	Land owned by family	0.0039 **	0.0233	-0.0035 **	0.0126
AGE	Age of wife	-0.0237	0.1405	-0.0055	0.5847
YRSSLC	years since last child	0.0279 **	0.0469	0.0128	0.1368
WPRIM	Wife: educn = between 0-6 yrs	0.0457	0.8712	0.0931	0.5732
WSECH	Wife has secondary or higher	-0.8852 ***	0.0041	0.5351 ***	0.0066
INHERIT	received inheritance	0.3996 ***	0.0006	-0.1384 **	0.0480
INHEREXP	Expectation of receipt of inh	0.3848 ***	0.0013	-0.1694 **	0.0195

Non-farm activities generate money rather and are better fulfilled in the presence of opportunities to save in a secure bank or other institution. At the same time, a greater number of non-farm opportunities are available as development proceeds. This table indicates a positive relationship between non-farm labor force participation (WW2) and economic development, where the latter is measured by greater access to asset markets (SVACCESS), as well as by greater educational attainment of the woman herself. The presence of the option to rent land (RENTMKT) lowers the need of women to directly work in the farm sector, as also the general level of wealth in the household (HELECT). A not-so surprising, but rarely examined variable, is the use of land as bequest in the society. If a woman has received land or expects to receive land (which is the overwhelmingly large component of the inheritance received as well as expected to be received[108]), then she is very strongly likely to work in the farm sector. The opposite effect operates if she does not expect to receive land. The decision of married women to participate in the labor force could be also be motivated by a variety of shocks to their

---

[108] 318 of the 416 women reporting details of inheritance received, reported receipt of land, and 244 of the 289 women reporting details of what they expect to receive, expected to receive land.

husbands' employment, such as sudden changes in their husbands' ability or health status. This and other plausible issues need further testing.

5.2.1 Labor Force Participation and Fertility

As per the simple theoretical model that had been outlined in Chapter 3, it was suggested that the fertility decision comes first, followed by the decision to work in the labor force. This is obviously rather simplistic. It is quite likely that both decisions come simultaneously (and are updated sequentially, as would be implied by the generalized life-cycle model of Chapter 1). The sequential nature of the fertility decision has been explored through hazard models (for example, Raut, 1996). "The perception about the degree of old-age insecurity, preference for son/daughter, and the occurrence of an infant or child death may depend at any time upon the number of surviving children, earnings profile of husband and wife, and stock of assets and therefore will vary over the life-cycles of a couple. Fertility decisions will also interact with the labor supply and savings decisions over the life-cycles of a couple" (*ibid*:83). Raut finds strong support for the OASH but weak support for gender-preference in Malaysia. Thus, we have a very complex relationship and the literature is not unanimous on the direction of the possible relationship between fertility and labor force participation.[109]

---

[109] We cite from Komalig (1991:13), "Waite and Stolzenberg (1976) have examined the relationship between expected family size and the wife's expected employment status at age 35 in the United States. They found a strong effect of employment plans on expected fertility and only a very weak effect of fertility on employment plans. On the other hand, Smith-Lovin and Tickamyer (1978), who studied wives employment activities since marriage and the number of live birth during the same period in the live births during the same period in the United States, found a strong effect of fertility on the years of employment and only a very weak effect in the other direction. An evaluation by Cramer (1980) notes that there are a number of explanations for the difference in the results in the work of Waite and Stolzenberg, and Smith-Lovin and Tickamyer."

The first complexity relates to income and substitution effects: given the availability of suitable personal characteristics, if a woman wishes to work in the non-agricultural sector and increase her income, then she could afford a greater number of children for her old age security, even with higher levels of education. However, more children need more care, particularly in terms of time invested, and that would raise the price of children, forcing a woman to substitute home or agricultural labor activities which are more compatible with raising children in place of non-farm activities. There is another crucial factor. The time needed to take care of children varies over by the age of children and the circumstances a woman finds herself in. Hence the *actual* work force participation decision is likely to be affected by the stage of growth of the entire children in the household, than on mere life-time optimization (as of Chapter 3) that is based on an estimate of the total first period income and second period income. We should expect to find that labor force participation rises as children in the house grow older. This indeed is seen to hold (see YRSSLC in Table 5.1 above). Also, we could expect to find some women optimally working to a limited extent both in the agricultural and non-agricultural sectors, balancing the needs for generating an optimal working period income with that of raising children who will yield high and secure returns in the second (old) period of life. We do indeed find this very complex 'balancing act' at play, with a quarter of the women reportedly working both at home and in activities away from home. It will require much more detailed study to determine the possible causality of the precise decision of the women.

Keeping in mind that desired fertility is a life-cycle decision while labor force participation is a short-term decision, we added DF11 and CEB to the basic model in Table 5.1 to get Tables 5.2 and 5.3. Komalig (1991) had found a strong influence of CEB

on the labor force participation decision, and we too find a somewhat greater influence of this than that of desired fertility, though the influence cannot be said to be statistically significant. In brief, the causality from desired fertility to labor force participation is not only weak, but susceptible to a lot of time-related adjustments that a cross-sectional study is ill-equipped for.

Table 5.2 Effect of CEB on wife's labor force participation
Assumption: Wife makes labor force participation decision independently

Probit
Dep. Variable=WW1   N: 1776
Level   Count
1   1634
0   107

Probit
Dep. Variable=WW2   N: 1776
Level   Count
1   549
0   1192

Observations with Missing Values= 35

Observations with Missing Values= 35

		Dependent Variable			
		WW1		**WW2**	
Variable	Label	Estimate	Pr>Chi	Estimate	Pr>Chi
INTERCPT	Intercept	2.7262 ***	0.0001	-0.7319 **	0.0413
RENTMKT	Active market for renting lan	-0.1749 ***	0.0032	0.0249	0.5183
SVACCESS	Access to savings institution	-0.0393 **	0.0133	0.0489 ***	0.0001
HELECT	HH has electricity: index	-0.2722 ***	0.0027	0.0472	0.3727
FLANDOWN	Land owned by family	0.0036 **	0.0349	-0.0034 **	0.0165
AGE	Age of wife	-0.0322 *	0.0599	0.0004	0.9696
YRSSLC	years since last child	0.0308 **	0.0302	0.0108	0.2156
WPRIM	Wife: educn = between 0-6 yrs	0.0578	0.8377	0.0845	0.6099
WSECH	Wife has secondary or higher	-0.8453 ***	0.0064	0.5130 ***	0.0095
INHERIT	received inheritance	0.3999 ***	0.0006	-0.1365 *	0.0513
INHEREXP	Expectation of receipt of inh	0.4001 ***	0.0009	-0.1768 **	0.0150
CEB	Children ever born	0.0768	0.1539	-0.0439	0.1789

Table 5.3 Effect of DF11 on wife's labor force participation
Assumption: Wife makes labor force participation decision independently

Probit
Dep. Variable=WW1   N: 1776
Level   Count
1   1634
0   107

Probit
Dep. Variable=WW2   N: 1776
Level   Count
1   549
0   1192

Observations with Missing Values= 35

Observations with Missing Values= 35

		Dependent Variable			
		WW1		**WW2**	
Variable	Label	Estimate	Pr>Chi	Estimate	Pr>Chi
INTERCPT	Intercept	2.6854 ***	0.0001	-0.6937 *	0.0521
RENTMKT	Active market for renting lan	-0.1852 ***	0.0017	0.0349	0.3626
SVACCESS	Access to savings institution	-0.0392 **	0.0136	0.0499 ***	0.0001

Variable	Label				
HELECT	HH has electricity: index	-0.2821 ***	0.0018	0.0579	0.2719
FLANDOWN	Land owned by family	0.0038 **	0.0271	-0.0037 ***	0.0089
AGE	Age of wife	-0.0252	0.1258	-0.0093	0.3660
YRSSLC	years since last child	0.0285 **	0.0435	0.0145 *	0.0953
WPRIM	Wife: educn = between 0-6 yrs	0.0468	0.8682	0.0958	0.5617
WSECH	Wife has secondary or higher	-0.8810 ***	0.0043	0.5439 ***	0.0058
INHERIT	received inheritance	0.3996 ***	0.0006	-0.1383 **	0.0482
INHEREXP	Expectation of receipt of inh	0.3890 ***	0.0012	-0.1602 **	0.0277
DF11	DF: both: unable included + a	0.0204	0.6722	0.0446	0.1308

How does the labor force participation decision (WW2) affect the fertility decision? An attempt is made to examine this issue in Table 5.4, which is the basic model of Table 4.10 to which the WW2 variable has been added. It does not appear that participation in non-farm activities significantly affects the desired number of children.

Table 5.4 **Effect of labor force participation on wife's desired fertility**

Assumption: Wife makes labor force participation decision independently

Tobit:
Dependent Variable=DF11
Noncensored Values= 1294
Left Censored Values= 19
Right Censored Values=   0
Observations with Missing Values= 463

Variable	Label	Estimate	Pr>Chi
INTERCPT	Intercept	0.3507	0.347
LIVALONE	Whether any elderly living wi	-0.2560 **	0.011
LIVINT	livalone * steriled	0.3355 **	0.020
RC	Cost of fertility regulation	0.0051	0.869
RENTMKT	Active market for renting lan	-0.0706 **	0.047
SVACCESS	Access to savings institution	-0.0268 **	0.028
SVACCINT	svaccess * steriled	0.0146	0.392
HELPFROM	Help from parents/ in-law	0.0405	0.519
HELECT	HH has electricity: index	-0.1154 **	0.018
FLANDOWN	Land owned by family	0.0044 ***	0.000
AGE	Age of wife	0.0915 ***	0.000
AGEINT	age * steriled	0.0059 *	0.062
AGEDIFF	Age difference between husban	0.0379 ***	0.000
YRSSLC	years since last child	-0.0587 ***	0.000
DC	# of deceased children	-0.0709	0.336
WPRIM	Wife: educn = between 0-6 yrs	-0.0324	0.832
WSECH	Wife has secondary or higher	-0.0644	0.735
EXPOCCCS	Expected occ of chld based on	-0.1266 ***	0.000
CHLDSIMP	Importance of children as sup	0.1389 *	0.088
INHEREXP	Expectation of receipt of inh	-0.2068 ***	0.001

CIMIMP	Care when ill most imp	0.0723	0.265
MMIMP	Financial help is most imp	0.1579 *	0.061
SURECHIN	Index of surety of retun from	-0.0288 *	0.056
DOEDUC	Human Resource: Give highest	-0.2348 *	0.070
DOWHINH	Strategic: withhold inheritan	0.1748 **	0.022
WW2	Work force participation type 2	0.0986	0.129

5.3 Savings

One of the basic implications of the model in Chapter 3 was that the *desire* for savings and fertility would operate in the opposite direction. Desired savings (SAVIMP) is obtained from the question which asks, "Do you feel for a family like yours that it is *desirable* to save for the future or is it unimportant?" We test for the influence of desired fertility (which is hypothesized to be decided first), on the desire for savings (Table 5.5). Observe a negative relationship between these desires. Also note that the actual act of working in the non-farm labor force seems to effect this desire to save negatively, which is puzzling.

Table 5.5 Effect of desired fertility on wife's desired savings
Assumption: Wife makes savings decision independently

Probit
Dep. Variable=SAVIMP   N: 1776
Level   Count
  2   781
  1   935

Observations with Missing Values= 60

Variable	Label	Estimate	Pr>Chi
INTERCPT	Intercept	-0.1467	0.667
RENTMKT	Active market for renting lan	0.2282 ***	0.000
SVACCESS	Access to savings institution	0.0064	0.503
HELECT	HH has electricity: index	0.0270	0.596
FLANDOWN	Land owned by family	0.0018	0.115
AGE	Age of wife	0.0039	0.693
YRSSLC	years since last child	-0.0015	0.855
WPRIM	Wife: educn = between 0-6 yrs	-0.0295	0.846
WSECH	Wife has secondary or higher	0.0199	0.915
INHERIT	received inheritance	-0.0921	0.171
INHEREXP	Expectation of receipt of inh	-0.1847 ***	0.009
DF11	DF: both: unable included + a	-0.0727 **	0.012
WW2	Work force participation type 2	-0.1230 *	0.068

While it is difficult to measure desired savings, it is perhaps possible to measure actual savings held. This issue is another very complex one, including as it does the study of the relative power structure in the household. A serious problem with measuring this variable in this study was that there is no available measure of the *level* of savings held by a wife or a family, only binary measures of whether there is savings or not. In a situation of partial opening of savings markets, one should expect the *level of access* to influence the act of holding savings, but the level should be determined by a complex of factors which take into account the needs of old age security, among others. Since we do not have information on the level of savings, we measure the action of holding savings by SAVMKT (which is 1 if savings are held by the household in either a bank, postal savings account, or a cooperative). In the Table 5.6, below, we include variables defined earlier, as

well as a new variable, WDEBTS, which measures whether anyone in the household owns debt at the moment.

Table 5.6 **Multivariate analysis of whether savings held**

Assumption: Wife makes savings decision for the household

Probit
Dep. Variable=SAVMKT   N: 1776
Level   Count
  1   786
  0   930

Observations with Missing Values= 60

Variable	Label	Estimate	Pr>Chi
INTERCPT	Intercept	-2.3001 ***	0.0001
RENTMKT	Active market for renting lan	-0.0348	0.3680
SVACCESS	Access to savings institution	0.0281 ***	0.0039
HELECT	HH has electricity: index	0.1993 ***	0.0001
FLANDOWN	Land owned by family	0.0089 ***	0.0001
AGE	Age of wife	0.0268 ***	0.0066
YRSSLC	years since last child	-0.0020	0.8168
WPRIM	Wife: educn = between 0-6 yrs	0.4984 ***	0.0040
WSECH	Wife has secondary or higher	0.8402 ***	0.0001
INHERIT	received inheritance	0.3383 ***	0.0001
INHEREXP	Expectation of receipt of inh	0.2069 ***	0.0040
WW1	Work force participation type 1	-0.1603	0.2567
WW2	Work force participation type 2	0.3699 ***	0.0001
WDEBTS	have debts	-0.0111	0.8624
SAVIMP	savings are important	0.0966	0.1320

The signs on SVACCESS and SAVIMP are in the expected direction, but the role of SAVIMP is insignificant in determining whether savings will be actually held. This is somewhat complex and difficult to explain. It is possible that this is happening because (a) we are measuring the binary act of holding savings rather than the actual *level* held, which would arguably be more sensitive to the *intensity* of the desire for savings, and (b) the path through which the desire for savings translates into the act of holding savings is not direct, being impacted strongly by the actual access to savings. (c) There is also the question of short-term adjustments of consumption and savings that take place during the life cycle. Perhaps the *cumulative* savings held at the end of the first period of life

would be determined by desired savings, but we have no way to test this possibility. (d) It is also possible that while planning the savings they wish to have, people follow the broad logic of Chapters 3 and 4, as seen from Table 5.5, but if *unanticipated* extra income is received in the working life period, they save as much of that as possible rather than consuming it, due to the uncertainties of old age. Thailand has seen a major boom in incomes for nearly two decades prior to this survey, and therefore the effects of economic development might overwhelm the optimal plans that they had designed. At the moment, however, in the absence of appropriate micro-level data to test for these alternatives, not much more can be said than leaving it as a puzzle to be further investigated.

5.4 Exploration of strategic behavior and bequests

We recall, from Table 4.10 and others, that those parents who tended to be suspicious of the reliability of children in terms of upholding the implicit intergenerational contract tended to demand more children and tended to believe that withholding bequests from their children would help ensure loyalty (DOWINH). This study of strategic use of bequests can be substantially enhanced by observing the actual behavior of the elderly in these villages. The data set relating to the *older* people can be put to use to explore the existence and extent of strategic behavior.

We find that of the 643 older people surveyed, 541 responded to the questions on bequests. 409 had not given away anything yet, and 86 had given away only a small portion of their planned bequest (Table 5.7). Additionally another 46 had given away most, but still had some more to give away. These 541 respondents were asked further questions about what they would do with their bequest. On adding up replies to

132

Questions 25.2 and 25.6, we find that 134 would give to the child that took most care of them, while 288 would give equally to all children, and others would give as per some other formula (see Table 5.7). Essentially, therefore, 24.7% of the older sample appeared to be using their bequest for strategic purposes, to attract greater care. That a quarter of the respondents in this sample of the elderly intended to use their bequests to attract greater care for themselves, speaks volumes for the difficulty in enforcing this implicit contract even in Thailand, a society where social norms are very well developed. This high figure might of course indicate an impending breakdown of these norms with the onset of modernization.

The theory regarding strategic bequests would predict that those who have more children, or are poorer, would tend to use bequests strategically more often than others. A multivariate analysis was carried out (Table 5.8) to test this argument, despite a scarcity of suitable data to create all the necessary variables. We note that the signs of most variables are in the expected direction even though only AGE and SURCHILD are significant. In general, this analysis of strategic behavior is in keeping with an institutional analysis of the OAS hypothesis of fertility, which predicts the greater use of strategic behavior if parents have reasons to be suspicious of a likely breakdown in filial loyalty.

Table 5.7 **Analysis of actual Strategic Behavior by older persons (both older men and women)**

OQ25:	"Have you already given some or all of your property or estate to your children or grandchildren?" (574/643 replied to this)

			Cumulative	
OQ25	Frequency	Percent	Frequency	Percent
1	31	5.4	31	5.4 (given away inheritance)
2	46	8.0	77	13.4 (given most of it)
3	86	15.0	163	28.4 (given some of it)
4	409	71.3	572	99.7 (not yet)
9	2	0.3	574	100.0

Frequency Missing = 69

OQ25.1: **"(If given some of the inheritance away) Do you plan to pass on your remaining inheritance before your death, in a will or do nothing in particular about it?" (132/543 replied to this)**

OQ25_1	Frequency	Percent	Cumulative Frequency	Percent
0	22	16.7	22	16.7 (do nothing)
1	27	20.5	49	37.1 (write a will)
2	81	61.4	130	98.5 (pass on before death)
3	2	1.5	132	100.0

Frequency Missing = 511

OQ25.2: **"(if given some of the inheritance away): To whom will you give your remaining inheritance?" (132 replied)**

OQ25_2	Frequency	Percent	Cumulative Frequency	Percent
1	50	37.9	50	37.9 (children equally)
2	49	37.1	99	75.0 (daughter or son who takes care mostly)
3	5	3.8	104	78.8 (daughters equally)
4	2	1.5	106	80.3 (sons equally)
5	23	17.4	129	97.7 (last child)
6	1	0.8	130	98.5 (first child)
7	1	0.8	131	99.2 (other)
9	1	0.8	132	100.0

Frequency Missing = 511

OQ25_6: "(If not given away at all), To whom will you give your inheritance?"

OQ25_6	Frequency	Percent	Cumulative Frequency	Percent
1	238	58.2	238	58.2 (children equally)
2	85	20.8	323	79.0 (daughter or son who takes care mostly)
3	22	5.4	345	84.4 (daughters equally)
4	8	2.0	353	86.3 (sons equally)
5	24	5.9	377	92.2 (last child)
6	7	1.7	384	93.9 (first child)
7	13	3.2	397	97.1 (other)
9	12	2.9	409	100.0

Frequency Missing = 234

Table 5.8   **Multivariate analysis of penchant of elderly to use bequests strategically**

Probit: N: 574

Level   Count
  0   440
  1   134
Missing Values= 69

Variable	Label	Estimate		Pr>Chi
INTERCPT	Intercept	-3.2761	***	0.0009
HELECT	have electricity	-0.2399		0.1935
FLANDOWN	Land owned by family	-0.0023		0.2936
AGE	Age of respondent	0.0367	***	0.0081
SEX	1 if male 0 if female	-0.1823		0.1590
SURCHILD	# of Surviving Children	0.0524	**	0.0380
SAVINGS	Have savings?	0.0551		0.7285
WIDOW	Whether respondent is a widow/ widower	-0.1911		0.2088
RPENSION	Respondent receives pension	0.2888		0.5799
NOCARIL	did not receive care when ill	-0.0607		0.8747
SAVPSUP	Savings, pension, insurance a	0.0189		0.9440
CHLDCARE	Actual care being received from children	0.2048		0.2745

Significance: * = 10%, ** = 5%, *** = 1%

5.5 Does having children enhance marital solidarity?

We see that various factors have different effects on desired fertility. Some factors enhance the desires, while other factors dampen this desire. There has been speculation on factors that might enhance this desire, in order to try to explain the observed lower limit on fertility of around two. According to the OAST, it is the 'safety first' argument that drives children above the corner solution. However, Friedman *et al* (1994) hypothesize that children are demanded to enhance *marital solidarity*, which presumably, is desired as a commodity in the Beckerian sense. A tentative attempt is made here to test this hypothesis using the assumption that communication between a couple is a reasonable indicator of marital solidarity . Therefore, the variables ETALKED and ETALKEDH have been added together to create a variable called SOLID1 ('solidarity')

which is then regressed as an ordered Probit on age, age difference, household wealth, children ever born, deceased children, and educational characteristics of the couple (Table 5.9). We find that higher educational levels enhance solidarity, while a higher age difference between the couple lowers solidarity. More important to the marital solidarity hypothesis, the higher the number of children that is born, the *lower* the solidarity. Indeed, the same test was conducted by an additional term CEB*CEB which confirmed that the negative effect on solidarity is increased as the number of children increases. Also, an alternative measure of solidarity was constructed by manipulating the difference in desired fertility of husbands and wives. A similar result was obtained. This is very surprising, at first glance, and suggests that Friedman *et al* might not be on the right track at all. Instead, it is likely that the OAST might be operating very significantly even in developed countries, in terms of driving the demand for children (through the need for insurance of uninsurable assets and through physical and emotional care when old). It would be eminently worthwhile to carry out similar research in developed nations to rule out the role of children in enhancing marital solidarity.

Despite the serious shortcoming of this measure of marital solidarity, preliminary investigations were carried out to test whether having a life-insurance policy at home enhanced marital solidarity. The variable used was LIFEINS, which measured whether the household possessed a life insurance policy. It turns out that 25.8% of the 1776 women's households had a life-insurance policy. It was found that life-insurance *did not* enhance solidarity, as measured by this variable, SOLID1. The results are not presented here. This leaves much unexplained regarding motives for purchase of life-insurance.

Clearly, the topic is very important in the generalized theory of the human life-cycle, and the present data set not quite suited to the pursuit of this investigation.

Table 5.9 **Multivariate analysis of marital solidarity in a household**

Ordered Probit N: 1321

Level	Count
0	228
1	316
2	777

Variable	Label	Estimate	Pr>Chi
INTERCPT	Intercept	1.1277	0.0051
AGE	Age of wife	-0.0149	0.1234
AGEDIFF	Age difference between husband and wife	-0.0159 **	0.0429
HELECT	HH has electricity: index	0.0715	0.1823
CEB	Children ever born	-0.1431 ***	0.0001
DC	# of deceased children	0.0838	0.3520
WPRIM	Wife: educn = between 0-6 yrs	0.1682	0.2788
WSECH	Wife has secondary or higher edn	0.2627	0.1944
HPRIM	Husband: 1 if prim. sch.	0.5024 **	0.0298
HSECH	Husband: 1 if sec or higher	0.5697 **	0.0241

5.6 Conclusion

This chapter was of an exploratory nature, touching upon many interesting topics of interest that a rich and diverse data set of this nature can throw light upon. In many cases, however, the data set could not provide entirely satisfactory measures of the theoretical variables, and the results were interesting but not convincing. At other times, there was insufficient time to complete the investigations. Either way, there is much scope to continue these investigations at least somewhat further, as well as examine other newer areas, since the data set has not yet been fully exploited and many nuances remain.

CHAPTER 6

POLICY IMPLICATIONS AND CONCLUSIONS

6.1 Review of the study

There has been considerable criticism about the standard models of fertility ignoring the strong effects of uncertainty and institutional factors such as information asymmetries and the moral hazard arising from this asymmetry. Many attempts have been made to overcome this noticeable weakness in theory and some progress has been independently by many authors by the introduction of 'real-life' complexities like social norms, strategic bequests, access to markets, etc. In this study we made an attempt to integrate, in Chapter 1 and 2, the existing theory of the life-cycle with some of these more difficult and intangible aspects of the social reality. The mathematical model of Chapter 3 was indicative of the range of possibilities that arise in the simple determination of fertility, and though some ground was covered, much remains to be done in order to incorporate the institutional issues mentioned therein.

The study then moved on to empirical tests of the role of institutional variables, and it has was interesting to find that many of the effects hypothesized in the literature do have some plausibility. This is consistent with life-cycle optimization with bequests by primarily 'selfish' individuals, as the simple model presented in Chapter 3 illustrates, and does not require altruism to explain most of the observed relationships.

Does this mean that we are now in a better position to predict the levels and direction of future fertility changes? The answer would be a qualified yes and no. We now can say with more certainty that macro-economic and institutional variables have strong

effects on fertility. If the developing world sees strong economic growth including the provision of alternative markets for savings, and reduces infant mortality, rapid declines in fertility would be possible in most societies. If it is a goal of the policy maker to reduce fertility in a society, the bulk of the focus should be on the *demand side* of the fertility equation. Once the demand for reduced the number of children builds up, it does not appear that the supply of contraception would form a major hindrance or barrier to the fulfillment of this reduced demand, since there were and continue to be many non-modern methods of contraception in most societies. Indeed, to be more precise, without the build-up of an appropriate demand, the mere act of supplying modern contraceptive devices would prove entirely meaningless (as indeed has been found in the case of Pakistan, for example, where family planning workers have been known to dump condoms supplied from the 'headquarters' into the rivers[110]).

At the same time, we have much more to learn. We are only barely beginning to understand the magnitude and direction of the impact of these institutions. Therefore, the goal of achieving accurate prediction of the magnitude of changes in fertility in the world, while definitely nearer to us in terms of being fulfilled than it was a few decades ago, remains distant even now. Changes in national fertility still continue to take most astute observers and demographers by surprise despite the many millions of dollars of research that has gone into this area since the past four or five decades. This calls for greater multi-disciplinary cooperation in the study of this area through the involvement of economists, demographers, sociologists, anthropologists and even psychologists.

---

[110] This has been documented by Afaque Ahmed, who worked in the Pakistan government, and who was a Fellow of the Population Reference Bureau, 1997-98.

6.2 Limitations and recommendations

It is clear by now that not only are there many theoretical issues that need further study, but there are many limitations to the empirical part of this study because of the nature of the data set and the difficulty in creating some needed variables, apart from some definitional and measurement issues. If we are to learn more about the 'mystery' of the formation of fertility desires, as a first step, a *panel* data set needs to be created, spread over at least 15 years with measurements taken every 5 years, commencing from the time of marriage of the couples. It is true that we had observations on the young and old populations, but since the crux of the study of formation of fertility desires is the study of the formation of expectations, these have to be traced out carefully, over time, to ensure that we are capturing exactly how these desires are formed, changed and impacted by institutional and other factors. In an essentially cross-sectional study of this nature, the exact range and impact of security concerns does not come out in an ideal fashion. Given that there will be attrition in the panel, and in order to minimize possible loss of statistical significance, the number of observations must be increased substantially from that of the current study.

The measurement of desired fertility remains very problematic and the questionnaire must be redesigned to eliminate as many potential problems as possible. One of the most important findings of this study was that husbands need to be studied with equal care as the wives, since they play such an important role in the determination of completed fertility. Hence *all* husbands should be surveyed in complete detail, and if husbands are missing, a clear effort should be made to determine why they are missing and how the environment of the woman changes in that process. It is important also to trace the actual marriage patterns of the household, to isolate the decisions taken in the first, second, and

140

additional marriages, if any, of either member of the couple. It would be important also to elucidate information on the level of communication and solidarity within a household, and its relative power structure.

Expectational variables are very difficult to rely upon as being formed exogeneously. A careful redesign of the survey would help minimize possible measurement errors. Another difficult set of variable which needs more care in its measurement is household income and the income of the various members of the household. So also the issue of labor force participation needs very careful analysis, since so many of the components of this seem to vary at very short duration.

At the community level, the effects of alternative assets markets, including insurance markets and the nature of the insurance contracts available, need more careful measurement. A separate measurement and analysis of social norms would be very useful, in order to arrive at an understanding of the actual components of the norms set. For example, it would be important to know the quantitative nature of the 'norm' of exchange of bequests and parental services in the society.

Despite these and many possible limitations this study is perhaps one of the very few that has examined the formation of demand for children at the micro-level and has also thrown light on the possible relationships of fertility with labor force participation, savings, marital solidarity, and bequests.

6.3 Policy implications

If the results of the study are anything to go by, there are some significant implications that invite the attention of policy makers, particularly those who are searching for ways to reduce the growth of population in their countries. While it is

always difficult to generalize across countries from studies in a single country, some regularities seem to emerge which might possibly hold across many nations.

It appears that the key 'side' of the demand-supply equation for children is the demand side.[111] To the extent possible, the policy maker interested in reducing fertility has thus to try to decrease the demand for children first. This demand is crucially dependent on three things: the growth of the economy and the consequent increase in the likelihood of a higher level of future economic returns and insurance from children, the likelihood of survival of children into the future, and the reliability of social norms which underly the upholding of the implicit intergenerational contract. The first two are relatively easily impacted by the policy maker, while the third one is more problematic.[112] It would obviously be a good idea to focus on policies that increase the likelihood of a child's survival and future income. At the same time, it might be a good idea to slow down the onset of governmental social security programs in rural areas which might give a false sense of security about the possibility of government stepping in to support the elderly in their old age.[113] Such programs can only speed up the breakdown of the extant, efficient, social norms for care of the elderly, and it is very difficult to find any example of economically efficient social security programs across the world. Most programs are ill-managed and are a drain on their economy.

---

[111] The Planned Parenthood Association of Zambia reported that "Ninety percent of Zambians have acquired family planning knowledge, while only 26 percent are practicing family planning methods" (as reported in *Popline*, vol. 20, Nov-Dec 1998). This further confirms that unless the demand factors for reduced fertility come into play, it is virtually impossible to achieve significant declines in fertility merely by expanding the supply side.

[112] The five recommendations for this purpose in World Bank (1994:67), with which one would generally agree, are (1) avoid biases against traditional agriculture, (2) improve communication between rural and urban areas, (3) consider special programs for widows, (4) try to have formal systems complement informal ones, and (5) go slow on formal systems.

[113] The fact that public pensions could "crowd-out" private care by children has some empirical support from Cox and Jiminez (1992). They find in Peru "that private transfers from the young to old would have been nearly 20 percent higher without social security benefits."

As social norms break down,[114] we have observed that there is likely to be an inverted U-shaped effect on fertility. At the very beginning, when norms are strong, favorable conditions will induce people to have fewer children and to focus on quality. Sometime later, as the norms start breaking down, people will want more children hoping that they can use strategic methods to enforce return. But as the breakdown of norms declines even more, and the reliability of children becomes lower than that of alternative insurers, one would find that OAS motives lead to a notable decline in the demand for children since they are no longer good serve any major economic purpose. Thailand seems to be distant from the second stage of increasing fertility, but if social norms were to completely break down, then fertility might show a blip in the positive direction before declining again.

Once a declining demand for children has set into place, it must be supported by a provision of access to family planning services. For societies that have very poor family planning services, it might be a good idea to give the supply of contraception a boost in order to fulfil the felt need of contraception. Thailand has had a very successful family planning program (see, for example, World Bank, 1993:18). It is a good idea to keep it going.

One of the findings of this study is that it is perhaps ill-advised to focus resources on adult education unless one is looking for possible short-term effects on economic growth.

---

[114]   Changes in expectations from children are definitely taking place in developing countries. For example, Hermalin (1995:13) states, "In Taiwan fertility surveys regularly include a question on whether respondents expected to be supported by their sons in old age. The sharp declines in positive responses to this question that occurred between 1973 and 1986 (from 51 to 19 percent) underscore the ongoing transformation in expectations" (data from Chang and Ofstedal, 1991).   At the same time, there is possibly a substitution at work in terms of greater financial support of parents who do not co-reside with children. The Program on Population (1998) states, "Data from Taiwan suggest that increasing financial support may be partially substituting for declining co-residence. The proportion of

Parent's education does not appear to have much bearing on the demand for children. People are generally good at rational decision making irrespective of the level of formal education they have had. This vindicates the statements cited from Knodel (1984) in the Box at the beginning of this paper.

A key policy implication of this study is that it is very important to increase access of rural people to savings institutions. To the extent that this is possible, in a socially efficient manner, it is very likely that fertility will decline. On labor force participation also, it was seen that more women will begin to work in non-farm activities as their education and opportunity increases. That would have further positive effects on economic development in general, as well as cause a 'virtuous' spiral upwards into better living conditions and reduced fertility.

6.4 Conclusion

Sadik (1991: 110) pointed out that "As yet ... there is little understanding of how social, economic, political and cultural structures and institutions interact to produce the motivation for reducing fertility." The current study has shed considerable light on some of these effects, but many questions remain unanswered, partly because some were not raised earlier. The OAST is much better supported by data than alternative and often simplistic, world views. These findings are seen to be generally robust to alternative measures and specifications. We can therefore say with some confidence that there is indeed substitution between children, capital assets and insurance under the incomplete markets conditions of rural Thailand.

---

married women age 20-39 reporting that they regularly give money to their husband's parents went up from 32 percent in 1973 to 42 percent in 1986." Similar effects might be taking place in Thailand.

It is clear from the tremendous significance of the OAS effects that their neglect by theorists has cost economic demography much in terms of the richness of analysis and predictive power. But before the OAS theory of Leibenstein and others takes its rightful place as the major theory of fertility, these findings need to be replicated in other societies, using even more sophisticated and comprehensive surveys. One possible fruitful direction of further research would be to create a panel of a similar nature to this data set over time. The time has come to take an institutional and comprehensive approach to fertility. Issues such as bounded rationality, the role of information, the role of expectations and strategies, and the role of power distribution in decision-making are intangible issues not readily susceptible to formal modeling. These need to be understood in a better way in order to increase the probability of predicting the path of fertility in a given society. Demographers (particularly economic demographers) will now have to look at macroeconomic policies and social institutions in a much more holistic way.

In the meanwhile, the key message of this study appears to be that governments in traditional societies should focus on economic growth and education of children (apart from reducing infant mortality and increasing access to family planning). There is a strong synergy in the pursuit of wealth and education on the one hand and the successful 'management' of population growth on the other.

BIBLIOGRAPHY

Abel, A. (1985). "Precautionary Savings and Accidental Bequests," in *American Economic Review* 75, pp.777-791.

Abernethy, V. (1993). *Population Politics: The Choices that Shape Our Future*. Plenum Press.

Amemiya, Takeshi (1985). *Advanced Econometrics*. Harvard University Press.

Ando, Albert, and Franco, Modigliani (1963). "The 'Life-Cycle' Hypothesis of Savings: Aggregate Implications and Tests," in *American Economic Review*, 53 (March), pp. 55-84.

Appelbaum, Elie, and Eliakim Katz (1991). "The Demand for Children in the Absence of Capital and Risk Markets: A Portfolio Approach," in *Oxford Economic Papers*, 43, pp.292-304.

Appleman, Philip (1976) (ed.). *An Essay on the Principle of Population by Thomas Robert Malthus: Text, Background, Contemporary Opinion and Critical Essays*. New York: W.W. Norton & Co.

Arcand, Jean-Louis, Ghazi Boulila, and Christian Tritten (1995). "Intergenerational Contracts, Remittances, and Growth," a University of Montreal working paper CAHIER 3895.

Barro, Robert J., and Gary S. Becker (1989). "Fertility Choice in a model of Economic Growth," in *Econometrica*, 57(2).

Bauer, John, Nipon Poapongsakorn, and Naohiro Ogawa (1993). "Labor Force and Wage Forecasts," in Campbell, Burnham O., Andrew Mason and Ernesto M. Pernia (1993). *The Economic Impact of Demgraphic Change in Thailand, 1980-2015*. East West Center, University of Hawaii.

Becker, Gary S. (1960). "An Economic Analysis of Fertility," in *Demographic and Economic Change in Developed Countries*. Princeton, N.J.: National Bureau of Economic Research, 1960.

Becker, Gary S. (1976). "Altruism, Egoism and Fitness: Economics and Sociobiology," *Journal of Economic Literature*, 14 (Sept.)

Becker, Gary S. and Robert J. Barro (1988). "A reformulation of the economic theory of fertility," in *Quarterly Journal of Economics*, 103, pp. 1-25.

Becker, Gary, S. (1974). "A Theory of Social Interactions," in *Journal of Political Economy* 82 (November-December), pp.1063-1094.

Becker, Gary, S. (1981). *A Treatise on the Family*. Cambridge, Mass.: Harvard Univ. Press.

Bergstrom, T. (1996). "A Survey of Theories of the Family," in M.R. Rosensweig and O.Stark (eds.). Handbook of Population and Family Economics. Amsterdam: North Holland.

Bernheim, B. Douglas, Andrei Shleifer and Lawrence H. Summers (1985). "The Strategic Bequest Motive," in *Journal of Political Economy*, 93 (6), pp.1045-1076.

Bernheim, D. (1984). "Dissavings after Retirement: Testing the Pure Lifecycle Hypothesis," Mimeographed. Stanford. Calif.: Stanford Univ.

Bernheim, D. (1991). "How Strong Are Bequest Motives? Evidence Based on Estimates of the Demand for Life Insurance and Annuities," in *Journal of Political Economy*, 99 pp. 899-956.

Bourgeois-Pichat, Jean (1967). "Social and Biological Determinants of Human Fertility in Nonindustrial societies," in *Proceedings of the American Philosophical Society* 3 (3) (June), pp.160-163.

Brittain, John A. (1978). *Inheritance and the Inequality of Material Wealth*. Washington: Brookings Institution.

Bulatao, R.A., and R. D. Lee (1983). "An Overview of Fertility Determinants in Developing Countries," in Bulatao, R.A., and R. D. Lee (eds.) (1983). *Determinants of Fertility in Developing Countries: A Summary of Knowledge*. 2 volumes. New York: Academic Press.

Busfield, Joan and Michael Paddon (1977). *Thinking about Children: Sociology and fertility in Post-War England*. Cambridge, London: Cambridge University Press.

Cain, Mead (1977). "The Economic Activities of Children in a Village in Bangladesh," in *Population and Development Review*, 3, pp. 220-227.

Cain, Mead (1980). "Risk, Fertility and Family Planning in a Bangladesh Village," in *Studies in Family Planning,* II, pp. 219-223.

Caldwell, J.C. (1982). *Theory of Fertility Decline*. London: Academic Press.

Chakrabarti, Subir, William Lord and Peter Rangazas (1993). "Uncertain Altruism and Investment in Children," in *American Economic Review*, 83(4), pp. 994-1002.

Chang, Ming-Cheng, and Mary Beth Ofstedal (1991). *Changing Attitudes toward Old-Age Support in Taiwan: 1973-1985*. Comparative Study of the Elderly in Asia Research Report 91-8, Ann Arbor: Population Studies Center, University of Michigan.

Chu, C.V. Cyrus (1998). *Population Dynamics: A New Economic Approach*. New York: Oxford University Press.

CICRED (1974) [Committee for International Coordination of National Research in Demography]. *The Population of Thailand*. National Economic and Social Board, The National Statistical Office, and the Institute of Population Studies, Chulalongkorn University.

Cigno, Alessandro (1995). "Saving, fertility and social security in the presence of self-enforcing intra-family deals," a paper presented at the Seminar on Intergenerational Economic Relations and Demographic Change, Honolulu, Hawaii, 12-14 September, 1995. IUSSP Committee on Economic Demography and East-West Center Program on Population.

Cigno, Alessandro. (1991). *Economics of the Family*. Oxford: Clarendon Press.

Cigno, Alessandro. (1992). "Children and Pensions," in *Journal of Population Economics*, vol. 5, issue 3, (Aug): pp. 175-183.

Clay, Daniel C. and Jane E. Vander Haar (1993). "Patterns of Intergenerational Support and Childbearing in the Third World," in *Population Studies*, 47(1), pp. 67-83.

Coale, Ansley J., and T. James Trussell (1974). "Modern Fertility Schedules: Variations in the Age Structure of Childbearing in Human Populations," in *Population Index* 40 (2) (April), pp. 185-258.

Cox, D. and E. Jiminez (1992). "Social Security and Private Transfers in Developing Countries - The Case of Peru," in *World Bank Economic Review*, 6(1), pp. 155-169.

Cox, D. and E. Jiminez (1995). "Coping with Apartheid: Inter-Household Transfers and the Elderly in South Africa," Boston College, The World Bank. Research in progress.

Cox, Donald (1987). "Motives for Private Income Transfers," in *Journal of Political Economy*, 95 (June), pp. 1045-1076.

Cox, Donald and Oded Stark (1992). "Intergenerational Transfers and the demonstration effect," a Technical Report, Harvard University, Department of Economics.

Cramer, C. James (1980). "Fertility and Female Employment: Problems of Causal Direction," in *American Sociological Review*, 45, pp. 167-190.

Dardanoni, Valentino (1988). "Optimal Choices under Uncertainty: The Case of Two-Argument Utility Functions," in *The Economic Journal*, 98 (391), pp. 429-450.

Dasgupta, Partha (1993). *An Inquiry into Well-Being and Destitution*. Oxford: Clarendon Press.

Davies, James B. (1981). "Uncertain Lifetime, Consumption, and Dissavings in Retirement," in *Journal of Political Economy*, 89 (June), pp.561-577.

Davies, James B. (1996). "Explaining Intergenerational Transfers," in Menchik, Paul L. (editor) (1996). *Household and Family Economics*. Boston: Kluwer Academic Publishers.

Dawkins, R. (1976). *The Selfish Gene*. New York: Oxford University Press.

De Jong, G.F., and R.R. Sell (1977). "Changes in childlessness in the United States: A Demographic Path Analysis," in *Population Studies*, 30 (1), pp.129-141.

Diamond, Peter, and Michael Rothschild (1989). *Uncertainty in Economics: Readings and Exercises*. San Diego: Academic Press.

Doherty, Neil A., and Harris Schlesinger (1983). "Optimal Insurance in Incomplete Markets," in *Journal of Political Economy*, 91(6), pp. 1045-1054.

Dutta, Samar K., and Jeffrety B. Nugent (1984). "Are Old-Age Security and the Utility of Children in Rural India Really Important?" in *Population Studies*, 38, pp. 507-509.

Easterlin, Richard A. (1978). "The Economics and Sociology of Fertility: A Synthesis," in Charles Tilly (ed.). *Historical Studies of Changing Fertility*. Princeton: Princeton University Press.

Easterlin, Richard A. (1996). *Growth Triumphant: The Twenty-first Century in Historical Perspective*. Ann Arbor: University of Michigan Press, 1996.

Easterlin, Richard A., Robert A. Pollak, and Micheal L. Wachter (1980). "Toward a More General Model of Fertility Determination: Endogenous Preferences and Natural Fertility," in Easterlin, R.A. (ed.). *Population and Economic Change in Developing Countries*. Chicago: Chicago University Press.

Ehrenberg, Ronald G. and Robert S. Smith (1988). *Modern Labor Economics*. Boston: Scott, Foresman and Company.

Entwisle, Barbara and C.R. Winegarden (1984). "Fertility and Pension Programs in LDCs: A Model of Mutual Reinforcement," in *Economic Development and Cultural Change*, 32 (Jan.), pp.331-354.

Flew, Antony (1957). "The Structure of Malthus' Population Theory," in *Australasian Journal of Philosophy*, 35, pp. 1-20.

Foster, Andrew D. and Mark R. Rosenzweig (October, 1995) (draft). "Imperfect Commitment, Altruism and the Family: Evidence from Transfer Behavior in Low-Income Rural areas."

Friedman, Debra, Michael Hechter, and Satoshi Kanazawa (1994). "A theory of the value of children" in *Demography*, 31(3) (Aug), pp. 375-401

Gale, W.G. and J.K. Scholz (1994). "Intergenerational Transfers and Accumulation of Wealth," in *Journal of Economic Perspectives* 8 (4), pp. 145-160.

Greven, Philip J. Jr. (1970). *Four Generations: Population, Land and Family in Colonial Andover, Massachuetts*. Ithaca.

Guttman, Joel M. (1996). "On the Stability of Cooperative Social Norms among Rational Agents," Unpublished.

Haldane, J.B.S. (1955). "Population Genetics," in *New Biology*, 18, pp. 34-51

Hamilton, W.D. (1964). "The Genetical Theory of Social Behavior (I and II)," in *Journal of Theoretical Biology*, 7, pp. 1-16, 17-32.

Hermalin, Albert I. (1995). "Aging in Asia: Setting the research foundation," Asia-Pacific Population Research Report, No. 4. East-West Center, Program on Population.

Hermalin, Albert I. (1995). *Aging in Asia: Setting the Research Foundation.* Asia-Pacific Population Research Report, No. 4, East-West Center: Program on Population.

Hirshleifer, J. (1978) "Natural Economy Versus Political Economy," in *Journal of Social and Biological Structures*, 1, pp. 319-337.

Hurd, Michael D. (1987). "Savings of the elderly and Desired Bequests," in *American Economic Review*, 77 (3), pp. 298-312.

Hurd, Michael D. (1989). "Mortality Risk and Bequests," in *Econometrica*, 57(4), pp. 779-813.

Kahneman, D. and A. Tversky (1979). "Prospect theory: An analysis of decision under risk," in *Econometrica* XLVII, pp. 263-91.

Kaplan, Hillard (1994). "Evolutionary and wealth-flows theories of fertility," in *Population and Development Review*, 20 (4) (December), pp. 753-791.

Knodel, John (1993). *Population Aging and Fertility: Some Implications for Thailand.* Elderly in Asia Research Report No. 93-25. Population Studies Center, University of Michigan

Knodel, John and Napaporn Chayovan (1991). "Age and Birth Date Reporting in Thailand," in *Asian and Pacific Population Forum*, Vol. 5, No. 2-3, Summer-Fall, 1991, East West Population Institute.

Knodel, John, Napaporn Havanon and Anthony Pramualratna (1984). Fertility Transition in Thailand: A Qualitative Analysis," in *Population and Development Review*, 10 (2), pp. 297-328

Koenig, Michael A., Ubaidur Rob, Mehrab Ali Khan, J. Chakraborty, and Vincent Fauveau (1992). "Contraceptive User in Matlab, Bangladesh in 1990: Levels, Trends and Explanations," in *Studies in Family Planning*, 6, pp. 352-364.

Komalig, Aske Theo (1991). *Fertility Behavior in Indonesia: A Study of the Relationship between Women's Work Status and Fertility in 1976 and 1987*. PhD Dissertation, University of Southern California.

Kotlikoff, Laurence J. and Spivak, Avia (1981). "The Family as an Incomplete Annuities Market," in *Journal of Political Economy*, 89 (April), pp. 372-391.

Kotlikoff, Laurence J. and Summers, L.H. (1981). "The Role of Intergenerational Transfers in Aggregate Capital Accumulation," in *Journal of Political Economy*, 89 (4), pp. 706-732.

Kreps, David M. (1990). *A Course in Microeconomic Theory*. New Delhi: Prentice-hall.

Lee, Ronald (1995). "A Cross-Cultural Perspective on Intergenerational Transfers and the Economic Life Cycle." Presented at the *Seminar on Intergenerational Economic Relations and Demographic Change*, Honolulu, Hawaii. East-West Center.

Lee, Ronald (1998). "Foreword," in Chu, C.Y. Cyrus (1998). *Population Dynamics, A New Economic Approach*. New York, Oxford University Press.

Lee, Ronald D. and Timothy Miller (1994). "Population age structure, intergenerational transfers, and Wealth: A New Approach," in *Journal of Human Resources*, 29 (4) (Fall), special issue edited by Paul Gertler on The Family and Intergenerational Relations, pp.1027-1063.

Leibenstein, Harvey (1957). *Economic Backwardness and Economic Growth*. New York: John Wiley & Sons.

Leibenstein, Harvey (1978). *General X-Efficiency Theory and Economic Development*. London: Oxford University Press.

Leibenstein, Harvey (1980). "Comment," on R. A. Easterlin *et al.*, "Toward a More General Model of Fertility Determination," in Easterlin, R.A. (ed.). *Population and Economic Change in Developing Countries*. Chicago: Chicago University Press.

Lewis, Frank D. (1983). "Fertility and Savings in the United States: 1830-1900," in *The Journal of Political Economy*, 91(5), pp.825-840.

Lin, Justin Yifu and J.B. Nugent (1995). "Institutions and Economic Development," in Behrman, J. T. N. Srinivasan. *Handbook of Development Economics*. Volume III. North-Holland: Amsterdam.

Lindert, Peter (1980). "Child Costs and Economic Development," in Easterlin, R.A. (1980) (ed.). *Population and Economic Change in Developing Countries*. Chicago: The University of Chicago Press.

Lucas, Robert E.B. and Oded Stark (1985). "Motivations to Remit: Evidence from Botswana," in *Journal of Political Economy* 93 (October), pp. 901-918.

Macunovich, Diane J. (1996). "A Review of Recent Developments in the Economics of Fertility," in Menchik, Paul L.(ed.) (1996). *Household and Family Economics*. Boston: Kulwer Academic Publishers.

Maslow, Abraham (1954). *Motivation and Personality*. New York: Harper & Row.

Mason, Andrew and Burnham O. Campbell (1993). "Demographic Change in the Thai Economy: An Overview," in Campbell, Burnham O., Andrew Mason and Ernesto M. Pernia (1993). *The Economic Impact of Demgraphic Change in Thailand, 1980-2015*. East West Center, University of Hawaii.

Menchik, Paul L., and Martin David (1983). "Income Distribution, Lifetime Savings, and Bequests," in *The American Economic Review*, 73 (4), pp. 672-690.

Mirer, Thad W. (1979). "The Wealth Age Relation Among the Aged," in *American Econmic Review*, 69 (June), pp. 435-443.

Modigliani, F. (1986). "Life Cycle, Individual Thrift, and the Wealth of Nations," in *American Economic Review*, 76, pp.297-313.

Modigliani, F. (1988). "The Role of Intergenerational Transfers and Life Cycle Saving in the Accumulation of Wealth," in *Journal of Economic Perspectives*, 2 (2), pp.15-40.

Modigliani, Franco and Richard Brumberg (1954). "Utility Analysis and the Consumption Function: an Interpretation of Cross-Section Data," in Kenneth Kurihara (1954) (ed.). *Post-Kenyesian Economics*. New Brunswick, N.J.: Rutgers University Press.

Mueller, Eva (1976). "The economic value of children in peasant agriculture," in Ronald G. Ridker (ed.). *Population and Development*. Baltimore: John Hopkins Press.

Neher, P.A. (1971). "Peasants, Procreation and Pensions," in *American Economic Review* 61 (June), pp. 380-89.

Nerlove, M, A. Razin and E. Sadka (1987). *Household and Economy: Welfare Economics of Endogenous Fertility*. Orlando: Academic Press.

Niraula, B.B. (1995). "Old-Age Security and Inheritance in Nepal - Motives versus Means," in *Journal of Biosocial Science*, 27(1), pp. 71-78.

Nugent, Jeffrey B. (1985). "The Old-Age Security Motive for Fertility," *Population and Development Review*, 11 (March): 75-97.

Nugent, Jeffrey B. (1990). "Old-Security and the Defense of Social Norms," in *Journal of Cross-Cultural Gerontology*, 5 (3) 1990.

Nugent, Jeffrey B. and Richard Anker (1990). "Old Age Support and Fertility." Geneva: ILO World Employment Programme Research Working Paper 172.

Palloni, Alberto and Hantamala Rafalimanana (1999). "The Effects of Infant Mortality on Fertility Revisited: New Evidence from Latin America," in *Demography*, 36(1).

Phananiramai, Mathana and Andrew Mason (1993). "The Educational Sector: Enrollment Rates and Expenditures on Schooling" in Campbell, Burnham O., Andrew Mason and Ernesto M. Pernia (1993). *The Economic Impact of Demgraphic Change in Thailand, 1980-2015*. East West Center, University of Hawaii.

Phillips, D.R. (1992). East and Southeast Asia: Issues of Ageing in the Region," in Phillips, D.R. (ed.). *Ageing in East and South-east Asia*. London: Edwin Arnold.

Piel, Gerard (1995). "Worldwide development or population explosion: Our choice," in *Challenge*, v38n4 (Jul 1995): 13-22 1995

Pritchett, Lant H. (1994). "Desired Fertility and the Impact of Population Policies," in *Population and Development Review*, 20 (1) (March), pp. 1-55.

Program on Population (1998). *Asia"s Next Challenge: Caring for the Elderly*. Asia-Pacific Population and Policy Report, No. 45, East-West Center, Honolulu, Hawaii.

Psacharopoulos, George, and Zafiris Tzannatos (1993). "Economic and Demographic Effects on Working Women in Latin America," in *Journal of Population Economics*.

Raut, Lakshmi K. (1996). "Old-Age Security and Gender Preference Hypothesis: A Duration Analysis of Malaysian Family Life Survey Data," in *Journal of Quantitative Economics*, 12(1), pp.81-104.

Raut, Lakshmi K. (1996). "Subgame perfect manipulation of children by overlapping generations of agents with two-sided altruism and endogenous fertility," Working Paper. University of Hawaii-Manoa.

Rendall, Michael S. and Raisa A. Bahchieva, (1998). "An old-age security motive for fertility in developed countries?" in *Population and Development Review*, 24(2).

Robinson, Warren C. (1986). "High Fertility as Risk-Insurance," in *Population Studies*, 40(2), pp. 289-298.

Rosenzweig, Mark R. (1988). "Risk, Implicit Contracts, and the Family in Rural Areas of Low-Income Countries," in *The Economic Journal*, Dec., pp. 1148-1170.

Rothschild, M., and J.E. Stiglitz (1970). "Increasing Risk I: A Definition," in *Journal of Economic Theory*, 2, pp.225-243.

Rutstein, Shea O. (1995). *Do Family Planning Programs Decrease Fertility?* Draft Paper presented at the 1995 Annual Meeting of the Population Association of America San Francisco, April 6-8, 1995.

Sadik, Nafis (ed.) (1991). *Population Policies and Programs: Lessons Learned from Two Decades of Experience*. New York: New York University Press (published for United Nations Population Fund).

Sandmo, Agnar (1969). "Capital Risk, Consumption, and Portfolio Choice," in *Econometrica*, 37 (4), pp. 586-599.

Schnaiberg and David Reed (1974). "Risk, Uncertainty and Family Formation: The Social Context of Poverty Groups," in *Population Studies*, 28, pp. 513-533.

Schulz, James H. (1995). *The Economics of Aging*. Westport, Connecticut: Auburn House.

Schumpeter, J. A. (1942) 1975. *Capitalism, Socialism and Democracy*. New York: Harper.

Scrimshaw, Susan C.M. (1983). "Infanticide and Deliberate Fertility Regulation," in Bulatao, R.A., Ronald D. Lee (eds.) (1983). *Determinants of Fertility in Developing Countries; Vol. 2: Fertility Regulation and Institutional Influences*. New York: Academic Press, pp.245-66.

Silverstein, Merril (1995). "Stability and Change in Temporal Distance between the Elderly and Their Children," in *Demography*, 32 (1).

Simon, Julian (1980). "Comment," on Kelley, Allen C. (1980). "Interactions of Economic and Household Demographic Behavior," in Easterlin, Richard A., Robert A. Pollak, and Micheal L. Wachter (1980). "Toward a More General Model of Fertility Determination: Endogenous Preferences and Natural Fertility," in Easterlin, R.A. (ed.). *Population and Economic Change in Developing Countries*. Chicago: Chicago University Press.

Skinner, William G. and Yuan Jianhua (1999). "Shaping Offspring Sets in the Lower Yangzi Macroregion of China, 1966-1990: A Family Systems Analysis of 1990 Census Data," a paper presented at the Population Association of America conference in March, 1999.

Sloan, Frank A. and Edward C. Norton (1997). "Adverse Selection, Bequests, Crowding Out, and Private Demand for Insurance: Evidence from the Long-term Care Insurance Market," in *Journal of Risk and Uncertainty*, 15: pp.201-219.

Smith-Lovin, L., and A. R. Tickamyer (1978). "Non-recursive Model of Labor Force Participation, Fertility Behavior, and Sex-role Attitudes," in *American Sociological Review*, 43, pp. 541-56.

Stigler, George and Gary S. Becker (1977). "De Gustibus non est disputandum," in *American Economic Review*, 67, pp. 76-90.

Stolzenberg, Ross M., and Linda J. Waite (1984). "Local Labor Markets, Children and Labor Force Participation of Wives," in *Demography*, 21 (2), pp. 157-170.

Thomas, Jonathan P. and T. Worrall (1995). "Informal Insurance Arrangements in Village Economies," manuscript, University of Warwick.

Tobin, James (1967). "Life Cycle Saving and Balanced Growth," in Feller, William, *et al.* (1967). *Ten Economic Studies in the Tradition of Irving Fisher*. New York: Wiley.

Turchi, Boone A. (1975). *The Demand for Children: The Economics of Fertility in the United States*. Cambridge, Mass.: Ballinger Publishing Company.

Turke, Paul (1989). "Evolution and the demand for children," in Population and Development Review, 15 (1) (March), pp.61-90.

Tversky, A., and D. Kahneman (1986), "Rational choice and the framing of decisions," in *Journal of Business*, 59 part 2, s251-s278.

Tversky, A., and D. Kahneman (1992), "Advances in prospect theory: Cumulative Representation of Uncertainty," in *Journal of Risk and Uncertainty* 5, 297-323.

United Nations (1982). *World Population Trends and Policies: 1981 Monitoring Report, Vol. 1*. New York.

Ware, Helen (1977). *Women's employment and fertility*. Dept. of International Economic and Social Affairs, Population Studies No. 96. New York: United Nations.

Weinstein, Jay and Moses T. Ebot (1976). *Fertility Decline as a Response to Improvement in Access to Social Systems*. University of Iowa.

West, Mark D. (1997) "Legal Rules and Social Norms in Japan's Secret World of Sumo," in *Journal of Legal Studies*, 26 (Jan.).

Wilson. James Q. (1993). *The Moral Sense*. New York. The Free Press.

Wongboosin, Kua (1985). "Fertility patterns and their determinants in Thailand, 1969-79: Results from cross-sectional and longitudinal studies." Ph.D. dissertation, Univ. of Pennsylvania, Philadelphia.

World Bank (1993). *Effective Family Planning Programs*. Washington D.C.

World Bank (1994). *Averting the Old Age Crisis*. Oxford University Press.

Yaari, M.E. (1965). "Uncertain Lifetime, Life Insurance and the Theory of the Consumer," in *Review of Economic Studies*, 32, pp. 137-150.

Zhao, Zhongwei (1997). "Deliberate Birth Control in China Before 1970," in *Population and Development Review*, 23, pp.729-68.

Zweifel, Peter and Wolfram Struwe (1996). "Long-Term Care Insurance and Bequests as Instruments for Shaping Intergenerational Relationships," in *Journal of Risk and Uncertainty*, 12, pp. 65-76

Definitions of Some Variables used in the SAS Program

Here we specify the precise definitions of some of the variables used. In case of any questions please do not hesitate to contact the writer by sending mail to sabhlok@indiamail.com. The variables are listed in alphabetical order.

<u>EXPOCCCS: Expected occupation of children based on 'security of occupation'</u>

```
if co16a = 2 | co16a = 18 then co16as = 0;
     label co16as = 'Security of occ. of children = 1';
if co16a = 1 | co16a =3 | co16a = 4 | co16a = 8 | co16a = 17 then co16as = 1;
if co16a = 5 | co16a =  7 | co16a = 16 | co16a = 80 |  co16a = 97 then co16as = 2;
if co16a = 6 | co16a =  9 | co16a = 16 | co16a = 14 | co16a = 16 then co16as =  3;
if co16a = 10 | co16a = 12 | co16a = 13 | co16a = 15 | co16a = 95 then co16as = 4;
if co16a = 55 | co16a = 66 | co16a = 77 | co16a = 99 then co16as = .;  [and similarly for other children]

co16sec =  sum (co16as, co16bs, co16cs, co16ds, co16es, co16fs,
     co16gs, co16hs, co16is, co16js, co16ks, co16ls);
     label co16sec = 'Sum of exp. occ. securitybased';

o16secc =  sum (co16asc, co16bsc, co16csc, co16dsc, co16esc, co16fsc,
     co16gsc, co16hsc, co16isc, co16jsc, co16ksc, co16lsc);
     label co16incc = 'Count of children: occ. security';

co11_16s = sum (co11sec, co16sec);
     label co11_16s = '11+16 expected occ: security based';

co1116sd = sum(co11secc, co16secc);
     label co1116sd = '11+16 no. of children sec. based';

If co1116sd ne 0 then expocccs = co11_16s / co1116sd;
     label expocccs = 'Expected occ of chld based on security';
```

<u>HELECT: Whether house has electricity: index</u>

```
if elect = 0 then helect = 0;
if elect = 1 and yrelect <= 7.204 then helect = 1;
if elect = 1 and yrelect > 7.204 then helect = 2;
     label helect='HH has electricity: index';
```

<u>SURECHIN: Surety of return from child (loyalty)</u>

```
if (sonrank = 2 | daurank =2) and wq45 = 1 then surechin = 7;
if (sonrank = 3 | daurank =3) and wq45 = 1 then surechin = 9;
if (sonrank >= 2 | daurank >=2) and wq45 = 2 then surechin = 5;
if (sonrank >= 2 | daurank >=2) and wq45 = 3 then surechin = 3;
if (sonrank <2 and daurank<2) and (wq44a = 1 | wq44f = 1 | wq44g = 1 | wq44h = 1) t$
if (sonrank <2 and daurank<2) and (wq44c = 1 | wq44d = 1 | wq44e = 1) then surechin$
     label surechin = 'Index of surety of retun from child';
```

TWO STAGE TOBIT MODEL

Step 1 **The decision to sterilize**

Run a probit

$$Y_1 = \begin{cases} 1 & if\ Y_1^* > 0 \\ 0 & if\ Y_1^* \le 0 \end{cases}$$

where $Y_1^* = \alpha X + u_1$

from this we can create an inverse Mills ratio

$$\hat{\lambda} = \frac{\phi(-\hat{\alpha}X)}{1 - \Phi(\hat{\alpha}X)}$$

Step 2 **Decision to have children**

Now, consider the decision of the two different sub-sets of women to have children.

a) Sterilized women could have a different desire for children

$$Y_2 = \begin{cases} Y_2^* & if\ Y_1^* > 0 \\ 0 & if\ Y_1^* \le 0 \end{cases}$$

where $Y_2^* = \beta_1 Z + u_2$

To correct for self-selection, run as

$$Y_2^* = \beta_1 Z + c_1 \hat{\lambda}(X) + u_2$$

and test for $c_1 = 0$

b) Unsterilized women:

$$Y_3 = \begin{cases} Y_3^* & if\ Y_1^* > 0 \\ 0 & if\ Y_1^* \le 0 \end{cases}$$

where $Y_3^* = \beta_2 Z + u_3$

To correct for possible self-selection, run as

$$Y_3^* = \beta_2 Z + c_2 \hat{\lambda}(X) + u_3$$

and test for $c_2 = 0$, using the Likelihood ratio test

The relevant portion of the SAS program

Since the SAS program for this work is rather complicated, it is being presented

here. It is based on source code found on the internet.

```
/* (1) STAGE I: PROBIT */

/* with inverse mills ratio  */
title 'Heckman Two-Step Selection Correction Estimation';

/**********************************************************************
    The code requires very little modification.  Change the
    variable names in the macro declarations that appear after
    this introduction to reflect the names of the dependent
    and independent variables in the first (probit) and second
    (tobit) stages of the estimation.  If your selection criterion
    is different, modify the values of the macros %slct and %nonslct
    as well (it is unlikely that you'll want to do this), and possibly
    the sort before the probit.  Modify the first DATA step (where
    dataset a is created) to access your data.  The rest of the program
    should be left unchanged. */

/* slct:  value of the selection variable that indicates the   */
/*      "selected" sample.  Usually this is "1", as below,   */
/*      but you may want to modify it.                 */

%macro slct;
  1
%mend slct;


/* nonslct:  value of the selection variable that indicates the  */
/*      "unselected" sample.  Usually this is "0", as below  */
/*      but you may want to modify it.                 */

%macro nonslct;
  0
%mend nonslct;

/* prbtlhs:  dependent variable for first stage (probit) */
/*      replace "sel" below with your variable      */
%macro prbtlhs;
  steriled
%mend prbtlhs;

/* prbtrhs:  independent variables for first stage (probit) */
/*      replace "x1" below with your variable(s)      */
/*      you can use more than one line for them      */
%macro prbtrhs;
```

157

```
u02 wyearsm rentmkt svaccess helpfrom inherexp rc ownhouse etalked
ownwsupp

%mend prbtrhs;

/* tobitlhs:  dependent variable for second stage (tobit) */
/*        replace "dep" below with your variable      */

%macro tobitlhs;
   df11
%mend tobitlhs;

/* tobitrhs:  independent variables for second stage (tobit) */
/*        replace "x2" below with your variable(s)       */
/*        you can use more than one line for them        */
%macro tobitrhs;

livalone rc rentmkt svaccess helpfrom helect flandown  yrsslc dc
wprim wsech expocccs chldsimp inherexp savpsup cimimp mmimp surechin doeduc
dowhinh

%mend tobitrhs;

/* Modify this DATA step to access your data.              */
/* Do _not_ change the name of dataset a                   */
/* The KEEP option keeps only variables that will be used in */
/* the estimation procedure; it may be deleted if so desired */

data a(keep= steriled pstlable lower %prbtlhs %prbtrhs %tobitlhs
%tobitrhs); set
pinkw;


/**************************************************************/
/* You shouldn't need to modify anything below this point      */
/**************************************************************/

/* need to sort data to get coefficients with right signs */

proc sort data=a; by descending %prbtlhs;

/***** First Stage:  Probit *****/
/* note use of order=data to get coefficients with right signs */
/* will save predicted gammaw's to dataset imr for calculation of
  inverse mills ratio; note that all variables from dataset a
  will also be saved in dataset imr */
proc probit order=data ;
   class %prbtlhs;
   model %prbtlhs=%prbtrhs / covb;
   output out=imr xbeta=gammaw;
   title2 'First Stage:  Probit Estimates of Selection';
   run;


/* Next we create the Inverse Mills' Ratio, as well as some
  variables we'll need to calculate the Var-Cov Matrix of the
  Probit Estimates and the tobit Estimates */

data x(keep=intercep %prbtrhs) /* variables for both x and w should */
   w(keep=intercep %prbtrhs) /* be the same */
   xstar(keep=intercep %tobitrhs lambda)
   delta(keep=delta)
```

```
     h(keep=h)
     b1(keep= steriled pstlable lower %tobitlhs %tobitrhs lambda);

   /* the retain below just gets the variables in proper order */

   retain intercep %prbtrhs %tobitrhs %tobitlhs;
   set imr;

   /* create inverse mills ratio */

   if (%prbtlhs eq %slct) then
      lambda=(1/sqrt(2*3.141592654)*exp(-1*gammaw**2/2))/probnorm(gammaw);
   else if (%prbtlhs eq %nonslct) then
      lambda=(1/sqrt(2*3.141592654)*exp(-1*gammaw**2/2))/
               (probnorm(gammaw)-1);
   else lambda=.;

   /* create intercep for use in cross-product matrices */
   intercep=1;

   /* create h for estimating asy. var-cov matrix of probit
      coefficients */

   h=lambda**2+lambda*gammaw;

   /* create delta for estimating asy. var-cov matrix of tobit
      coefficients; this is a little redundant, but makes the
      notation easier to follow */

   delta=h;

   data b; set b1;
      if steriled = 1;

/***** Second Stage:  TOBIT *****/
/* Run only on those who are non-sterile */
/* Note that selection is done in the above DATA step  */
/* we could have also done it here with a WHERE clause */

proc lifereg data=b outest=tobitest;
   model (lower, %tobitlhs)= %tobitrhs lambda /d = normal;
   output out=err;
   title2 'Second Stage:  Tobit Estimates of Model: STERILE';
run;
```

Covariance Matrix of the major variables

	AGE	DC	HELECT	FLANDOWN	AGEDIFF	WPRIM	WSECH	EXPOCCCS
AGE	1.00	0.09	0.06	0.09	-0.03	0.12	-0.18	-0.12
DC	0.09	1.00	-0.03	0.01	0.03	0.05	-0.07	-0.06
HELECT	0.06	-0.03	1.00	-0.02	-0.01	0.02	0.10	0.16
FLANDOWN	0.09	0.01	-0.02	1.00	0.04	0.01	-0.01	-0.01
AGEDIFF	-0.03	0.03	-0.01	0.04	1.00	0.04	-0.05	-0.08
WPRIM	0.12	0.05	0.02	0.01	0.04	1.00	-0.78	-0.03
WSECH	-0.18	-0.07	0.10	-0.01	-0.05	-0.78	1.00	0.14
EXPOCCCS	-0.12	-0.06	0.16	-0.01	-0.08	-0.03	0.14	1 .00
YRSSLC	0.48	0.04	0.05	0.00	0.13	0.10	-0.13	-0.15
DOWHINH	0.09	0.04	-0.04	0.08	0.07	0.03	-0.04	-0.09
DOEDUC	0.00	-0.03	0.02	0.00	-0.01	0.04	-0.02	0.12
HELPFROM	-0.24	-0.03	0.03	-0.03	-0.09	-0.01	0.07	0.06
INHEREXP	-0.15	-0.04	0.12	-0.06	-0.03	0.03	0.02	0.08
MMIMP	0.08	0.07	0.04	-0.04	0.02	0.04	0.06	-0.06
CIMIMP	-0.06	-0.04	0.03	0.00	0.00	-0.03	0.04	0.10
CHLDSIMP	0.05	0.00	0.03	-0.03	0.01	0.04	-0.06	-0.02
SURECHIN	0.01	0.03	0.02	0.00	0.04	0.04	-0.06	-0.01
LIVALONE	-0.04	0.03	-0.12	-0.01	-0.05	-0.05	0.01	0.00
RENTMKT	-0.10	-0.01	0.05	-0.06	-0.05	-0.04	0.03	0.08
SVACCESS	0.05	-0.02	0.26	-0.14	-0.03	0.03	0.09	0.13
RC	-0.02	0.02	-0.27	0.08	-0.02	-0.08	-0.07	-0.10

	YRSSLC	DOWHINH	DOEDUC	HELPFROM	INHEREXP	MMIMP	CIMIMP
AGE	0.48	0.09	0.00	-0.24	-0.15	0.08	-0.06
DC	0.04	0.04	-0.03	-0.03	-0.04	0.07	-0.04
HELECT	0.05	-0.04	0.02	0.03	0.12	0.04	0.03
FLANDOWN	0.00	0.08	0.00	-0.03	-0.06	-0.04	0.00
AGEDIFF	0.13	0.07	-0.01	-0.09	-0.03	0.02	0.00
WPRIM	0.10	0.03	0.04	-0.01	0.03	0.04	-0.03
WSECH	-0.13	-0.04	-0.02	0.07	0.02	-0.06	0.04
EXPOCCCS	-0.15	-0.09	0.12	0.06	0.08	-0.06	0.10
YRSSLC	1.00	0.07	-0.01	-0.21	-0.11	0.02	-0.03
DOWHINH	0.07	1.00	-0.06	-0.04	-0.03	0.04	-0.04
DOEDUC	-0.01	-0.06	1.00	0.04	0.01	0.01	0.03
HELPFROM	-0.21	-0.04	0.04	1.00	0.18	0.00	0.01
INHEREXP	-0.11	-0.03	0.01	0.18	1.00	0.00	0.00
MMIMP	0.02	0.04	0.01	0.00	0.00	1.00	-0.32
CIMIMP	-0.03	-0.04	0.03	0.01	0.00	-0.32	1.00
CHLDSIMP	0.02	0.01	0.00	0.00	0.01	0.09	0.01
SURECHIN	0.04	0.05	0.02	0.01	0.00	0.04	0.04
LIVALONE	-0.01	-0.04	-0.01	-0.01	-0.02	0.01	-0.01
RENTMKT	-0.05	-0.14	0.02	-0.02	-0.04	-0.05	0.05
SVACCESS	0.05	-0.09	0.06	0.03	0.09	0.04	0.00
RC	-0.07	-0.02	-0.02	-0.01	-0.05	-0.04	0.04

	CHLDSIMP	SURECHIN	LIVALONE	RENTMKT	SVACCESS	RC
AGE	0.05	0.01	-0.04	-0.10	0.05	-0.02
DC	0.00	0.03	0.03	-0.01	-0.02	0.02
HELECT	0.03	0.02	-0.12	0.05	0.26	-0.27
FLANDOWN	-0.03	0.00	-0.01	-0.06	-0.14	0.08
AGEDIFF	0.01	0.04	-0.05	-0.05	-0.03	-0.02
WPRIM	0.04	0.04	-0.05	-0.04	0.03	-0.08
WSECH	-0.06	-0.06	0.01	0.03	0.09	-0.07
EXPOCCCS	-0.02	-0.01	0.00	0.08	0.13	-0.10
YRSSLC	0.02	0.04	-0.01	-0.05	0.05	-0.07
DOWHINH	0.01	0.05	-0.04	-0.14	-0.09	-0.02
DOEDUC	0.00	0.02	-0.01	0.02	0.06	-0.02
HELPFROM	0.00	0.01	-0.01	-0.02	0.03	-0.01
INHEREXP	0.01	0.00	-0.02	-0.04	0.09	-0.05
MMIMP	0.09	0.04	0.01	-0.05	0.04	-0.04
CIMIMP	0.01	0.04	-0.01	0.05	0.00	0.04
CHLDSIMP	1.00	0.64	-0.03	-0.02	0.04	0.00
SURECHIN	0.64	1.00	0.00	-0.06	0.00	-0.01
LIVALONE	-0.03	0.00	1.00	0.01	-0.03	0.14
RENTMKT	-0.02	-0.06	0.01	1.00	0.05	-0.04
SVACCESS	0.04	0.00	-0.03	0.05	1.00	-0.29
RC	0.00	-0.01	0.14	-0.04	-0.29	1.00