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THE EFFECTS OF OLD-AGE PENSIONS ON HOUSEHOLD STRUCTURE, MARRIAGE, FERTILITY AND RESOURCE ALLOCATION IN RURAL AREAS OF DEVELOPING COUNTRIES*

Jeffrey B. Nugent, Kipham Kan and Robin J. Walther**

University of Southern California

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TABLE OF CONTENTS

CHAPTER I: Introduction 1
A. Conditions Determining the Importance of the Old-Age Security Motive 4
1. Underdeveloped Capital Markets 5
2. Uncertainty about the Extent of Accumulation that is Necessary for Old Age and Disability 6
3. Absence or Inefficiency of Private and Governmental Old Age and Disability Insurance Programs 7
4. Loyalty of Children to their Parents 10
5. Absence of Markets for Non-Standard Labor (such as Women and Children) 14
6. Underdeveloped Markets for the Goods and Services that Elderly People Consume 15
7. Absence of a Young Spouse 16
8. Relative Importance of Old-Age in the Life Cycle 25
B. Existing Theoretical and Empirical Analyses of the Old-Age Security Motive for Fertility 26
1. Theoretical Studies 26
2. Empirical Studies 32
C. What People Say about the Old-Age Security Motive for Children 50
D. Purpose of the Study and an Outline of the Presentation 58
Footnotes to Chapter I 61

CHAPTER II: A Survey of the Descriptive Literature and Its Implications for Modeling 63
A. The Choice of the Appropriate Decision-Making Unit in Decisions Relevant to the Relationship between Old-Age Security and Fertility 65
B. Household Structure and Type: Determinants and Effects 67
1. Effects 68
2. Determinants 70
C. The Allocation of Household Resources and Marriage 77
D. Fertility and Infant and Child Mortality 85
E. Some Suggestions Arising from the Literature on Social Security Effects in Developed Countries 93
1. The Savings Reduction Effect 94
2. Other Life-Cycle Effects 98
3. Intragenerational and Distributional Effects 103
F. Implications of Village Surveys and Descriptive Studies for Modeling Household Decisions 107
Footnotes to Chapter II 113

CHAPTER III: A Formal Model Linking Old-Age Security with Household Structure, Marriage, Fertility, Wealth and Resource Allocation and Accumulation 115
A. The Household Structure Module 117
B. The Marriage Model 127
C. A Simple Model of Fertility and Old-Age Security 145

TABLE OF CONTENTS (cont.)

CHAPTER III: (cont.)
D. The Resource Accumulation and Allocation Module 155
E. Interrelationships Between the Modules 165
Footnotes to Chapter III 169

CHAPTER IV: Empirical Specification of the Modules for Application to the Additional Rural Income Survery Data 171
A. Household Structure 176
B. Marriage 185
C. The Fertility Module 195
D. Resource Allocation: Cropping Patterns, Input Demand and Expenditure Allocation 205
Footnotes to Chapter IV 220

CHAPTER V: Estimation, Hypotheses Tests, Empirical Results, and their Interpretation and Implications for All Modules with the ARIS Data for Rural India 222
A. Household Structure 223
B. Marriage 233
C. Fertility 248
D. Resource Allocation 255
1. The Production System 255
2. The Expenditure System 273
3. Joint Estimation of the Production and Expenditure Systems 286
Footnotes to Chapter V 297

CHAPTER VI: Main Conclusions With Regard to the Empirical Results Obtained from Rural India and Their Implications 298
A. General Findings 298
B. Specific Findings of Each Module 299
C. Implications for Future Research and Policy 304

CHAPTER VII: Application of the Modules to Malaysian Data 307
A. The Malaysian Setting and Differences therein from Rural India 307
B. The Malaysian Family Life Survey (MFLS) 313
C. Empirical Specification of All Modules including the New Expectational Module 317
1. The Household Structure Module (Module A) 318
2. The Marriage Module (Module B) 327
3. The Fertility Module (Module C) 332
4. The Resource Allocation Module (Module D) 340
5. The Expectations Module (Module E) 341
(a) General Features 342
(b) The Model 344
(c) Derivation of Hypotheses 350
(d) Econometric Specification 356
- The Desired Number of Children, NSTARH and NSTAR 358

TABLE OF CONTENTS (cont.)

CHAPTER VII: (cont.)

- Expectations on the Likelihood of Husbands and Wives of Support from Children, Savings, Work and the Provident Fund 361
- The Entire System of Equations and its Method of Estimation 363
- Definition of Variables and Descriptive Statistics 368

Footnotes to Chapter VII 378

CHAPTER VIII: Empirical Results and Their Interpretation for Malaysia 380

A. Household Structure 380
B. The Marriage Module 389
   1. Age at Marriage of the Male (AMM) 390
   2. Educational Attainment of the Wife (EDUCF) 395
   3. Age-at-Marriage of the Female (AMF) 398
C. The Fertility Module 401
   1. Expectations of Children's Educational Attainment (EDIND) 402
   2. The Number of Surviving Children (OWNCHILD) 405
   3. Actual Fertility Relative to Natural Fertility (FERT2) 411
D. Female Labor Force Participation 411
E. The Expectations Module 415
   1. Expectations on the Likelihood of Support from Pensions and Provident Fund (PP and PPH) 416
   2. Expectations on the Likelihood of Old-Age Support from Work (WORK and WORKH) 419
   3. Expectations on the Likelihood of Support from Savings (SAVINGS and SAVINGSH) 423
   4. Expectations on the Likelihood of Old-Age Support from Children (CHILD and CHILDH) 425
   5. Number of Children Demanded (NSTAR and NSTARH) 428
   -- Summary and Conclusion of the Results of the Expectations Module 433

Footnotes to Chapter VIII 435

CHAPTER IX: Malaysian Results and Simulations, Their Comparison with those from Rural India, and Further Conclusions 436

A. Assimilation of the Malaysian Results for the Different Modules 436
   1. Household Structure 437
   2. Marriage Services 439
   3. Child Services 440
   4. Female Labor Force Participation 442
   5. Expectations of Old-Age Support and the Desired Number of Children 443

TABLE OF CONTENTS (cont.)

CHAPTER IX: (cont.)
B. Some Crude Simulations of the Direct and Indirect Effects of Increased Expectations of Old-Age Support from Pensions 445
C. Comparisons between the Results Obtained for Rural India and Peninsular Malaysia and Some Further Conclusions 454
Footnotes to Chapter IX 459

REFERENCES . . . . . .

TABLES AND FIGURES

CHAPTER I

Table 1.1 - Expectations of Life at Birth and Age at First Marriage by Sex and Country and Derived Estimates of Expected Years of Widowhood 19

Table 1.2 - The Old Age Security Value of Children (in percentages) 56

Table 1.3 - Expectation of Financial Help from Sons and Daughters, Expressed in Rounded Percentages 57

CHAPTER II -- no tables or figures

CHAPTER III

Table 3.1 - A Simplified Model of Marriage Services for Rural Areas of Developing Countries 133

Figure 3.1 - Spouse Service Equilibrium between Households o and d 139

Table 3.2 - The Fertility Model 148

Figure 3.2 - The Relationships Between the Modules: Exogenous Variables Including Participation in Old-Age Security Program and Initial Conditions 167

CHAPTER IV

Table 4.1 - Distribution of Adult Married Males with Spouse Present by Type of Household in Rural India, 1970-71 180

Table 4.2 - Definitions of Variables for Household Structure Models 182

Table 4.3 - Sample Size and Means of All Right Hand Side Variables Used in Application of the Household Structure Module to ARIS Data 184

Table 4.4 - Definition of Variables Used in the Empirical Application of the Marriage Module to ARIS Data 189

Table 4.5 - Descriptive Statistics for Variables in the Model of Marriage Services for Different Subsamples of Ever-Married Women (with Spouse Present) Married for 15 Years or Less in the ARIS Data for Rural India 192

Table 4.6 - Descriptive Statistics on All Variables in Samples of Ever Married Women (with Spouse Present) of Age 35 and Above in the ARIS Data 203

Table 4.7 - Descriptive Statistics - Means and Standard Deviations - and Definitions of Variables in the Production System for Non-Cultivating and Cultiviating Households by Household Structure Type, 1970-71 in the ARIS Data for Rural India 207

Table 4.8 - Descriptive Statistics - Means and Standard Deviations - and Definitions of Variables in the Expenditure System for Different Types of Households in the ARIS Data for Rural India 212

TABLES AND FIGURES (cont.)

CHAPTER V

Table 5.1 - Household Structure Regression Results for Cultivating Households Obtained from ARIS Data 230

Table 5.2 - Household Structure Regression Results for Noncultivating Households Obtained from ARIS Data 231

Table 5.3 - Empirical Estimates Obtained from ARIS Data: Age at Marriage of the Male (AMM) 241

Table 5.4 - Empirical Estimates Obtained from ARIS Data: Educational Attainment of the Female (EDCIF) 243

Table 5.5 - Empirical Estimates Obtained from ARIS Data: Age at Marriage of the Female (AMF) 245

Table 5.6 - Empirical Results for Cumulated Fertility Relative to Potential Fertility for Ever Married Women (with Spouse Present) of 35 Years of Age or More in Rural India 252

Table 5.7 - Empirical Results for Choice of Dominant Crop for Cultivating Households in Rural India for the Year 1970-71, by Household Type 257

Table 5.8 - Empirical Estimates of the Production System of Profit and Input Demand Functions; by Household Type, in Rural India in 1970-71 262

Table 5.9 - Partial Results of the Translog Profit Function (LAGPROF) for Nuclear and Extended Cultivating Households in Rural India in 1970-71 270

Table 5.10 - Results of Equations of the Expenditure System for Cultivating Households in Rural India with Leisure Measure C by Year without and with Interactions with HOUST1 288

Table 5.11 - Results of Equations of the Expenditure System for Non-Cultivating Households in Rural India with Leisure Measure C by Year Without and With Interactions with HOUST1 291

Table 5.12 - Results of Equations for Average Negative Expenditure Shares of Cultivating Households in Rural India 1968-69 - 1970-71 294

CHAPTER VI -- no tables or figures

CHAPTER VII

Table 7.1 - Distribution of Ever Married Females of Less than 50 Years of Age by Type of Household in Malaysia, 1976 320

Table 7.2 - Definitions of Variables Used in the Household Structure Model for Use with Malaysian Family Life Survey Data 323

Table 7.3 - Sample Size and Means of All Variables in the Household Structure Module for Malaysia 325

TABLES AND FIGURES (cont.)

CHAPTER VII (cont.)
Table 7.4 - Definition of the Variables Used in the Marriage Module for Malaysia 329
Table 7.5 - Sample Size and Means of All Variables in the Marriage Module for Malaysia 331
Table 7.6 - Definitions of Variables Used in the Fertility Module for Use with Malaysian Family Life Survey Data 334
Table 7.7 - Sample Size and Means of All Variables in the Fertility Module with Malaysian Family Life Survey Data 336
Table 7.8 - Sample Size and Means of All Variables in the LF1 Equation for Malaysia 337
Table 7.9 - Definitions of All Variables Used in the Expectations Module for Application to MFLS Data 371
Table 7.10 - Frequencies of the Dependent Variables by Ethnicity in Percent of Column Total 373
Table 7.11 - Frequencies of the Dependent Variables by Location in Percent of Column Total 375
Table 7.12 - Means of All Variables Used in the Expectations Module for Application to Malaysia 377

CHAPTER VIII
Table 8.1 - Logit Estimates of HOUST1 Equation with MFLS Data 382
Table 8.2 - Logit Estimates of Equation for HEAD with MFLS Data 383
Table 8.3 - OLS Estimates of Number of Adults (ADULTS) Equation with MFLS Data 384
Table 8.4 - Emprical Estimation of Regression Coefficients in Age-at-Marriage of the Husband Equation (AMM) 391
Table 8.5 - Estimates of Regression Coefficients of the Educational Attainment of the Wife (EDUCF) Equation 396
Table 8.6 - Estimates of the Regression Coefficients in the AMF Equation for Malaysia 399
Table 8.7 - Estimates of Regression Coefficients in the Equation for the Expectations of Education Index (EDIND) with MFLS Data 404
Table 8.8 - Regression Coefficients for Number of Surviving Children (OWNCHILD) with MFLS Data 409
Table 8.9 - Regression Results for Actual Fertility Relative to Natural Fertility (FERT2) with MFLS Data 412
Table 8.10 - OLS Estimates of the Equation for the Average Labor Force Participation of Married Women with MFLS Data 414

CHAPTER VIII (cont.)
Table 8.11 - Empirical Estimates of the Equation for Expectations of the Likelihood of Old-Age Support from Pensions and Provident Fund of Women (PP) and Men (PPH) 417
Table 8.12 - Empirical Estimates of the Likelihood of Support from Work of the Wife (WORK) and the Husband (WORKH) 420
Table 8.13 - Empirical Estimates of the Equation for Expectations of the Likelihood of Old-Age Support from Savings of the Wife (SAVINGS) and of the Husband (SAVINGSH) 424
Table 8.14 - Empirical Estimates of the Equation for Expectations of the Likelihood of Old-Age Support from Children of the Wife (CHILD) and of the Husband (CHILDH) 426
Table 8.15 - Empirical Estimates of the Equation for Number of Children Desired of the Wife (NSTAR) and of the Husband (NSTARH) 430

CHAPTER IX
Figure 9.1 - Actual and Simulated Fertility Distributions in MFLS Women: Simulation based on Giving All Women a Value of the PPI Expectations Index of 3, i.e., a Likelihood of Old-Age Support from Pension, Provident Fund and Insurance of "It Depends" 447
Table 9.1 - The Effects of a Unit Increase in PPI(H) on the Number of Surviving Children 449

"The main shortcoming of the new home economics for the analysis of fertility decisions is that it assumes too little.... My belief is that if we want to study the demand for children, we have to put more content into the theory and start asking why people want to have children." (p. 547)

Zvi Griliches, "Comment" on Marc Nerlove," Toward a New Theory of Population and Economic Growth," in Economics of the Family: Marriage, Children and Human Capital, T.W. Schultz, ed. NBER Conference Report, Chicago and London: University of Chicago Press, 1974, pp. 546-548.

CHAPTER I

INTRODUCTION

In the spirit of the comment at the top of this page, the purpose of this report is to explore one important reason why people want children, namely for old-age security.

If one were to judge the importance of the old-age security motive in fertility behavior in rural areas of developing countries by what couples, and especially women, say about why they want children, as is pointed out in Section C below the security motive almost certainly would be at or near the top of the list. Likewise, in the quest for policies for slowing down the high rates of population growth which currently pervade most developing countries and especially the rural areas thereof, there are few policies which have attracted as much interest as the introduction of old-age pension systems. As one recent Nobel prize winner in Economics boldly put it, "a very important institution needed everywhere is an old-age pension, however modest, to facilitate a population policy" [Tinbergen (1980, p. 199)]. Since old-age security programs in developing countries have until recently been concentrated almost entirely in urban areas, a number of

countries and the ILO in particular are on record for assigning priority attention to the spread of social security into rural areas.[1] In rural areas, however, even modest old-age pension programs can be extremely costly and, as recent studies in developed countries have shown,[2] can have other effects which may be considered counter-productive as far as both long-term development and human welfare are concerned. Careful analyses of the potential direct as well as indirect effects of the introduction of old-age pension systems would thus seem imperative.

Yet, in terms of both theory and empirical evidence the old-age pension motive would seem to be, and probably by a wide margin, the least investigated motive for fertility and, as shall be demonstrated in Section B below, especially in rural areas of developing countries. Of the relatively few empirical studies on the subject that are available most are based on international cross-section studies relating cross-country variations in both the breadth and depth of coverage of the old-age pension systems in each country as a whole to variations in national fertility rates across countries. Since as shown in Section A below, the old-age security motive for fertility is considerably stronger in rural areas than in urban areas in which coverage to date has been most complete, the evidence provided by such studies (which is at best controversial) is also largely irrelevant to the places where the bulk of the population of developing countries actually lives, namely, rural areas of developing countries. As shall be demonstrated, the few empirical studies based on data from rural areas of developing countries are limited by extremely small sample sizes, the absence of detailed micro-level data, and to a certain extent also rather unrepresentative samples. Virtually all such studies ignore the possibility of feedbacks going from desired fertility behavior

to old-age pensions and any other interdependencies between the two phenomena.[3]

Where and why have the existing empirical and theoretical studies of the old-age security motive gone wrong? To test the hypothesis of the importance of the old-age security motive for fertility, three conditions would have to be satisfied. First, one would have to be able to measure variations in intensity of the motive. Since motives are often deemed not directly observable, this might well imply the need to proceed more indirectly by identifying a priori conditions which could be expected to influence the intensity of the motive. Second, one would have to be able to observe fertility behavior in conditions differing with respect to the intensity of the old-age security motive or in those factors underlying that motive while holding other factors as constant as possible. Third, it would be necessary to establish that the causality in any observed relationship actually goes from the old-age security motive to fertility behavior and not vice versa.

As we shall demonstrate in Section B below, the greatest shortcoming of existing studies is with respect to the first of these conditions, namely the identification of the factors or conditions giving rise to the old-age security motive. In our opinion, moreover, it is primarily the failure to satisfy this condition that has led to the gross underestimation of the importance of the old-age security motive, at least among economic and demographic studies. It is, therefore, to the identification of conditions in which the motive could be expected to be strong to which we turn in Section A which follows. As noted above Section A is followed by Section B in which the existing literature on the fertility effects of old-age pensions is reviewed. Since existing studies are at best very mixed in

their assessment of the importance of such effects, in Section C we review what people have said about the old-age security motive. The present chapter is concluded by Section D which explains the purpose of the study and outlines the presentation.

A. Conditions Determining the Importance of the Old-Age Security Motive

In outlining the conditions wherein this motive could be important, we make little claim at originality. Individually, most of the points have been made. What has not yet been done, however, is to bring all the points together into a coherent picture of the necessary conditions for the old-age security motive. Some somewhat surprising conclusions, moreover, emerge.

To put the issue as simply as possible, old-age security is likely to be an important motive for fertility when the relevant parent is both uncertain about his (her) own ability to provide for himself (herself) in old-age and dubious that there are other more reliable or more effective means of such support than from his (her) own children.

In what circumstances or environmental conditions are these basic conditions likely to coexist? Because for any condition there are other combinations of circumstances from which the condition derives, one might well be able to come up with many alternative combinations of the conditions that could be considered necessary and sufficient for a strong old-age security motive. Nevertheless, for expository purposes we shall limit ourselves to the following: (1) the underdeveloped state of capital markets, (2) uncertainty about how much asset accumulation is necessary for old age, (3) the absence or inefficiency of private or social old-age and disability insurance programs, (4) the loyalty of children, (5) the absence

of well developed labor markets for women and children (non-standard labor), (6) underdeveloped markets of the goods and services that elderly people consume, (7) the absence of a spouse who is of considerably younger age, and (8) old-age is a relatively important part of one's life cycle.

We proceed next to explain each of these conditions in turn.

1. Underdeveloped Capital Markets

Underdevelopment of capital markets can be seen in terms of (a) the small number of different kinds of assets that can be accumulated for use in old age, (b) the inefficiency, as exemplified by their low (or even negative) rates of return, of those assets that can be accumulated for use in old age, and (c) the insecurity or unreliability of the preciously few assets that can be efficiently accumulated. These conditions typify most developing countries and especially the rural areas of those developing countries with relatively low per capita incomes. The available assets in such circumstances are generally limited to money, land and commodities (inventories). Since the commodities available in rural areas of developing countries, such as grain, harvested crops, and livestock, are expensive or even impossible to store for long periods of time, their accumulation can hardly be considered efficient. Money is likewise subject to rapid depreciation due to inflation. Money and commodity stocks are, therefore, in general, not suitable as long term stores of value.

That leaves land. While land accumulation may be more efficient and profitable in some circumstances, in many circumstance it is either impossible to obtain property rights to such land or land possession is highly insecure. If land is not subject to being overrun by squatters, the property rights associated with land are frequently subject to abrupt changes

or to persistent limitations, making even land an unreliable form of accumulation in many, if not most, circumstances. Even where it is possible to obtain property rights over land and to accumulate it, with land quality varying greatly from one parcel to another even in the same region, it is difficult for a prospective buyer to determine quality. Given the "thinness" of such markets, it is often expensive and time-consuming for sellers to find suitable buyers and buyers to find suitable sellers, again rendering land accumulation a risky means of providing for disability and old age. The thinness and underdeveloped state of such markets can in turn be explained by virtue of the fact that land is almost inevitably more valuable to the owner with experience in using it than to any prospective buyer from the outside, thereby acting as deterrents to market sale. In other words, land sale tends to be avoided because of high transactions and information costs.

All of these capital market underdevelopment problems are more characteristic of rural areas than of urban areas. While in principle indebtedness should be expected to force indebted owners to put land on the market to pay off their debts, in practice labor and commodity markets are so closely interlinked with those of land and capital that it is frequently uneconomic for creditors to do so.[4]

2. Uncertainty about the Extent of Accumulation that is Necessary for Old Age and Disability

Even if the capital markets were well developed, complete and free of imperfections and transactions costs, however, they would offer insufficient protection against insecurity in disability and old age. Only in the extremely unlikely circumstance where the individual would know exactly the

extent of old-age disability and the length of time before death would he (she) know how much to accumulate. In the absence of certainty about such matters, one can protect oneself adequately only by purchasing insurance in the form of old-age annuities.[5]

Rural areas of developing countries are, of course, by no means the exclusive domain for uncertainty about disability and mortality. Yet their relatively lower levels of education, lesser availability of potable water and sewage disposal, less extensive knowledge of personal hygiene, poorer access to medical treatment, and greater possibilities for employment-related accidents,, and attack by insect and animal-borne infectious diseases tend to raise the degree of uncertainty about such matters in rural areas relative to those of urban areas.

3. Absence or Inefficiency of Private and Governmental Old Age and Disability Insurance Programs

Given uncertainty with respect to the requirements of old age support, insurance is required. Yet, once again it is especially in the rural areas of developing countries, where it is perhaps needed the most, that such insurance is most conspicuously lacking. It is most important to realize, moreover, that the dearth of disability and old-age insurance in rural areas of developing countries is no mere accident. There are indeed several factors characteristic of such areas that tend to undermine the viability of such programs.

In the first place, the geographic dispersion of human settlements in rural areas, the low levels of per capita income and consumption, the exchange risks and other costs involved in converting from kind (crops) into cash to buy insurance and then from cash back into kind at the time of

receipt of annuities, all combine to make the transactions costs of such insurance extremely high. Second, given the wide variation in health, strength and life style and hence also in insurance risk from one individual to another, the information requirements and transactions costs that would be required to identify the appropriate premium for each individual are excessively high. This is especially true because of the asymmetry of information, wherein such information is more easily available at the level of the household than at the level of an outside insurance agent. As a result the costs of instituting a system of individual-specific premiums are prohibitive. In practice, therefore, virtually all insurance programs have to settle for one or two basic premium rates which of course cannot pretend to be appropriate for everyone. In a voluntary or private system, this leads to the problem of "adverse selection" wherein only those whose insurance risk is actually greater than the premium assigned opt to participate in the program. Since the more insurable potential participants opt out, such programs are not viable in the long run. By requiring everyone to participate in the program, governmental insurance programs can eliminate the adverse selection problem but even these programs are subject to the aforementioned high transactions costs and exchange risks which make them much less attractive and viable than they otherwise might seem. The effectiveness of government programs in reducing the strength of the old-age security motive is also likely to be impeded by dubiousness on the part of the public as to whether the government will actually deliver on its promises concerning old age and disability annuities when the time comes. Quite frequently, it is the long history of broken promises on the part of government to rural residents that accounts for this.

Finally, because insurance risk is also likely to be affected by the activities one undertakes, <u>all</u> formal insurance programs are likely to be

confronted with the "moral hazard" problem. The moral hazard problem arises when, as a result of the aforementioned excessively high costs of monitoring and enforcing penalties upon those who unnecessarily engage in activities that raise the insurance risk (such as smoking, drinking, flying or working in hazardous conditions), no such monitoring activities are engaged in and no penalties are imposed. Without monitoring and penalties for behavior that increases the insurance risk, the individual sees no reason not to engage in such activities. He/she does so, and the insurance risk rises. As a result the moral hazard problem compounds all the other problems of providing a viable old-age and disability insurance program. Whereas the costs of determining whether or not a person smokes, drinks or flies a plane, especially in a developed country context, may not be very great, the costs of determining whether or not a farmer handles his tools carelessly, drives his tractor too fast, or puts excessive strain on his back in manual labor operations are likely to be prohibitive, implying that the moral hazard problem is considerably more serious in rural areas of developing countries than in other contexts.[6]

The high information and transaction costs underlying these adverse selection and moral hazard problems are problems for formal insurance programs only. Families and households, on the other hand, are likely to (1) have excellent information on the relevant insurance risks and (2) be in a better position to monitor, penalize and thereby minimize behavior of the moral hazard variety. Moreover, since intergenerational transfers within an extended household context are usually provided in kind, the transactions costs and exchange risks can be minimized if not altogether eliminated. Intrahousehold insurance programs which feature transfers from children to parents during old-age and disability enjoy still another

advantage relative to formal insurance programs. Rather than having to adopt some arbitrary retirement age or standards of qualification for disability, since the household has at its disposal a large variety of incentive mechanisms, it can encourage household members to work as hard as they can and as long as they can. Persons who to formal insurance programs would qualify as totally disabled, in the household insurance context can be encouraged to work part-time . This minimizes the magnitude of the transfers required, and makes the household a particularly efficient source of providing old-age and disability insurance.

4. Loyalty of Children to their Parents

The aforementioned system of intergenerational intrahousehold transfers provides a potentially efficient mechanism for combining capital accumulation with insurance. But the system can be relied upon by parents for old-age and disability protection only if their children can be counted upon, i.e., only if the loyalty of their children toward them is assured. Traditional cultures are generally known for their adherence to certain norms. The care of parents during their old age by children is one of those norms. The norms are maintained in traditional communities by assessing strong sanctions in the form of ill-repute to those who deviate from such norms. Once the norms are inculcated, individual preference functions are affected. Individuals come to feel pride and satisfaction in being able to fulfill their obligations to their parents.[7]

Caldwell (1977) provides an interesting illustrative example of the well-developed social mechanisms whereby older generations insure the loyalty of children. When a Yoruba parent has a son or daughter who is socially/economically successful he/she is suppose to give the parents

presents, especially those ones that are highly visible like a new house made of real bricks, fancy clothing, etc. The parent will thus show off to the other villagers telling this present was given to them by so-and-so. When the offspring in question visit the village, all the villagers will praise him/her highly for his generous behavior toward his/her elders. This praise in turn sholud be compensated, even if only symbolically by taking a beer together or breaking a Kola nut toagether.

The complete adherance to such norms or the complete assurance of loyalty on the part of children are certainly not required for the old-age security motive to be important. Moreover, it need not be the case that the expected transfer from children should more than compensate for the direct and indirect costs of raising children. Hence, as Willis (1978, 1979) has emphasized existing studies showing that children do not always transfer as much to their elderly parents as the latter would like and/or that the rate on return to children is negative does not necessarily imply that the old-age security motive for investing in children is unimportant. To the contrary, a low or even negative rate of return on children may be the result of the importance of the old-age security motive in the absence of better alternative mechanisms for satisfying that motive. Indeed, some uncertainty about child loyalty or a low rate of return on children may in certain circumstance make high fertility more necessary than it would otherwise be.

Modernization and development involve a whole host of forces which tend to reduce the strength of the traditional norms of family and community, leading of course to the gradual erosion of loyal behavior. This erosion process is of course a very slow and gradual one. Moreover, because of the substantial differences that exist in personalities and

their dynamic interaction over time and in environment conditions and random events from one household or even individual to another and from one point in time to another, the rate of breakdown of such norms and the degree of loyalty in children for their parents are rather difficult to predict. Nevertheless, it is possible to suggest a number of conditions which would affect the loyalty of children to their parents. Among the most important of these influences would seem to be educational opportunities, extra household employment opportunities, the size and stability of the community, inheritance rules, and the amount of inheritable wealth possessed by the parents.

Loyalty is certainly not an innate biological trait. Rather loyalty is a characteristic that is learned. Loyalty to parents can, in appropriate circumstances, be reinforced by communal or religious institutions but by far the most important locus for learning the importance of loyalty to parents is the household itself. The training that one receives in the household, of course, is to some extent and in various respects competitive with formal education. Loyalty training is likely to be more successful when the informal education that takes place within the household is unencumbered by formal education whose influence, while rarely directly inimical to family loyalty, usually emphasizes the merits of independence and stresses the tools that allow the individual to operate better outside the confines of the household. The rationale for loyalty to parents is, of course, likely to be most convincing when conditions 1, 2 and 3 identified above are fulfilled. Hence, it should not be surprising that children tend to be more loyal in rural areas than in urban areas. Parents who have migrated to urban areas on occasion even send their children to be with their rural grandparents so as to receive better training in the traditional values than can be received in the cities.[8]

The size and stability of the community affect the degree to which communal sanctions can be imposed on those who are not loyal to their parents. In small, stable communities, disloyalty can be easily detected and communicated, making it difficult for disloyal children to obtain worthy spouses, employment, credit and communal help when needed. The detection of and the assignment of penalties for disloyalty are obviously more difficult to accomplish in large communities and in communities characterized by substantial in- or out-migration.

Loyalty can more easily be induced in circumstances in which parents have more and stronger instruments at their disposal with which to provide incentives for loyalty. The greater the extent to which parents directly control the employment opportunities, the easier it will be for them to induce loyal behavior on the part of their children. The greater the availability of extra-household employment opportunities, the more difficult it will be for parents to induce loyalty from their children. Likewise, the more land that the parents possess even in the presence of outside employment opportunities, the more attractive will intrahousehold employment appear to children and hence the more loyal behavior that can be induced. Finally, the more land and other property that is potentially inheritable, the more children are likely to want to qualify for inheritance by being loyal. Inheritance rules can of course influence the importance of the inheritance motive for loyalty. For example, in those societies where inheritance is prescribed along lateral lines among siblings, the inheritance motive for loyalty of children will be dissipated. Likewise, even where inheritance follows the traditional patterns of patrilineal or matrilineal descent, if the heir is predesignated by law, e.g., in primogeniture where the oldest son is the heir, where equal dividion of

wealth among all heirs or bequest sharing is mandated, or alternatively in ultigeniture where the last son is the heir, parents are in a less favorable position to induce loyalty, even if they have considerable property. Parents are obviously in a stronger position to induce loyalty from their children if they both possess inheritable property and are able to retain flexibility with respect to heir designation until the last possible moment.[9]

5. Absence of Markets for Non-Standard Labor (such as Women and Children)

Whereas markets for regular labor (i.e., full-time male labor) are rather universal, markets for part-time and non-standard labor, e.g., for children after school or for women when not caring for their children, are by no means universal. Indeed, the extent of development of markets for non-standard labor varies considerably from place to place. Extra-household employment opportunities for such labor are likely to vary by region and even by crop in rural areas of developing countries but to be considerably greater in urban areas than in rural areas. The role of extra-household labor market opportunities for children and young adults has already been mentioned in that they tend to make children more independent of parents and diminish the opportunity for parents to induce loyal behavior on the part of their children. Part-time and other employment opportunities for women are also relevant because they affect both the extent to which a wife is likely to be employed during marriage, and the extent to which she will be able to provide for her own support duing widowhood. Where female labor markets are relatively well developed, as is frequently the case in urban settings where domestic servant, clerical, sales and

professional employment opportunities for women are widely available, the old age security motive, at least on the part of women, is likely to be much weaker.

6. Underdeveloped Markets for the Goods and Services that Elderly People Consume

Even if viable, efficient and dependable means of accumulation and forms of insurance for old age could be found, such developments would be of little use if the goods and services that the elderly consume directly are not purchasable in the desired form and at reasonable prices. Getting products from market to home is likely to be a major problem for the elderly. Whereas home delivery of most goods and services is possible in developed countries, and to some extent also in urban areas of developing countries, home delivery is rarely available on a routine basis for most goods in rural areas of developing countries. Likewise, whereas consumer durable goods like automatic washers and driers, dishwashing machines, and garbage disposal units are increasingly pervasive in developed countries and in urban areas of developing countries, neither the machines themselves nor the power to run them are usually available in rural households. So too, potable water and sewage systems are rarely available to the typical rural dweller in developing countries. Without consumer durables, prepared foods, regular daily markets for consumer goods, catering services, refrigerators for storing foodstuffs, elderly care centers, or even electricity, plumbing and drinking water which are so frequently taken for granted in developed countries, the satisfaction of the daily subsistence requirements of the elderly in rural areas of developing countries is no simple matter. All these activities are time consuming and laborious. Even if the manual

labor for such activities could be purchased in the labor market, their efficient and dependable provision requires coordination and supervision that elderly or disabled persons may be unable to provide by themselves. Servants may be trained but there are almost always more serious questions of their efficiency, loyalty and dependability than in the case of children, grandchildren and others within the household.

It should not be surprising therefore that the old-age security motive for fertility should be expected to be particularly strong in conditions characterized by underdeveloped markets in the aforementioned goods and services that elderly people consume directly. These conditions are clearly most characteristic of rural areas of developing countries.

7. Absence of a Young Spouse

If an individual adult is free to take on a much younger spouse, as for example in a second marriage or in situations in which polygamy and polygony are allowed, much of the need for children as sources of care during old-age and disability can be reduced. There are indeed situations where this is likely to be the case. For example, among the Tiwi of North Australia where both polygamy and polygony are possible, both men and women take younger spouses for the specific purpose of providing for care during old-age and disability [Hart and Pilling (1960)].[10] Where polygamy is practiced in Africa, it is sometimes the wife who asks her husband to take on another younger wife so as to help take care of her. Other examples arise in those societies, e.g., in those parts of rural Iran, where the institutions of levirate and sororate are relatively common. In the levirate a man, usually a younger brother, may be obliged to marry his older brother's widow. In the sororate a younger sister may be obliged to marry her older sister's widower.

In order to identify which member of the couple is more likely to have the stronger old-age security motive, it is necessary to calculate the life expectancy differences of the marriage partners at a given point in time after marriage. The identification of the spouse who is likely to surve the other can be reduced to two different sex differentials: those of life expectancy and age-at-marriage. If the life expectancies of adult males and females are the same, the surviving spouse will typically be that who is younger at the time of marriage. On the other hand, if the marriage ages of husbands and wives are the same, the spouse with the greater life expectancy will typically be the survivor. In fact, as shown in Table 1.1 below, both sex differentials combine to allow, on average, the wife to outlive the husband, indeed, in many countries by quite a margin.

In order to calculate the expectation that the wife would survive the husband, and by how much, one would ideally like to have life expectancy data on males and females at age 15, 20 or 25. Such data is, however, very scarce and limited to a few not necessarily representative LDCs or regions or groups thereof. Data for life expectancy at birth is more readily available. Therefore, in Table 1.1 we present data on life expectancy at birth by sex for each of 48 African LDCs, 30 Latin American and Caribbean LDCs, 36 Asian LDCs, 4 LDCs in Oceania and 8 Southern European countries which are frequently classified as LDCs. As can easily be seen, the life expectancy of females at birth is in almost all cases greater than that of males. Among the exceptions are countries like Liberia and Iran indicated by asterisks after the figures where, although at birth the life expectancy of males exceeds that of females, at virtually all subsequent ages the data shows that female life expectancy exceeds male life expectancy. Even in the remaining exceptions - Bhutan, India, Nepal, Pakistan and Papua - New

Guinea - although there is no reliable data on the subject, one may suspect that the female life expectancy would in fact exceed that of males at the higher and more relevant age groups. An important contributor to the switching of the sex differential in life expectancy between birth and virtually all higher ages in favor of the female is the higher mortality rate of females furing infancy, especially in those very poor developing countries where the sex preference in children is heavily in favor of males, which is then followed by greater susceptibility to alcoholism, violent death, work-related injuries and so on and hence higher mortality rate of males during school and working ages.

Data on age-at-first-marriage for LDCs is even more limited. The data available from international sources for the LDCs listed in the table, although generally pertaining to different years than the expectation of life-at-birth data, is presented in columns 4 and 5 of Table 1.1. In all cases the marriage age of the female is considerably below that of the male. The sex difference in age at marriage ranges from lows in the range of 1.5 to 3.5 years in some of the more developed LDCs in Latin America, Europe and Asia (e.g., Brazil 1.5 years, Spain 2.6 years, Portugal and Chile 2.9 years, Singapore 3.2 years, Argentina 3.3 years and Mexico, Israel and Uruguay 3.4 years) to 7 years or more in some of the Islamic countries of the Near East (Egypt 6.9 years, Bangladesh 7.7 years, Tunisia 7.1 years, Jordan 6.9 years and Kuwait 9.0 years). Other outliers on the low side are Philippines 2.9 years and Thailand 2.5 years.

By adding the life-at-birth differential to the age-at-marriage differential a rough estimate can be obtained of the expected number of years that a married woman can expect to live as a widow. For all LDCs for which such a number can be calculated, the resulting estimates are given in

Table 1.1

Expectations of Life at Birth and Age at First Marriage
by Sex and Country and Derived Estimates of Expected Years of Widowhood

Column Number	1	2	3	4	5	6	7
Country & Year Applicable if other than 1975-80	Expectation of Life at Birth		Age at First Marriage			Years of Widowhood	Widowhood as Percent of Life after Marriage
	Male	Female	Year of Data	Male	Female		
Africa							
Algeria (1978)	55.8	58.1		--	--	--	--
Angola	39.5	42.6	1972	31.6	25.5	9.2	53.8
Benin	44.3	47.5		--	--	--	--
Botswana	46.7	50.0		--	--	--	--
Burundi (1970-71)	40.0	43.0		--	--	--	--
Cape Verde	58.3	62.0		--	--	--	--
Central African Rep.	44.4	47.6		--	--	--	--
Chad	42.5	45.1		--	--	--	--
Congo	44.4	47.6		--	--	--	--
Egypt	53.6	56.1	1977	28.9	22.0	9.4	27.6
Equatorial Guinea	44.4	47.6		--	--	--	--
Ethiopia	37.5	40.6		--	--	--	--
Gabon	41.9	45.1		--	--	--	--
Gambia	39.4	42.6		--	--	--	--
Ghana	46.7	50.0		--	--	--	--
Guinea	41.9	45.1		--	--	--	--
Guinea-Bissau	39.4	42.6		--	--	--	--
Ivory Coast	44.4	47.6		--	--	--	--
Kenya	53.9	57.5		--	--	--	--
Lesotho	49.2	51.4		--	--	--	--
Liberia (1971)	45.8*	44.0*		--	--	--	--
Libya	53.8	57.0		--	--	--	--
Madagascar	44.4	47.6	1972	27.7	22.7	8.2	32.9
Malawi (1970-72)	40.9	44.2		--	--	--	--
Mali	40.6	43.8		--	--	--	--
Mauritania	40.6	43.8		--	--	--	--
Mauritius (1971-73)	60.7	65.3		--	--	--	--
Morocco	53.8	57.0		--	--	--	--
Mozambique	44.4	47.6	1970	24.4	21.9	5.8	22.6
Namibia	50.0	52.5		--	--	--	--
Niger	40.6	43.8		--	--	--	--
Nigeria	45.9	49.2		--	--	--	--
Rwanda	44.3	47.5		--	--	--	--
Senegal	40.6	43.8		--	--	--	--
Seychelles (1974-78)	64.6	71.1		--	--	--	--
Sierra Leone	44.3	47.5		--	--	--	--

Table 1.1 (cont.)

Column Number	1	2	3	4	5	6	7
Country & Year Applicable if other than 1975-80	Expectation of Life at Birth		Age at First Marriage			Years of Widowhood	Widowhood as Percent of Life after Marriage
	Male	Female	Year of Data	Male	Female		
Africa (cont.)							
Somalia	41.4	44.6		--	--	--	--
Sudan	45.5	47.5		--	--	--	--
Swaziland	44.3	47.5		--	--	--	--
Togo	44.4	47.6		--	--	--	--
Tunisia	56.3	58.4	1974	29.0	21.9	9.2	34.7
Uganda	50.8	54.3		--	--	--	--
United Rep. Cameroon	44.4	47.6		--	--	--	--
United Rep. Tanzania	48.8	52.2		--	--	--	
Upper Volta	40.6	43.8		--	--	--	--
Zaire	44.4	47.6		--	--	--	--
Zambia	46.7	50.0		--	--	--	--
Zimbabwe	51.8	55.3		--	--	--	--
Latin America							
Argentina	65.2	71.4	1970	28.1	24.8	9.5	20.4
Bahamas (1969-71)	64.0	69.3		--	--	--	--
Barbados	67.7	71.9		--	--	--	--
Bolivia	48.4	53.1		--	--	--	--
Brazil (1960-70)	57.6	61.1	1980	25.7	24.2	5.0	13.6
Chile	61.3	67.6	1980	26.7	23.8	9.2	21.0
Colombia	60.7	63.7	1975	27.8	23.2	7.6	18.8
Costa Rica (1972-74)	66.3	70.5	1980	26.6	22.9	7.9	16.6
Cuba	68.5	71.8	1978	29.6	25.7	7.2	15.6
Dominican Republic	58.4	62.2	1976	32.5	27.6	8.7	25.1
Ecuador (1974-79)	59.5	61.8	1974	25.7	22.2	5.8	14.7
El Salvador	60.0	64.5	1980	29.8	25.5	8.8	22.6
Guadeloupe	66.6	72.0		--	--	--	--
Guatemala (1972-78)	53.7	55.5	1978	27.0	23.1	5.8	25.9
Guyana	66.5	71.7	1980	--	19.8	--	--
Haiti	49.1	52.2		--	--	--	--
Honduras	55.4	58.9	1978	27.9	23.2	9.2	25.1
Jamaica	67.8	72.5	1980	--	17.7	--	--
Martinique	66.6	72.0		--	--	--	--
Mexico	62.8	66.6	1978	25.8	22.4	7.2	16.3
Neth. Antilles (1966-70)	58.9	65.7		--	--	--	--
Nicaragua	53.5	57.1		--	--	--	--
Panama (1970)	64.3	67.5	1980	30.3	26.3	7.2	17.5
Paraguay	61.9	65.3	1975	28.9	23.7	8.6	20.7
Peru	55.1	58.0	1972	28.6	24.6	6.9	20.7
Puerto Rico (1979)	69.6	76.1		--	--	--	--
Suriname	64.8	69.8		--	--	--	--
Trinidad & Tobago (1970)	64.1	68.1	1977	30.3	25.8	8.5	20.1
Uruguay	66.3	72.8	1978	28.9	25.5	9.9	20.9
Venezuela (1975)	65.0	69.7	1973	27.1	22.7	9.1	19.4

Table 1.1 (cont.)

Column Number	1	2	3	4	5	6	7
Country & Year Applicable if other than 1975-80	Expectation of Life at Birth Male	Expectation of Life at Birth Female	Age at First Marriage Year of Data	Age at First Marriage Male	Age at First Marriage Female	Years of Widowhood	Widowhood as Percen of Life after Marriage
Asia							
Afghanistan	42.0	43.4		--	--	--	--
Bangladesh (1974)	45.8	46.6	1980	24.0	16.3	8.5	28.0
Bhutan	44.0	42.5		--	--	--	--
Brunei (1970-72)	61.9	62.1		--	--	--	--
Burma (1974)	56.3	60.2		--	--	--	--
China	62.1	65.9		--	--	--	--
Cyprus (1976-77)	71.9	74.9		--	--	--	--
Dem. Kampuchea	47.0	49.9		--	--	--	--
Dem. Yemen	42.9	45.1		--	--	--	--
East Timor	41.6	43.4		--	--	--	--
Hong Kong (1973)	67.9	74.3	1975	27.3	23.3	10.4	20.4
India (1971-)	46.4	44.7		--	--	--	--
Indonesia	48.7	51.3	1980	23.8	19.4	7.0	21.9
Iran (1973-76)	57.6*	57.4*		--	--	--	--
Iraq	53.6	56.7	1976	33.0	27.4	8.7	29.7
Israel (1980)	72.1	75.7	1980	26.9	23.5	6.0	11.5
Jordan	62.4	66.0	1979	27.7	20.8	10.5	23.2
Korea (Dem.)	60.5	64.6		--	--	--	--
Korea (Rep.) (1978-79)	62.7	69.1	1980	27.3	23.2	10.5	22.9
Kuwait (1970)	66.4	71.5	1979	27.7	18.7	14.1	26.7
Laos	42.1	45.0		--	--	--	--
Lebanon	63.2	67.1		--	--	--	--
Malaysia Pen. (1979)	67.2	72.5	1979	29.6	25.8	9.1	19.5
Mongolia	60.5	64.6		--	--	--	--
Nepal	44.0	42.5	1980	20.6	17.1	2.0	7.9
Oman	46.2	48.4		--	--	--	--
Pakistan	51.9	51.7	1980	25.3	19.3	5.8	17.9
Philippines	59.1	62.4	1976	26.0	23.1	6.2	15.8
Saudi Arabia	46.7	49.0		--	--	--	--
Singapore (1980)	68.9	74.2	1976	26.5	23.3	8.5	16.7
Sri Lanka	62.0	65.0	1978	27.8	23.6	7.2	17.0
Syria (1977)	63.0	65.4		--	--	--	--
Thailand	57.6	63.0	1980	25.0	22.5	7.9	19.5
Turkey	60.3	61.6	1976	26.4	22.3	5.4	13.7
Vietnam	46.2	49.1		--	--	--	--
Yemen	38.7	40.3		--	--	--	--
Oceania							
American Samoa	65.0	69.1		--	--	--	--
Fiji	69.5	73.1	1980	25.2	21.8	7.0	13.6
Papua-New Guinea	50.0	49.5		--	--	--	--
Samoa	61.0	64.3		--	--	--	--

Table 1.1 (cont.)

Column Number	1	2	3	4	5	6	7
Country & Year Applicable if other than 1975-80	Expectation of Life at Birth Male	Expectation of Life at Birth Female	Year of Data	Age at First Marriage Male	Age at First Marriage Female	Years of Widowhood	Widowhood as Percent of Life after Marriage
Southern Europe							
Albania	68.0	70.7		--	--	--	--
Bulgaria (1974-76)	68.7	73.9		--	--	--	--
Greece (1970)	70.1	73.6	1979	29.2	23.9	8.8	17.7
Malta (1979)	69.4	73.4		--	--	--	--
Portugal (1975)	65.1	72.9	1978	27.6	24.7	10.7	22.2
Romania (1976-78)	67.2	72.2	1980	27.3	23.8	8.5	17.6
Spain (1975)	70.4	76.1	1976	26.6	24.0	8.3	15.9
Yugoslavia (1970-72)	65.4	70.2	1978	27.6	23.9	8.5	18.4
				Average of all countries			21.1

Notes: * data on life expectancy at higher ages indicates that females have greater life expectancy than males.
-- indicates data not available.

Sources: (1) expectation of life: United Nations, Demographic Yearbook 1981.
(2) age at first marriage: United Nations, Demographic Yearbook 1976, 1981 and/or comparative studies cross-national summaries, Int. Stat. Instit. World Fertility Survey #7, April 1980.

column 6 of the same table. The expected number of years of widowhood is in almost all cases quite substantial, in all but one case at least 5.0 years and in one case as high as 14.1 years. More meaningful perhaps is the relative importance of widowhood in the lifetime of the average married female. These estimates, given in column 7 of the table, reveal that, even when measured at the year of marriage, when it is both of less importance and less relevance as far as fertility is concerned[11] widowhood is a relatively important part of the married woman's life in almost all LDCs. The estimated percentage of such time ranges from lows of perhaps 10 percent in Nepal and Israel to highs of 30 percent or more in some African countries.

These figures should be treated with considerable caution, especially since the quality of the underlying data undoubtedly leaves much to be desired. It should also be borne in mind that, even at best, the data does not measure what we would like it to measure, i.e., expectations of life for a married man and woman of 20 or 25 years of age in the case of life expectancy, and the ages at marriage of rural males and females in the case of marriage age. Nevertheless, since for reasons given above the life expectancy differential between females and males is frequently larger at the more relevant higher ages than at birth and marriage age differentials are often greater in rural areas than in urban areas,[12] there is little reason to believe that widowhood is not as important as it is estimated to be in the table, comprising a minimum of something like 20 percent of a married woman's lifetime. Indeed, in some countries, regions and social groups and for married women beyond the age of 30 for whom fertility outcomes are more genuinely in the ream of choices, it could be considerably higher.

Therefore, while husbands are in large part taken care of during their old age by their younger wives, on average at least, wives have relatively long periods of widowhood to which to look forward.[13] If they are not able to provide for themselves through extrahousehold employment, the lot of such widows is not a particularly happy one. The problem is further compounded in many instances by restrictions on inheritance by women and by the fact that, where they do exist, formal old-age and disability insurance programs provide fewer benefits to women than to men.[14] Indeed, in rural India for example, at least until recently, the prospect of widows was regarded as sufficiently unfortunate that the commission of suicide on the funeral pyre of their husbands was both acceptable and common.

In most societies, however, suicide is no longer deemed to be an acceptable alternative, and widows are almost invariably partially or even totally dependent on support from their children -- usually their male children.[15] Not surprisingly, given that it is the female who has the greater concern for old-age security than the male, it is the female who generally plays the primary role in mending the generation gap, training loyalty and other activities which raise the probability that children will support them.

The relatively poorer extra-household employment opportunties for women especially in those Islamic societies where purdah is practiced, and the higher probability of extended periods of widowhood in rural areas of developing countries both tend to make the old-age security motive stronger for women than for men and especially so for those in rural areas of developing countries. The motive may also be stronger among women in those societies where female and especially wives' rights to inheritance are limited by law or custom.

One should bear in mind that several of the implications of the old-age security motive are different from those of alternative explanations for high fertility in rural areas of developing countries. For example, Caldwell's (1976, 1982) explanation stresses that high fertility in developing countries is attributable to the male head of household's ability to exploit children. According to Caldwell, therefore, it should be the male who would be more interested in numbers of children not the female as would seem to be suggested by the old-age security hypothesis. Caldwell's theory is not exceptional in this respect. Given the well-known dominance of males in most rural areas of most developing countries, most demographers and economists have depicted fertility decisions including those motivated by the old-age security motive as if they were the male's or at least the joint couple's. There are also differences between implications of the old-age security motive and the productive utility of children in agricultural activities. As noted above, the former is consistent with a negative or low rate of return on children, but the latter requires a high rate of return on children.

8. Relative Importance of Old-Age in the Life Cycle

Obviously, old-age security can be an important factor in human behavior only if it is considered to be relevant to the human life cycle. In the poorest of the poor sections of the least developed countries of Africa especially where life expectancy, even of those over 10 years old, is extremely low, old-age may simply not be a relevant consideration. The least developed countries may, therefore, not be the best places to conduct tests of the importance of the old-age security motive. In between the bottom end of the least developed countries and the developed countries

where other necessary conditions are violated, there is a wide range of developing countries where it may at least be relevant to test.

B. Existing Theoretical and Empirical Analyses of the Old-Age Security Motive for Fertility

1. Theoretical Studies

While he may have done little more than list "the utility derived from the prospective child as a potential source of security, either in old age or otherwise" [Leibenstein (1957, p. 161)] among the utilities that children provide to their parents, Leibenstein did the great service of bringing the old-age security motive for fertility into the mainstream of economic demography. He offered neither detailed explanations nor empirical evidence but he did suggest the testable hypotheses that the motive would be stronger at low levels of per capita income and in the absence of old age pension and other insurance programs.

In the context of attempting to demonstrate the viability of a "pay as you go" system of old-age security such as that in the United States, Samuelson (1958) carried the analysis a giant step forward by developing a two-generation life-cycle model. In such a model everyone is in one of two generations, the younger generation which constitutes the labor force and contributes to the support of the other generation, i.e., that of retirees. Samuelson demonstrated that the social security system of intergenerational transfers from younger to older would be viable indefinitely only if the base of the system were growing steadily -- either as a result of improved productivity or population growth. Subsequently, however, Aaron (1966), Samuelson (1975a, 1975b), and Arthur and McNicoll (1977, 1978) have shown

that Samuelson's conclusion holds only if (as seems quite unlikely in an LDC context) the capital-labor ratio can be maintained in the face of the higher population growth.

In a well-known paper Neher (1971) improved upon the Samuelson model by expanding it to three generations and by focusing more particularly on LDC conditions. Neher attempted to explain the fertility-enhancing effect of the old-age security motive as an externality. Specifically, the externality was said to arise when the parents do not take the welfare of their children into consideration in choosing their optimal number of children. Only if they weight the welfare of their children in their old age as equal to their own is the externality avoided and Neher's variant on the well-known golden rule of consumption, saving and growth maintained. Neher also shows that the need for excessive fertility can be avoided if private property accumulation and sale to children is possible. As Southey (1973) pointed out, however, Neher's explanation holds only if one assumes (unrealistically) that the number of grandchildren who compete with their grandparents for support from their parents (the children) is independent of the number of children.

The idea that high fertility may be associated with an externality is further developed and articulated in two recent papers by Willis (1978, 1979). Willis follows Neher in the use of an asexual overlapping generations model in which while people pass through the same three generations, namely childhood, adulthood and retirement. As in Neher and Samuelson during retirement the individual is entirely dependent on sources of income other than his (her) own labor. In an economy with no storabe assets besides children, Willis shows that in such circumstance it is possible to obtain a Pareto efficient solution without having to assume as Becker

(1981) did both altruism and the complete control of the household's resources on the part of the household head. However, in place of altruism (or tastes for children in the utility function of the household head), Willis assumed the existence of a sociological rule of the Golden Rule type such that one transfers to one's elderly parents as one would want to receive transfers from one's children during old age. Pareto optimality can be achieved, moreover, by such a rule even if the rate of return on investments in children were negative. This demonstration is rather important inasmuch as several studies have attempted to debunk the old-age security and other investment-oriented theories of fertility on the basis of empirical and/or hypothetical findings of negative rates of return to children [Enke (1966), Ohlin (1967), Mueller (1976)].

The negative externality arises when an alternative asset which can serve as a store of value is available. In such cases, the negative rate of return on children removes the incentives for fertility and, as a result, the population gradually disappears. The household, moreover, becomes non-viable. Even in this case, however, the adherance to a social norm of having children and the Pareto-optimal Golden Rule of intergenerational transfer can make for positive ferility despite the negative return on children. If transfers to the elderly are in fact smaller than would be the case if the Golden rule were adhered to, fertility will be positive and privately rational despite the negative rate of return to children and hence the social inefficiency of this fertility. Willis demonstrates that under such circumstances, the introduction of old-age pensions might both reduce fertility and raise welfare.

Also of relevance to and perhaps even partly responsible for the subsequent relative neglect of the old-age security motive are the simula-

tion studies of Heer and Smith (1968, 1969), Enke and Brown (1972) and O'Hara and Brown (1973). All of these studies assumed that the old-age security motive was important. With the use of dynamic programming and simulation techniques, they attempted to evaluate alternative strategies for satisfying that motive (e.g., in the sense of having at least one surviving son when the adult reaches age 65) given prevailing ages of marriage, infant and child mortality rates, etc., Heer and Smith in their study showed that relatively high fertility was necessary for satisfying the old-age security motive in LDC conditions. This result seemingly justifies the theoretical link between old-age security and fertility.

The more recent studies of Enke and Brown and O'Hara and Brown, on the other hand, showed that with wider child-spacing as would be possible through the use of some contraceptive techniques but not others (like vasectomies) the desired number of children and old-age support could be attained with relatively low fertility. The wider spacing of children accomplishes this by reducing infant mortality and increasing the time interval between generations. These latter studies therefore demonstrate that the old-age security motive need not be an explanation for or cause of high fertility. By the same token, the introduction of a formal old-age pension system need not be an efficient mechanism for reducing fertility and population growth. However, although the old-age security motive need not be fertility-increasing, it may well be anyway, especially if people do not behave as in an optimal programming model with lots of options and linear constraints. One should also bear in mind that there may well be more to the motive than simply having one surviving son at age 65. If one becomes disabled before 65, the surviving son may be needed earlier. Two sons may also be much better than one son in satisfying the old-age security motive.

What have we learned from the theoretical models? From the Neher and Willis theoretical models and the Heer and Smith simulation models we have learned that it is possible to explain high fertility in terms of the old-age security motive. Moreover, from Willis, in particular, we have learned that the old-age security explanation for high fertility need not rely on difficult-to-test assumptions about tastes for children, altruism and so on. We have also been shown by Willis that a situation could arise (in which adults transfer to their elderly parents less than they would like to receive from their children) where the high fertility is privately rational but socially undesirable (because of a negative rate of return on investments in children). As a result it could be possible to design a system of old-age pensions wherein fertility could be reduced while individual welfare would be increased.

On the other hand, the studies of Southey, Enke and Brown and O'Hara and Brown have shown how sensitive the results are to critical assumptions in these models the realism of which is certainly open to question. The micro models, especially Neher and Willis, have indeed succeeded in modelling decision-making with regard to old-age security concerns in the absence of efficient alternatives for satisfying these concerns which were two of the conditions identified in Section A above for the old-age security motive to be important. These studies, however, have abstracted away from all the other conditions (identified in Section A above) which would also have to be satisfied for the models' conclusions to be valid. From the simulation models we have learned how to embed more real world realities into the theoretical models.

Despite their shortcomings, therefore, by applying simulation techniques to such models, the models could be useful for purposes of distin-

guishing critical assumptions from unimportant ones. A more serious potential flaw in these models is their assumption of a unified decision-making structure. This prohibits any offsetting influences from arising. When such offsetting options are allowed, e.g., in Southey in the form of children making their own decisions about how many children they should have, or in Enke and Brown and O'Hara and Brown in the form of child-spacing decisions, the results of the old-age security models break down. In the next chapter, we provide evidence suggesting that this assumption of a unified decision-making framework is patently unrealistic, different agents, each with his (her) own objectives and constraints, make different decisions. The various decisions are interrelated but they are not all made simultaneously by the dictates of the household head. As a result there are various indirect effects that have to be considered making the net effect on fertility of the introduction of an old-age pension system much less certain. Particularly disturbing in the theoretical models is that, while formally, asexual, because of the need to justify the unified household decision-making framework, they are models of male head-of-household decision-making. This specification contrasts rather sharply with the rationale provided Section A above and the further evidence to follow in Chapter 2 suggesting that it is not the head-of-household but rather the wife-mother who is most concerned with old-age security, who plays a very critical role in fertility, and who finds children a particularly suitable instrument for satisfying her old-age security objectives. As a result there would seem to be a very distinct possibility of a gross specification error in the models that have been constructed to date.

Given these limitations, therefore, even taken together, the theoretical studies have by no means been convincing in demonstrating that the

old-age security motive can be an important explanation for high fertility. Indeed some of the studies have even tended to suggest that it is not a particularly important explanation.

The appropriate specification of realistic and hence policy-relevant models requires, therefore, much more information concerning how individuals behave. The measurement of behavioral responses to changes in exogenous variables such as the introduction of an old-age pension sytem, requires empirical studies. Empirical studies are therefore what are needed at this point. Several empirical studies have been undertaken but most of them, as shall be presently pointed out, are either badly flawed or of limited relevance to the effects of the old-age security motive.

2. Empirical Studies

The first empirical study was that of Friedlander and Silver (1967). As a quantitative study of the determinants of fertility in general, social security participation was only one of some thirty-three independent variables used to explain variations in fertility rates across countries in a sample of 18 developed countries, 20 intermediate countries and 47 underdeveloped countries. Indeed, the social security participation variable, as measured by the percentage of participants of all ages in the population aged 15-64 (SSP) was included in only one of 42 reported regression results. Because of missing observations for many of the countries, in this particular regression equation observations for only 13 developed, 10 intermediate and 10 underdeveloped countries could be included. While in the sample as a whole and in the first two subsamples, the coefficient on the SSP variable was negative and significant at the ten percent level, for the sample of 10 underdeveloped countries the coefficient was positive (but

not significant). Since according to the considerations discussed in the previous section, the effect of social security participation on fertility would be expected to be more strongly negative the lower the income and more underdeveloped the country, these results were somewhat surprising. Indeed, they led the authors to speculate that the reason was that the social security laws and programs are ineffective in underdeveloped countries [Friedlander and Silver (1967, p. 55)].

Quite naturally, the exceedingly general international cross-section study of Friedlander and Silver was followed up by Hohm (1975) which focused more specifically on the fertility effect of social security programs. Hohm's study also improved on Friedlander and Silver by increasing the number of observations and by adding a second social security variable, namely the level of benefits provided by the programs. Despite a relatively high R^2 and the fact that the coefficients on both social security participation variables were generally negative, the coefficients were generally not significant. Since the sizes of the relevant regression coefficients were quite large -- both absolutely and standardized for size of the variable -- Hohm attributed the lack of significance of the coefficients to collinearity among the regressor variables. As Entwisle and Bollen (1981) point out, Hohm's own procedures of including two related measures of social security participation -- the prevalence and depth of coverage -- in the same estimating equation and of filling in missing observations on the basis of the observed values of other regressors no doubt exacerbate the multicollinearity problem quite considerably.

Kelly, Cutright and Hittle (1976) and Entwisle and Winegarden (1981) point out that, there are other more fundamental problems in studies of this sort. First, is the serious matter of the direction of causation.[16]

Instead of the existence of social security programs reducing fertility, it could well be that the low fertility and resulting rectangularization of the age pyramid that accompany development cause people to demand social security programs of their governments. Second, Kelly, Cutright and Hittle (1976) demonstrate that, if development or modernization were more adequately controlled for, the relationship between fertility and social security would disappear. In his reply, Hohm (1976) denied this, demonstrating with a considerably larger sample of countries that significantly negative coefficients can still be obtained even after controlling for level of development or modernization. Entwisle and Bollen (1981), however, suggest that the results obtained by introducing such controls are likely to be sensitive to the functional form employed in the control.

Subsequently, Entwisle and Bollen (1981) and Entwisle and Winegarden (1981) have improved upon the international cross-section approach introduced by Friedlander and Silver, Hohm and others in the following ways:

(1) Rather than using separate indicators of social security which are bound to be related to one another, they construct a composite index combining the characteristics of (a) effectiveness (measured by the number of years elapsed since the program was legislated into existence), (b) coverage, (c) financial commitment (measured by the percent of gross domestic product spent on pension benefits) and (d) benefit level (measured by average yearly pension benefit expenditure per person over 65 years of age).

(2) They control not only nonlinearly for level of development or modernization but also for family planning as advocated by Mauldin, Berelson and Sykes (1978).

(3) To clarify the direction of causality, the social security variable is lagged -- alternatively by 5, 10 and 15 years -- to ensure both that the results would not be reflecting causality going from fertility to old-age pensions, and that appropriate time is allowed for the effects on fertility to be realized.

(4) To control more satisfactorily for cultural factors these authors utilize only developing countries in their sample and provide for both intercept and interaction term differences between regions through the use of regional dummy variables with interactions.

(5) The number of developing countries in the sample is further increased to 73.

Their results indicate that the social security variable has a significantly negative effect on fertility only when the 15 year lag is employed. The results are robust, however, to several other changes in specification.

Notably, none of the aforementioned studies provides empirical evidence for areas where the old-age security motive could be deemed important, namely rural areas of developing countries. Fortunately, however, several recent studies have sought to redress this deficiency by focusing more specifically on rural areas.

The first of these is the well-known article by M. and Carol Vlassoff (1980) (henceforth referred to as VV).[17] VV attempted to remedy the dearth of empirical studies on the old-age security motive for children (and particularly sons) in rural areas of developing countries by addressing a number of old-age-security-related questions to 357 ever-married men in a rural village in Maharashtra state in India. From the responses they concluded that the old-age security motive was in fact unimportant as far as fertility was concerned. In our opinion, their conclusion, though

widely cited, is most unwarranted and, if left unquestioned, would undoubtedly have the effect of setting back the serious investigation of the effects of old-age security motive rather than furthering it. The invalid or at least questionnable inferences are taken up one at a time in the order of their appearance:

1. Argument:

   Although admitting that joint families serve certain unspecified economic and social functions, VV argued that since "joint families represent a stage in the family", joint household residence should not be "taken as a reliable indicator of economic support" (p. 488).

   Comment:

   While it is true that there can be both other reasons for living together and other means of providing for economic support to one's parents, it should be recognized that (a) old age security is at least an important reason for different generations to live together, and (b) other means of support such as the provision of financial transfers to parents from outside the household may be imperfect substitutes for the support that is possible in joint households, especially in rural areas where, as we have noted in the previous section, medical care, food preparation, laundry and other services cannot easily be purchased in the market.[18]

2. Argument:

   "Because of the long interval between fertility decisions and security received from sons in old age," VV doubt that the present value of the security benefits could be large enough to affect fertility behavior (p. 488).

Comment:

Even if the time interval is relatively long, any such calculation would depend rather critically on the subjective value that the parent places on the value of security from the threat of being disabled and without anyone to take care of him (her). The costs assigned to any such calamity and hence the value of the means of avoiding it might well be regarded as extremely high. Moreover, because of the generally large age differential between husbands and wives in rural areas of India as well as other developing countries, and the typically shorter life expectancy of males than females noted in Table 1.1 above, the period of time between fertility decisions and dependence (in the form of widowhood) in the case of the female parent can be quite short, thereby negating the argument of VV.

3. Argument:

From responses to their questionnaire indicating that (a) the "actual and desired ages (or retirement) of village males are very similar," (p. 490), (b) "30 percent of men aged 60 and over were still working" (p. 490), (c) senility is both rare and subject to disapprobation by the villages (p. 490), (d) men aged 60 and over tend to have little or no leisure even if they live with their sons, (p. 491) and (e) only 12 percent of all the men sampled had living fathers who were not working (p. 491), VV conclude that "the magnitude of old age security in agricultural, less developed societies is, therefore, extremely limited" (p. 498).

Comment:

VV confuse and fail to distinguish between several rather different concepts. (a) Most importantly, the desire for old-age secur-

ity should not be confused with retirement and leisure. Old-age security is protection or insurance against inability to earn one's own support due to disability. Such insurance is by no means the same thing as retirement and leisure, nor does its possession necessarily imply that the possessor should be able to retire and do nothing but enjoy leisure. The value of insurance for disability and old age should, therefore, not be construed as being limited to those with either the misfortune to be disabled and unable to work or the fortune to have nothing to do. (b) Senility is but one relatively unimportant and rather special form of disability. Hence the fact that it is rare and disapproved of implies virtually nothing about the unimportance of old age and disability insurance. (c) The fact that only 12 percent of the males interviewed had fathers who were not working (mostly because they were not able to work) is more an artifact of the sample (almost half of the respondents being over 50 years of age) than evidence of the unimportance of old-age security. (Note also that the aforementioned 12 percent who were not working (and generally unable to work) constituted more than half of the fathers who were living.) (d) Moreover, the strategy of men to accumulate land and other assets as they grow older can be seen both as an instrument of generating loyalty on the part of their sons and as a means of making self-employment economically viable. In contrast to the conclusion of VV, therefore, the unimportance of retirement, leisure, senility and illness, on the one hand, and the importance of asset accumulation and diversification, on the other, imply nothing about the unimportance of the old-age security motive.

4. Argument:

VV interpret responses indicating that even the older men interviewed seldom "reflected upon" (p. 491), "thought about" (Table 3, p. 492) or "were pessimistic about" (p. 493) their old age security, as "casting further doubt upon the role of subsequent filial support in motivating fertility decisions" (p. 498).

Comment:

Since most of the men (especially the older ones) had wives and in many cases also sons living with them and had accumulated substantial amounts of land for inducing at least one son to stay with them, it is certainly not surprising that most of the men had little need to be concerned for their old-age security. Indeed, their lack of concern, together with the very considerable concern on the part of their poorer and less fortunate neighbors, rather than minimizing the importance of old-age security, actually underscores it. Relatively successful men obtain old-age security by (a) marrying a woman who is younger and likely to outlive him, (b) raising productive sons and (c) accumulating enough land so as to be able to hold onto at least one son. The fact that only those who are unable to do so are concerned with old-age security should not be interpreted as indicating that it is unimportant to other men and hence to men in general.

5. Argument:

While VV admit that "only 29 percent of respondents (aged 25-59) named persons other than sons as their expected providers in old age, and 55 percent stated that sons were their only prospective means of security" (p. 494), they attribute such responses to the pervasiveness of traditional social norms. Moreover, they belittle the validity and

meaningfulness of the above admission with the following observations that they consider to be inconsistent with the old-age security motive: (a) that village men willingly allow (some of) their sons to migrate to urban areas for work even though time away and distance from home are usually shown to negatively affect the propensity to transfer income back to one's home (p. 494), (b) the number of sons desired to stay at home for purposes of old-age security was negatively related to the total number of sons (Table 8, p. 494), (c) that fewer than half of the 67 men aged 60 and over felt that more educated sons would provide more help in their old age (p. 495), (d) that 11 of 18 dependent elderly men felt that they had provided their fathers with better support than they were receiving from their sons (p. 495), (e) that almost half the sons had not provided medical care to their fathers at the time of death, (f) that men aged 60 and over were receiving relatively little help of most kinds from their sons (the exception being the purchase of medicine) (p. 497), (g) that wealthier village men expected to be more secure in old age than less wealthy ones, which was interpreted to suggest "that economic resources, not an abundance of sons, are relevant factors, that determine security in old age: (p. 499).

Comment:

The degree to which any one of these observations should be considered contradictory to the old-age security motive, however, can and should be challenged. With respect to (a) above, the strategy of sending sons, especially those not needed at home, out to other villages and to other cities, rather than indicating the unimportance of sons for old age, can be better seen as a risk-reducing diversifica-

tion strategy motivated by the importance of old-age security in a context in which land is scarce and farm output is subject to the whims of local weather conditions. With respect to observation (b), the fact that the marginal utility of sons declines with the number of sons and that the importance of having more than one son stay with the father declines with the number of children hardly violates the validity of the old-age security motive. Likewise, with respect to (c), the higher wage rate that would be earned by an educated son may not offset the greater degree of independence and hence the lower propensity to transfer out of given income that education tends to generate. Observation (d) above, rather than ruling out the importance of old-age security, underscores the relevance of stability in expectations for the viability of present mechanisms for providing old-age security. Given that more than half of the men referred to in observations (e) and (f) above had living (and younger) wives, it should not be surprising that sons were not particularly important sources of support.[19] The fact that wealthy men are more secure than poor ones should not necessarily be taken to imply that only economic resources and not sons are important in satisfying old-age security. Wealth and sons are not necessarily only substitutes for one another. On the contrary, wealth in resource endowment and/or accumulation can be looked at as being complementary to rather than a substitute for the help of sons. The promise of inheritance is an excellent instrument for inducing sons to be loyal, and more land is likely to raise the marginal productivity of (family) labor and hence to induce sons to remain in the joint household.

Finally, even if all the inferences that VV draw from their

sample of village men concerning the unimportance of old age security were correct, in view of the fact that females (1) are likely to be dependent on their sons at much younger ages and for much longer periods of time (widowhood) than their husbands and (2) tend to have less education and lower wage rates in the labor market, such inferences would not necessarily contradict the importance of old-age security. On the contrary, it might merely serve to indicate that the motive could be expected to be more important for women than for men.

Another interesting and relevant rural-oriented empirical study, though according to the author not on the old-age security motive per se but rather on risk in the more general sense, is that of Cain (1981a, 1981b). Cain's more general concept of risk was meant to include in addition to disability and death the risks a of violent injury, destruction or confiscation of property, bad weather and even unemployment.

Cain compares three villages in Maharashtra and Andra Pradesh states of India with one in Bangladesh. The Bangladesh village is characterized by considerably greater risks of the aforementioned type than any of the Indian villages. All villages are poor but the Indian villages seem to have better sources of credit and stronger lateral relations, within extended family households than the Bangladesh village, thereby allowing Indian villagers to adjust to unwanted calamities more easily than Bangladesh villagers. Cain points out that fertility rates have remained high in the Bangladesh village but were low and falling in the Indian villages. The differences in fertility are attributed to the differences in risk and risk-coping institutions between the two groups of villages. Since women are particularly limited in their ability to cope with such risks in the Bangladesh village because of their exclusion from market activities due to local Islamic practice and tradition, they are more dependent on children

for support, especially during widowhood, than their Indian counterparts. As heart-rending evidence of the consequences of the greater risks in Bangladesh, Cain showed that a higher percentage of widows without surviving sons were forced to sell their land, or, if they didn't have land, to become completely destitute in the Bangladesh village than in the Indian villages.

While Cain deliberately distinguishes this kind of risk from old-age insecurity, the difference would seem quite inconsequential. The conditions for Cain's insurance motive for fertility would seem to be virtually identical to those which would make the old-age security motive strong. The application to the consequences for widows, moreover, is especially indicative of old-age insecurity. Implicitly, Cain is supportive of the proposition that the old-age security motive is greater among women than among men.

The main shortcoming of the study is, of course, that it provides really only two data points, i.e., the two groups of villages, thereby making it difficult to judge whether the many other factors that one would like to hold constant between the two groups of villages were in fact constant.

A third rural-oriented study and a study which relates both Cain's study and the international cross-section studies reviewed above is that of Nugent and Gillaspy (1983). This study attempts to explain intercommunity variations in the changes in fertility rates between 1960 and 1970 in a sample of 34 municipios in Mexico's Papaloapan River Basin. The Papaloapan River Basin was chosen because it is Mexico' s principal sugar cane-growing region and old-age pensions and other social security benefits were introduced to cane-growing farmers and cane-cutting workers but to few other

inhabitants of rural Mexico in 1963. Measuring the rate of participation in the social security pension programs by 1/(1-s), where s is the share of income from sugar in total agricultural income, Nugent and Gillaspy found that social security participation had a significantly negative effect on fertility. This finding, while not particularly strong, was relatively insensitive to various changes in specification, and held up even after standardizing for various other factors such as changes in the female labor force participation rate, per-capita income, the literacy rate, land tenure, commercialization and income inequality. The study estimated that an increase in social security participation from zero to 50 percent would reduce the child-woman ratio by more than 10 percent.

Shortcomings of the study are its limited sample size, the possibility of selectivity bias, and insufficient control for various cultural factors. Nevertheless, the study is a particularly useful and relevant one for calling atttention to the possible importance of the fertility-reduction effect of the introduction of an old-age pension system into a rural area.

Another rural LDC oriented empirical study of relevance to the old-age security motive is that of DeVany and Sanchez (1977, 1979). These authors attempt to test a modified version of the Neher model in which second period consumption i.e., consumption in old age, is not only dependent on transfers from the labor income of children but also on the probability of having land (a complementary factor of production), p_a, where p_a is positively related to the number of children. The reason is that in a situation where land markets are incomplete and then in excess demand for land, implying that such land is rationed, the number of children or number of people in the household may be one of the criteria used in rationing. As in the aforementioned study of Nugent and Gillaspy (1983), DeVany and

Sanchez choose rural Mexico to test their model because of the absence of alternative forms of old-age insurance and relatively high insecurity of land. Since the land retention benefits of children would be expected to be greater for those living on ejidal land (which cannot be bought or sold) than those on privately owned land, DeVany and Sanchez hypothesize that fertility and fertility-related variables would be higher for those on ejidal land than on other land.

Using cross-section data from the 1970 census, the show that cross-community variations in various measures of fertility and also of the marriage rate are positively and usually significantly related to cross-community variations in the share of ejidatorios in the agricultural work force, even after controlling for variations in infant mortality rates, female labor force participation rates, income and education.

Since (1) in practice the restrictions on rental of land by ejidatarios are not well enforced, (2) certain credit institutions have been developed especially for providing credit to ejidatorios and, (3) privately held land is also very insecure because of the threat of invasion by squatters and even in this case large families can serve as a deterrent to invasion, the rationale for expecting especially high fertility among ejidatarios would seem weak. Other shortcoming of their study are (a) multicollinearity which makes the results rather sensitive to small changes in specification and (b) the crudeness of the proxies used to measure both the relative importance of ejidos and some of the control variables, especially income. Notably, the aforementioned study by Nugent and Gillaspy which includes changes in the ejidal share as one of the right hand side variables in explaining changes in fertility across communities in rural Mexico found the coefficients of the ejidal share on fertility to be positive but insignificant.

Because of the close relation between the quantity and quality of children and concept of child services which joins the two, another rural-oriented empirical study that is relevant is the study on the demand for children's education in the Philippines by King (1982) in which a role is given to transfers from children to their parents. Indeed King's study also included an equation for the number of children. In a preliminary step she explains the transfers to parents of adult children per unit of quality in terms of a number of household characteristics including the level of educational attainment of the father and mother and the age of the mother. Then in a second step she uses household-specific estimated values of these transfer rates as right-hand side variables in the quality and quantity of children estimating equations. Her results show that the rate of income transfers by adult children to parents significantly raises the household's investments in quality of children, i.e., schooling, in the two different Philippine samples she used (Bicol and Laguna). The effect on the quantity of children was found to be positive and significant (at the 10 percent level) when the Bicol sample was used but negative and insignificant when the Laguna sample was used.

Although few of the variables used in the first-step of the procedure, i.e., arriving at household-specific estimates of the rate of transfer from adult children to parents per unit of child quality, are statistically significant, the results for the Bicol sample indicate that the transfer rate is positively related to wealth-type variables, whereas the results for the Laguna sample indicate the opposite. Since the transfer variable is in both cases correlated with wealth and other household characteristics, the estimated coefficients of this variable in the quantity and quality equations may be picking up wealth more than anything else, posi-

tively in the first instance and negatively in the latter instance. Also since the transfer rate variable is measured from transfers received at the time of the interview, it is undoubtedly a rather poor proxy for such expectations relevant to fertility decisions made at least ten years earlier (because the sample included only children of age 8 and above).

For the same reasons, the stronger and more consistently positive finding with respect to the effect of the transfer expectation on education can be attributed, at least in part, to the fact that the transfer expectation variable is a better proxy for decisions made with respect to education of these children (because of their more recent occurrence) and the expected positive relation among different forms of wealth (including human capital).

Before embarking on costly programs of social policy the benefits of which are uncertain, it has frequently been the case that governments or other institutions have attempted to overcome the usual problems of the type noted above in econometric studies of behavior under conditions which are far from controlled by undertaking controlled experiments with applications of the relevant policies. Notably, despite the aforementioned shortcomings of the aforementioned studies of the effect of old-age pensions, and the obvious applicability of experimental techniques in studying their effects, no such experiments have yet been carried out on the introduction of old-age pensions. There is, however, one interesting experiment of a related nature which can be considered relevant. This is the experiment with a "No-Birth Bonus Scheme" (NBBS) offered to married women on selected South Indian tea estates beginning in 1971. While a no-birth bonus scheme is, of course, something quite different from an old-age pension scheme, the fact that the no-birth bonus was to be paid into an account which was

usable only upon "retirement", in this case the end of the fertile portion of the woman's life cycle, gave it a character which was a combination of an old age pension system and a bonus scheme. The experiment is described and the results reported in Ridker (1980).

The study involved married women on 18 tea estates, divided into three groups, namely, three estates on which the NBBS was offered along with a comprehensive maternity, child care, educational welfare program designated CLWS which aimed at promoting the quality instead of the quantity in children, nine estates on which only the CLWS was initiated, and six estates as a control group in which neither program operated. Records were kept on approximately 1000 women in each of the three groups of estates. The results indicated that between 1971 and 1977 the crude birth rate fell, and contraceptive use increased in all three groups. The changes in the control group, however, were in keeping with the national trends in India, whereas in the other groups the trends were accentuated, especially in the group with both NBBS and CLWS. The crude birth rates, were about 39 (per thousand) on all three groups of tea estates in 1970-71 but by 1976-77 had declined to 21.9 in the first group (the NBBS-CLWS group), to 28.1 in the CLWS only group and to 34.1 in the control group. The decrease among those in the first group was found to be greatest among women aged 30-39 and among those who already had three children or more. 22 percent of the couples not previously sterilized in the first group undertook sterilization between 1971 and 1975. The comparable percentages for the other groups were 19 percent for the CLWS-only group and 10 percent for the control group.

Shortcomings of the study are that (1) the population of the tea estates is not very representative of the rural Indian population as a

whole (high percentages of the population on such estates being Christian and tribal minorities), (2) some workers on the tea estates were already affiliated with the Provident Fund, an old-age security type pension fund, (3) the schemes were implemented and administered in less than optimal ways which left many people on the estates uncertain about their participation, the nature of the benefits, the purpose of the program, etc., (4) only group means are represented with incomplete consideration given to differences other than educational levels in external or internal conditions between the three groups, (5) that the time period studied may have been insufficiently long to capture the full effects, and (6) at least for current purposes, the experiment was only of limited relevance to the old-age security motive. Nevertheless, despite the shortcomings both in the study and the experiment itself explained in Ridker (1980), the considerably sharper reduction in the crude birth rate in the pension-type NBBS-CLWS group than in the CLWS only or control groups is certainly worthy of attention.

As mentioned in the introduction to the study, the most common shortcomings of the existing studies have been the following:

1. None of the theoretical studies is sufficiently comprehensive to be able to incorporate the indirect as well as the direct effects on fertility of the introduction of an old-age pension system.

2. Few of the empirical tests have utilized data collected from people living in conditions where the old-age security motive could be expected to be strong, namely rural areas of developing countries. As a result, even at best few existing studies may be considered relevant.

3. Of the few studies that do apply to rural areas of LDCs, hardly any have focused on women who (for reasons given in Section A) are the

people for whom the old-age security motive would be expected to be strongest. Since the best known study, and that which came up with findings most negative to the old-age security motive [Vlassoff and Vlassoff (1980)] deliberately excluded women entirely, the strength of the old-age security motive may well be substantially underappreciated.

4. Another reason for believing that the old-age security motive and hence the effect of the introduction of an old age pension program on fertility may be underappreciated is the fact that by and large the studies revealing these to be most significant have been those that have been relatively more successful in minimizing methodological flaws.

5. Even the best of the existing studies are of limited importance and relevance because (a) their sample sizes are small, (b) they fail to control for many other relevant influences, (c) their samples may not be representative of the relevant populations and (d) they are unable to identify which among the various mechanisms whereby fertility could be affected by the introduction of an old-age pension program are the most important.

C. What People Say about the Old-Age Security Motive for Children

The previous section has documented the dearth of both systematic and sufficiently realistic theorizing and techincally sound and relevant empirical studies concerning the old-age security motive and/or the effects of the introduction of formal old-age and disability pension and insurance systems in rural areas of developing countries and especially on female attitudes and behavior where and for whom they might be of greatest importance.

Given the rather negative conclusions as to the importance of the motive that have been drawn from the existing studies, and especially some

of the better known ones, we deem it relevant to turn to a somewhat different literature, mainly descriptive case studies and village surveys, to see what rural people in general and rural women in particular have had to say about the old-age security motive.

While we do not pretend that our survey of this literature is exhaustive, we have made a deliberate attempt to draw upon the literature for many different regions of the world so as to minimize the danger of generalizing from interviews of those in some or a few parts of the developing world which may not be representative of the totality of that world.

Among societies where interviews have turned up the importance of children as sources of old-age security are:

1. China both pre-revolution [Lang (1946)] and post-revolution [Parish and Whyte (1978)]

"Though high fertility may have had marked disadvantages for the population as a whole, the immediate concern of the average farmer was his own welfare and that of his family. He did not think in terms of what would happen a hundred years hence if everyone managed to raise seven or eight children. He thought instead of his old age, his duties to his ancestors, and the possibility of enlarging his farm. More children meant more sons, and more sons more labor, a larger farm, and a more comfortable old age [Wolf and Huang (1980, p. 283)].

We list China first because it is frequently referred to as the example *par excellence* of the importance of the old-age security motive.

2. Indonesia (Java) [Nag, White, and Peet (1978)]

It seems that, to a very great extent, parents rely on their own (including adopted) offspring, etc., at least for their immediate, day-to-day support. A couple with few or no living children is often eager to adopt one or more, preferably from among the children of a sibling or other close relative, precisely to ensure this kind of support. (p. 299)

3. Nepal [Nag, White, and Peet (1978)]

...this indicates that here, too, most elderly persons depend on their children, children's spouses, or grandchildren. (p. 299)

4. Solomon Islands [Keesing (1970)]

5. Japan [Smith (1977), Arnold et. al. (1975)]

6. Mexico [Ryder (1976), Van Keep and Rice-Wray (1975), Nugent and Gillaspy (1983)]

Note for example in the Van Keep and Rice-Wray KAP study that almost 40 percent of the urban women interviewed agreed that "having many children is a guarantee of being well-looked after when one is old."

7. Botswana [Mueller (1979)]

"The desire for large numbers of children on the part of poor rural women probably is motivated by this striving for security rather than by the value of child labor" (p. 30).

8. Kgatla, South Africa [Nag (1962)]

Among the principal factors behind the high level of fertility was the fact that "parents rely upon their children for support in their old age" (p. 29).

9. Ceylon [Nag (1962)]

Old people depend on their sons for economic security. Often aged parents, especially when widowed, live with the eldest son. (p. 45)

10. The Chagga of the foothills of Mt. Kilimanjaro in East Africa

Moore (1978) summarizes the plight of the old women in the village without married sons by saying..."The flaw is that, lacking sons with families nearby, they find themselves surrounded by kin whose interest in them is secondary rather than primary in the Chagga hierarchy of intensity of relationships and obligation."

11. Yugoslavia [Simic (1978)]

"However, most Yugoslavs would undoubtedly consider that in the normal course of events children will care for their elderly parents as a moral imperative and that parents in turn will view this relationship not as one of demeaning dependence but rather as an opportunity to further engage in the exchanges which have typified their entire life cycle." (p. 103)

12. Korea

According to Arnold et. al. (1975) 71 percent of rural respondents to questions about the value of children indicated that they expected to rely

on children for financial support in old age.

13. Philippines [Arnold et. al. (1975)]

14. Thailand [Arnold et. al. (1975)]

15. Bangladesh [Cain (1981)]

16. Nigeria

Both husband and wife respondents to the Changing African Family Project -- Nigerian segment described by Caldwell (1974, 1982) indicated that "major support of family in father's old age or after his death" was the most important reason for wanting some male children. The percentage giving this response was somewhat higher for the wives than the husbands. As Caldwell emphasizes, there is nothing necessarily inconsistent between investments in education and satisfaction of the old age security motive: "... the main aim is that the child should obtain employment with guaranteed tenure and regular salary that will permit help to be given to parents no matter what disaster should strike them -- blighted cocoa crops, drought, flood, cholera, urban unemployment, a succession of funerals or many other domestic or village crises." [Caldwell (1982, p. 68)].

17. India [Nag (1962), Babu (1979), Vatuk (1980a,b), Mandelbaum (1974)].

"In India it is expected that when a person grows old he will be provided a home by his married sons." [Vatuk (1980b, p. 4)]

"...sons are the only reliable form of social security for the aged in the traditional system"..."It is generally agreed that providing for old age is one of the major motives for a high rate of reproduction, particularly among rural Indians" [Vatuk (1980b, p. 5)]. From the interviews with household heads in a large national survey of rural India known as the Additional Rural Income Survey carried out by the National Council of Applied Economic Research (1975) it can be seen that more household heads

gave the old-age security benefits of children as their primary reason for having children than for any other reason.

18. Malaysia

From the Malaysian Family Life Survey, a national sample which will be utilized extensively in subsequent chapters, 41.51% of the men and 45.70% of the women gave the lack of help from children in old-age as the most important (out of 6 listed) disadvantage of a small family (i.e., of having only about three children). These percentages were considerably higher, moreover, among those respondents from rural areas.

This brief list of societies in which the old-age security motive has been alleged to be of considerable importance in fertility behavior is certainly incomplete. Undoubtedly, it can easily be supplemented.

19. Cross-Country Studies

One of the more comprehensive investigations of the importance of the old-age security motive for children in a variety of countries is the Value of Children project. The second phase of this project involved detailed, in-depth interviews with some 20,403 married young adults in nine countries, two of which are highly developed, Germany (Federal Republic) and the United States, and one of which may be regarded as somewhat developed, Singapore, and the rest less developed, Indonesia, Korea, Philippines, Taiwan, Thailand and Turkey. For each of many reasons given, each respondent was asked to indicate, using a 3-point scale, how important each reason was. The results as reported in Kagitcibasi (1982, Table 1, p. 34) are given in Table 1.2.

Several characteristics stand out in these results and their relevance to the hypotheses derived in Section A above. First, the old-age-security value of children is seen as great in developing countries but not in developed countries. Second, in every country -- developed or developing

alike -- the percentage of women giving old-age security as a very important reason for having a child is greater than that of men. The same is true of the old-age value of children as the "reason for wanting another child" in all countries except Taiwan (perhaps because of its rapid development in recent years).

As shown in Table 1.3 somewhat similar results were obtained from the question "would you expect your sons(s) (daughters) to support you financially when you grow old?" Specifically, in each of the less developed countries at least 79 percent of the women and 76 percent of the men responded "Yes" as far as their sons were concerned. In the somewhat developed country (an entirely urban country), Singapore, these percentages were 39 percent and 31 percent respectively and in the United States 12 percent in both cases. This table also supports a third proposition mentioned above, namely that male children are more important in this respect than female children.

An even more comprehensive survey is that of 173 "Knowledge, Attitude and Practice" surveys undertaken between 1950 and 1970 in various parts of the world. As reported by Mathew (1975, p. 103) the results revealed parents' "evaluation of children as the source of family strength and the economic anchor of the family and sons as the security against old age" to be the major motive for desiring children. See also Bulatao (1979).

Of course, this is not to say that it is the dominant motive or that people who mention the old-age security motive in interviews may not be attributing to this motive what are closely related but nevertheless distinct kinds of motives. By the same token, however, other motives mentioned in such interviews, such as "survival," "viability," the desire for survival of the family line," and "prestige," may well be proxies or guises

Table 1.2

The Old Age Security Value of Children (in percentages)

	As reason for having a child						As reason for wanting another child					
	Women			Men			Women			Men		
	NI[a]	SI	VI	NI	SI	VI	NI	SI	VI	NI	SI	VI
Ger[b]	68	24	8	-	-	-	79	17	3	-	-	-
Jav	1	6	93	2	9	89	8	10	82	15	12	73
Sun	0	2	98	1	5	94	6	9	84	23	13	64
Kor	19	27	54	33	27	40	64	18	18	74	13	12
Phil	2	9	89	3	11	86	10	12	78	10	12	77
Sing	13	36	51	17	39	44	15	37	48	18	39	43
Taiw	7	14	79	11	17	72	37	15	48	33	15	53
Thai	3	18	79	6	23	71	5	24	71	10	24	67
Turk	8	15	77	8	15	77	38	14	48	50	14	37
USA	73	19	8	75	18	7	73	18	9	75	17	7

Notes:

a. NI: not important; SI: somewhat important; VI: very important.

b. The abbreviations for countries stand for (in alphabetical order): the Federal Republic of Germany; Javanese and Sundanese (Indonesia); the Republic of Korea; the Philippines; Singapore; Taiwan; Thailand; Turkey; the United States of America.

Source: Kagitcibasi (1982, Table 1, p. 34)

Table 1.3

Expectation of Financial Help from Sons and Daughters,

Expressed in Rounded Percentages

Would you expect your son(s) daughter(s) to support you financially when you grow old?

	Jav[a]		Sun		Kor		Phil		Sing		Taiw		Thai		Turk		USA	
	S[b]	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
WOMEN																		
No	6	7	9	10	9	45	6	7	5	8	12	56	8	9	9	22	86	87
Depends	9	9	12	20	6	9	8	7	55	61	3	5	4	4	0	0	2	2
Yes	85	83	79	59	85	46	86	85	39	31	85	39	89	87	91	78	12	11
MEN																		
No	9	10	6	6	17	52	8	10	7	9	19	67	16	19	16	36	85	88
Depends	13	13	8	9	5	7	10	10	62	66	5	4	6	6	0	0	3	2
Yes	79	77	86	85	78	42	82	80	31	25	76	29	78	75	84	64	12	11

Notes and Sources: Same as in Table 1.2

for the old-age security motive. Hence, there is very considerable prima facie evidence for the relevance and importance of the old-age security motive for fertility in rural areas of LDCs.

D. Purpose of the Study and an Outline of the Presentation

As mentioned above and more fully explained in the next chapter, the effects of an old-age pension system on fertility need not be only direct, such as can be captured and understood in terms of the simplistic theoretical models or single equation regression estimates of the type that have characterized virtually all studies to date on the subject. For example, from the previous section it should be obvious that old-age pension systems could reduce the prevalence of extended households, and household fragmentation itself could have its own effects on fertility.

Likewise, from studies of developed countries the introduction of old-age pension systems have been known to reduce savings rates, and hence capital accumulation and also to shift the life cycle profile of labor force participation. Since changes in wealth and labor force participation are also generally acknowledged to have effects on fertility, the indirect effects of the introduction of old-age pensions by way of such changes should not be excluded.[20]

In the absence of an existing theoretical model capable of dealing with all of these aspects of the relationship between the old-age security motive and fertility, this study starts from scratch by surveying the relevant descriptive literature on family life and household decision-making. This is done in Chapter II which follows.

From this literature review and constant communication back and forth between it and our own, somewhat eclectically identified building blocks of

the relationship between old-age security and fertility, there have emerged several potentially important implications, not only for the analysis of the old-age pension motive, but also for both theory and policy with respect to rural development and the determinants and effects of fertility behavior in rural areas of developing countries.

The major building blocks or links between the introduction of an old-age pension system and fertility are: the effect on household structure, the effect on age-at-marriage (especially of the female), the effect on fertility relative to natural fertility (which is determined in large part by duration of marriage), and the effect on savings, investment and the allocation thereof. These building blocks, or stages in the overall process, need to be analysed separately because the key decisions in them are made by different decision-makers, often at different points in time and with different information available and subject to different constraints. This is done in Chapter III. As is articulated in Section E of Chapter III, however, these stages or links are closely interrelated, the result being that indirect effects arising from these interdependencies may outweigh the direct effects.

In subsequent chapters the theoretical models are operationalized for econometric estimation and then estimated with two different micro data sets.

The strategy followed in the empirical work is to compare the various relevant kinds of behavior of households, individuals and couples who are participating in formal old-age pension programs with those of other but similar households, individuals and couples who are not eligible for old-age pensions. One form or kind of behavior is treated at a time, and each stage in the analysis is dealt with separately.

Chapter IV describes the data set utilized in the first portion of this study, namely that of the Additional Rural Income Survey (ARIS) pertaining to a national weighted random sample of households in rural India for the years 1969-1971. This data set was developed under AID support by the National Council of Applied Economic Research (NCAER). Although there are some significant shortcomings in the ARIS data set in the context of the present study, it does at least contain information relevant to all of the modules specified in Chapter III and it is one of the largest and best microdata sets available for a developing country. The chapter also includes the detailed econometric specification of each module and descriptive statistics from the sample on the variables relevant to each such module.

Chapter V describes the estimation procedures and specific problems faced in empirical estimation and presents and interprets the empirical results based on the Indian data. Chapter VI pulls together the main results for rural India, traces the impacts of the old-age pension program both direct and indirect through the various stages of analysis and summarizes what has and has not been learned, leaving the reader with several important suggestions for further research.

Chapter VII describes the Malaysian Family Life Survey data used in the second phase of the empirical analysis. It also discusses modifications in the various modules that were thought to be relevant to Malaysia. Chapter VIII presents and analyses the results of the revised version of the model utilizing the Malaysian data. Chapter IX compares the results obtained for India and Malaysia, calls attention to both the policy implications and the implications for future research that emerge from the analysis.

Footnotes to Chapter I

[1]See for example International Labor Organization (1981) and Oppong (1982).

[2]See, e.g., Friedman (1957, 1972), Feldstein (1974, 1975, 1976, 1977), Munnell (1974), Pellechio (1979), Lasch (1979), and other studies surveyed in Nugent and Gillaspy (1983).

[3]See, however, Entwisle and Weingarten (1981).

[4]See Datta, Nugent and Tishler (1983) for an explanation.

[5]This point was made persuasively by Parsons (1977).

[6]For more extensive discussions of these issues see Arrow (1963), Akerlov (1970), Spence and Zeckhauser (1971), Rothschild and Stiglitz (1976), Wilson (1977) and the useful summary which is related more specifically to the present context by Pollak (1982).

[7]On the role of social norms in individual utility functions see Pollak (1982), Kuran (1983a, 1983b) and Datta, Nugent and Wang (1983).

[8]For evidence of this, especially in the Caribbean and West Africa, see Smith (1962), Goode (1963), Oppong (1973) and Sanchez (1976).

[9]More details and references on these influences will be given in Chapter II below. Also see Habakkuk (1955) and Parsons (1983a, 1983b) who cites historical evidence suggesting that fertility declined sharply in France following the imposition of bequest equality around 1800.

[10]Even among the Tiwi, however, children (especially female children) play an important role in this process, not only for the brideprice they can command, but also for the interhousehold alliances or networks that arise from their marriages.

[11]One should bear in mind that the greater room for discretion about fertility and source of variation in completed fertility among women is generally fertility after age 30. As the reader can easily determine relative importance of widow-hoold calculated at such a date would typically be considerably higher than that at marriage shown in column 7.

[12]For evidence see Arnold, Retherford and Wanglee (1977).

[13]For additional support and rationale for this proportion see also Cain (1982).

[14]See for example Laroque (1972), U.S. Department of Health, Education and Welfare, Social Security Administration (1973), Gelber (1975), Task Force (1978), Ben Israel (1979), Voirin (1982) and Oppong (1982).

[15]For evidence of the preference for male children in this respect see Arnold et al. (1975), Arnold and Fawcett (1975), Kagitcibasi (1982) and Lee (1978).

[16]Hohm had tried to avoid this problem by using for the SSP variable data from 5 years prior that for this fertility varible. Since such participation tends to change only very slowly, doubts can easily be raised about the adequacy of this adjustment.

[17]This section is taken from Datta and Nugent (1983).

[18]See, for example, Shah (1974) and Vatuk (1981).

[19]Not only is the marrying of a young wife consistent with the old-age security motive but so too is the tendency for some assets, especially those transferred at marriage, to take the form of land in the wife's name and jewellery which can easily be liquidated if necessary in case the husband is disabled.

[20]All of these effects will be more thoroughly discussed in the following chapter.

CHAPTER II

A SURVEY OF THE DESCRIPTIVE LITERATURE AND ITS IMPLICATIONS FOR MODELING

The recent economic modelling -- both micro and macro -- of marriage and fertility behavior have increasingly utilized the simultaneous equation approach wherein fertility and/or marriage decisions are depicted as being made simultaneously with those of labor force participation, education, savings and household formation. This framework has many advantages in attempting to capture indirect influences and for analyzing the interdependencies which indeed exist among these variables in a relatively simple manner. The simultaneous equation framework, however, is justifiable only if (a) the various decisions related in the analysis are made at more or less the same period of time and hence with the same available information and (b) the various decisions are made by the same decision-maker so the same objectives or utility functions and resource constraints apply in all cases. How realistic are these assumptions? As explained below, there are indeed serious reasons for doubting the validity of either assumption.

The failure to realize the important degree to which the realism of the assumptions, especially assumption (b), is violated is rather astonishing. This failure would seem attributable to the extremely casual regard that has been given to the precise identification of the appropriate decision-makers in household decisions. The result has been considerable ambiguity and inconsistency from one analyst to another about who the relevant decision-maker is, e.g., the household head, the wife, the married

couple, or the household. Quite frequently the decision-making unit is chosen quite arbitrarily seemingly for convenience according to how the data comes or can be most easily collected.

Apart from the rather arbitrary treatment of the relevant decision-maker, following Becker's influence, economic models of marriage decisions in particular, even those in LDCs, have treated them as if they are decisions made by independent individuals who invest in the search for a suitable marriage partner until the likelihood that they would find a more suitable partner by further search is not sufficiently high to justify the extra investment in search.

Other common characteristics of economic models are: (1) that, prompted by the importance of explaining the demographic transition, considerable attention has been given to the relationship between fertility and infant mortality and the various possible lags between decreased infant mortality and reductions in fertility, and (2) that the structure of the household is generally considered to be exogenous[1], in the sense of not being explained in the analysis, even though marriage, migration and fertility decisions all have obvious implications for household structure.

As we pointed out in the previous chapter, the effects of any old-age security system on fertility could be expected to materialize in large part only indirectly through changes in household structure, resource allocation (including labor force participation, savings and investment), age-at-marriage, and infant mortality. Given the breadth of scope that would therefore be required in order to adequately analyze such effects, in the present chapter we provide a brief survey of the descriptive literature -- from case studies, attitudinal surveys, village studies and cultural ethnographies. We then use this survey in order to derive some implications for

judging the adequacy of the aforementioned conventional economic modelling approach and for suggesting better methods for modelling such phenomena.

Our presentation is organized as follows: Section A concerns the choice of the appropriate decision-making unit for the different decisions that comprise components of the overall relationship between old-age security and fertility. One of those components is household structure which, as suggested in Section B, arises as the resultant of both household affiliation and partition decisions, and marriage and fertility decisions. Section C concerns the allocation of the household's resources including marriage decisions, while Section D deals with fertility decisions and infant mortality and the interrrelationships between them. Section E more briefly reviews the economics literature mainly dealing with the effects of social security programs on resource accumulation and allocation. In Section F we bring out the salient points from each of the preceding sections and derive some important implications for how the relationships under consideration should be modeled.

A. The Choice of the Appropriate Decision-Making Unit in Decisions Relevant to the Relationship between Old-Age Security and Fertility

As noted above, economic studies have often taken the decision-making unit for granted, merely adopting that unit, be it the individual, the household head, or the firm, which happens to be analytically or statistically convenient. Once the decision is made, the aforementioned tendency in the literature toward the use of more sophisticated general equilibrium models (as opposed to earlier partial equilibrium models) has brought with it the implicit assumption that the unit of analysis, i.e., the decision-making unit, is common to all the decisions made simultaneously. This

assumption of a single utility function, when applied to household demographic behavior, implies that the welfare of children and other family members enters the utility function of the single decision-maker even in cases where the objective is to explain the determinants of family composition [Nerlove (1974)]. Is this assumption sufficiently realistic? This is an important question because, if the answer is "no," many of the conclusions derived from such studies may be invalid.

We begin with household behavior. Most of the descriptive literature stresses that most of the important allocational decisions are made at the level of the household. There is some controversy in the literature with regard to the appropriate unit of analysis for studying such behavior. Some, e.g., Kessinger (1974), argue that the common property holding group is the appropriate unit of analysis. Others argue that a higher level, e.g., the clan, tribe, or set of persons with common kinship relations, is the appropriate unit of analysis. The majority, however, seem to favor the residential household as the appropriate unit of analysis for most forms of behavior. Although there are merits to the other perspectives, we find compelling the arguments in favor of the residential household as the basic unit of analysis for most resource allocation decisions [Sahlins (1972, Chapter 2), Shah (1974), Sanchez (1976), Ben-Porath (1977, 1980), Simic (1978), Parry (1979)].

As Carter and Merrill (1979), Nag (1962), Shah (1974), and others point out, however, it would seem important to allow for different individuals or subunits of the household (especially in the case of "extended" family households) to play different roles in different decisions. Clearly, different subgroups are relevant in deciding whether or not to live in a joint family or to separate; the head of the household may be the rele-

vant decision maker for many decisions, especially those involving the allocation of resources; yet as shall be pointed out below, wives are of special importance as far as fertility decisions are concerned. The relative importance of different individuals in some forms of behavior may vary from society to society, but within any society certain norms can generally be detected (Nag, 1962).

Moreover, even if different decisions are made by the same individual or sub-group within the household, numerous instances in which there are inconsistencies in the ranking of alternatives and/or irrationalities can be cited. These inconsistencies are likely to be especially noticeable when, because of changing circumstances, priorities in objectives vary from one decision to the next. Hence, even if different decisions should, in fact, be made by the same individual or subgroup, in practice the consequence may be the same as if they are made by different individuals or subgroups in that different objective functions or constraints are relevant to the different decisions. Moreoever, if they are not made at precisely the same time, the informational content to even the same constraint variables will vary.

B. Household Structure and Type: Determinants and Effects

Once one adopts the household as the basic unit of analysis in the rural LDC context, one has to come to grips with and take account of both the considerably greater diversity of household types that exist compared to DCs and the determinants as well as effects of these different household types. Households vary widely in size and structure in most rural areas and may be subject to systematic changes over time. These changes, moreover, may be intimately related to the fertility and other decisions made within the household [Carter and Merrill (1979), Birdsall et. al., (1979)].

1. Effects

Following the lead of Chayanov (1925), the effects of household structure on household expenditure and allocation patterns, farm size, land tenure and numerous other forms of behavior have been widely studied. In many cases, behavior has been found to be significantly different in households of different structure. Of particular interest and importance for fertility behavior are two complementary hypotheses; first, the hypothesis of a secular trend in household types toward the nuclear type that dominates in "western" developed countries [Bailey (1957), Epstein (1962)]; and second, the hypothesis that the institution of the extended family contributes to the high fertility rates prevailing in most rural areas of developing countries. For example, Davis (1955) argues that extended families would favor high fertility rates by lowering the costs of bearing and raising children, by reducing the age at marriage as a result of removing the need to accumulate savings for household formation, and by increasing the incentive for a wife to have children early in marriage so as to induce her husband to split off from the parental household, thereby protecting her from her in-laws. [See also Lorimer (1954), Davis and Blake (1956)]. The transition from "traditional" extended family households to "modern" nuclear ones would then be expected to lower fertility rates gradually over time.

How do these seemingly plausible hypotheses stand up in front of the evidence, historical and other?

First, there does not seem to be any compelling evidence that there has been a general trend toward nuclear households, either from historical studies of developed countries, e.g., by Laslett (1972a, 1972b), Goody (1972), Anderson (1972), Andorka (1975), Berkner (1976), Waters (1976),

Goody, Thirsk, and Thompson (1976), or from cross-sectional or historical studies of LDCs, e.g., Kessinger (1974), Orenstein (1961), Gore (1968), Rao (1968), Karvé (1963), Avalaskar (1966), Shah (1974), and Kolenda (1967, 1968) for India, by Cohen (1976) for China, Little and Price (1974) for Africa, and Fukutaki (1967) and Smith (1977) for Japan.

The second hypothesis, that of higher fertility in extended family households than in nuclear households is also open to challenge on several grounds [Stykos (1958), Burch and Gendell (1972), Carter and Merrill (1979)]. While the possibility of living in the extended family may make it easier as far as the couple is concerned to marry and raise children, the joint household as a whole has to face up to the costs of financing marriages (which include both bride price or dowry payments and the costs of often elaborate wedding feasts and can thus be major investments as far as the household is concerned) and of feeding and raising the children in those households. These pressures, of course, would serve to limit fertility in extended family households.

Historical studies in Europe and elsewhere, moreover, have revealed cyclical movements in household size, thereby demonstrating that both nuclear and extended households can be consistent with either high or low fertility [Laslett (1972a), Tilly (1978)]. The historical cycling evidence has been supplemented by the cross-sectional observations by Nag (1962) and Goode (1963) suggesting that fertility behavior of both nuclear and extended households can vary considerably as conditions change. This evidence greatly weakens the case for necessarily believing fertility to be higher among those living in extended family households than in nuclear households, and suggests the importance of detailed empirical studies.

Empirical studies of India by Nag (1967), Pakrasi and Malaker (1967), Bebarta (1977) and Shah (1974) and of other countries by Freedman,

Takeshita, and Sun (1964), Liu (1967), Gendell and Burch (1970) and Aghajanian (1978) have yielded ambiguous results on the effect of household structure on fertility. Much of the ambiguity of the results may be attributable to the rather arbitrary distinctions that have frequently been drawn in such studies between those households that have been classified as "nuclear" and those that are "extended" [Shah (1974)] and from other shortcomings in data and research design [Bebarta (1977), Shah (1974), Burch and Gendell (1972)]. Since the household structure tends to vary with the life cycle of the family, it would seem important to distinguish the character of the household of current residence of the woman from that of her past residence, a distinction which has not generally been made in such studies [Burch and Gendell (1972)]. Most importantly, as Shah (1974), Burch and Gendell (1972), Parry (1979), and Carter and Merrill (1979) have all persuasively argued, there may be a self-selectivity bias problem and also interdependencies between fertility and household structure. As a result, more complex analytical models and testing procedures must be used in order to separate out the influences of other differences, such as those of wealth, occupation, education, and religion, between nuclear and extended households and to determine the extent to which household structure causes fertility rather than vice-versa. It is therefore important to distinguish sharply between (and yet to consider both) the determinants and effects of household structure.

2. Determinants

With respect to the determinants of household structure (an issue which has been largely neglected in the formal modelling literature[2]), several interesting and potentially important hypotheses can be found in the descriptive literature. Among the most important are:

(1) Households go through a life cycle with respect to size and structure. Indeed, Fortes (1949), Goody (1958, 1972), and others have suggested that this natural life cycle of the household is its most important feature, and therefore that position in the life cycle may be the most important and perhaps even sole determinant of household size and structure. More detailed investigations, however, e.g., by Kolenda (1968), Shah (1974), Parry (1979) and others, tend to illuminate the rather wide variations that exist in household structure even after taking account of position in the life cycle.

(2) Decisions to partition the household are brought about largely by personal rivalries and personal conflicts within households which are random in occurance. Recently, however, some anthropologists, e.g., Shah (1974), Kolenda (1968), Parry (1979), Carter and Merrill (1979), have become increasingly skeptical of this view, finding variables that seem systematically related to the probability that these conflicts result in partition.

> Although personalities undoubtedly come into it, such decisions are not, I suggest, a purely random outcome of individual whims of a man's sudden realization that he can no longer face the prospect of living at such close quarters with his brothers. The crux of the case I shall argue below is that these individual decisions conform to a pattern which can only be understood in the light of a set of material constraints imposed by the employment and inheritance prospects of men, and by marriage strategies of fathers vis-a-vis their children. (Parry, 1979, p. 179)

Household affiliation and composition are in this light the outcomes of individual or group strategies of how to do the best one can within the relevant resource and other constraints. They are the net result of various competing centrifugal and centripetal forces. Not surprisingly, the factors involved and their relative importance tend to depend on the type of relation, with father-son and intergenerational relations generally

being stronger and subject to somewhat different pulls and pushes than those between siblings.

(3) The propensity to partition may be affected by societal norms which can be deviated from only when one is willing to pay a price in terms of moral and other sanctions. Both the norms themselves and the sanctions against their violation vary from society to society. In India, for example, the norms and the moral sanctions on those who sever familial relationships prematurely (as for example the partition of a household by a son prior to the death of his father) are considerably stronger in the case of father-son relations than in other cases. As Parry (1979) points out, it is the combination of these societal norms and environmental constraints which serve to condition household affiliation and hence formation and partition decisions.

> In any single instance partition takes place because individuals decide that it should and this decision is made within the context of certain demographic, economic, and moral contraints. It is these constraints on choice which generate regularity or frequency in empirical form. (Parry, 1979, p. 155)

> ...individual and group self-interest (i.e., what was economically rational) varied widely. As a result, the economic value to an individual living within a joint family or of making use of the authority structure and role relationships of a joint family...also varied widely. (Owens, 1971, p. 223)

(4) The decision to live together and hence not to partition is affected by the security motive. Large, complex families provide a mechanism for pooling risks [Kotlikoff and Spivak (1981)]. The advantages of extended households need not be confined to the security motive and the risk-sharing advantages of cohesion. Nevertheless, the relevance and importance of the old-age security motive is a major consideration in favor of cohesion with respect to fathers and sons and their respective wives and children [Shah, (1974, p. 50)]. Even those observers who have failed to

see household affiliation as a rational decision, and those who have failed to appreciate the other advantages of the extended household, such as economies of scale and specialization, have not failed to appreciate the risk-sharing advantages of the large extended household. For example, as Cassen (1978, p. 76), a strong critic of the system, expressed it:

> In a society lacking in communal supportivness, where the powerful use and perpetuate their advantages in every conceivable way, the family becomes for most people the only source of security. It is an inefficient and in some ways a cruel one; it will continue so until an alternative appears.

The conditions under which the old-age security benefits of joint living arrangements are likely to be important have been detailed in Section A of Chapter I. Hence, they shall not be repeated here.

(5) Societal rules with respect to inheritance can greatly affect the structure of the household. The prospect of inheritance is certainly an important instrument that older persons have with which to induce flows of desired goods and services from their potential heirs. In most societies inheritance generally goes from fathers to sons (mother's brothers to sister's sons in matrilineal societies). In some societies, such as those in parts of Africa, inheritance goes from brother to brother or from sister to sister. Not surprisingly, joint or laterally extended households latter societies whereas stem households among parents and their children are more common in those where the former types of inheritance rules dominate (Goody, 1972).

In most societies where inheritance goes from father to son, land and other accumulated endowments are not transferred until death of at least the male parent, and sometimes also not until the death of the female parent. The effectiveness of the inheritance instrument is strengthened if the parents can wait until the last possible moment in naming their heir.

Shoup (1966) argues that the control advantages of waiting explains why in the U.S. context elderly parents do not provide their children with gifts prior to their death despite the substantial tax advantages of doing so. When forced to make such a decision in advance of death, other things being equal, there may be advantages to naming the youngest son as the heir since the youngest son offers the greatest security by his higher probability of longevity; and by holding off the decision until the youngest son comes of age and is fully productive, the parent maximizes the contributions that he (she) is in the meantime able to extract from the older sons as earners and providers to the joint family by holding onto them as long as possible during their prime working years [Lesthaeghe (1980)].

The threat of non-bequeathal is certainly an important tool in the hands and minds of parents to instill loyalty on the part of their children, especially in societies in which accumulations of land and capital are difficult to accomplish. In some cases the requirement for inheritance that children live with and care for their parents is a written and formal one [Homans (1941), Sussman, Cates and Smith (1970)]. More frequently, however, it is only implicit [Ortiz (1967), Anderson (1971)]. Its effectiveness can be constrained by certain institutional rules such as those of primogeniture or equal division (which may have been established to control fratricidal murders and disruptive fighting) [Berkner and Shaffer (1978)]. Its effectiveness can also be reduced by the absence of competition, as when there is only one potential heir. Parents, however, can make this tool more effective by having several children or indeed several male children in patrilineal societies. Notably, the rules tend to be defined to fit the circumstances, and, where the rules have been set with other motives in mind, as for example by colonial powers or urbanites, there is

often considerable deviation of actual practice in rural areas from official rules. [Parry (1979) points out, e.g., that the Indian government's efforts to guarantee equal inheritance shares to female children as to male children is disregarded in rural areas.]

(6) The extent to which parents are likely to be able to hold on to their children and indeed extract their loyalty by the bequeathal promise is positively related to their wealth [Freedman (1966), Klapisch (1972) and Carter and Merrill (1979)]. Also wealth in the form of land or business assets increases the marginal product of labor and hence is likely to induce additional adults and children to remain in the household. Since the extent and even direction of such an effect may well vary considerably with the type of asset, household structure can also be affected by the composition of wealth. For households with more wealth, the ratio of non-human wealth to human wealth tends to be larger than in poor households. Since human wealth tends to increase independence, this may be another explanation for why wealth increases the complexity or extension of the household [Parsons (1983b)].

(7) The propensity among adults to live together can be reduced by education and outside employment opportunities [Thadani (1980), Caldwell (1981), Parsons (1983b)]. While there may be circumstances wherein one can work elsewhere than on the family farm and yet remain in the household, there are certainly limits to such possibilities and hence often a decision to work elsewhere is accompanied by a decision to move out.

(8) The degree of extension of the household and household structure can be affected by the nature of land and labor contracts. Berkner and Shaffer (1978), for example, point out the correlation between the incidence of sharecropping and of extended or joint living arrangements

throughout long periods of French history. In the context of large landholdings, where supervision costs of labor are likely to be relatively important, sharecropping with heavy reliance on family labor may provide an efficient and, in particular, transactions cost-minimizing means of combining land and labor [See also Datta and Nugent (1981a, 1981b) for detailed explanations]. Land reforms which limit property rights may limit a parent's interest and ability to hold onto one's sons [Parish and Whyte (1978)].

(9) If all male members of the household provide an equal share of the budget of the joint household, the propensity to partition will be greater, the greater is the differential in fertility between the wives of the married males. To avoid friction, fertility differentials would have to be compensated for by differential contributions to the household budget. Note, however, that children and wives can provide at least part of these differential contributions [Carter and Merrill (1979)].

(10) The timing of marriages can also be a factor in partition. In India, for example, where marriage costs are of major importance in the overall household budget, and a brother has no responsibility for financing the marriage of his brother's daughter after partition, partition is likely to take place prior to the marriage of the children of siblings.

(11) Although not usually the principal decision-makers, since wives can influence fertility, and also vary their willingness to cooperate with other household members, wives can influence household structure at least indirectly. They also may play an important role in deciding when and to whom the son should get married [Wolf and Huang (1980, p. 290)]. Early in marriage a wife may want to get out from under the domination of her in-laws with whom she lives initially in extended households. Therefore,

early in marriage wives may find high fertility beneficial for them in part because it is likely to induce partition of the joint household. On the other hand, once a wife becomes the mother-in-law in the joint family household, and assuming that she already has had male children, it may be in her interest to stop having children in order to induce her sons to remain in the joint household. (This explanation would seem to have been overlooked in the case study and village literature. Presumably, it might explain (a) the otherwise paradoxical findings of Bebarta (1977) that women in joint households have children earlier than other women but also stop having them earlier, making it possible for their completed fertility to be lower than that of women living in nuclear households, and also (b) the taboo that is sometimes observed on women having additional children once their sons are married and living in the joint household, and (c) why women may well encourage the importation of a child bride for the son since thereby they would be able to train their daughters-in-law to be loyal to them; thereby "saving their sons from their daughters-in-law" and thus maintaining loyalty of sons to their mothers [Wolf and Huang (1980)].

C. The Allocation of Household Resources and Marriage

Since for the most part there is coincidence between the property-holding group and the residential group, the household's resources are generally utilized collectively and allocated by the household head whose responsibility it is to resolve disputes about the fairness of resource allocation within the household. Generally, household heads allocate resources in what would seem a "rational" or "efficient" manner [Parry (1979), Carter and Merrill (1979)]. The choice of age-at-marriage and the choice of marriage partners are aspects of the household's resource allocation problem.

Given the variety of tasks that have to be performed within a rural household, only a small proportion of which are typically marketed, it is not surprising that there is substantial room for variation in comparative advantage among the different members of the household and that a division of labor and degree of specialization among tasks is arrived at. Almost all anthropological studies provide at least qualitative evidence of the marked extent to which there is division of labor especially between sexes.

Even allowing for a considerable margin for error in measurement, virtually all time allocation studies, e.g., Dasgupta (1977), Nag, White, and Peet (1978), Shah (1974), Cain (1977), Bond (1974), Mueller (1979), DaVanzo and Lee (1978), and Murdock and Provost (1973), although drawn from a wide variety of countries, report a high degree of specialization by age and sex. In particular, young girls spend large portions of their time on those activities, such as fetching water, cooking, food preparation, care for the sick and disabled, sewing and repair work, that are in demand by old-age dependents. Women spend their time on housework, child care, food preparation, and in some cases on marketing and agricultural activities. Young boys spend substantial portions of their time on animal husbandry, gathering firewood, and hunting and fishing; middle-aged men concentrate on the heavy agricultural tasks and on civic responsibilities such as meetings. Old people tend to remain active in primary agricultural activities until later in life than their counterparts in DCs [Adams (1972), Harlan (1964), Vatuk (1975, 1980a,b), Raj and Prasad (1971), Mueller (1976)].

Changes in technology, in market prices, in transport costs, or in institutions (such as the introduction of a social security system with an old-age pension component) are frequently associated with substantial reallocations of time to activities among members of the common household,

and can affect the relative value of having different types of people in the household. In technical terms, the shadow prices of the time of different sex and age groups can be affected, thereby also affecting the economic value of the wives of husbands and of their children and hence of different household structures, and of marriage and fertility. As will be explained below, marriage is another important means of changing the sex composition of the households, given the prevalence of certain conventions such as that daughters "marry-out" of households and daughters-in-law are "married into" households for sons as is the case in most of rural India and other parts of Asia.

In all of these reallocation decisions the household head's role is vital. The parallel in these allocation functions between the role of the household head and that of the entrepreneur or manager of the firm is striking indeed. The household head's role is to coordinate and supervise the work of the household, to allocate people and their time to tasks, to exert leadership in reaching dynamic decisions such as the level of savings and the allocation of investments including marriage. The work of the household head and of the household as a whole is likely to be most effective when his headship is unchallenged, and because of close family relations in a common residence, there is both good teamwork among household members and a considerable amount of mutual trust, thereby avoiding the need to set up elaborate and costly monitoring activities to detect shirking and self-indulgence by individual household members.[3] With more distant relations or unrelated persons, the trust and intimate knowledge of the members of the household team are likely to be weaker and hence the potential for partition of the household is likely to be greater.

Since the household head normally has considerable discretion over the allocation of resources, he can exert considerable influence over the

composition and structure of the household inasmuch as he can offer inducements to stay or to leave. Indeed, the household head is also likely to possess the power of expulsion over household members. Yet, since, according to Parry (1979) and Carter and Merrill (1979), this power is extremely strong, it is in fact seldom utilized. Moreover, the household head has no comparable instrument of control over voluntary withdrawal by other household members (at least other than has been mentioned above) and hence his power over household structure decisions is less than complete.

The household head's (and also the non-head husband's) control over fertility and infant mortality of his wife and of his brothers and sons' wives is, likewise, weaker and more ambiguous, and certainly more indirect. Undoubtedly also its effectiveness varies considerably from one society to another, and perhaps even from one head to another. The head is certainly not without instruments. He can usually divorce his own wife; he can usually remarry after being either widowed or divorced and, in some cases, he can take several wives at once. But, he cannot of course divorce the wives of other males in the household; hence his ability to influence their fertility decisions is limited to that of allocating resources so as to encourage or discourage fertility according to both his (own) preferences and those of the household as a whole. His most effective instrument of control over fertility behavior of his sons or daughters arises from his very substantial control over both the timing of and the choice of partners in their marriages.

Indeed, because (1) expenditures on marriage and adoption frequently constitute a very significant part of overall household expenditures, (2) the presence of male and female members in several generations is of great importance to the short-run as well as long-run viability of the household[4]

and (3) the timing of marriage and the choice of marriage partners are major sources of influence over fertility decisions, household heads in many if not most rural societies play a very important role in arranging marriages of daughters and sons. This power includes considerable and sometimes even unlimited discretion over the choice of time, place, and partner-in-marriage.

As has already been pointed out, the bulk of the village studies evidence on rural areas of developing countries suggests that marriages are more likely to be "arranged" or at least approved than are marriages in more developed countries [Lang (1946), Gore (1968), Jahan (1973), Goode (1963), Dixon (1976)]. Marriage also tends to be more essential in such countries, inasmuch as the long-run viability of households requires the individual household to have both male and female members, and preferably to have those of more than one generation, so as to ensure complementarity in production and consumption both in a given time period and over time.

Household heads may invest a great deal in search activities to assure that the wives they obtain for their sons (husbands for daughters) not only are reliable marriage partners for their children, but also possess characterisitics of value to the household as a whole. The head can be expected to search for women who are capable of producing healthy sons and daughters, and who are likely to be productive, hardworking members of the household, loyal to the household head and his wife so as not to be likely to want to induce partition of their sons from the joint household (thereby lowering the expected value of transfers from children in old age), and also trustworthy and cooperative so as to facilitate good teamwork among all members of the household. The values of the services of the marriage partners that are exchanged between households in marriage may well not be

equal and marriage contracts are often accompanied with net side payments from one household to the other. If the payment is from the groom's family to that of the bride, it is called a bride price; if it goes from the bride's family to that of the groom, it is called a dowry. It is generally recognized that although such payments are viewed as "traditional" and may take traditional forms, they are in fact influenced by relative scarcities (shadow wage rates) and the relative stocks of human capital [Salaff and Wong (1977), Rajaraman (1982)]. For recent and colorful evidence of this see Dash (1982). The magnitude and direction of the side payment are also affected by the ages of marriage of the respective marriage partners. Generally, age is discounted; i.e., other things being equal,[5] the bride price would be higher (dowry would be smaller) the younger is the wife relative to her husband. There are, quite naturally, limits to the age discounting rule. For example, as Wolf and Huang pointed out for China and Taiwan, the bride price would be reduced (instead of increased), and quite considerably so, for youth marriages. In other words a household importing a wife for a son could greatly reduce its expenditure outlay on the bride price by doing so at a very young age, e.g., between one and five years of age. The explanation for the reduction in bride price in this case is quite naturally that the investment costs of raising the young girl to be a healthy and hopefully fertile wife and productive household member fall on the importing household instead of the household of her origin.

The control of the head of the household over marriage decisions is a part of his control over all the property of the household including its human capital. Referring to conditions that used to prevail in rural China, Lang (1948, pp. 26-28) notes:

> The head of the family was the oldest male member...he held the title to all family property and he alone could

> dispose of it, as well as of the earnings and savings of all the family members. He settled the marriage of his children and signed the marriage contracts.

As a result of marriage, the daughter who married-out is transferred from one household to another. As Freedman (1961-62, p.328) expresses it:

> Her marriage cut her off economically and as a legal person from her own family and transferred the rights in and over her to the family receiving her...to a large extent physically, and in all degrees legally, she was locked within her husband's gates.

Again, referring to China, Cheung (1972) calls attention to various devices such as the binding of feet which among other things would prevent daughters from running away from their new households, thereby raising their value in terms of bride price. In many religious rituals, couples are not to see each other prior to marriage, thereby allowing household heads to arrange marriages free from the interference and expressed preference of their children. In contemporary times, of course, the relative importance of "blind" marriages has diminished, but the household head still maintains considerable control over both the timing and choice of partners in marriage, at least in rural areas.

It would be both unrealistic and unwise, however, to interpret the marriage decision as being the exclusive prerogative of the male head of household. Almost inevitably the female head will also be deeply involved because of her informational advantages and her traditional role as the emotional fulcrum of the family. In fact, the marriage decision would seem to be one that the male head is likely to delegate to his wife. Given the wife's special interest in fertility mentioned in the previous chapter but explained more fully in the next section, moreover, the wife is generally eager to play such a role. At the extreme, as may have been the case historically in China, at least before the prohibition of youth marriages,

the wife's role could be dominant [Wolf and Huang (1980)] since it would be she who would direct, train and utilize the labor activities of her daughter-in-law.[6]

Still another reason for the parental control over the marriage decisions of their children is to protect headship and the authority of the head from emotional attachments that may arise when marriage decisions result from the voluntary choice of the marriage partners themselves. This can also be an explanation for marriage early in life [Hitchcock and Minturn (1963), Jacobson (1977), Wolf and Huang (1980] and for rules that require a woman to marry outside her native village. [Sharma (1980), Wolf and Huang (1980)]

> "If the young girl or boy can be kept from members of the opposite sex so that no emotional attachments can be formed and marriages are arranged early, the bride and groom have neither independent emotional nor independent socioeconomic resources with which to oppose such decisions. Thus it was to the interest of elders who wished to maintain the traditional family system to arrange the marriage at as early an age as possible." [Goode (1963), p. 105)]

Admittedly, however, there are other influences which may tend to reduce the influence of parents and household heads in arranging or even approving the marriages of their children or other relatives in their households. Education, for example, may tend to make children more independent, both by keeping the children away from the household and perhaps by changing their tastes, aspirations, and goals. Also, better communications, commercialization, and other factors that are certainly of growing importance may tend to reduce the role of parents in educating their children about the world, and in making marriage decisions for them [Hull (1978)]. It would seem important, therefore, to account for the education of children, non-agricultural employment, and other factors that might tend to reduce the extent to which marriages are arranged, and which also, of

course, are likely to have direct influences on age-at-marriage and hence on fertility.

Notably, several of these factors tending to reduce the role of parents and household heads in marriage decisions (and also to raise the age at marriage) are associated with urbanization. In Hong Kong (which is almost entirely urbanized now), Mitchell (1971) notes that 53% of women over 60 years of age said that they were introduced to their husbands by a match-maker (in most cases their parents or appointed by their parents) whereas only 1% of those under 25 years of age said the same thing. Likewise, 66% of spouses of at least 60 years of age but only 18% of those under 25 said that their marriage was either "ordered by parents or arranged by a match-maker". Similarly, 47% of those aged 60 and over said that they had no courtship before marriage whereas only 1% of those under 25 gave the same response. Even when urbanization and modernization influences are pervasive, however, the household head is not without instruments for delaying or mitigating the household-disintegrating, and old-age insecurity-increasing effects of such influences. For example, in the Caribbean and West Africa it is not uncommon to send one's children to one's parents or other relatives who may be better disciplinarians or more likely to happen to live in environments where children are likely to have fewer options and less freedom to maneuver [Smith (1962), Goode (1963), Oppong (1973), Sanchez (1976)].

D. Fertility and Infant and Child Mortality

Since the old-age security motive can be satisifed only by surviving children and frequently by those of only one sex, another important link between old-age security and fertility is infant and child mortality and

its relation to fertility. Because of its relevance to the theory of demographic transition, one of the classic issues in demography, the relation between infant mortality and fertility is a subject that has received a great deal of attention including some excellent economic analyses and even some interesting interdisciplinary studies [Schultz (1976, 1978, 1980), Preston (1978), and Butz and Habicht (1976). Part of the reason for the special interest in the relationship is that there are a wide variety of effects of infant mortality on fertility, supply effects, and among the demand effects, replacement effects, wealth effects and price effects, which can be challenging indeed to sort out. Its special relevance in the present context is that rural-urban differences in infant mortality may be sufficient to explain a fairly sizeable portion of the rural-urban differences in fertility [Schultz (1981)].

Traditional demographic transition theory and most economic models have depicted the relation between mortality and fertility to be a simple one: namely, that population growth is attributable to the rather long realization and adjustment lag between decreases in mortality and subsequent decreases in fertility, thereby ascribing to mortality the role of an exogenous variable [Stolnitz (1965)]. This theory and this role, however, are increasingly open to challenge.

First, recent historical studies have increasingly challenged the view that fertility rate declines lagged substantially behind mortality rate declines in Europe, Japan, and elsewhere, and anthropological studies have tended to reject the notion of a long adjustment lag in contemporary developing countries [(Carter and Merrill (1979)]. This is not to say that declining mortality rates are not responsible for population growth in the recent history of LDCs, but only to point out that the sharpness of the

decline in mortality rates that developing countries have experienced during these years has been without historical precedent and that fertility rates have indeed been falling quite significantly, especially during the last decade [Birdsall et al. (1979)].

Second, the relation between mortality and marital fertility need not be a very direct one for the overall relationship between mortality and fertility to hold [Heer and Smith (1969), Burch (1970)]. One possible reason for this is that much of the adjustment to variations in mortality may take the form of variations in age at marriage, rather than in marital fertility rates [Wrigley (1978)].

Third, changes in mortality can affect several other variables with possible indirect effects on fertility. For example, as Ram and Schultz (1979) have argued, the decline in mortality rates can affect the rate of return to investments in human capital, especially education. This, in turn, can influence household savings, income growth, sex-specific labor force participation rates, the entire allocation of resources within the household, and in the long run even the structure of the household. Any such changes can influence fertility, and can also have consequences for the direction of the intergenerational transfers within the household [Goode (1963), Caldwell (1976), Aries (1965), Goubert (1970), Laslett (1965), Laslett and Wall (1972), Stone (1977), Thadani (1978)]. As Birdsall et al. (1979) emphasize, the overall effect of mortality on fertility can be captured only if one considers both the biological effects (such as the shock and disruption to household activities that sickness and death of one's child may bring about) and the economic effects including both the wealth and relative price effects and both the static and dynamic effects of each. Notably both the relative price and the income or wealth

effects of mortality declines may vary significantly from one household to another depending on the size and structure of the household.

Fourth, the direction of causation in the relationship may not be as unidirectional as it had been assumed to be. Much recent work on nutrition and infant mortality has revealed that fertility and birthspacing can have important effects on infant nutrition and hence on the probability of survival. As evidence for the hypothesis that infant mortality is at least partially explained by factors other than public health and other factors external to the household and local economy in rural areas of poor, overpopulated developing countries, Schofield (1974) points out the effect of seasonality on nutritional deficiency and of nutritional deficiency on infant mortality, and Scrimshaw (1978) cites (a) examples of extreme child neglect and even infanticide, (b) the relation of the female work load to infant mortality, (c) rather marked sex differentials in infant mortality, and (d) a positive relation between infant mortality and the time elapsed from the immediately preceding birth. Again as the above-mentioned new historians of the family point out, expectations with respect to infant mortality can be self-fulfilling and reinforcing. If one expects there to be a good chance that one's child will not survive, one invests little in the child in terms of time and emotional attention; as a result, the probability of survival is reduced. Smith (1977) rather convincingly documents, with birth registration and census statistics, the importance of systematic infanticide over long periods of time historically in rural Japan. Cassen (1978), Parry (1979) and Mitra (1979) suggest that infanticide is not unheard of and enjoys the collaboration of the wife-mother in it in contemporary India, especially with respect to female children.

Some of these effects on infant mortality may thus be intended. Others may well be inadvertent. For example, the effect of the close spac-

ing of births on infant mortality, especially of an earlier birth on a subsequent birth, may be attributable to the premature weaning of the infant from the mother's breast to make room for the newborn without a satisfactory alternative source of nutrition. In the absence of sanitary and nutritionally sound alternatives, and of better knowledge of the potential dangers thereof there is a relatively high probability that the weaned child will not survive into adulthood [Khan, Hammer, and Lynch (1977), Wray (1971)]. For additional evidence of this and other economic and social effects on infant mortality see Heller and Drake (1979). Interdependence between fertility and infant mortality can also be attributed to the practice of breastfeeding and its effect on postponing ovulation (post partum amenorrhoea). The strength of this effect is also affected by the health and the nutritional status of the mother [Butz and Habicht (1976)].

Additional evidence that infant mortality depends on factors internal to the household and local economy comes from (1) demonstrations that public health improvements, such as malaria and other disease eradication programs, and programs to supply potable water and to provide sewage systems, explain only a fraction of the mortality decline in specific countries [Preston (1980)], and (2) studies showing that infant mortality has tended to decline more rapidly in those societies that have achieved reductions in the degree of income inequality, such as Sri Lanka [Birdsall et al. (1979)], and (3) studies showing that within communities it has declined more rapidly in high income and better educated households than low income ones with lower educational attainment [Schultz (1981, chapter 5)].

With respect to the important issue of the appropriate decision-maker(s) within the household with respect to fertility and infant mortality decisions, as has been mentioned above, the role of the household head

especially in extended households would seem to be much smaller and more indirect than that in the other decisions which have been reviewed. Most studies, e.g., Dixon (1976), Salaff (1972), and Wolf and Huang (1980) concede to the wife an important, if not dominant, role in fertility behavior, especially in relation to how constrained she is in virtually all other respects. Also in infant mortality, the wife-mother plays a dominant role, although, of course, circumstances can be much affected by the household structure and the static and dynamic allocation of resources.[7] Within the household not only are fertility and mortality variables over which married women are likely to have more control, but, in view of the likelihood of long widowhood, women also are likely to have the incentive to exercise that control.

The importance for women of widowhood and hence the degree of their dependence on their sons especially in rural areas of LDCs, have already been pointed out and partly explained in Chapter I. Since the degree to which this is the case can hardly be overempasized, we add some more examples. For example, it was noted by Vatuk, (1980b) that only 25% of all Indian males over 60 years of age are without wives whereas over 70% of all Indian women over 60 are widows. This large discrepancy is due in part to higher remarriage rates for husbands than wives after divorce or widowhood and also to the rather sizeable age differentials that generally prevail between husbands and wives at first marriage [Vatuk 1975, 1980a,b]. Given that widowhood is such an important fact of life for most women, that sons are a relatively reliable form of old-age security, and that various surveys [Vatuk (1981)] show that more than two-thirds of elderly women in rural India live with their sons, it should hardly be surprising that Indian women "....generally begin to be concerned at a fairly early stage

of life with the need to provide themselves with a male heir" [Vatuk (1980b, p. 5)]. As Ridker put it, "children, especially sons, may appear to be all that will save them from destitution after their husbands are dead ...." [Ridker (1976, pp. 9-10)].

Another source of evidence in the anthropological literature for the old-age security motivation for fertility being especially strong in females is the tendency for the wife-mother to be the center and most effective promoter of the affectual links, the peacemaker between generations, and the fulcrum of stability of the household [Velez (1978, p. 159), Simić (1978, p. 102)].[8] An important motivator of the wife-mother's special expertise in this area may be the sex-specific restrictions on her property rights. Such restrictions are especially severe in Moslem societies, and leave her with especially few options for taking care of her old age. In contrast, in societies where women can legally own property independent of their husbands as is common in certain parts of West Africa, women are less interested in this particular role [Tomiche (1968), Vreede-de-Stuers (1968), Wolf (1972), and Sanchez (1976)].

Many anthropologists, especially those working in Africa and in the more primitive regions of other geographic areas, e.g. Fortes (1978), explain the special interest in, and hence independence of the wife-mother over fertility in terms of the substantial rights that she attains from motherhood as opposed to the rather few rights that accrue to her on marriage. Likewise, the prestige associated with the demonstration of fertility (but also the shame or blame for failure to conceive) is focused almost exclusively on the wife rather than on the husband.

Still another explanation for the wife-mother exerting an independent (though perhaps rather constrained) influence on fertility and child-

survival in rural areas of LDCs comes from the literature of social psychology. In this literature it is argued that degree of agreement over action, i.e., lack of independence of the wife-mother in family matters, is positively related to the degree of communication between spouses. The literature also provides strong evidence that communication between spouses is much less frequent, complete and satisfying in rural areas of LDCs, and perhaps paradoxically especially so in societies in which male domination of women is strongest, than it is in developed countries. [See, for example, Stycos (1955), Bott (1957), Blood and Wolfe (1960), Hill et al (1959), Yaukey et al (1965), Navran (1967), Poffenberger (1969), Carlaw et al. (1971), Mitchell (1972), Knodel and Prachuabmoh (1976), Coombs and Fernandez (1978)]. Where lack of communication and hence lack of agreement between spouses about fertility are prevalent, it is implied that wife-mothers will exercise independent influences over fertility and child-survival.

Finally, some psychologists have argued that there is experimental evidence suggesting that females in different cultures are generally more risk-averse than males [Greene (1964), Kass (1964) and Slovic (1964, 1966), Maccoby and Jacklin (1974)]. Although the number of studies on risk-averseness is rather limited (especially with respect to different cultures), if one includes studies dealing with different but perhaps closely related attitudes or behavioral forms, such as the degree of activity (as opposed to passivity or dependence) [Maccoby and Jacklin (1974, Table 5.1)], level of personal aspiration [Maccoby and Jacklin (1974, Table 4.2)], anxiety [Maccoby and Jacklin (1974, Table 5.4)], propensity to be helpful to others and to seek help [Whiting et al.; ed. (1973), Whiting and Pope (1974)], and especially aggression [Wallach and Caron (1959), Wallach and Kogan (1959), Maccoby and Jacklin (1974, Table 7.1), (1980) and

Schaeffer (1979)], the case for attitude-based sex differences is strengthened considerably. What is particularly impressive about the findings of some of these studies, especially that with respect to aggression is that the sex differences are observed at very young ages and more so in non-human species than in humans [Maccoby and Jacklin (1974, Chapter 7, 1980); Nagel and Kummer (1974)] where presumably the effects of social, cultural and other influences would presumably be mitigated,[9] making it seem that some of these differences could indeed have a biological base. Even the best of the experiments are, however, not free of controversy, and serious questions can be raised as to the relevance of the aforementioned attitudes and behavioral forms and samples to the strength of the security motive among women in rural areas of LDCs. Hence, the psychological-biological bases for the greater strength of the old-age security motive in women than in men should at this point be treated simply as an interesting conjecture.

Whatever the cause or source of the independent role of the wife-mother, the point is that there are very considerable grounds for believing that she may be able to play such a role when it comes to fertility behavior, even in societies in which males dominate females in virtually all aspects.

E. Some Suggestions Arising from the Literature on Social Security Effects in Developed Countries

Whereas in the previous sections we have concentrated on the descriptive literature from developing countries, in this section we draw upon the literature of developed countries. We analyze the effects of old age persions on fertility in terms of a number of different, but necessarily interdependent, effects. We begin with the savings reduction effect.

Second, we take up several different life-cycle effects, including effects on the time phasing of labor force participation, family fragmentation, the time phasing of consumption and intergenerational transfers, the sex composition of the labor force, and the allocation of family resources between the sexes. Finally, we consider information costs, uncertainties about various aspects of any social security system, and the possibility of differences between desired and actual fertility.

1. The Savings Reduction Effect[10]

The most common effect attributed to the introduction of a social security system financed on a pay-as-you-go basis is that total savings and, when these are accumulated over time, total (private) wealth would be reduced.[11] If correctly anticipated, the net transfer receipt of the pension would be discounted backward relative to the situation without it, as if it were an increase in real wealth. The pseudo increase in wealth would reduce the need for other forms of accumulation (including accumulating in the form of children) and hence could be expected to reduce total saving and hence in the long run real wealth. No such pseudo increase in wealth would have to be accounted for if the old-age pensions were financed entirely by taxes or contributions made earlier in life as in a fully funded old age insurance program.

If there were only one asset -- the quantity of children -- it would be obvious that any wealth inspired savings-reduction effect would translate directly into reduced desired fertility. Even in the rural LDC context, however, it would seem realistic to consider some other assets -- at the very least investments in education or in location (migration) and perhaps even agricultural capital, land, and small shops. If so, rather

than the reduced accumulation necessarily taking the form of a smaller number of children, conceivably it could take the form of reduced investments in these other kinds of assets.

The choice of which type of asset accumulation to reduce might well depend on the specific characteristics of these different assets and the extent to which these assets protect against old age insecurity. For example, the degree to which investments in the quality (as opposed to the quantity) of children would be reduced would depend on a number of factors, including the elasticity of substitution between quantity and quality in farm production and the difference in expected wage rates between unskilled and educated labor in the labor markets. For reasons that will be explained below, it would be unlikely that the reduced savings would take the form of reduced investment in quality. Hence, a reduced investment demand for children would seem likely. Because children serve in part as consumer goods, providing consumption utility to parents and grandparents,[12] the reduced investment demand for children could be partly offset by increased consumption demand for children. Probably, however, the marginal propensity to consume child services is fairly low, especially after the first three or four children, and hence this offset is not likely to be very large.

The economic analysis, especially the recent analysis, has suggested other, potentially more powerful offsetting influences. First, and especially when pension payments go directly to the retiree and are reduced by current earnings, labor force participation of the elderly may fall and a retirement-age effect may be realized.[13] Earlier retirement of course creates a greater demand for savings, and hence this effect would tend to offset the decrease in demand for children. Considering that in LDC agri-

culture it is common for workers to work until their mid-seventies or even longer, basically as long as they are physically able,[14] the retirement-age effect could be rather strong. Similarly, the decreased need to work in later years may give the elderly more time to rest and attend to their ailments, thereby prolonging life and again creating a greater demand for savings and hence, in this case, for children.

Another factor that might serve to minimize the savings (fertility)-reduction effect in the rural LDC context is the likelihood that intergenerational transfers are motivated by noneconomic factors. Anthropologists describe the delicate system of reciprocity arrangements in traditional societies, with broad social, political and ritual significance in the day-to-day life of the cultural bearers. Under such circumstances, even when pensions are supplied by a social security system, the traditional system of intergenerational transfer may well be sustained, thereby maintaining the demand for children.

Finally, two other closely related noneconomic arguments for the offset given for DCs may also be applicable in LDCs: the goal-gradient and goal-recognition effects. The goal-gradient effect occurs when the promise of a pension makes the middle-aged worker feel that his security goal is more attainable than it would have been without it. Therefore, the pension promise might make him strive harder, increasing his demand for saving and, therefore, of children.[15] Similarly, according to the goal-recognition effect, the introduction of the pension plan would force the family to think of its future and thereby to recognize the need for saving, especially since the pension would cover only a part of future needs [Cagan (1965)].

On the other hand, there are likely to be factors in the rural areas of LDCs tending to mitigate the power of these offsets. First, there is

little reason to believe that the pension systems set up in LDCs would impose such a high marginal tax rate on other income as in the DCs where social security is much more closely connected to welfare and calibrated to welfare rules. Second, even if the LDC systems were to duplicate the antiwork bias of such systems, governments would most likely be far less able to enforce such rules in LDCs, especially in rural areas, than in DCs. This is because both the distances between units to be supervised are greater, making for higher administrative costs, and a larger part of rural output is for subsistence purposes only making it difficult to measure. Moreover, physical work, at least for the able-bodied, is often good therapy, and hence earlier retirement might lower rather than increase longevity. The propensity of farmers and other rural workers to work to an advanced age may not be because of economic necessity, but rather because of pride in being physically able to do so and because of other cultural factors.[16] Finally, because in many rural societies property rights are limited to usufruct rights (one "owns" one's parcel only so long as one uses it), the farmer may work his land out of fear that, if he should retire, he would lose it.

Taking account of all these factors, it is no longer obvious what would be the direction of the effect on savings and fertility of the introduction of a formal old age pension system. It could well be negative, as it has generally been conceived to be. Indeed, it could be especially strong, considering that children are the most satisfactory form of old age security and the possibility that farmers would not reduce their work even after receiving pension. On the other hand, it could also be <u>positive</u> if the preexisitng private system of intergenerational transfers were continued even after the pension system had been introduced and the goal-

gradient, goal-recognition, retirement-age, or longevity-increasing effects were relatively strong.

2. Other Life-Cycle Effects

Either because of or independent of any of the above effects and their offsets and counteroffsets, the life-cycle pattern of living, working, and consuming quite conceivably could be affected. Among the most important changes in the life cycle that could result from the introduction of the old-age pension system are: (1) changes in the time phasing of labor force participation and labor supply; (2) changes in the generational composition of the family (household fragmentation and formation); and (3) changes in the direction and nature of the time phasing of consumption and intergenerational transfers at other phases of the life cycle. As we will point out presently, each such type of change could well have important effects on fertility.

Although there is considerable overlap between these types of changes, and between their various effects on fertility, in order to improve the organization of our presentation we discuss separately and, in turn, each of these life-cycle changes and their effects on fertility.

Time phasing of labor force participation. As a result of the institution of a formal pension system, it is quite predictable that there would be some adjustments in the time phasing and magnitude of labor force participation and effective labor supply. It is more difficult to predict just what these adjustments would be.

One important change in the time phasing of labor supply would be the retirement-age effect, which has already been discussed. With respect to that effect, one should bear in mind that, even if the rural worker should

withdraw from wage employment or from selling his cash crop to the purchaser with whom his social security program has been set up in order to qualify for his maximum pension, it would not necessarily imply that he would then be idle. To the contrary, he may simply divert his activities to noncommercial activities, including subsistence agriculture. Hence, properly measured, his labor force participation may not be affected, at least to the extent that might be expected, official statistics notwithstanding.

To the extent, however, that the labor supply of the elderly would be reduced, there may be a tendency for it to be raised in the years prior to retirement.[17] Such an increase in labor force participation during working years could be induced by the need to earn extra income to pay for the social security taxes. The extra income generated as a result of the higher labor force participation could lead to a higher demand for children for both investment and consumption purposes. In the rural LDC context, however, this effect may not be pronatalist, and indeed could be antinatalist because the higher labor force participation and effective labor supply would probably take the form of either more women in the labor force or second jobs for the male family members, in both cases lowering fertility. Although the mechanisms whereby female labor force participation reduces fertility are well known, some explanation of the effect of male moonlighting is probably necessary. Although there are several possible explanations, the most likely one is that these second jobs would take the men away from their homes, and thus away from their wives, for substantial periods of time, thereby reducing the opportunities for marital sex.

Also of great consequence might be what happens to labor force participation early in life. This will probably largely depend on the net

balance of all the effects mentioned above on the demand for savings. To some extent the monetary tax effect of the social security taxes imposed on the adult workers already in the labor force might spill over, thereby putting pressure on teenagers to seek money wage jobs. To the extent, however, that fewer adults are left on the farm and in the home, it would seem unlikely that the youngster would also be forced or induced to leave the homestead.

Indeed, because the overall effect of the pension syatem on saving probably would be negative, and yet it is possible (though certainly not necessary) that the retirees would be doing less dissaving and the middle-aged more saving, the main place in the life cycle for the lower saving to be realized would seem to be in children (for investment purposes). Partly, however, the decrease in saving could take the form of increased education for consumption purposes. The postponement of labor force participation in favor of education would also probably imply postponement of marriage, which would reduce fertility. The higher educational attainment, especially of the female children, would be still another source of reduced fertility, at least in the long run.

Family fragmentation and new household formation. As already mentioned in Section B above, the (partial) substitution of the public system of intergenerational transfers for the allegedly preexisting private one may reduce the benefits for the extended-family, multigenerational character of the household unit and hence may encourage fragmentation of the extended family. Also, to the extent that the need for savings is reduced, the budget constraint on family fragmentation and new household formation would be relaxed. With the need for unity diminished and the ability to fragment increased, the household may quite naturally choose to fragment,

perhaps to avoid intergenerational conflicts. A family-fragmentation effect, therefore, would seem likely although obviously it would materialize only in the long run. We have already seen that the effects on fertility of this family-fragmentation effect could be strong but in either direction.

While most of the possible effects of household structure on fertility have been mentioned several other possible effects of the household formation/fragmentation processes, themselves, deserve mention. The fragmentation process itself may not be a peaceful, equilibrating one. Any instability-increasing tendencies may well offset the initial insecurity-reducing influence of social security and hence retard or mitigate any of the effects attributed to it above. The outcome may well depend on the type of instability created. For example, to the extent that the fragmentation process contributes to children being considered less loyal to their parents, the advantages of investing or consuming in the form of children (quantity or quality) would diminish, thereby reducing desired fertility. Likewise, if the fragmentation process should cause marital unhappiness and increased marriage dissolution household members would become less likely to invest in children at all, investing instead in their own education, location (migration), or (if available) in physical and financial assets that can more easily be transported should the household dissolve (as in divorce), or increased consumption. On the other hand, the instability and dissatisfaction may be such that the possession of additional children may be seen as the best way of restoring and recreating the lost sense of satisfaction in belonging to the large (extended) family.

Still another possible effect derives from the process of household formation. Household formation generates its own specific demands for

saving to finance the formation process, but these additional savings are unlikely to take the form of additional children. Indeed, each additional child would be likely to further increase these savings requirements for establishing the new household, especially to the extent that the cost of providing housing space for children in the fragmented family context becomes a more important consideration. These costs may be offset by greater labor force participation rates of young adults, but at the margin it is women whose labor force participation rates are likely to increase, which in turn may have a negative effect on fertility.

Changes in the time phasing and consumption of intergenerational transfers. Whether or not the extended family is preserved, members of the older generation may attempt to maintain their claim to transfers from the young adult generation by increasing their consumption streams, thereby demonstrating their need for continued supplemental intrafamiliar intergenerational transfer. Fostered perhaps by the tendency toward household fragmentation and by their increasing decision-making independence, but also perhaps by other factors, the younger generation may attempt to resist these claims by shifting the direction of their transfers to their children by investing in their education and location (e.g., by helping their children to attend schools, to attain technical training, and/or to seek employment in cities or towns). To the extent that, as a result, the children postpone their entry into the labor force, the time phasing of labor force participation would again be affected. The life cycle of consumption can also be affected by the higher cost of living in urban areas, the effect of additional education in raising consumption standards via the demonstration effect, and in other ways. The potential importance for fertility reduction of the redirection of intergenerational transfers from the older generation to children can hardly be exaggerated.[18]

Aside from the rather negative motive for this redirection -- the desire to resist continued private intrafamiliar transfers to retirees -- the young adult generation may find that investments in the quality of children are likely to become more profitable. For example, to the extent that the number of children is reduced through any of the mechanisms mentioned above, the greater care and attention that can then be devoted to these children may well reduce child mortality, thereby raising the profitability of investment in quality, thus inducing still further changes in the time phasing and direction of intergenerational transfers. Indirectly, desired fertility would be reduced still further by raising the costs of children in terms of both money and time.

3. Intragenerational and Distributional Effects

As we mentioned above, the private intergenerational transfers preceding the advent of social-security-type old age pensions would generally not take monetary form. Indeed, in the rural LDC context, to a large extent they would probably be in kind. The substitution of these in-kind transfers by the monetary transfers to and then back from the social security system can very conceivably have profound impacts on sex differences in labor force participation, consumption, and education.

As noted above, there is considerable evidence from time allocation studies that it is female children who are the main providers of the food preparation and other services to the older generation. As the formal social security system replaces the traditional method of providing such transfers, it is primarily these young girls whose time allocations would be affected, making it more likely that they would be able to attend school for additional years, once again reducing fertility.

To the extent that the female labor force participation rate increases it may also tend to induce the reallocation of education and locational investments more toward females. As has already been noted, moreover, an increase in the consumption motive for education relative to the investment motive would be likely and, if so, would tend to lead to an improvement in the educational attainment of female children relative to that of male children. Increases in female educational attainment from any of these sources could be expected to have fertility-reducing effects, at least in the long run.

Other intragenerational effects might arise from the effects of the social security tax and transfer system on the distribution of income and thereby indirectly on fertility. The old age pensions are usually financed, as they are in the United States, through payroll deductions that are not necessarily strictly proportional to wages. Likewise, the benefits are not necessarily equal or even strictly proportional to taxes, and the tax and benefit schedules may well vary from one type of worker to another. Typically, there tends to be a significant grant or welfare element in any old age pension scheme, and the relative importance of that element varies between different groups and over time.[19] One may expect, therefore, that the introduction of a social security system in virtually any context is going to have distributional effects, probably in the direction of making for greater inequality in income distribution between participants and nonparticipants and pernaps even among participants themselves.

As to predicting the effect of greater income inequality on fertility, there is less reason to be very confident about magnitude or even direction. One can make a case for an impact in either direction.[20] The only conclusion that can be made, therefore, about the intragenerational income

distribution effect of social security on fertility is that it could be substantial in either direction.

Although most of the discussion thus far has assumed perfect foresight with or without the pensions, one might expect information costs to be higher, uncertainties greater, and myopia therefore more prevalent in LDCs than in DCs, especially in situations of rapid cultural and social change. As a result, the expected direction and magnitude of the effects discussed above could well be modified substantially and still other possible effects could be established. Obviously, there are far too many possibilities and degrees of certainty, miscalculation, and myopia to allow us to discuss them all. Let us simply illustrate the various roles that these factors could play in the rural LDC context with one, perhaps relatively important, example.

While in many DCs, or even in the urban areas of LDCs, information about government programs may be good and confidence that their promises will be realized may be fairly high, such may not always be the case in rural areas of LDCs. Often as a result of many painful experiences, but also from lack of information, rural residents are likely to be either suspicious of or uninformed about the operational features of new government programs like old age pensions. If so, it would be quite likely that the social security tax bite would be felt and adjusted to but not the promises of future old age pension. In that case savings might well be forced directly by the tax but without either the savings reduction effect or any of its potential offsets being triggered. The effect would be a simple reduction in disposable real income which might either reduce or increase fertility, depending on the direction of the income effect; eventually, when the pension would start to flow into qualified retirees, these

flows would be seen as unexpected windfall gains. These subsequent transitory income gains might well be saved, at least for a while (according to the permanent income hypothesis), or bequeathed back to the younger generation. In the latter case, such bequests may well be tied to higher educational investments in the children, and, even if they were not, the incentives might induce such expenditures. If so, despite the increase in saving, fertility could actually be reduced.

This effect would, of course, be offset to the extent that the private intergenerational flows also come unexpectedly to the older generation. Given the daily contact between the generations in the extended-family context, however, miscalculations or surprises would seem highly unlikely.

As we have explicitly stated on several occasions, our expectations about the effects of the pension scheme on fertility have been in terms of desired fertility. Changes in desired fertility, of course, may not translate into changes in actual fertility. The introduction of a social security system may also have effects on actual fertility independent of those arising from the effects on desired fertility. Several sources of such effects may be considered. First, it is not uncommon that among the various other services involved in LDC social security packages are health clinics where contraceptive devices, advice, and information are available, and perhaps even "pushed." Second, the household-fragmentation effect may reduce the influence of traditional religious and other mores against the use of contraceptives. Third, the various ways in which education (especially female education) and female labor force participation would be increased would all serve to improve the likelihood that females would have and seek access to cheaper, more efficient forms of contraception. On the other hand, however, we do not mean to imply that all the effects on actual

as opposed to desired fertility would be in this direction. For example, to the extent that labor force participation, education of females, and commericialization of agriculture would be increased, breast feeding may decline and with it the natural contraceptive protection of amenorrhea. Decreased breast feeding and the greater use of bottle feeding can, if hygiene is not understood or not practiced, increase sickness, infant mortality, and thus fertility and decrease the profitability of educational and other investments in children.

Given the long list of possible effects, and offsetting influences and uncertainties about the magnitudes of these effects, the actual outcome can only be resolved from empirical studies. Suffice it to say that the net effect on fertility of the introduction of an old-age pension sytem could be in either direction, but they could be very substantial, thereby underscoring the need for further empirical studies, especially in rural areas.

F. Implications of Village Surveys and Descriptive Studies for Modeling Household Decisions

The purpose of this chapter has been to review the relevant case studies and village surveys with the objective of deriving implications for the development of models of household decision makings in LDCs. Special attention has been directed towards the validity of the traditional economic modeling of fertility decisions, and in view of the seeming importance of the old-age security motive the possible vehicles whereby the effects on fertility of the introduction of an old-age pension system could be realized.

In the previous chapter, it was noted that there is considerable <u>prima facie</u> evidence in support of the hypothesis that old-age security is an

important concern in rural LDCs. Ther is also evidence that this motive is stronger among women than among men. Although the most important explanation for these findings were given in the previous chapter, additional explanations have been given in the present chapter.

In Section B, above it was shown that the practice of joint living arrangements with one's parents may be useful for its demonstration effect on one's own children of what they should do for their parents in their old-age. Ample evidence in a variety of institutional conditions was also provided for the fact that property rights and inheritance rules are generally rigged in such a way that household heads, especially wealthy ones, have at their disposal rather powerful instruments of control for holding onto their children, i.e., inducing them to remain in the parental household until their demise. Household affiliation and structure, therefore, are important links in the causal chain between old-age security and fertility, especially considering that the degree of extension of the household can exert a variety of influences, both positive and negative, on age-at-marriage, on infant mortality, on resource allocation and accumulation and on fertility. Notably, however, there is also evidence of potentially important feedbacks from these other forms of behavior to household structure.

Although already well established in the literature, evidence from case studies and village surveys was provided in Section C for the proposition that completed fertility is likely to be rather closely related to age-at-marriage. Indeed, since household heads have relatively limited direct control over the fertility behavior of their daughters, daughters-in-law, nieces, etc., age-at-marriage and the choice of partners in marriage are the major instruments of control by household heads over fertility

and thus constitute another important link in the relationship between old-age security and fertility. Once again, however, the relationship is not free of feedback effects from age-at-marriage and hence marital status to household structure and old-age security. With respect to the nature of and way in which marriage decisions are arrived at, considerable evidence was provided suggesting that marriages in rural areas of LDCs are more likely to be motivated by economic factors and strategic considerations of the household as a whole than by the romantic objectives of the marriage partners themselves. Likewise, marriages are more likely to be carried out through the search activities and arrangements of the household head, other family members and marriage brokers than by those of the marriage partners themselves.

What is important for the provision of old-age security in rural areas of LDCs, however, is not simply births or even male births but surviving male children. Considerable evidence is provided in Section D for the view that infant and child mortality, to a much greater extent than has generally been realized, are endogenously determined and affected very considerably by the allocation of breast milk, time and other resources by the wife-mother. Not surprisingly, therefore, there tend to be important sex differentials in infant and child mortality. Infant and child mortality are also apparently very closely related to fertility, child-spacing, and the sex-ordering of live births. Fertility, on the other hand, seems closely related to experience with and expectations concerning infant and child mortality. Clearly, therefore, fertility and infant mortality or survival are rather intimately interrelated, and both must be considered in the satisfaction of the old-age security motive.

Although there is some remaining controversy on the issue, the evidence presented strongly suggests that the majority of decisions relevant

to old-age security and fertility in rural LDCs are made at the level of the residential household. The household head serves the residential household as its primary decision maker, coordinator of activities, arbiter of disputes, and allocator of its resources both statically and dynamically. Household heads tend to reward the display of cohesive and productive behavior and their ability to hold the household together, especially their ability to induce their married sons to remain in the household, tends to increase with the value of the resources at their disposal, i.e., the wealth of the household, and to decrease with the quality and quantity of external opportunities which are not only affected by location but also by the age, sex and educational attainment level of other family members. Household affiliation decisions and the resulting household structure are thus not simply subject to the direct dictates of the household head. Indeed, household affiliation decisions or outcomes would more realistically seem to be individual decisions, essentially the outcomes of the interactions of different individuals or subgroups within the household with the household head and/or with other individuals and subgroups within the overall household.

Several important implications for how economic models of household behavior should be constructed can be derived from this survey.

First, because not all household decisions are made by the same decision-maker, it underscores the importance of correctly identifying the appropriate decision-maker and the appropriate unit of analysis for specific cultural environments if gross errors in specification are to be avoided.

Notably the identification of the appropriate unit of analysis for some decisions in certain rural areas of some parts of LDCs would appear to

be different than that in other areas of LDCs, in DCs and as conventionally modelled. For example, marriage decisions seem to be largely household decisions in rural areas of LDCs whereas they are usually considered to be individual decisions in DCs and hence have typically been modelled as such. The same may also be true for educational decisions. On the other hand, because of the importance of the distinction between the couple and the household and of the possible presence of several married couples and of those of different generations within the same extended household, it would seem especially important to allow the wife-mother a role in fertility and infant mortality outcomes in rural LDCs even if no such distinction between the household and the wife is important and therefore conventional in DCs. The choice of the appropriate unit of analysis, an issue which has been ignored by most social scientists in their quest for convenience and expedience in research design, cannot be ignored in the rural LDC context.

Second, even though many different kinds of "household" behavior are closely interrelated, because they are made by different individuals or subgroups within the household, it is most obviously incorrect to specify them as being determined within a single simultaneous equation system, which as mentioned in the introduction to the chapter, has become increasingly common among social scientists and especially among economists.

Third, in view of the closeness of many rural households in LDCs to the very minimum of subsistence, and the evidence cited above that marriage, household affiliation, and fertility-infant mortality decisions are in large part motivated by economic forces, the recent efforts to generalize the models of the new household economics in the direction of allowing for altruism and other motives may well be unnecessary as far as rural LDCs are concerned.

Fourth, in contrast to the seemingly insatiable propensity of economists to generalize with respect to both time and space, the above survey makes it clear that many of the relevant forms of behavior can be understood only in terms of the underlying institutional circumstances which may well vary substantially from one time and place to another. Chief among the important institutional circumstances which may vary are those in regard to inheritance and property rights and the degree of development of capital and insurance markets.

Last, but certainly not least, since all household decisions are in fact made by or within households, and yet since there is much greater variation in household size and structure among households in rural areas of LDCs than there is elsewhere, the structure of the household can be of potential importance in explaining virtually all forms of household behavior in rural areas of LDCs. In the long run, the structure of the household can be affected by a number of influences both endogenous and exogenous to the household. In order for the long run effects of various influences, especially those concerning long run goals like the satisfaction of old-age security, to be fully sorted out and measured, the indirect effects by way of changes in household structure must be included within the anaylsis. Both marriage and fertility are in themselves important vehicles for changing the structure of the household, and yet each of these can be affected by household structure. Hence, since the determination of household structure has not been given much attention by economists, and since the evidence from case studies and village surveys concerning their effects seems to belie the stereotyped assumptions that are usually made about them by economists, the explicit treatment of both the determinants and effects of household structure would seem to be an important addition to economic models of household behavior.

Footnotes to Chapter II

[1]Important examples especially relevant in the current context include Rosenzweig and Evenson (1977), Makhija (1977, 1978).

[2]Some recent exceptions are Yotopoulos (1982), Rosenzweig and Wolpin (1981, 1982), and Entwisle (1982), and Parson (1983b).

[3]For an interesting elaboration of these aspects as well as a more detailed explanation of the importance of authority, see Sanchez (1976) and Caldwell (1978).

[4]See especially Stenning (1958) and Keesing (1970).

[5]One needs to bear in mind that other things do not generally remain equal as age at marriage changes. Older ??? for example will have accumulated more wealth.

[6]Even in such circumstances Wolf and Huang point out that the male head would retain responsibility for arranging the marriage in situations where it is the son-in-law who would be imported.

[7]This is further attested to by statistical studies showing education of the wife-mother to be particularly important in explaining variations in infant and child mortality across households and groups.

[8]The wife-mother's role as the emotional and sentimental entrepreneur of the household, although referred to in many different ways such as leader of the "uterine family" [Wolf (1972)] "matrifocality" [Smith (1973)], is generally recognized. Given the strength of women in this role, it follows that their effect and indeed to some extent also their purpose may be "to compromise their husband's relationships with his descendants."

[9]Much of this section is adapted from Nugent and Gillaspy (1983).

[10]See Friedman (1957) and Feldstein (1974, 1975, 1976, 1977).

[11]Leibenstein (1957).

[12]See especially Munnell (1974) and Pellechio (1979).

[13]See Adams (1972) and Goody (1976).

[14]See Katona (1964).

[15]Again the reader is referred to Adams (1972) and Goody (1976).

[16]See Smith (1975), Burkhauser and Turner (1978). To some extent, however, the changes in labor force participation both during old age and during working years may be more apparent than real since changes in formal

measured employment may be offset by compensating changes in informal household productive activities.

[17]For different but rather strong explanations for and expositions of the redirection of transfers, the reader is referred to Goode (1963), Caldwell (1976, 1982), Aries (1965), Goubert (1970), Laslett (1965), Laslett and Wall (1972) and Stone (1977). For an interesting comparison of these approaches see Thadani (1978).

[18]See Parsons and Munro (1977).

[19]See for example Kocker (1973), Repetto (1974, 1979) and Birdsall (1977).

CHAPTER III

A FORMAL MODEL LINKING OLD-AGE SECURITY WITH HOUSEHOLD STRUCTURE, MARRIAGE, FERTILITY, WEALTH AND RESOURCE ALLOCATION AND ACCUMULATION

The purpose of this chapter is to specify a formal model of household behavior that makes explicit the manner in which the old-age security motive affects household formation and partition, marriage and fertility, technology, resource accumulation and allocation in rural areas of less developed countries. The model is designed so as to be suitable for analyzing both the direct and indirect effects of introducing a formal social security system on these various forms of behavior and to be sufficiently flexible so as to allow for various cultural differences that may well exist between different countries or even regions within a single country. In specifying the model, a concerted effort is made to be as faithful as possible, (but without adding unnecessary complexity) to the findings of the survey presented in Chapter II, and especially to the implications for modelling presented in Section F of the chapter.

The model is one of household decision making and postulates that all household decisions are made rationally, in the sense that they are motivated by a desire to achieve given objectives, subject to environmental, economic and institutonal constraints and a set of initial conditions. Within the context of the model, decisions are assumed to be made either by the household as a whole or by individual members of the household, implying both that many of the decisions may be closely interrelated and that any or all such decisions may well be affected by the size and structure of the household. In order to allow for differentiation in the identity of the decision maker(s) and for variations in the timing of the various

household decisions from one such decision to another, the interdependence of household decisions is represented by a series of interdependent models which we refer to as modules. This approach contrasts with the approach frequently taken in which interdependencies are represented by a system of simultaneous equations which can be traced back to one decision maker and one set of constraints.

The model consists of four distinct modules. The first module focuses on the structure of the household; the second module deals with the marriage decision for both males and females; the third module concerns the fertility decision; the fourth module is designed to explain the distribution of wealth and its composition across households, and demonstrates how these various components of wealth could be updated overtime by short-run production and expenditure decisions. Related to the fourth module is the determination of short-run changes in the distribution of income. Implicitly at least, expectations about future states of the world including sources of old-age support play important roles in the various modules. In general, of course such expectations are non-operational and hence it is not very useful to introduce such variables explicitly in the analysis. Later on, in the context of our empirical application of the modelling system to Malaysia and the Malaysian Family Life Survey data in particular which happens to possess data of this sort, we make these expectational relationships more explicit with a fifth module which we call the Expectations Module. The presentation of that module, however, is postponed until Chapter VII.

The decision-making unit varies from one module to the other. The first or household structure module adopts the individual as the decision-making unit; the fertility module adopts the wife as the decision-making

unit. Finally, the marriage and resource distribution and allocation modules adopt the household as the unit of analysis. The time frames also vary by module. The household structure module incorporates an infinite horizon in an intergenerational model; the marrriage module adopts the lifetime of the "household' or the parents of the potential marriage partners as the time frame; the fertility module adopts the lifetime of the wife as the time frame; and finally, the resource allocation module uses a three year or short-run time horizon with constraints on end-year capital stocks. The modular framework, while placing restrictions on the decision-making unit for specific decisions, allows for some variation in the choice of the decision-making unit from one decision to the next, a feature generally not available in economic models of demographic decision-making.

Our presentation proceeds as follows. In Section A the Household Structure Module is formulated and testable implications are derived. Likewise, in Sections B-D, the same things are done with respect to the Marriage Module, the Fertility Module, and the Wealth and Resource Allocation Module, respectively. Finally, in Section E we present an overview of the modeling system as a whole indicating how the different modules are related to one another.

A. The Household Structure Module

The purpose of this section is to present a model capable of considering at the same time several alternative mechanisms for achieving old-age security, including that of living with one's children which as noted above would seem to be a rather fundamental motive for the intergenerational complexity or the degree of extension which tends to be the norm in rural areas of LDCs. The model also incorporates the role of

wealth in the determination of household structure. In order to keep the model as simple as possible, however, most of the other considerations stated above are brought in only in the empirical specification. The model is a two-generation general equilibrium model which distinguishes the production-based benefits of joint living from the transfer-based benefits of such arrangements.

In relation to previous models of household structure, the model makes no assumptions regarding preferences either for privacy or for "noise" and companionship [Beresford and Rivlin (1968); Carliner (1975); Michael, Fuchs, and Scott (1980)]. The model also takes as given previous fertility and marital decisions and, as a result, the expected availability of kin [Kobrin (1976)]. The focus of the model is thus on variations in household structure attributable to variations in the availability of substitutes for the family system of transfers.

The historical antecedent for the formal model of household structure to be presented is the two-period life cycle growth model considered by Samuelson (1975a, 1975b). Innovations in the current formulation relative to that of Samuelson include the introduction of intrafamily transfers as an alternative to the government transfers previously introduced by Samuelson, and the explicit recognition of the potential role played by household structure in determining output, family transfers, and utility. By focusing attention on the form of the intergenerational transfers, the interdependencies among household structure, fertility, private savings, and social insurance schemes are emphasized.

The starting point for the model is a two-generation asexual society.[1] Each individual (distinguished only by year of birth) is assumed to live for two periods, the first as an adult who both consumes and produces

output, and the second as a dependent elderly person who only consumes output. Although the individual is asexual, the decision on which we focus is made by actual or potential heads of household who are generally males in most rural areas of LDCs. For simplicity, therefore, we refer to the representative individual as "he".

The well-being of the representative individual is given by an ordinal utility function, quasi-concave in c^1 and c^2,

$$U(c^1, c^2; E) \tag{A.1}$$

where c^1 and c^2 are the levels of consumption for the representative individual in the two periods, i.e., as a productive adult and as a non-productive older adult, and E is the complexity of the household structure. The introduction of E directly into the utility function allows for an effect of household complexity on the individual's utility. In the case of rural India where the complex household is generally recognized as an ideal household form and individuals are assumed to place positive value on the degree of complexity or extension of the household, the marginal utility of household complexity, $\frac{\partial U}{\partial E}$, would normally be assumed to be positive except at very high levels of household complexity when concern for lack of privacy may be considerably stronger. In the longer run, preferences may be assumed to change, and the marginal utility of additional complexity may become zero or negative at lower levels of complexity as would seem to be the case in the urban areas of LDCs where trends toward separate living arrangements are observed. In summary, for the case of rural India, we assume

$$\frac{\partial U}{\partial c^1} > 0,\ \frac{\partial U}{\partial c^2} > 0,\ \frac{\partial U}{\partial E} \gtrless 0,\ \text{and}\ \frac{\partial U^2}{\partial c^1},\ \frac{\partial U^2}{\partial c^2},\ \frac{\partial U^2}{\partial E} < 0 \tag{A.2}$$

In the absence of a capital market in which to borrow or lend, the individual's consumption in each period is subject to a period-specific constraint. In the first period, i.e., period 1, the individuals consumption, c^1, is constrained by his level of output during the period 1, i.e., while a productive adult, less what he is required by the household head to contribute to investment to maintain the household's capital-labor ratio k in the face of the rate of growth of its members g (which is known to it), and less that which he provides in the form of both taxes τ_1^1 and family contributions τ_2^1 during period 1. Given the aforementioned assumption of dependency in the second period, consumption in the second period, c^2, is constrained by the transfers which he receives in the form of both social security benefits β_1^2 and family contributions β_2^2 during that (the second) period.

$$c^1 = f(k_1;\ E) - gk - \tau_1^1 - \tau_2^1(E,k_1) \tag{A.3}$$

$$c^2 = \beta_1^2 + \beta_2^2(E,k_2) \tag{A.4}$$

where f( ) is the per capita production function characterized by non-increasing returns to scale in capital and labor.

In the production function expressed on a per worker basis, $f(k;\ E)$, $\partial f/\partial k$ is positive and decreasing, consistent with the non-increasing returns to scale assumption. For a given capital-labor ratio, k, $\partial f/\partial E$ is expected to be positive when E is small (less complex) because of the advantage in terms of experience, knowledge and advice that older dependent

adults may be able to offer in terms of technical and allocative efficiency and the reduced transactions costs that derive from the use of family as opposed to wage labor in farm and household production, and to be negative when E is large (more complex), an assumption based on the observation that, under a given set of conditions, there is an optimal degree of complexity for production purposes. In the family transfer functions, τ_2^1 and β_2^2, the partial derivatives with respect to E and k, i.e., $\partial\tau_2^1/\partial k$, $\partial\tau_2^1/\partial E$, $\partial\beta_2^2/\partial E$, and $\partial\beta_2^2/\partial k$ are expected to be positive.[2] These assumptions regarding the influence of the maintenance of extended households on the benefits derived from family transfers are consistent with the finding of the anthropological literature surveyed in the previous section which suggested that the support that one can expect in old age is related to living arrangements and to the non-human wealth that can potentially be inherited. In other words, both the degree of extension and the level of capital (which represents potential inheritance) may be thought of as instruments for increasing transfers in old age.

Utilizing our previous definition of the rate of population growth of the household as g (or alternatively that at the societal level as g^s), the relationship between the numbers of members of the productive and dependent generations in period t, the latter having been the productive generation in period $t-1$, at the household level L_t and L_{t-1}, and at the societal level, L_t^s and L_{t-1}^s, respectively, can be defined as:

$$L_t = (1 + g)L_{t-1};\ L_t^s = (1 + g^s)L_{t-1}^s \tag{A.5}$$

In the society at large, the following accounting identity must hold with respect to the tax-transfer system:

$$[\beta_1^2 + \beta_2^2(E_t,k_t)]L_{t-1}^s \equiv [\tau_1^1 + \tau_2^1(E_t,k_t)]L_t^s$$

$$+ rk^sL_t^s - (k_{t+1}^sL_{t+1}^s - k_t^sL_t^s) \qquad (A.6)$$

where k^s is the social or government capital stock or pension fund per member of the productive generation of the population and r is the rate of return on that stock or fund. In some schemes, such as the "pay-as-you-go" type of social security system employed in the U.S., k^s is close to zero. In other systems, however, one pays in to a fund which is accumulated, invested, and then drawn upon as needed, substituting thereby for the need to finance the entire value of current transfers from current taxes and transfers. The identity (A.6) is thus sufficiently general to hold for any type of system.

Assuming a steady-state equilibrium wherein $\beta_1^1 + \beta_2^1 = \beta_1^2 + \beta_2^2$, $g = g^s$ and k, k^s, E, g and g^s are all constant, certain time and sector superscripts can be deleted. With these deletions and by substituting equation (A.5) into equation (A.6), the following steady-state equilibrium condition is obtained:

$$\beta_1 + \beta_2(E,k) \equiv [\tau_1 + \tau_2(E,k) + rk^s - [k^s(1+g) - k^s]](1+g) \qquad (A.7)$$

Note that in obtaining this steady-state equilibrium condition, the task of proving the existence of the steady-state equilibrium has been bypassed. We simply assume (based on the aforementioned evidence in the descriptive literature) that such an equilibrium exists.

To emphasize the relationship between the interest rate and the population growth rate in this identity, as well as in order to prepare for the

substitution of the right hand side of (A.7) for β_1 and $\beta_2(E,k)$ in the optimization problem, (A.7) may be rewritten as:

$$\beta_1 + \beta_2(E,k) \equiv [\tau_1 + \tau_2(E,k) + (r-g)k^s](1+g) \tag{A.8}$$

This is the steady-state equilibrium condition for the society as a whole. (The reader is reminded that the relevant society may be as small as a certain portion of a village.) All three systems of providing for old age dependents are incorporated; the formal social security system is represented by τ_1 and β_1, the family transfer system is represented by τ_2 and β_2, and the capital accumulation and rate of return process (in this case of the government) is represented by r and k^s. As such, the capital accumulation and earning process is treated as simply a part of the government's old-age pension system. In principle, it could be separated out and introduced as a genuinely different (private) alternative. This, however, could only be done at the cost of adding greater complexity to the model by allowing for heterogeneity among the agents with respect to endowments and hence by providing the rationale for borrowing and lending operations among private individuals. The imposition of the steady-state equilibrium condition leaves the budget constraint of the first period essentially unchanged.

$$c^1 = f(k, E) - gk - \tau_1 - \tau_2(E, k) \tag{A.9}$$

The only difference is that in (A.9) we drop the time subscripts because of the steady-state assumption. Likewise, substituting the right hand side of (A.8) into the budget constraint of period 2, (A.4), gives us the simplified steady-state resource constraint of the individual for period 2 (old age), given by:

$$c^2 = [\tau_1 + \tau_2(E, k) + (r - g)k^s](1 + g) \tag{A.10}$$

The Lagrangian formulation for the problem of optimizing the utility function (A.1), subject to the steady-state resource constraints for the two periods (A.9) and (A.10), is:

$$\mathscr{L} = U(c^1, c^2, E) - \lambda_1[c^1 - f(k;E) + gk + \tau_1 + \tau_2(E,k)]$$

$$- \lambda_2\{c^2 - [\tau_1 + \tau_2(E, k) + (r - g)k^s](1 + g)\} \tag{A.11}$$

Differentiating (A.11) with respect to the five endogenous variables c^1, c^2, E, λ_1, and λ_2, given the values of the exogenous variables r, τ_1, g, k and k^s, yields the following first-order conditions:

$$\frac{\partial U}{\partial c^1} = \lambda_1 \tag{A.12a}$$

$$\frac{\partial U}{\partial c^2} = \lambda_2 = \lambda_1\left(\frac{1}{1+i}\right) \tag{A.12b}$$

$$\frac{\partial U}{\partial E} = \lambda_1\left[-\frac{\partial f}{\partial E} + \frac{\partial \tau_2}{\partial E}\right] + \lambda_2\left[-(1+g)\frac{\partial \tau_2}{\partial E}\right] \tag{A.12c}$$

$$= \lambda_1\left[\frac{\partial \tau_2}{\partial E} - \frac{\partial f}{\partial E}\right] - \frac{(1+g)}{(1+i)}\lambda_1\frac{\partial \tau_2}{\partial E} = \lambda_1\left\{\left[\frac{i-g}{1+i}\right]\frac{\partial \tau_2}{\partial E} - \frac{\partial f}{\partial E}\right\}$$

$$c^1 = f(k, E) - gk - \tau_1 - \tau_2(E, k) \tag{A.12d}$$

$$c^2 = [\tau_1 + \tau_2(E, k) + (r-g)k^s](1+g) \tag{A.12e}$$

Condition (A.12a) equates the marginal utility of consumption in the first period with its shadow price, λ_1. Similarly, condition (A.12b) equates the marginal utility of consumption in the second period with its shadow price, λ_2. Setting $\lambda_1 = 1$, $\lambda_2 = \partial U/\partial c^2 = 1/1+i$, where i is the

subjective discount rate or rate of time preference. Conditions (A.12d) and (A.12e) are the budget constraints for the two periods. From the latter it can be seen that tax-transfers of the government system of old-age pensions τ_1 would substitute on a one-to-one basis for those of the intrahousehold intergenerational type τ_2. Hence any increases in τ_1 would bring about decreases in τ_2 and hence E. The same would be true for any system of capital formation yielding a return r that can be used in order to satisfy the consumption needs of the second period. Note, however, that in the latter case it is only the excess of r over that savings rate which is needed to maintain the steady-state capital-labor ratio with growing population, $(r-g)(1+g)k^s$ that would substitute for intrahousehold transfers τ_2.

The most important condition for present purposes is, of course, (A.12c) which equates the marginal utility of household complexity or extension $\partial U/\partial E$ with the sum of several terms involving λ_1, i (or alternatively λ_2), g, the negative of the marginal product of the degree of extension, i.e., $-\partial f/\partial E$, and the partial derivative of intrafamiliar intergenerational transfers with respect to E, $\partial\tau_2/\partial E$. Assuming that λ_1, $\partial\tau_2/\partial E$ and $\partial f/\partial E$ are all positive, the sign of $\partial U/\partial E$ depends on the sign of $(i-g/1+i)\partial\tau_2/\partial E - \partial f/\partial E$. If $g > i$, it is virtually assured that $\partial U/\partial E < 0$. On the other hand, if $g < i$, $\partial U/\partial E$ would be negative only if $\partial\tau_2/\partial E(i-g/1+i) < \partial f/\partial E$. Since in most circumstances, it may be realistic to assume $g < i$, the demand for E would be greater (making it more likely for $\partial U/\partial E$ to be negative) the larger is $\partial f/\partial E$ and/or the smaller is $\partial\tau_2/\partial E$, for given E. In the special case in which $i = g$, $\partial U/\partial E = -\lambda_1(\partial f/\partial E)$.

Although the derivation of more specific testable implications would require the specification of functional forms for the utility and other

functions in the model, and as suggested in footnotes 1 and 2 above, it would be very desirable to introduce greater complexity into the model. Without going further in this regard, the model in its present form suggests that the degree of household extension is negatively related both to the quality and dependability of investment alternatives, and to the availability of old-age pension programs. From the production function, the larger the wealth or capital stock, the higher would be the marginal product of extension and hence the larger the degree of extension that would be predicted. Likewise, and perhaps even more importantly, recalling the presence of k in the τ_2 function of equation (3), a rise in k would also raise the ability of the dependent generation to extract transfers from the productive generation, and hence once again would raise the demand for E. As we have already shown, other things being equal, the higher the weight that is attached to old-age dependence, i.e., the higher is λ_2 relative to λ_1 (or the lower is i), the higher would be the desired degree of extension.[3] Likewise, as long as education could be interpreted as extension-augmenting in the sense of increasing the efficiency of extension in household production, the higher the level of education, the lower would be the desired degree of extension. These predictions of the model are consistent with the historical and anthropological evidence referred to in Chapter II above suggesting that extended households are more common in relatively wealthy households and especially in those in which land and other non-human capital related assets are important relative to human capital [Nimkoff and Middleton (1960), Goode (1963), Laslett (1972), Anderson (1972), van der Woude (1972) and Goody (1972)].

Since the periods of the model are long (entire generations) and it is solved from the perspective of steady-state equilibrium, it should be

abundantly clear that these predictions should hold only in the very long run. It does not predict how long it would take for household structure to respond to its determinants, such as the establishment of viable investment opportunities, competitive capital markets, and government-sponsored old-age pensions. Since these actions may take time, since there may be substantial lags in the recognition of such changes on the part of the economic agents, and perhaps also since there may be substantial costs of adjusting to such changes, the adjustments may well be slow.

The two-period, or equivalently two-generation, model is a far cry from the complexity of human populations, and the simplicity of the model admittedly limits its usefulness. As noted by Arthur and McNicoll (1978), the restriction to two periods effectively means that the costs of children both to private individuals and to society at large are ignored. In addition, the exclusion of sex differences means that sex differences in survival rates as well as the complex process of marriage that in turn can affect household structure are not dealt with explicitly. If attention were to be focused on the first problem, the solution would appear to be the adoption of either an n+1 period or a continuous time model [Gale (1973), Arthur and McNicoll (1978)]. However, when (as in the present context) attention is focused on household structure and the accompanying importance of distinguishing nuclear families from extended families, the adoption of an n+1 period or a continuous time framework is not particularly useful.

B. The Marriage Model

In much of the literature on marriage and especially of that emerging from the new home economics, marriage decisions are assumed to be made by rational individuals who trade off the advantages of accepting specific

marriage offers from partners of the opposite sex with those of remaining single while engaging in further marriage search activities [Becker (1973, 1974), Freiden (1974), Preston and Richards (1975), Becker, Landes and Michael (1977), Keeley (1977, 1979), Grossbard (1978a, 1978b, 1979), Hogan (1978), Anderson (1981)]. The benefits relative to costs of marriage are based in large part on complementarities in the production of children and other household commodities. Almost invariably, these models specify that all such commodities are produced with constant returns to scale production functions, having the effect of placing most of the burden of adjustment in equilibration on the demand side of the markets (models). Since marriage decisions are often conceived of as being made simultaneously with those regarding education, labor force participation, household formation and fertility, a simultaneous equation system is often utilized as the analytical framework.

From the descriptive literature primarily of anthropology, surveyed in Chapter II, however, we conclude that there are several basic shortcomings in the application of the conventional type of marriage models to rural areas of LDCs, in general, and to rural India, in particular.

First, in contrast to what may be realistic in developed countries or even in urban areas of developing countries (LDCs), marriage decisions are in general not made independently by the marriage partners themselves. Rather they are largely household decisions over which the household head and his wife exercise considerable control. Since in rural areas of LDCs extended or complex household structures, in which married sons and their wives and children remain within the household of the father and household head for a considerable number of years, are very common, and since household heads are generally unable to exercise much direct control over the

fertility decisions of their daughters-in-law, it is by the exercise of their very substantial control over the timing and choice of partner-in-marriage that household heads can influence the fertility behavior of their sons' wives. The exercising of indirect influence over the fertility behavior of their children is not the only motive for the household head's interest in controlling age at marriage and the choice of the marriage partner. Because of the importance of household production activities of various sorts in the overall production and consumption activities of the household and the rather extreme degree of specialization by age and sex of the household members in the different activities,[4] the determination of ages-at-marriage of sons and daughters (who "marry-out" of the household) is an important mechanism for affecting the age and sex composition of the household.

The second principal shortcoming of the application of traditional marriage models to rural areas of LDCs, and one which results from the fact that it is household heads who control age at marriage and even partners-in-marriage, is that the search process for marriage partners is not one which involves primarily the time of the potential marriage partners themselves. This is not to say that search activities are unimportant,[5] but only to point out that the resources involved in search activities are either the time of other household members or ex-household members (such as daughters who have married into other villages and families and hence may have rather intimate knowledge of the characteristics of potential wives for the sons of household heads in those villages) or professional marriage brokers whose services can be procured in almost every village. If the resources involved in the search process are not those of the marriage partners themselves, it is obvious that it is unrealistic to depict the

benefits and costs of search as being the primary or even only important determinants of age at marriage.

The third aspect of traditional marriage models which is of dubious relevance to rural areas of LDCs is the assumption that the values of the services exchanged by way of the marriage contract between the marriage partners, or in this case between households, are equal and/or of no relevance in understanding marriage decisions. To the contrary, in rural areas of LDCs the consummation of the marriage contract is almost invariably accompanied by a side payment in one direction or another. In those cases where the side payment is from the husband's family to the wife's family, the payment is known as the bride price; in cases where the direction of payment is reversed, the payment is a dowry. Anthropologists working in rural areas of LDCs, especially in India, have long pointed out that both the direction and magnitude of the side payment tend to vary between different classes, different regions and according to the characteristics of both the individual marriage partners and the households from which they come.

Because of the aforementioned shortcomings of applying the traditional marriage models to rural areas of LDCs, we proceed to develop a model of marriage services that (1) takes account of the fact that marriage decisions are made at the level of the household and hence may be motivated by various household characteristics such as wealth, the age and sex composition of the household, and location, (2) recognizes the importance to the contracting parties of the respective values of the marriage services exchanged and hence incorporates a dowry function as an essential ingredient of the model, and (3) pays little attention to search since search activities are generally undertaken by persons other than the potential

partners in marriage and hence cannot influence age at marriage. For the reasons given in Chapter II above, marriage decisions are regarded as being contingent on wealth and its composition, educational attainment, and household structure instead of being determined simultaneously with all their other decisions.

In many rural areas of LDCs and especially in India it is usually daughters who change residence upon marriage; sons, both married and unmarried, tend to remain in their household of origin. Because of these common patterns our model is designed to explain the ages at which sons are married, and the ages and quality characteristics of the daughters-in-law who "marry in." Although we explicitly model only a single representative household with sons for whom to obtain wives, full equilibrium depends on agreement in marriage contracts among the households supplying wives and the households demanding wives.

In order to simplify the analysis, we assume that all sons and their wives in the representative household are identical one to another. That is, we assume that all sons would have identical wage rates and be married at the same age. Similarly, we assume that all wives obtained for these sons would be brought into the family at the same ages and have the same wage rates. (These assumptions are not necessary and are invoked only to facilitate the exposition of the model. They could easily be relaxed by distinguishing between different husbands, wives and daughters.) Likewise, and again strictly for convenience in exposition, we assume that the time allocations of all members of any such set would be identical. Further, since marriage is almost universal and polygamy is extremely rare in rural India, the country to which the model is to be applied in subsequent sections of the paper, we assume monogamy and hence that the number of sons (husbands) is equal to the number of daughters-in-law (wives).

In order to facilitate the reader's comprehension of the model, the complete set of equations making up the marriage module is given in Table 3.1. Exogenous variables are distinguished from endogenous ones with the use of bars over the variables. The model begins with the utility function of the representative household in equation (B.1). The household's utility depends on the consumption of marriage services, MS_c, and the consumption of other marketable goods and services, X_c. Although for simplicity the utility function and all other equations of the model are stated in static terms, the time horizon of the model is that of a lifetime. Thus it is recognized that a certain amount of time discounting is implicit in the formulation of the model. In particular, because of their special relevance for old-age security, marriage services, and particularly for the children services which result from marriage services, may well be discounted relative to other goods and services, X_c, which are more important earlier in life. The nature of the utility function, and indeed of all other functions in the model, may be conditional on the existing degree of complexity of the household. However, since we are considering at present only the situation for the representative household, both the degree of household complexity and other household and community characteristics are considered given and hence are ignored in the following discussion.

In equation (B.2), the quantity of marriage services per wife, ms, is converted into the aggregate quantity per household, MS, that enters into the utility function by multiplying by the number of wives N^w. The production function for ms is given in equation (B.3). Specifically, the production of ms depends on the human capital-weighted time allocation to such activities of husbands and wives, $T^h_{ms}\bar{H}^h$, and $T^w_{ms}H^w$, respectively, the quantity of market goods used in production of such services, X_{ms}, and

Table 3.1

A Simplified Model of Marriage Services
for Rural Areas of Developing Countries

$$U = U(MS_c, X_c) \tag{B.1}$$

$$MS = ms\ \bar{N}^w \tag{B.2}$$

$$ms = ms(T^h_{ms}\bar{H}^h,\ T^w_{ms}H^w,\ X_{ms};\ \bar{Z}_1) \tag{B.3}$$

$$X = X(\bar{N}^w T^h_x \bar{H}^h,\ \bar{N}^w T^w_x H^w,\ MS_x,\ \bar{N}^o \bar{T}^o_x \bar{H}^o,\ \bar{V};\ \bar{Z}_2) \tag{B.4}$$

$$X_c = X - X_{ne} - \bar{N}^w X_{ms} \tag{B.5}$$

$$MS_c = MS - MS_x \tag{B.6}$$

$$\bar{T}^h = T^h_{ms} + T^h_x \tag{B.7}$$

$$T^w = T^w_{ms} + T^w_x \tag{B.8}$$

$$\bar{I} = -\bar{q}_x X_{NE} - D^w \bar{N}^w \tag{B.9}$$

$$D^w = D^w\left(\frac{\bar{V}}{\bar{V}_m},\ T^w H^w \bar{w}^w,\ T^h_{ms}\bar{H}^h \bar{w}^h\right);\ \frac{\partial D^w}{\partial T^w},\ \frac{\partial D^w}{\partial H^w},\ \frac{\partial D^w}{\partial w^w} < 0 \tag{B.10}$$

$$\bar{R}_1 = \bar{N}^w \bar{T}^h \bar{H}^h \bar{w}^h + \bar{N}^o \bar{T}^o \bar{H}^o \bar{w}^o + \bar{V} \tag{B.11}$$

Note: Unless otherwise specified, all first derivatives in the functional relationships (indicated by parentheses) are positive while the second derivatives are negative. For the exceptions where, as indicated in equation (B.10) the first derivatives are assumed to be negative, the second derivatives are assumed to be positive.

Table 3.1 (cont.)

Endogenous Variables (in order of appearance)

MS_c = quantity of marriage services consumed per household.

ms = quantity of marriage services per wife.

X_c = quantity of market goods and services consumed directly by the household.

T^h_{ms} = time allocation of husband (son) to marriage services.

T^w_{ms} = time allocation of wife (daughter-in-law) to marriage services.

H^w = human capital index of the wife.

X_{ms} = quantity of market goods and services used in production of marriage services by each wife (daughter-in-law).

X = quantity of market goods and services produced by the household.

MS_x = quantity of marriage services used in production of market goods.

T^h_x = time allocation of husband (son) to the production of market goods and services.

T^w_x = time allocation of wife (daughter-in-law) to the production of market goods and services.

X_{NE} = quantity of net exports of market goods of the household.

T^w = time allocations of the wife.

D^w = dowry received for excess of value of husband services of sons over that of wife services of their wives.

Exogenous Variables

N^w, N^o = number of wives or daughters-in-law for sons as husbands and of other household members respectively.

T^h = time endowment of sons.

T^o_x = time endowment of other household members for use in market goods production including the supply of wage labor to the market.

V = stock of non-human wealth available for use in production of X.

Table 3.1 (cont.)

Exogenous Variables (cont.)

V_m = stock of non-human wealth of household of origin.

I = the overall life time balance of payments constraint with respect to other households and institutions.

H^h, H^o = human capital stocks of husbands and others, respectively.

w^h, w^w, w^o = wage rates of husbands, wives, and others, respectively.

q_x = market price of x.

Z_1, Z_2 = the present value of community services specific to household production of marriage services and market goods, respectively.

finally on the lifetime supply of community services such as health and education specific to the production of marriage services, Z_1. The quantity of marriage services can be thought of in terms of both numbers of children and their health and education.

The production function for market goods and services, X, is given in equation (B.4). It depends upon the aggregate time allocations of all household members, i.e., all husbands, all wives, all children (in the form of marriage services) and all others, allocated to production of X, upon the present values of both the non-human capital of the household and the community services such as roads, markets, etc. relevant to the production of X, Z_2. Equation (B.5) is the balance equation for X. It states that the quantity of market goods available for direct consumption by the household, X_c, is the quantity of such goods produced, X, less the net exports of X, X_{NE}, and net of the use of X in the production of MS, i.e., $N^W X_{ms}$. Equation (B.6) is a similar balance equation for marriage services (children). The consumption of marriage services MS_c is equal to the quantity produced MS less the quantity allocated to production of X, MS_x.

The time constraints of each husband and of each wife are given in equations (B.7) and (B.8), respectively. Since the time allocations of other household members is directly relevant only to the production of X, T_x^o is simply treated as exogenously given, thereby avoiding the need for a separate equation for T^o. The human capital of the wife H^W and the wife time, T^W, which translates into the age-at-marriage of the wife, are key variables to be determined in the model. The lifetime balance of payments constraint of the household is given in equation (B.9). The net imports of market goods over the lifetime must be equal to the net dowry receipts from the families whose daughters marry-in.

The model is completed with equation (B.10) that explains how the dowry or bride price of wives (daughters-in-law), D^W, is determined. In each case the dowry price is specified to depend on the relative stocks of non-human wealth of the households of destination and of origin, V and V_o, respectively, and the human capital- and wage rate-weighted time allocations to marriage services of both marriage partners, $T^W H^W w^W$ and $T^h_{ms} \bar{H}^h \bar{w}^h$, respectively. Specifically, increases in wife-time, the human capital of the wife or the female wage rate in the vicinity of the household should be expected to lower the dowry while increases in the wealth of the husband's household relative to that of the wife, the time allocation of the husband to marriage services, and the human capital and wage rate of the husband would be expected to increase the dowry, i.e., the value of the side payment required to balance the exchange of marriage services between households. By combining the budget and time constraints, the full income constraint of the household given in equation (B.11) which is stated in terms of lifetime potential labor income and non-human wealth is obtained.

Before going to the solution of the model, an intuitive understanding of the marriage model is provided by means of the graphical representation of the model given in Figure 3.1. Emerging from the formal model of the representative household of destination for wives, household d, would be a supply curve of human capital-weighted husband services, $T^h_{ms} \bar{H}^h$, which is designated S_{H_d} in the diagram. Also emerging from the model would be a demand curve for wife services, $T^W H^W$ in the model. This curve is designated D_{w_d} in Figure 3.1. One should bear in mind that these curves of the representative household of destination d are not independent of each other but rather are jointly determined in the model. Likewise, from a similar model of another household, household m, would come a jointly

determined human capital-weighted supply curve of daughters as wives, S_{W_m} in Figure 3.1, and a jointly determined demand curve for human capital-weighted husband services, D_{H_m} in the diagram. The dowry payment can hence be interpreted as the transfer payment from household of origin m to household of destination d that settles the net surplus of household d in the values of the two streams of services exchanged in kind after the optimal allocations of time and net export of goods X_{NE} have been arrived at.

Most of the variables included in the formal model are variables which would determine the position and slope of the respective supply and demand curves in the diagram.

We turn now to the solution to the formal version of the model given in Table 3.1.

Utilizing the Lagrangian formulation wherein the utility function (B.1) is maximized subject to the production functions for MS and X, (B.2)-(B.4) respectively, and the full income constraint (B.11), we obtain the following Lagrangian equation:

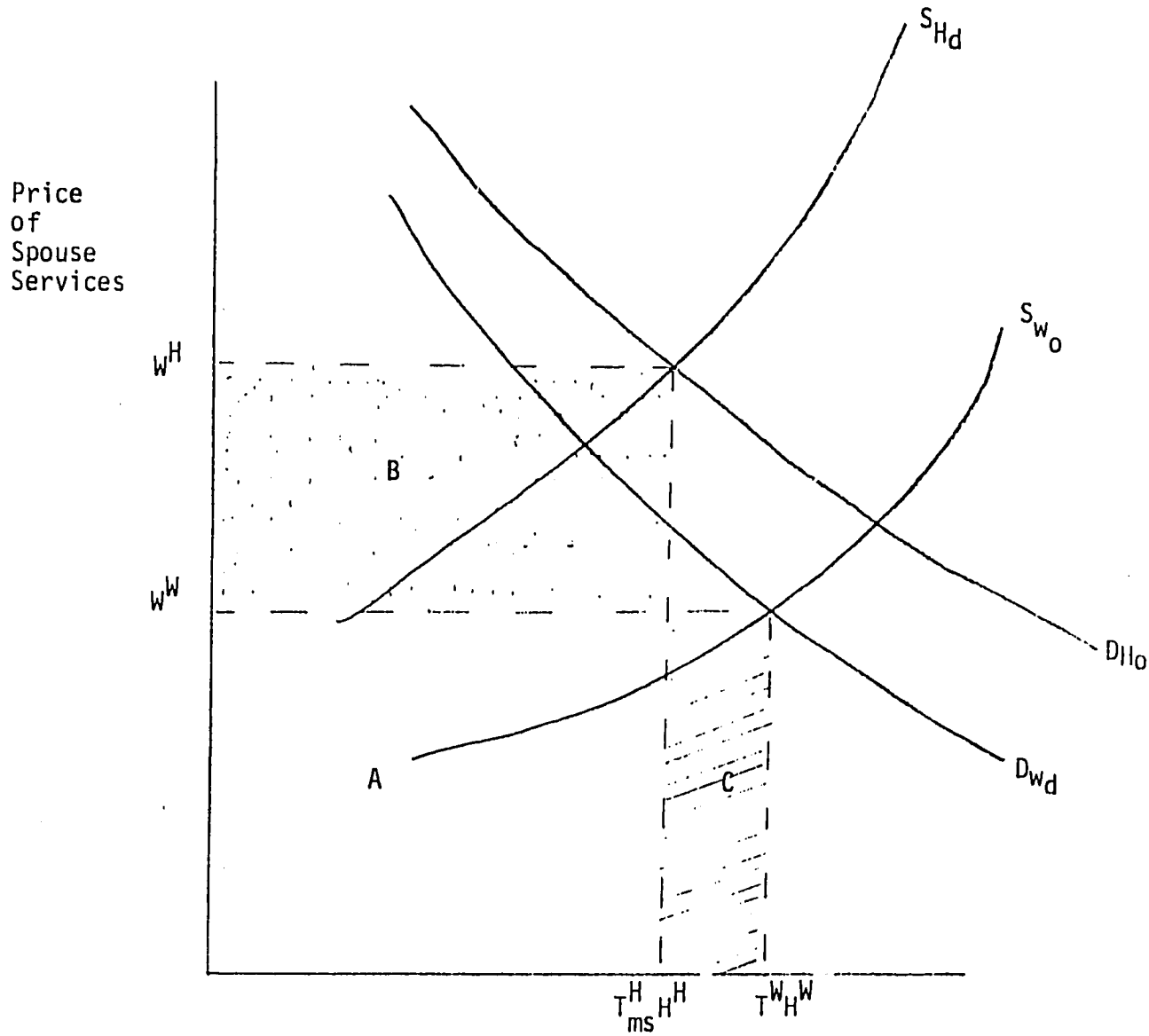
$$L = U[ms(T^h_{ms}\bar{H}^h, T^w_{ms}H^w, X_{ms}; \bar{Z}_1)\bar{N}^w - MS_x, X(\bar{N}^w T^h_x \bar{H}^h, N^w T^w_x H^w, MS_x, \bar{N}^o T^o_x \bar{H}^o, \bar{V}; \bar{Z}_2) - X_{NE} - \bar{N}^w X_{ms}]$$

$$+ \lambda_1[\bar{I} + q_x X_{NE} + D^w\left(\frac{\bar{V}}{V^o}, (T^w_{ms} + T^w_x)H^w\bar{w}^w, T^h_{ms}\bar{H}^h\bar{w}^h\right)\bar{N}^w]$$

$$+ \lambda_2[\bar{R} - \bar{N}^o\bar{T}^o\bar{H}^o\bar{w}^o = V - \bar{N}^w\bar{H}^h\bar{w}^h(T^h_{ms} + T^h_x)] \qquad \text{(B.12)}$$

Figure 3.1

Spouse Service Equilibrium between Households o and d



Equilibrium Condition: $\frac{Vd}{V_o}$ [Area B - Area C] = $\overline{\text{Dowry}}$

or $\frac{Vd}{V_o}[(W^H - W^W)(T^H_n + T^H_q) - W^W(T^W - T^H_n - T^H_q)]$

Differentiating (B.12) with respect to the following ten endogenous variables in the system, T^h_{ms}, T^w_{ms}, T^h_x, T^w_x, H^w, X_{ms}, X_{NE}, MS_x, λ_1 and λ_2, and after rearranging terms, we obtain in the same order the following first-order conditions:

$$\frac{\partial U}{\partial MS}\frac{\partial ms}{\partial T^h_{ms}} = -\lambda_1 \frac{\partial D^w}{\partial T^h_{ms}} \bar{w}^h + \lambda_2 \bar{w}^h \tag{B.13a}$$

$$\frac{\partial U}{\partial MS}\frac{\partial ms}{\partial T^w_{ms}} = -\lambda_1 \frac{\partial D^w}{\partial T^w_{ms}} \bar{w}^w \tag{B.13b}$$

$$\frac{\partial U}{\partial X_c}\frac{\partial X}{\partial T^h_x} = \lambda_2 \bar{w}^h \tag{B.13c}$$

$$\frac{\partial U}{\partial X_c} = -\lambda_1 \frac{\partial D^w}{\partial T^w_x} \bar{w}^w \tag{B.13d}$$

$$\frac{\partial U}{\partial MS}\frac{\partial ms}{\partial H^w}\frac{T^w_{ms}}{T^w_{ms} + T^w_x} + \frac{\partial U}{\partial X_c}\frac{\partial X}{\partial H^w}\frac{T^w_x}{T^w_{ms} + T^w_x} = -\lambda_1 \frac{\partial D^w}{\partial H^w} \bar{w}^w \tag{B.13e}$$

$$\frac{\partial U}{\partial ms}\frac{\partial ms}{\partial X_{ms}} = \frac{\partial U}{\partial X_c} \tag{B.13f}$$

$$\frac{\partial U}{\partial X_c} = \lambda_1 \bar{q}_x \tag{B.13g}$$

$$\frac{\partial U}{\partial X_c}\frac{\partial X}{\partial MS_x} = \frac{\partial U}{\partial MS_x} \tag{B.13h}$$

$$\bar{I} = -q_x X_{NE} - D^w\left[\frac{V}{V_o}, (T^w_{ms} + T^w_x)H^w\bar{w}^w, T^h_{ms}H^h\bar{w}^h\right]\bar{N}^w \tag{B.13i}$$

$$\bar{R} = N^o\bar{T}^o\bar{H}^o\bar{w}^o + \bar{V} + N^w\bar{H}^h\bar{w}^h(T^h_{ms} + T^h_x) = 0 \tag{B.13j}$$

Condition (B.13a) states that the marginal utility attributable to the marginal product of husband time or marriage services per wife should be equal to the difference between (a) the shadow price of time relative to the numeraire (the price of marriage services), and (b) the shadow price of money income multiplied by the marginal effect on the dowry of an extra infinitesimally small increment of husband-time, where both (a) and (b) are weighted by the male wage rate, $\bar{w}^h$.

Condition (B.13b) equates the marginal utility derived from the marginal allocation of wife-time to marriage services to the female wage rate-weighted marginal effect of that time on the dowry, weighted by the shadow price of money income (again relative to the value of marriage services). Because of the expectation that $\partial D^W/\partial T^W < 0$, both sides of (B.13b) are positive.

Condition (B.13c) equates the shadow price of time weighted by the male wage rate with the indirect marginal utility derived from the marginal product of husband-time to market goods production. Condition (B.13d) equates the marginal utility of the consumption of market goods with the marginal opportunity cost of wife-time allocated to market goods production, which is the marginal effect of that time on the dowry, weighted by the female wage rate and multiplied by the shadow price of money income. Once again, since $\partial D^W/\partial T^W_X < 0$, the right hand side of (B.13d) is positive. Condition (B.13e) equates the marginal utility derivable from the time share-weighted marginal productivities with respect to the marginal increment to her human capital with the female wage rate-weighted effect of that marginal increment on the dowry multiplied by the shadow price of money income.

Condition (B.13f) equates the marginal utility of consumption of market goods with the marginal utility of marriage services generated by the marginal product of market goods in the production of marriage services. Condition (B.13g) simply equates the marginal utility of direct consumption of market goods with their price, weighted by the shadow price of money income. Condition (B.13h) equates the marginal utility of marriage services with the indirect marginal utility of market goods attributable to the marginal product of marriage services in the production of market goods. Conditions (B.13i) and (B.13j) are, of course, simply equations (B.9) and (B.11) of the model as presented in Table 1.

Several of these conditions can be combined. For example, from equations (B.13b), (B.13d) and (B.13g) we find:

$$\frac{\frac{\partial U}{\partial MS}\frac{\partial ms}{\partial T^{w}_{ms}}}{\frac{\partial D^{w}}{\partial T^{w}_{ms}}\bar{w}^{w}} = \frac{\partial U/\partial X_{c}}{\frac{\partial D^{w}}{\partial T^{w}_{x}}\bar{w}^{w}} = \frac{\frac{\partial U}{\partial X_{c}}}{q_{x}} = \lambda_{1}$$

$$\frac{\frac{\partial U}{\partial MS}\frac{\partial ms}{\partial T^{w}_{ms}}}{\frac{\partial U}{\partial X_{c}}} = \frac{\partial D_{w}/\partial T^{w}_{ms}}{\partial D^{w}/\partial T^{w}_{x}} = \frac{\frac{\partial D^{w}}{\partial T^{w}_{ms}}\bar{w}^{w}}{q_{x}} = 1 = \frac{\frac{\partial D^{w}}{\partial T^{w}_{x}}\bar{w}^{w}}{q_{x}} = \lambda_{1} \qquad \text{(B.14)}$$

In equation (B.14) we see the condition that the shadow price of money income is equal to unity, and is also equal to the ratios of the marginal utilities of marriage services and of market goods. We also note that the response of dowry to the time of the wife is independent of whether or not the wife is actively employed.

Because of the large numbers of terms, the large number of partial and cross-partial derivatives, and the fact that not all of the parameters in a

particular relationship have the same sign, it is not possible to derive hypotheses which yield unambiguous outcomes regardless of the magnitudes of the various parameters in the model. The size of the model, moreover, makes it rather cumbersome in practice to formally derive such comparative static results concerning the effects of changes in exogenous variables on all the endogenous variables in the system. Nevertheless, from Figure 3.1, from the specification of the model given in Table 3.1 directly as well as from the first-order conditions given in equations B.13a-B.13j, the basis is provided for the following hypotheses:

(1) The greater the wealth $\bar{V}$, the larger will be the marginal products of given levels of MS_x and of the time allocations of husbands, wives and other household members in the production of market goods, and hence the larger will be the demand for wife-time, in general, and marriage services, in particular. Naturally, the composition of wealth would affect not only the magnitude but also the direction of these demand effects. For example, land, and especially irrigated land, and livestock might well increase the demand for marriage services, whereas agricultural machinery might tend to reduce the demand for such services. According to the model, wealth would also exert an influence through its role in the dowry function, equation (B.10). According to this function an increase in V would tend to increase the quantity and quality of the wage rate-weighted wife services that can be purchased in return for a given amount of quality- and wage rate-weighted husband services and given dowry.

(2) The higher the male wage rate relative to the female wage rate, from the dowry function (for a given level of dowry) the greater is the volume of wife services that would have to be exchanged for any given value of husband services.

(3) Similarly, the higher the human capital index of the husband, the

larger is the value of wife services (either younger age or more probably a higher human capital index) that would have to be offered (for given dowry) to settle the marriage contract.

(4) Since some of the benefits of marriage services, for example the old-age security benefits of children, are particularly important in the absence of capital markets, the demand for T^w and T^h_{ms} might be expected to be larger the less available or less developed the capital markets in the community. The effect of the presence or absence of such markets, however, might also be affected by the structure of the household and especially by the degree of its intergenerational extension.

(5) Given the aforementioned specialization by age and sex in the various different activities of the household, the demand for wife services, and also the supply of husband services, may well be affected by the age and sex composition of the other household members within the household, which for simplicity were all treated as simply "other" in the model. Specifically, we hypothesize that the larger the percentages of female and children members in the household, the lower would be that household's demand for marriage services.

(6) Finally, the relative supplies and the nature of the community supplied services, Z_1 and Z_2, and the price of market goods, q_x, could also exercise considerable influence over both the overall costs of production of marriage services relative to market goods and the marginal productivities of the different factors of production used in the production of each. For example, proximity to the market, or to employment opportunities, might be expected to increase the production of market goods relative to marriage services, whereas proximity to health and educational facilities might have the opposite effect. Assuming that the old-age security motive may be an

important determinant of the demand for marriage services, one variable of this type which might exercise an especially depressing influence on the demand for marriage services would be a dummy variable indicating the household's participation in an old-age pension system.

Many of these hypotheses are couched in terms of conditions such as "given dowry" or "given human capital indexes." As the alert reader no doubt already realizes, in the formulation of the model these variables are indeed not given or constant. The derivation of specific hypotheses is, therefore, neither as easy nor as clear-cut as the above examples would indicate. In any case, further discussion of the hypotheses is postponed until after the data and empirical specifications are presented.

C. A Simple Model of Fertility and Old-Age Security

This section presents the theoretical model relating fertility to old-age support from the perspective of the wife-mother. As suggested in Chapter II, fertility decisions of the wife are viewed as being conditional on age-at-marriage, on personal characteristics of both herself and her spouse, and on the size, structure, wealth and other characteristics of the husband's family. Again, for reasons given in the previous chapter, the model, as developed below, focuses on the demand for surviving children relative to potential fertility (given age-at-marriage and the effective duration of the marriage) and, assumes that the wife-mother, the person who bears and rears the children, is the primary decision-maker. Other members of the household, including her husband, influence her decisions through their control over the flow of resources to her. Thus, the time she is required to contribute to productive activities for the household is assumed to decrease as the number of children she bears and cares for

increases, the amount of the decrease depending on the value placed on children by the household. In a similar fashion, the household also controls the share of the household's food and other goods that the wife-mother receives. The wife-mother, however, is assumed to be in a position to determine how to allocate the resources and time available to her among child-bearing and rearing activities and other activities that are "hers", i.e., are above and beyond the time and resources she is required to devote to fulfillment of her responsibilities to the household.

The model shares a number of features with the one-period household production models of fertility behavior which have been developed over the last two decades [Becker (1960), Willis (1974), Becker and Michael (1976), Rosenzweig and Evenson (1977)]. Specifically, the model employs a static one-period framework, envisions the decision-maker as having preferences both for child services and for other commodities, and considers the production of these commodities to be the result of combining time and goods. However, in contrast to the models mentioned above, the model presented here treats the mother (as opposed to the household or other individuals in the household) as the decision-maker and restricts her resources to "her" time, i.e., that which is net of the time she is required to allocate to productive activities for the household, and to the resources she receives both for herself and for her child-bearing and rearing activities. These features allow the mother's preferences for children to differ from those of the household and give her some independence in fertility behavior but at the same time recognize that the mother's decisions to bear children are very much constrained by the household's decisions.

At this point, we turn to a formal specification of the model. In order to facilitate the presentation, the equations specifying the struc-

ture of the model, as well as the first-order conditions for optimization, are presented in Table 3.2.

The structure of the model consists of three parts: the utility function for the decision-maker (Eq. C.1), in this case the wife-mother, the production functions for the commodities providing utility, namely, the number of children, the quality of children (per child) and other commodities which provide satisfaction (Eq. C.2-C.4), and the constraints on the inputs, time and goods, in the production functions (Eq. C.5-C.8).

As specified in equation (C.1), the utility of the mother is a function of child services, C, and other commodities, Z, where child services are defined as the product of number of children, N, and quality per child, Q. The preferences for C and Z are determined by the social and cultural environment and depend specifically on the value placed on child services relative to that on other activities which provide satisfaction.

The benefits of children to the wife-mother associated both with their direct contributions to her when she is old, widowed and dependent on others for support and with the contributions that the household provides her that are dependent on her fertility behavior are not included in the preference function directly. Instead, these reasons for valuing children are incorporated in the resource constraints.

The production functions for the three commodities in the mother's utility function are specified in equations (C.2)-(C.4). The production functions for numbers of children and for quality of children are specified as functions of the time inputs by the mother, T_{1N} and T_{1Q}, of the time inputs of other family members, T_{2N} and T_{2Q}, of the marketable goods inputs, X_N and X_Q and to be contingent on the degree of extension of the household E a proxy for the efficiency of the household in producing these commodi-

Table 3.2

The Fertility Model

I. Structure of the Model

Utility function: $U(C,Z) = U(NQ,Z)$ (C.1)

Production functions:

$$N = N(T_{1N}, T_{2N}, X_N; E) \quad (C.2)$$
$$Q = Q(T_{1Q}, T_{2Q}, X_Q; E) \quad (C.3)$$
$$Z = Z(T_{1Z}, X_Z; E) \quad (C.4)$$

Time and Goods Constraints:

$$T_1 - T_{1L}(C) = T_{1N} + T_{1Q} + T_{1Z} \quad (C.5)$$
$$T_{2N} = T_{2N}(N) \quad (C.6)$$
$$T_{2Q} = T_{2Q}(Q) \quad (C.7)$$
$$V_1(C) + V_2(C) + V_3 = q_x(X_N + X_Q + X_Z) \quad (C.8)$$

II. Optimization of the wife-mother's utility utilizing the Lagrangian formulation of constrained optimization.

$$\begin{aligned} L = U(NQ, Z) &- \lambda_1(N - N(T_{1N}, T_{2N}, X_N)) - \lambda_2(Q - Q(T_{1Q}, T_{2Q}, X_Q)) \\ &- \lambda_3(Z - Z(T_{1Z}, X_Z)) - \lambda_4(T_1 - T_{1L}(C) - T_{1N} - T_{1Q} - T_{1Z}) \\ &- \lambda_5(T_{2N} - T_{2N}(N)) - \lambda_6(T_{2Q} - T_{2Q}(Q)) \\ &- \lambda_7(V_1(C) + V_2(C) - V_3 - q_x(X_N + X_Q + X_Z)) \end{aligned} \quad (C.9)$$

First order conditions (18)

$$\frac{\partial L}{\partial N} = \frac{\partial U}{\partial C} \cdot Q - \lambda_1 + \lambda_4 \frac{\partial T_{1L}}{\partial C} \cdot Q - \lambda_5 \frac{\partial T_{2N}}{\partial N} - \lambda_7 \frac{\partial V}{\partial C} \cdot Q = 0 \quad (C.10a)$$

Table 3.2 (cont.)

$$\frac{\partial L}{\partial Q} = \frac{\partial U}{\partial C} \cdot N - \lambda_2 + \lambda_4 \frac{\partial T_{1L}}{\partial C} \cdot N - \lambda_6 \frac{\partial T_{2Q}}{\partial Q} - \lambda_7 \frac{\partial V}{\partial C} \cdot N = 0 \qquad \text{(C.10b)}$$

$$\frac{\partial L}{\partial Z} = \frac{\partial U}{\partial Z} - \lambda_3 = 0 \qquad \text{(C.10c)}$$

$$\frac{\partial L}{\partial T_{1N}} = -\lambda_1 \frac{\partial N}{\partial T_{1N}} + \lambda_4 \left(\frac{\partial T_{1L}}{\partial C} \cdot Q \frac{\partial N}{\partial T_{1N}} + 1\right) + \lambda_5 \frac{\partial T_{2N}}{\partial N} \cdot \frac{\partial N}{\partial T_{1N}}$$

$$-\lambda_7 \frac{\partial V}{\partial C} \cdot Q \cdot \frac{\partial N}{\partial T_{1N}} = 0 \qquad \text{(C.10d)}$$

$$\frac{\partial L}{\partial T_{1Q}} = \lambda_2 \frac{\partial Q}{\partial T_{1Q}} + \lambda_4 \left(\frac{\partial T_{1L}}{\partial C} \cdot N \frac{\partial Q}{\partial T_{1Q}} + 1\right) - \lambda_6 \frac{\partial T_{2Q}}{\partial Q} \cdot \frac{\partial Q}{\partial T_{1Q}}$$

$$- \lambda_7 \frac{\partial V}{\partial C} \cdot N \frac{\partial Q}{\partial T_{1Q}} = 0 \qquad \text{(C.10e)}$$

$$\frac{\partial L}{\partial T_{1Z}} = \lambda_3 \frac{\partial Q}{\partial T_{1Z}} - \lambda_4 = 0 \qquad \text{(C.10f)}$$

$$\frac{\partial L}{\partial T_{2N}} = \lambda_1 \frac{\partial N}{\partial T_{2N}} + \lambda_4 \left(\frac{\partial T_{1L}}{\partial C} \cdot Q \cdot \frac{\partial N}{\partial T_{2N}}\right) + \lambda_5 - \lambda_7 \frac{\partial V}{\partial C} \cdot Q \frac{\partial N}{\partial T_{1N}} = 0 \qquad \text{(C.10g)}$$

$$\frac{\partial L}{\partial T_{2Q}} = \lambda_2 \frac{\partial Q}{\partial T_{2Q}} + \lambda_4 \left(\frac{\partial T_{1L}}{\partial C} \cdot N \cdot \frac{\partial Q}{\partial T_{2Q}}\right) - \lambda_6 - \lambda_7 \left(\frac{\partial V}{\partial C} \cdot N \frac{\partial Q}{\partial T_{2Q}}\right) = 0 \qquad \text{(C.10h)}$$

$$\frac{\partial L}{\partial X_N} = \lambda_1 \frac{\partial N}{\partial X_N} + \lambda_4 \left(\frac{\partial T_{1L}}{\partial C} \cdot Q \frac{\partial N}{\partial X_N}\right) + \lambda_5 \left(\frac{\partial T_{2N}}{\partial N} \frac{\partial N}{\partial X_N}\right)$$

$$- \lambda_7 \left(\frac{\partial V}{\partial C} \cdot Q \cdot \frac{\partial N}{\partial XN} - q_x\right) = 0 \qquad \text{(C.10i)}$$

$$\frac{\partial L}{\partial X_q} = \lambda_2 \frac{\partial Q}{\partial X_Q} + \lambda_4 \left(\frac{\partial T_{1L}}{\partial C} \cdot N \frac{\partial Q}{\partial X_Q}\right) + \lambda_6 \left(\frac{\partial T_{2Q}}{\partial N} \cdot \frac{\partial N}{\partial X_Q}\right)$$

$$- \lambda_7 \left(\frac{\partial V}{\partial C} \cdot N \frac{\partial Q}{\partial X_Q} - q_x\right) = 0 \qquad \text{(C.10j)}$$

$$\frac{\partial L}{\partial X_Z} = \lambda_3 \frac{\partial Z}{\partial X_Z} + \lambda_7 q_x = 0 \qquad \text{(C.10k)}$$

$\frac{\partial L}{\partial \lambda_i}$ = the ith constraint from equations (2)-(7) above,

$i = 1 \ldots 7$ (C.10ℓ) - (C.10s)

Table 3.2 (cont.)

III. Definition of Terms

C	Child Services
N	Numbers of children
Q	Quality of services per child
Z	Other commodities
E	The degree of household extension and other variables determining efficiency in household production
T_{ij}	Time inputs for i^{th} person (1 = mother, 2 = others) in j^{th} activity (j = N, Q, Z, X, L)
X_j	Marketable goods inputs into j^{th} activity
L	Productive work either in wage market or required by household.
V_1	Resources dependent on transfers from household
V_2	Resources dependent on direct transfers from children to mother
V_3	Resources such as social insurance benefits not contingent on child services
V	Sum of V_1 and V_2, both of which are functions of C.
λ_k	Shadow prices for commodities and inputs to production of commodities (k = 1, 2, ...7)

ties. The production function for Z is similar, but the time of other household members is excluded. The concept underlying these production functions is that there are a number of alternative means for producing child services and other commodities. The mother's time is distinguished from the time of others in that the two inputs are not considered to be perfect substitutes. A usual assumption regarding the production function for number of children is that they are linear homogenous which implies that doubling the inputs - T_{1N}, T_{2N}, and X_N - would lead to a doubling in the number of children. Since this assumption is excessively restrictive, it is not invoked in the present model.

Finally, the goods and time constraints, are presented in equations (C.5)-(C.8). Both the goods and time constraints are specified assuming no joint production. The time of the wife-mother required by the household for household activities, T_{1L}, is specified to be negatively related to the children services she produces. i.e., $T_{1L} = T_{1L}(C)$, $\partial T_{1L}/\partial C < 0$, $\partial^2 T_{1L}/\partial C^2 > 0$. The available time of the mother, i.e., her total time, T_1, less T_{1L}, is specified in equation (C.5) to be the sum of the inputs of her time into the three production functions, i.e., T_{1N}, T_{1Q} and T_{1Z}. We assume also in equations (C.6) and (C.7) that the time provided by other members for producing numbers of children, T_{2N}, and child quality, T_{2Q}, are related to the child services produced, such that $\partial T_{2N}/\partial C$, $\partial T_{2N}/\partial C > 0$ and $\partial^2 T_{2N}/\partial C^2$, $\partial^2 T_{2Q}/\partial C^2 < 0$, and hence that T_{2N} and T_{2Q} can at least indirectly be influenced by the fertility behavior of the wife-mother.

The goods constraint, equation (C.8), is possibly the most crucial one in the model as far as the motives for fertility behavior are concerned. It allows us to distinguish the contributions of the household to the wife-mother in the form of the wife-wage, V_1, from those she expects to

receive directly from her children, V_2, and from other sources, such as social insurance, V_3. Both V_1 and V_2 may be assumed to be positively related to C, such that $\partial V_1/\partial C$, $\partial V_2/\partial C > 0$ and $\partial^2 V_1/\partial C^2$, $\partial^2 V_2/\partial C^2 < 0$. Equation (C.8) should be interpreted in present value terms, indicating that the present value of the resources she receives $V_1 + V_2 + V_3$ must be equal to the present value of the value of the marketable goods (whose price is q_x) she uses in production of N, Q and Z, X_N, X_Q and X_Z, respectively.

The extent to which the household rewards the mother for bearing children depends on the value it places on children which, in turn, is likely to depend on the structure of the household, E, and particularly on the sex and age distribution of dependents, and on the agricultural practices and land ownership of the household. The relative importance of V_1 and V_2 in her budget constraint would depend on such things as her expectations of outside support, V_3, on the length of time she expects to be widowed, and on the relative levels of benefits she expects to receive on an annual basis from the household in the form of wife-wage and from her sons.

The mother is assumed to choose how to allocate her time (net of the time she is required to contribute to the household) and her resources in the production of the three commodities (numbers and quality of children and other commodities) so as to maximize her satisfaction. The Lagrangian for the optimization problem, equation (C.9), along with the first-order conditions, the necessary conditions for optimization, equations (C.10a)-(C.10r), are presented in Part II of Table 3.2. There are a total of 18 first-order conditions and 18 unknowns so that conceptually one may solve for the demand for children and for the demand for child quality simultan-

eously with all the other unknowns (endogenous variables). Among the other endogenous variables are the shadow prices for the inputs to the production and utility function (λ_1-λ_7), the time inputs of the mother and other family members (T_{1N}, T_{1Q}, T_{1Z}, T_{2N}, T_{2Z}), the marketable goods inputs (X_N, X_Q, X_Z), and the commodities (N, Q, Z) which enter the utility function and which are obtained from the specified production function relationships. We proceed now to interpret these conditions.

The first-order condition, (C.10a), indicates that the shadow price of children, λ_1, depends on the direct utility, $\partial U/\partial C$, and the old-age benefits she derives from her children, $\partial V_1/\partial C$, as well as on the response of the household to additional children, $\partial T_{1L}/\partial C$, $\partial T_{2N}/\partial N$, and $\partial V_2/\partial C$. These relationships may be expressed as:

$$\lambda_1 = \frac{\partial U}{\partial C} \cdot Q + \lambda_4 \frac{\partial T_{1L}}{\partial C} \cdot Q - \lambda_5 \frac{\partial T_{2N}}{\partial N} - \lambda_7 \frac{\partial V}{\partial C} \cdot Q$$

$$= Q \left(\frac{\partial U}{\partial C} + \lambda_4 \frac{\partial T_{1L}}{\partial C} - \frac{\lambda_5}{Q} \frac{\partial T_{2N}}{\partial N} - \lambda_7 \frac{\partial V}{\partial C}\right)$$

According to the assumption made above, $\partial T_{1L}/\partial C < 0$, $\partial T_{2N}/\partial N > 0$, $\partial V/\partial C > 0$ and thus from the standpoint of the woman, the shadow price of number of children would be lower than the direct utility of children given by $\partial U/\partial C$. A similar relationship for the quality of child services is obtainable from (C.10b) and may be written as:

$$\lambda_2 = N \left(\frac{\partial U}{\partial C} + \lambda_4 \frac{\partial T_{1L}}{\partial C} - \frac{\lambda_6}{N} \cdot \frac{\partial T_{2Q}}{\partial Q} - \lambda_7 \frac{\partial V}{\partial C}\right)$$

Thus, the shadow prices of quality and quantity of children, as viewed by the mother, are dependent on her expectations regarding the response of the

household to her child-bearing and rearing activities and on her expectations regarding the direct benefits she expects from her children when she is old and widowed.

Condition (C.10c) implies that the marginal cost of producing Z must be equal to the marginal utility of Z to the wife-mother. Conditions (C.10d)-(C.10f) equate the opportunity cost of the time allocation of the wife-mother T_1 to N, Q and Z, respectively, to the marginal benefits arising from the effects of these time allocations on current and future expected transfers and production of Z. Equations (C.10g)-(C.10k) provide somewhat similar efficiency conditions for the allocation of T_2. Equations (C.10l)-(C.10s), not repeated in the table, are simply the seven technical and resource constraints given by equations (C.2)-(C.8).

A more complete and realistic formulation of the model would require distinctions between male and female children, sex-ordering of children, and also the provision for changing household structure and budget constraints, realistic constraints on borrowing and lending between periods, which could only be adequately dealt with in a fully dynamic model. All these extensions would have the effect of further complicating the model. Even as it is, it is sufficiently complex that the derivation of a full set of implications (hypotheses) from the model would require (a) the specification of the functional forms of all functional relationships in the model, (b) the assignment of suitable values to all parameters in these functions, and then (c) simulation experiments (with an appropriate amount of sensitivity analysis) involving changes in the values of the exogenous variables. The derivation of unambiguous implications is rendered even more difficult by the fact that, in practice, a certain empirically defined variable may serve as a proxy for more than one exogenous variable in the model.

In view of these considerations, therefore, we deem it appropriate to keep the model relatively simple and then to appeal to it for providing the intuition for several of the hypotheses put forward in Chapter IV below.

D. The Resource Accumulation and Allocation Module

The purpose of this section is to model the resource accumulation and allocation decisions which in the long run affect the wealth, market participation, educational attainment, cropping pattern, labor force participation and other variables that have been considered to be exogenous variables in the household structure, marriage and fertility models presented in Sections A-C. Since most of these accumulation and allocation variables are potentially affected -- directly or indirectly -- by the introduction of an old-age pension system, and yet since household structure, marriage and fertility can also be affected by changes in wealth, market participation, cropping patterns, etc., our analysis of the effects of old-age pensions on household structure, marriage and fertility would be incomplete were we to ignore the effects of old-age pensions and each of the variables determined in modules A-C on resource accumulation and allocation, and hence in the long run on the aforementioned wealth and other variables.

Although in the spirit of political economy one could broaden the scope further by trying to trace the decisions to have schools, factories, old-age pension systems, health clinics, agricultural extension workers, and various other "community characteristics", further back to political and economic forces operating at the village or higher levels, we treat all such community characteristics as exogenous. Our focus, therefore, in

resource accumulation and allocation decisions is intentionally more narrowly focused on explaining cropping patterns and investment decisions, including investments in education. These investment decisions are assumed to be affected by the existing level of wealth and by its composition across different forms, such as land, machinery, irrigation, livestock, housing, and educational attainment, and numerous other influences including relative prices, community characteristics, the structure of the household and participation in the old-age pension system. In the longer run, the initial capital stocks, cropping patterns, educational attainment levels and other stock or state variables could be updated on the basis of the behavioral responses to other changing conditions uncovered in this module.

We utilize as the basis for our theoretical model the theory of subjective equilibrium of the household, developed by Sen (1966), Jorgenson and Lau (1969) and Nakajima (1969), and applied empirically by Lau and Yotopoulos (1971, 1972, 1973), Sidhu (1974), Yotopoulos and Nugent (1976), Tamin (1979), Lau, Lin and Yotopoulos (1978), Kuroda and Yotopoulos (1980) and Barnum and Squire (1980). The application of such a framework to a dynamic situation has not yet been attempted and only Yotopoulos (1982) and Repetto, Deolalikar and Shah (1980) have pointed out that such a framework can be especially useful and provide a consistent framework for investigating the effects of the age and sex composition of the household, and in particular the number of children on both productive and consumption decisions. As we shall presently see, under certain conditions these two sets of decisions can be separated. Indeed, for this reason we shall subsequently refer to the production system as Part I and the expenditure system as Part II of the Resource Allocation and Accumulation Module.

The utility function of the rural household is assumed to be quasi-

concave in all its arguments, namely, consumption of grade and services C, investment of all kinds I, and leisure L, in each of three consecutive periods, designated 1, 2, 3. The time periods are defined to be sufficiently short that investment within any one of the periods cannot influence the capital stock and hence output or income in any of the other two periods. By expressing the utility function as:

$$U = U(C_1, C_2, C_3, I_1, I_2, I_3, L_1, L_2, L_3; a_{11}\cdots a_{M1}, a_{12}\cdots a_{M2}, a_{13}\cdots a_{M3}) \tag{D.1}$$

we assume (1) that investment, which serves as a proxy for consumption and leisure streams beyond the three periods considered, contributes to utility directly, thereby allowing us to ignore consumption and leisure beyond those of the three periods and (2) that the household's preferences can be influenced by household characteristics including location, and the size, sex and age structure of the household represented by the vector of characteristics, $a_1\cdots a_M$.

The household is assumed to be subject to both a time constraint and a budget constraint in each period j, $j = 1, 2, 3$.

The time constraint may be represented by:

$$\bar{N}_j = \sum_{i=1}^{m} n_i t_{ij} = \sum_i^m n_i t_{ij}^A + \sum_i^m n_i t_{ij}^W + \sum_i n_i L_{ij} = T_j^A + T_j^W + L_j \tag{D.2}$$

where there are m members of the household who can contribute time to household agricultural activities t^A, to the labor market t^W and to leisure L in any of the three periods. The time allocations of the m members of the household can either be defined in effective units so as to

allow the time allocations of different household members to be additive (i.e., substituted for one another) or could be kept separate so that the time endowments would in fact be a vector of endowments distinguished by age and sex types, such as children, adult females, adult males, etc. For simplicity the present formulation is based on the former assumption.

Assuming that it is not possible to borrow on any appreciable scale, current monetary expenditures are subject to a current money income constraint.

$$Y_y^M = Y_j^P + Y_j^W = Y_j^P + HT_j^W w_j \tag{D.3}$$

where the non-labor income of the household in period Y_j^P is determined by the outcome of the household production functions, Y_j^W is the net labor income of the household in period j defined as the product of the human capital-weighted time allocation of the average potential worker in the household HT_j^W and the wage rate of that household member in period j, w_j.

The household production function for crop C in each period j is assumed to be concave and of the form:

$$Q_{cj} = Q_{cj}(b_{cj}A,\ K,\ HT_{cj}^A,\ H'T_{cj}'^W,\ M_{cj}) \tag{D.4}$$

where b_{cj} represents the proportion of land allocated to crop C, A is the fixed endowment of land, K is the fixed endowment of agricultural capital, and T_{cj}^A, $T_{cj}'^W$ and M_{cj} are the inputs to crop C during period j of human capital-weighted labor, imported labor and materials, respectively.[6] Non-wage income or profits of the household in period j, Y_j^P may thus be defined as:

$$Y_j^P = \sum_c (P_{cj}Q_{cj} - H'T_{cj}'^{W} w_j' - M_{cj}P_{mj}) \tag{D.5}$$

where P_{cj} and P_{mj} are the prices of crop C and of materials in period j. The monetary income constraint and the time constraint can be combined into a "full" income constraint, Y_j which in this case is:

$$Y_j = Y_j^M + HL_j w_j \tag{D.6}$$

The optimal behavior of the representative rural household according to the model represented by (D.1)-(D.6) above can be expressed in terms of two maximization problems: maximizing the utility function (D.1) subject to successive period-specific full income constraints (D.6), and maximizing agricultural profits or non-wage income given by equation (5) subject to the technical constaint of the production function (D.4), the given endowments of land A, capital k, human capital H, and potential household labor $\bar{N}$, and the monetary constraint (D.3). Assuming that there exist perfect markets for outputs, and that cropping patterns are rather dependent on soil and climatic conditions, the latter problem can be divided into two separate decisions: the choice of cropping pattern Q_{cj} (which depends on the different technologies, and the prices of the variable factors of production, P_{cj}, w_j, w_j' and P_{mj}), and the determination of the variable input demands, T_{cj}', T_{cj}, and M_{cj} and profits, Y_j^P, all of which depend on P_{cj}, w_j, w_j', P_{mj} and the cropping patterns).

Likewise, Sasaki and Maruyama (1966) and Jorgenson and Lau (1969) have shown that the production and expenditure sides of the system are separable if the markets for all types of labor are complete and perfectly competitive, and there is insufficient time for the results of the expenditure

decision such as investment to affect capital stocks on the production side of the system. Under such assumptions the model becomes block-recursive in that the agricultural household determines first its cropping pattern, then, given its cropping pattern, its profit-maximizing levels of inputs and outputs, and finally, given its cropping pattern, its input demands and its non-wage income (profits), it determines its expenditure pattern over time and across commodity groups and uses.

Since output markets are indeed rather competitive even in rural areas of developing countries (with public markets of various sorts for agricultural products and items of basic necessity operating throughout the year in most villages), and since cropping patterns tend to be rather similar in a given region because of soil and climatic conditions and relative product prices, we assume that the cropping pattern decision is separable from the other profit-maximizing input decisions and from the utility-maximizing expenditure decisions.

Therefore, the cropping pattern which is assumed to be measured in terms of a dummy variable for dominance of crop C in period j, D_{cj}, can be expressed as

$$D_{cj} = D_{cj}(P_{cj}/P_j, w_j, w_j', Z_1) \tag{D.7}$$

where P_{cj}/P_j is the relative price of crop c, Z_1 is a vector of regional and other locational characteristics, and the other variables are as defined above, for each $c = 1,\ldots, k$.

In such circumstances, the period-specific profit function of the household can be expressed as

$$Y_j^P = Y_j^P(P_{qj}, Z_2) \tag{D.8}$$

where P_{qj} represents the household-specific prices of the three variable inputs, household labor, purchased labor and materials T_j, T_j' and M_j, respectively, and Z_2 is a vector of s household characteristics including the age and sex composition of household members, the cropping pattern D_{cj}, and the fixed endowments of land and capital A and K. Under the assumptions made above, the variable input demand functions q_q, in this case for family workers, for hired laborers and for materials input, $q_1 = T_j$, $q_2 = T_j'$ and $q_3 = M_j$, respectively, would be of the same form. Moreover, from profit-maximization the negative of the shares or ratios of the value of each variable input q in period j to the profits of j, $p_{qj}q_{qj}/Y_j^P$, or s_q is equal to the derivative of the profit function with respect to the price of that variable factor $\partial Y_j^P/\partial P_{qj}$. (Shepard's Lemma).

Assuming for generality that the profit and input demand functions are of the translog form (a second-order approximation to any function), the translog profit and variable input share equations can be expressed as

$$\ln Y_j^P = \alpha_0 + \sum_{q=1}^{3} \alpha_q (\ln P_{qj}) + \frac{1}{2} \sum_{q=1}^{3} \sum_{q=1}^{3} \gamma_{qr} (\ln P_{qj})(\ln P_{rj})$$

$$+ \sum_s \sum_q \delta_{qs} (\ln Z_{2sj})(\ln P_{qj}) + \sum_s \beta_s (\ln Z_{2sj})$$

$$+ \sum_s \sum_t \phi \ (\ln Z_{2s})(\ln Z_{2j}) \qquad \text{(D.9)}$$

$$-s_q = \partial \ln Y_j^P / \partial \ln P_{qj}$$

$$= \alpha_q + \Sigma \gamma_q \ln P_{rq} + \Sigma \delta_{qs} \ln Z_s \qquad \text{(D.10)}$$

Since the three variable input shares sum to unity, one of the share equations is redundant.

Assuming that the direct utility function given by (1) above is twice differentiable, strictly monotonic and locally strongly quasi-concave and that the prices of goods within the consumption c and investment I classes move in the same direction, Lau, Lin and Yotopoulos have demonstrated that the corresponding indirect utility function corresponding to (1) would exist.

$$V = V(P_{c1},\ldots, P_{c3}, P_{I1},\ldots, P_{I3}, w_1,\ldots, w_3; a_{11},\ldots, a_{H1}, a_{21},\ldots, a_{H2}, a_{31},\ldots, a_{H3}) \qquad (D.11)$$

where $P_{c1},\ldots, P_{c3}, P_{I1},\ldots, P_{I3}, w_1,\ldots, w_3$ are the prices of consumption goods, investment and leisure in each of the three periods, $a_{11},\ldots, a_{H3}$ are the household characteristics 1 - H in each of three periods. One of the relevant household characteristics quite certainly would be full income in each period Y_1, Y_2 and Y_3, defined in equation (D.6) above.

Assuming a specific form for the indirect utility function (D.11), the expenditure functions can be obtained via Roy's Theorem by differentiating the indirect utility function with respect to the prices of the various commodity bundles designated, i.e. P_c, P_I and w in each of the three periods, 1, 2, 3.

The more general the form assumed for the indirect utility function (D.11), the more parameters that have to be estimated and the more complex the analysis. One convenient assumption that has been used quite frequently in recent years in this context is that the utility function is homogeneous of degree minus one, implying that the form of the function is independent of the level of full income which otherwise might be expected to influence the function. Then, assuming that the function is transcen-

dental logarithmic in all the other arguments of the function (a second-order approximation to any form), from Roy's theorem the expenditure functions would each be linear in the logarithms of all the arguments of the function

$$
\begin{aligned}
-\frac{P_{cj}C_j}{Y_j} = {} & a_1^{cj} + b_{11}^{cj} \ln P_{c1} + b_{12}^{cj} \ln P_{c2} + b_{13}^{cj} \ln P_{c3} \\
& + c_{11}^{cj} \ln P_{I1} + c_{12}^{cj} \ln P_{I2} + c_{13}^{cj} \ln P_{I3} \\
& + d_{11}^{cj} \ln w_1 + d_{12}^{cj} \ln w_2 + d_{13}^{cj} \ln w_3 \\
& + e_{11}^{cj} \ln a_{11} \ldots e_{H3}^{cj} \ln a_{H3}
\end{aligned}
\tag{D.12a}
$$

$$
\begin{aligned}
-\frac{P_{Ij}I_j}{Y_j} = {} & a_1^{Ij} + b_{11}^{Ij} \ln P_{c1} + b_{12}^{Ij} \ln P_{c2} + b_{13}^{Ij} \ln P_{c3} \\
& + c_{11}^{Ij} \ln P_{I1} + c_{12}^{Ij} \ln P_{I2} + c_{13}^{Ij} \ln P_{I3} \\
& + d_{11}^{Ij} \ln w_1 + d_{12}^{Ij} \ln w_2 + d_{13}^{Ij} \ln w_3 \\
& + e_{11}^{Ij} \ln a_{11} + \ldots e_{H3}^{Ij} \ln a_{H3}
\end{aligned}
\tag{D.12b}
$$

$$
\begin{aligned}
-\frac{w_s L_j}{Y_j} = {} & a_1^{Lj} + b_{11}^{Lj} \ln P_{c1} + b_{12}^{Lj} \ln P_{c2} + b_{13}^{Lj} \ln P_{c3} \\
& + c_{11}^{Lj} \ln P_{I1} + c_{12}^{Lj} \ln P_{I2} + c_{13}^{Lj} \ln P_{I3} \\
& + d_{11}^{Lj} \ln w_1 + d_{12}^{Lj} \ln w_2 + d_{13}^{Lj} \ln w_3 \\
& + e_{11}^{Lj} \ln a_{11} + \ldots e_{H3}^{Lj} \ln a_{H3}
\end{aligned}
\tag{D.12c}
$$

A simple test for the validity of the homogeneity-of-degree-minus-one assumption would be to include the full income variables Y_1, Y_2, Y_3 among the exogenous household characteristics $a_{11}, \ldots, a_{H3}$, and to test the validity of the assumption that the associated e_{ij}^{L} coefficients are equal to zero.

By the definition of full income and full expenditure, the three expenditure shares, therefore, must add up to -1. This implies that following restrictions:

$$a_1^{cj} + a_1^{Ij} + a_1^{Lj} = -1 \tag{D.13a}$$

$$b_{11}^{cj} + c_{11}^{cj} + d_{11}^{cj} = 0 \tag{D.13b}$$

$$b_{12}^{cj} + c_{12}^{cj} + d_{12}^{cj} = 0 \tag{D.13c}$$

$$b_{13}^{cj} + c_{13}^{cj} + d_{13}^{cj} = 0 \tag{D.13d}$$

$$b_{11}^{Ij} + c_{11}^{Ij} + d_{11}^{Ij} = 0 \tag{D.13e}$$

$$b_{12}^{Ij} + c_{12}^{Ij} + d_{12}^{Ij} = 0 \tag{D.13f}$$

$$b_{13}^{Ij} + c_{13}^{Ij} + d_{13}^{Ij} = 0 \tag{D.13g}$$

$$b_{11}^{Lj} + c_{13}^{Lj} + d_{13}^{Ij} = 0 \tag{D.13h}$$

$$b_{12}^{Lj} + c_{12}^{Lj} + d_{12}^{Lj} = 0 \tag{D.13i}$$

$$b_{13}^{Lj} + c_{13}^{Lj} + d_{13}^{Lj} = 0 \tag{D.13j}$$

$$e_{11}^{cj} + e_{11}^{Ij} + e_{11}^{Lj} = 0 \qquad \text{(D.13k)}$$

$$e_{12}^{cj} + e_{12}^{Ij} + e_{12}^{Lj} = 0 \qquad \text{(D.13+1)}$$

$$\vdots \qquad \vdots$$

$$e_{1H}^{cj} + e_{1H}^{Ij} + e_{1H}^{Lj} = 0 \qquad \text{(D.13k+H)}$$

Profit-maximization requires that the symmetry conditions $a_{ij} = a_{ji}$, $b_{ij} = b_{ji}$, $c_{ij} = c_{ji}$ and $d_{ij} = d_{ji}$ are also imposed. Hence, the imposition of these assumptions provides a convenient test for utility maximization.

Once again since the three expenditure shares add up to unity, only two of the above three equations (D.12a)-(D.12c) can be estimated independently. The third equation can simply be derived from the results of the first two.

Should the aforementioned separability assumption not be valid, the production side of the system given by (D.9) and (D.10) and the expenditure side given by (D.12a)-(D.12c) would have to be treated as a single system.

E. Interrelationships Between the Modules

The basic purpose of the these modules (or modelling system), namely to analyze the direct and indirect effects of old-age security on household structure, marriage, fertility and resource accumulation and allocation, should be firmly kept in mind.

The modular approach we have advocated and articulated, primarily on the basis of the lack of simultaneity of the various decisions and the differences in the decision-makers responsible for the various decisions, should in no way conceal the interdependencies between the modules. The

purpose of the present section is to spell out, at least in general terms, the nature of these interdependences.

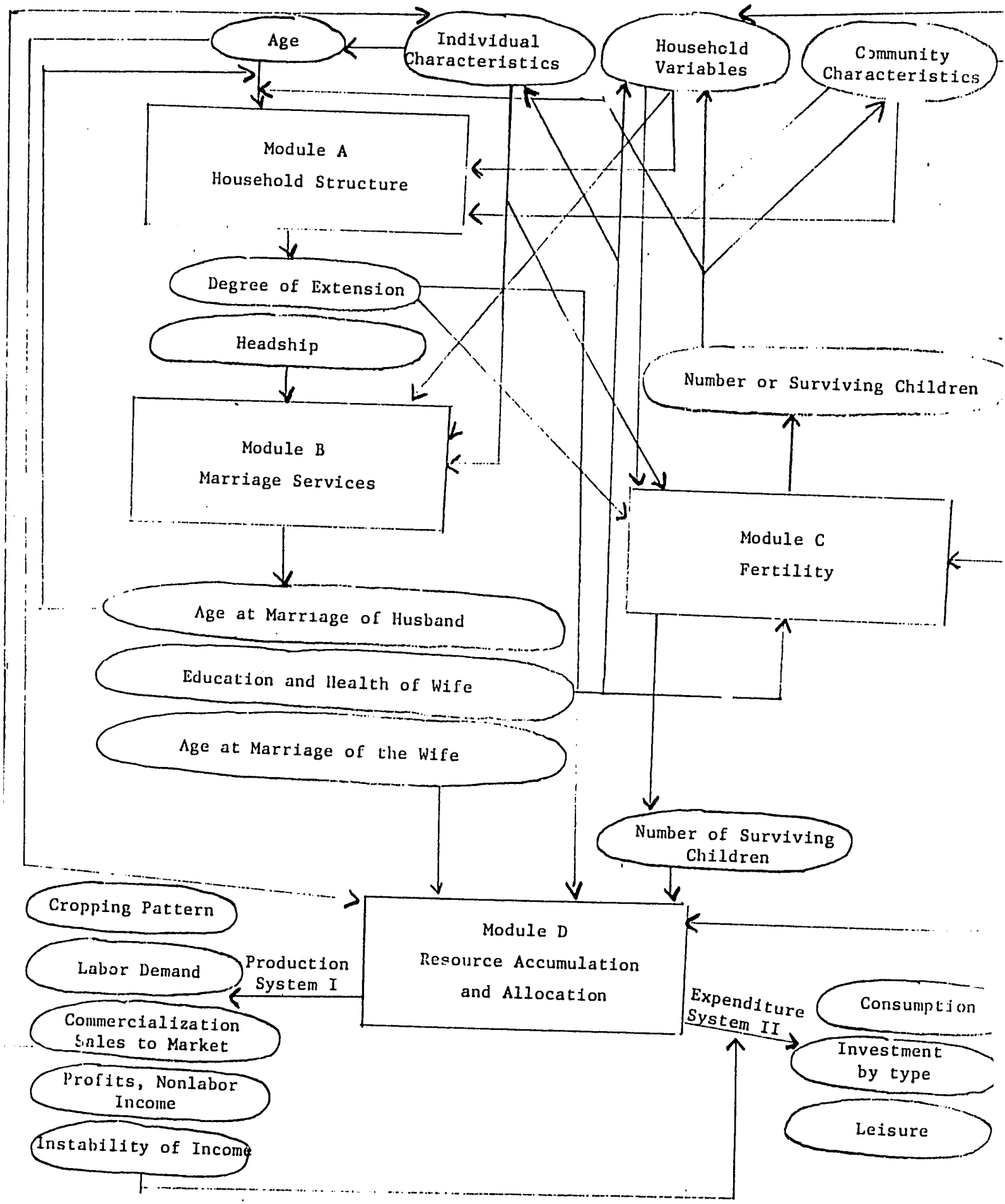
The reader is referred to Figure 3.2, where all four modules are pictured as rectangles. The outputs, i.e., the endogenous variables in each particular module, are identified with ovular shapes. In particular, note that the endogenous variables determined in the Household Structure Module, Module A, are the degree of extension and headship. Likewise, those determined in the marriage services module, Module B, are the ages at marriage of the husband and wife, representing the quantity of marriage services, and the education and health, or quality, of the wife. Those determined in Module C, the fertility module, are the actual number of surviving children and that relative to the potential fertility. It is determined in part by age at marriage of the female in Module B, and the variables in Modules A, B and C are affected by those in the production and expenditures systems of Module D. The variables determined in Part I of Module D are the cropping pattern, labor demand, commercialization, profits and their degree of instability . Finally, those determined in Part II of that module, the expenditure system, are the consumption, leisure and investment shares in total expenditures. The latter can also be broken down by type of investment.

The various arrows indicate the ways in which variables determined as outputs in one module become exogenous inputs in other modules. From Module A, for example, the degree of extension, becomes an input or exogenous variable in Modules B-D. The marriage ages of the marriage partners determined in Module B (for marriage services) become inputs to Modules A, C and D. The number of surviving children from Module C affects household structure in Module A, the timing of marriage of other adults living in

Figure 3.2

The Relationships Between the Modules

Exogenous Variables Including Participation in Old-Age Security Program and Initial Conditions



extended households in Module B, and the age and sex structure of the household, and its degree of extension which play an important role in Module D. The expenditure system given by Part B of Module D determines the investment shares and hence the levels of investment by type which can be used to update the household-specific capital stocks by type which constitute components of the household and individual characteristics that are treated as exogenous variables in (i.e., as inputs to) Modules A-D.

In order to fully analyze the effects of any exogenous variable X_i on any endogenous variable Y_j in the system, one must of course, include not only the direct effect of X_i on Y_j in the module in which Y_j is determined but also (a) the influences of X_i on Y_K and Y_L as captured in other modules but also the influence of Y_K and Y_L on Y_j. A more detailed explanation of such interdepencies and the generation of indirect effects is postponed to Chapter VI after the results are presented.

Footnotes to Chapter III

[1]The absence of sex distinctions is, of course, only a simplification, and one that could easily be relaxed without affecting the results, but at the cost of considerably greater complexity. In the context of rural India, to which the model is subsequently applied, the model may be thought of as applying to males who are potential heads of households.

[2]The intrafamiliar transfer function could easily be extended to include other considerations derived from the anthropological evidence. To include the number of dependent children (D) would be one such extension. One might expect that the ability to transfer to one's dependent parents could be reduced by the need to transfer to one's dependent children. Likewise, from the standpoint of the dependent parents or those approaching the period of dependence, they would be less likely to want to live with sons with many children as long as there are other sons with fewer children. Therefore, one would expect $\partial\tau_2/\partial D < 0$. Since such an extension would amount to the addition of a third generation to the model, rather considerably complicating it, we deliberately avoid the inclusion of this consideration at least until the empirical analysis in Chapters IV and V below. Another such extension would involve the effect of education on τ_2 and β_2. If education has the effect of improving the off-farm employment opportunities and/or of countering or at least reducing the within-the-family loyalty training, it might have the effect of reducing τ_2 and β_2. On the other hand, to the extent it raises the income of the L_t generation, it might be expected to increase β_2. Such an extension would be less difficult to bring about, but, since one could think of education as embodied in E, these effects can be considered dealt with even within the present model as long as it is properly interpreted. Another possible extension would be the inclusion of the numbers of unmarried females in the household (other than one's own daughters) since it was suggested in the anthropological evidence that in those areas of India in which dowry payments are substantial, and all members of the household share equally in the responsibility to finance the dowries of household members, the presence of females approaching marriage age would tend to lower the expected transfers and hence to lower the desired degree of extension. This and other extensions of a similar sort could be handled by simply making both the transfer function and the resulting demand for E function depend on the specific characteristics of the household.

[3]On the other hand, the higher educational attainment level should raise income for any given level of k and E and hence should increase the individual's ability to demand more E through relaxation of the budget constraint. Ambiguity in the effect on E of this variable is also demonstrated in the model of Parsons (1977). Nevertheless, a negative effect of education on E would seem likely.

[4]Even allowing for a considerable margin for error in measurement, virtually all time allocation studies, e.g., Dasgupta (1977), Nag, White, and Peet (1978), Shah (1974), Cain (1977), Bond (1974), Mueller (1979), DaVanzo and Lee (1978), although drawn from a wide variety of countries, demonstrate a high degree of specialization by age and sex. In particular, young girls spend large portions of their time on those activities, such as fetching water, cooking, food preparation, care for the sick and disabled, sewing and repair work, that are in demand by old-age dependents. Young boys spend substantial portions of their time on animal husbandry, gathering firewood, and hunting and fishing; middle-aged men concentrate on the heavy agricultural tasks and on civic responsibilities such as meetings; finally, women spend their time on housework, child care, food preparation, and in some cases on marketing and agricultural activities.

[5]Indeed, household heads may invest very considerably in search activities to assure that the wives they obtain for their sons not only are reliable marriage partners for their sons and daughters, but also possess characteristics of value to the household as well as to their sons. The head can be expected to search for women who are capable of producing healthy sons and daughters, and who are likely to be productive, hard-working members of the household, loyal to the household head and his wife so as not to be likely to want to induce partition of their sons from the joint household (thereby lowering the expected value of transfers from children in old age), and also trustworthy and cooperative so as to facilitate good teamwork among all members of the household.

[6]Although the influence of tenurial form is not introduced explicitly, since households of different size, structure and other characteristics tend to specialize in different tenure types, the influence of tenurial form was implicitly captured by household characteristics.

CHAPTER IV

EMPIRICAL SPECIFICATION OF THE MODULES FOR APPLICATION TO THE ADDITIONAL RURAL INCOME SURVEY DATA

The purposes of this chapter are to describe the first data set employed in the study, India's Additional Rural Income Survey, and to explain how the data is used to estimate each of the four modules developed in Chapter III above. In Chapter VII below we do the same with respect to the second data set used in the study, namely the Malaysian Family Life Survey.

As noted in Chapter II much of the descriptive literature has been based on anthropological, historical and sociological studies of rural India. Since the theoretical models of household structure, marriage, fertility and resource allocation developed in Chapter III have been developed in such a way as to be as consistent as possible with that descriptive literature, rural India would seem the ideal place for seeking data useful for testing these various models.

In view of the broad scope of the models developed, one could not expect any existing data set to be ideal and fully satisfactory for testing all of the relationships. Fortunately, however, there is one data set drawn from rural India that contains much of the information relevant to all four of the models. This is the Additional Rural Income Survey (ARIS) which was based on a national, weighted random sample of 4118 households in rural India collected with financial support from US AID by India's National Council of Applied Economic Research (NCAER). Most of the data collected pertain to the agricultural years 1968-69 through 1970-71 but historical data on marriage, pregnancy and fertility were also collected retrospec-

tively from the ever-married women in the sample. As such surveys go, the sample is quite large (4118 households and more than 27,000 individuals). Although far from ideal in some respects (as will be explained momentarily) for testing the relationships postulated in the various models, the fact that the survey contains: retrospective data on marriage and fertility, and on several of the other most important and most relevant variables in the model for at least one year makes it an extremely valuable data set for present purposes.

Specifically, the survey contains data on the size and structure of households, on income and expenditure, on wealth and the composition thereof in some detail, and on the age, education, marital status, and relationship to the household head of all individuals in the household. For all married women in the sample households, it also contains data on the timing of children, surviving and otherwise, and hence on the age and sex composition of the household. ARIS also contains a fair amount of information on cropping patterns, technology, and on a variety of other household and community characteristics, including prices, employment status, and the availability of various kinds of services, such as those of credit, savings, health, agricultural extension, education, employment opportunities and electricity within the village.

A major limitation of the ARIS data set for present purposes is that the only information available on a retrospective basis is that pertaining to marriage and fertility, thereby making it impossible to know anything about household structure, labor force participation, income, wealth, cropping patterns and the like, at points in time earlier than that of the survey years (such as for example at the time of marriage).

With respect to analyzing the effect of the introduction of a formal system of old-age pensions on fertility, marriage, household structure and

resource allocation , notably the data contains information that identifies whether or not there are household members participating in the "Provident Fund", the major formal old-age pension system in India. Although there are welfare programs at the state and local government levels and several old-age homes run by religious and other groups that may also substitute for such a system, the amounts of support available from such programs are so small, and the indigence requirements so difficult to satisfy that lack of information about them in the data set is not an important qualification, especially considering that most such programs and facilities are restricted to urban areas. [See, for example, Vatuk (1980b)]. Unfortunately, however, the number of rural householders participating in the formal Provident Fund program is relatively small, making it difficult in practice to distinguish the effects of participation in that scheme from those of other common characteristics of such participants such as high income and educational status, and to a certain extent also region and village size.[1]

Other limitations of the data are (1) that it contains little information about tenure status or of the nature and duration of contracts, and (2) that information on prices and wage rates is quite limited in both quantity and quality.

The ARIS data have been organized into certain files by the NCAER. The largest and most important file is the household file which is organized by household and year; there are also an agricultural file (ARISDK 95) organized by household and crop-season entry, an individual file (ARISDK 94) with data on age, sex, relation to the household head, education, marital status, employment status and so on, an ever-married woman file (ARISDK 74) containing marriage and pregnancy histories, and a household expectations file (ARISDK 73).

Given the relatively large number of observations in the household file, i.e., 4118, and the number of checks for internal consistency that are possible, information across files for each particular individual and household was cross-checked for consistency and completeness and all observations with missing or inconsistent data were omitted. In addition, four households whose primary occupations were classified as "military" were excluded because military households were not considered representative of rural Indian households as a whole.

The household file contains 303 variables, of which there are really only a little over one hundred, but with the values for three different years for each variable. The greatest problem with this file is the presence of certain inadmissible values for some variables. Out-of-range cases were recoded as missing observations in the subsequent analysis. In certain other cases values given as missing were recoded as zero values when the latter seemed appropriate. For example, the number of males above 14 years in 1968-69 has 1597 missing values but almost no zeros on the original data tape. The data on income, investment and consumption also had many missing values. In both cases zero values seemed more likely to be correct than simply missing data. The variables with such missing values were, therefore, recoded to zero for use in the subsequent analysis. While considerable effort was made to measure income-in-kind, and to impute values to the consumption of services like those derived from owner-occupied housing, the data are not necessarily free of systematic measurement error. A fair amount of age-heaping was observed in the reporting of age. Income-in-kind may well be underreported. Employment status was rather crudely measured and occupational variables were found to be unreliably coded. In some cases we used the data as is, e.g., the age data but

tested for the sensitivity of the results to age-heaping by also rerunning regressions after excluding observations with ages reported in round numbers, such as 20, 30, 45, etc. In most such cases, however, the results were not found to be very sensitive to such exclusions and hence the questionable observations were retained.

Data on the Agriculture File contains 25 variables drawn from 2798 agricultural households. Detailed information with respect to agricultural activities undertaken by these households is recorded for the year 1970-71 only. Since a household can engage in agricultural activities in three seasons (Kharif, Rabi, and other) and may be producing more than one crop in the same season, the number of observations is 8899. This file is complex since production of a particular crop in a particular season constitutes a unique agricultural activity requiring information with respect to all 25 variables. The data were checked for obvious punching errors, such as duplicate observations. Such duplicates were identified when, within the same interview number (household), the information given for season, crop, high-yielding variety and irrigation was identical for two observations. As a result of this check we decided to delete 32 households having one or more such duplicates.

In cases where the disaggregation of farm inputs was not available by season and/or crop, such inputs were given a code of 9. Therefore, we have recoded such 9's to missing, i.e., to (·) in the nomenclature of the SAS package which was employed in this study. For example, it was observed that the agricultural asset variables for the most part had only one entry for each household, usually the first crop-season-technology observation, all subsequent observations in the same household being coded as (·), i.e., as missing. Since a season/crop disaggregation of asset use, such as that

of tractors and machinery, is understandably difficult, zero values were assigned to the missing for these variables so as not to eliminate such observations. Information in this file is given by season and by crop. Kharif is the dominant season and paddy (rice) is its main crop. In the Rabi season wheat is the main crop.

The individual file contains 12 variables on all (cultivating and non-cultivating) households and provides information with respect to each household member regarding the relationship to the head, sex, marital status, age, educational attainment, occupation and earner status. The data were checked for obvious punching errors, duplicates, and inconsistent entries, the latter being detected when the information on sex, marital status and age were mutually contradictory.

Similar problems were confronted in the pregnancy history file, and the problems were dealt with in a similar manner. While potentially rather useful, since it contains information on the desired number of children of each sex and the motives for such desires, the expectations file could not be used because of ambiguity as to whose expectations were recorded.

A. Household Structure

In order to operationalize the household structure module, wherein the degree of extension of the household is determined as well as all the other modules which assign to household structure a potential role in affecting fertility, marriage and resource allocation decisions, an unambiguous measure of household structure is required. We, therefore, begin our description of the application of the ARIS data for testing key components of the various theoretical modules developed in Chapter III with the coding of households by household type.

The foundation for our coding system is the household classification system suggested by Laslett (1973) on the basis of all the relationships existing within the household. Applying the Laslett procedure to all households inhabited by married males with spouse present in the ARIS sample, we obtain the distribution of households across types shown in Table 4.1. The same procedure was applied to all adults in the sample but the sample sizes were small and have not been used in the empirical analyses.

This detailed classification system is then aggregated into two distinct household groups, namely nuclear households (HOUST1 = 1) and complex or extended households (HOUST1 = 0). The basis of this distinction is given in the definitions of HOUST1 in Table 4.2. The dummy variable for nuclear household structure (HOUST1), which can take on only the values of 0 or 1, therefore, constitutes one measure of household structure used in this study. As an alternative measure of the willingness to partition we use the headship dummy variable (HEAD), which, again as defined in Table 4.2, can assume only the values 0 for non-heads of household and 1 for household heads.

Since education, years married, children and, of course, household structure may all vary systematically with age and position in the life cycle of the household head, we deem it important to estimate the empirically specified functional relationships separately for samples of married males in different age groups. Moreover, since both the data base and the behavioral response of household structure to its various determinants may vary between cultivating and non-cultivating households, it is both appropriate and necessary to specify the hypothesized relationships differently and to estimate them separately for cultivating and non-cultivating households.

Descriptive statistics (means) for all variables defined in Table 4.2 on each of the age groups and household occupational types are presented in Table 4.3. As can be seen from the column entries in the rows labeled HEAD and HOUST1 in Table 4.3, the probabilities of headship and of living in a nuclear household tend to rise together by age up to a certain age group. At still higher ages the probability of headship tends to rise still further, but the probability of living in a nuclear household declines. As far as overall averages are concerned, these figures strongly support the existence of a life cycle pattern in household structure for married males, wherein as hypothesized in Chapter III the degree of extension is high for young males soon after marriage, but then declines for middle-aged males before rising again for older males expecting to be (or actually) dependent on their sons. Although these patterns are evident among both cultivating and non-cultivating married males, consistent with the hypothesis developed from the literature survey of Chapter II that landed wealth would help fathers hold onto their married sons, the probabilities of headship and of living in nuclear households are universally higher for the generally poorer non-cultivating households than for the generally wealthier cultivating households.

As evidence of the aforementioned tendency for cultivating households to be richer than non-cultivating households, educational attainment, permanent non-labor income and other desirable characteristics are generally higher for cultivating households than for non-cultivating households. Likewise, undesirable characteristics such as the absence of credit facilities, i.e., CREDD21 and CREDD22, tend to be more characteristic of non-cultivating households than of cultivating households. Not surprisingly, however, non-cultivating households tend to live in villages which are

larger and closer to transport facilities than those inhabited by cultivating households.

The descriptive statistics of Table 4.3 also reveal a number of differences in characteristics between different age groups within both sample, i.e., among both cultivating and non-cultivating households. For example, in both cases the number of years married increases with age. So does the number of own children (OWNCHILD), but in this case only up to a point because of the upper limit of 14 years of age at the time of the survey that was used in the definition of OWNCHILD. While, in general, the wealth measure [i.e., for land ownership, values of livestock, value of house and YNONLPER (a measure of permanent non-labor income)] increase with age, the relationship is by no means as sharp as might have been expected.[2]

Three shortcomings with respect to our ability to capture in the estimated coefficients of the dummy variable for participation in the Provident Fund (PROVIDF) the effects of such participation on household structure should be mentioned. First, as shown by the means for PROVIDF in Table 4.3, the proportions of those in all age groups and both household types who participated in the Provident Fund scheme at the time of the ARIS data collection effort among rural Indian households were sufficiently small, i.e., generally between two and four percent, so as to provide limited variation in this variable within and between the different subsamples making it difficult in practice to distinguish such effects.[3] Second, since the underlying data upon which our dummy variable measure PROVIDF is based do not identify which household member is the one who is the participant in the Provident Fund Scheme, and yet since this can indeed make a substantial difference as far as household affiliation/ partition decisions are concerned, it is not possible to arrive at unambiguous inter-

Table 4.1

Distribution of Adult Married Males with Spouse Present by Type of Household in Rural India, 1970-71

	All Persons (Number)	4003
	All Persons (Percent)	100.0
100	Single Person Units	
110	Married, Spouse Absent	0.0
120	Widowed	0.0
130	Separated	0.0
140	Divorced	0.0
150	Single	0.0
200	Non-family Units	
210	Co-resident siblings	0.0
220	Co-resident relatives (non-siblings)	0.0
230	Co-resident relationship not determined	0.0
300	Simple Family Households	
311	Married Couple, no children	2.7
312	Married Couple, children	17.2
321	Widowers, children	0.0
322	Widows, children	0.0
331	Separated males, children	0.0
332	Separated females, children	0.0
341	Divorced males, children	0.0
342	Divorced females, children	0.0
351	Single male, own children	0.0
352	Single female, own children	0.0
361	Married male, spouse absent, children	0.0
362	Married female, spouse absent, children	0.0
400	Extended Family Households	
410	Extended Upwards	0.5
420	Extended Laterally	0.4
430	Extended Downwards, one generation	20.6
440	Extended Downwards, two generations	0.4
450	Extended, Undefined relationships	*
460	Extended Downwards, one, two or more generations	2.6
470	Multiple Types of Extensions	5.9
500	Multiple Family Households	
510	Secondary Units, Upwards	1.1
520	Secondary Units, Lateral	1.3
530	Secondary Units, Downwards one generation	10.8
540	Secondary Units, Downwards two or more generations	0.7

Table 4.1 (cont.)

550	Secondary Units, All Relationships undefined	0.8
560	Secondary Units, Downwards one, two or more generations	24.4
570	Secondary Units, Multiple types	4.7
600	Complex Households, Extended or Multiple Type	
610	Extended or Multiple, Upward	*
620	Extended or Multiple, Lateral	0.3
630	Extended or Multiple, Downwards one generation	1.0
640	Extended or Multiple, Downwards two or more generations	0.3
650	Extended or Multiple, Relationships Undefined	0.3
660	Extended or Multiple, Downwards one and two generations	3.3
670	Multiple Relationships	0.8
700	Households Not Classified	0.1

Source: National Council of Applied Economic Research Additional Rural Incomes Survey

* Positive but less than .05

Table 4.2

Definitions of Variables for Household Structure Models

Dependent Variables:

HEAD	= 1 if person is head of household = 0 otherwise
HOUST1	= 1 if household type is 300 $\leq$ 400 or = 430 = 0 if household type is 440 $\leq$ 700 or = 410 or 420

Independent Variables:

Education:

EDCIMD1	= 1 if education level is literate but no formal education or below primary = 0 otherwise
EDCIMD2	= 1 if education level is above primary but below matriculation = 0 otherwise
EDCIMD3	= 1 if education level is matriculation or above = 0 otherwise
YEARSM	= years married (with spouse living)
YEARSMSQ	= the square of YEARSM
OWNCHILD	= number of own children of age less than 15

Size of Land Holdings (hectares):

LANDD2	= 1 if positive but less than 1.1 hectares = 0 otherwise
LANDD3	= 1 if land holdings are 1.1-2.5 hectares = 0 otherwise
LANDD4	= 1 if land holdings are 2.6-4.5 hectares = 0 otherwise
LANDD5	= 1 if land holdings are 4.6-6.5 hectares = 0 otherwise
LANDD6	= 1 if land holdings exceed 6.5 hectares = 0 otherwise
LIVESTOCK	= value of livestock in thousands of rupees

Table 4.2 (cont.)

Independent Variables (cont.)

HOUSE	= value of house in thousands of rupees
IRRIGP	= percentage of landholdings irrigated
VILPOP	= village population in thousands
MINDIST	= minimum of distances from bus or railway station in kilometers

Village Credit Institutions:

CREDD21	= 1 if no credit facilities except a moneylender exists in the village = 0 otherwise
CREDD22	= 1 if no credit facilities except a cooperative or moneylender exists in the village = 0 otherwise
PROVIDF	= 1 if household member is participating in the Provident Fund = 0 otherwise
YNONLPER	= three year average of annual gross household nonlabor income divided by number of adults in household

Table 4.3

Sample Size and Means of All Right Hand Side Variables
Used in Application of the Household Structure Module to ARIS Data

	Cultivating Households				Non-Cultivating Households			
Age:	< 34	35-44	45-54	≧ 55	< 34	35-44	45-54	> 55
Number of Observations	1063	745	610	666	431	390	332	288
HEAD	.204	.621	.880	.934	.401	.838	.943	.952
HOUST1	.101	.388	.446	.239	.290	.681	.654	.448
EDCIMD1	.242	.319	.236	.224	.241	.279	.280	.219
EDCIMD2	.211	.192	.316	.267	.153	.192	.250	.250
EDCIMD3	.161	.125	.192	.270	.144	.151	.169	.201
YEARSM	8.207	16.826	25.574	36.800	8.227	16.018	24.608	36.345
OWNCHILD	1.778	3.357	2.538	1.032	1.798	3.338	2.804	.851
LAND D2	.120	.132	.166	.117				
LAND D3	.233	.291	.252	.257				
LAND D4	.217	.207	.230	.195				
LAND D5	.142	.125	.141	.158				
LAND D6	.279	.234	.202	.264				
LIVESTOCK	2.272	2.021	1.926	2.252				
HOUSE	5.636	5.483	5.689	6.462				
IRRIGP	.455	.463	.443	.461				
VILPOP	1.749	1.840	1.966	2.058	2.407	2.905	3.059	3.265
MINDIST	6.590	6.244	6.302	6.045	5.877	5.344	5.036	4.872
CREDD21	.117	.110	.072	.102	.139	.110	.093	.101
CREDD22	.386	.332	.374	.380	.390	.369	.395	.365
YNONLPER	.687	.675	.716	.781	.339	.329	.372	.504
PROVIDF	.020	.024	.033	.016	.032	.044	.033	.017

pretations of the resulting parameter estimates of PROVIDF. Third, since the variable is measured only by the presence of contributions to the Provident Fund during each of the three years of the survey, it is not possible to determine the term of such an affiliation and hence to know how important it may be in each household's decisionmaking.[4]

B. Marriage

We turn now to the detailed empirical specification of the marriage model. Although the model was presented in terms of a simultaneous equations framework in which some ten or more variables are determined simultaneously, unfortunately not all of these variables are observable. In particular, neither the amount of the dowry, D^W, nor the allocations of market goods to marriage services or of the present value of marriage service inputs to market goods production, are observed. Indeed, the only observations on variables relevant to the inputs and outputs of market goods are for the two or three years of the survey which may bear little relation either to the life cycle of the household as a whole or to the period near the time of marriage. Also, the only available measures of the quality of husband and wife services are the educational attainment levels of the respective spouses. Therefore, in our empirical work we have to restrict our focus to the variables which are either observable directly or measurable by proxies.

It will be recalled that, from the perspective of the whole lifetime of the household, the time allocations of husbands and wives devoted to marriage services are inversely related to their ages-at-marriage. For measures of the quantity and quality of marriage services, therefore, we use the following variables: age-at-marriage of the male (AMM), age-at-

marriage of the female (AMF) and their educational attainment indexes (EDCIM and EDCIF, respectively). The precise definitions of these variables as well as those of all exogenous variables in the model are given in Table 4.4.

Although the model, as presented in Chapter III and in particular in Table 3.1 and Figure 3.1, portrays the decisions with respect to the quantity and quality of both husband and wife services, i.e., AMM, AMF, EDCIM and EDCIF, as being determined simultaneously, in the context in which the model is tested, however, and in particular since information is available only for the household in which the wife lives after her marriage, normally that of her husband's parents, several simplifications would seem appropriate.

First, for such a household, and especially because of the low level of educational attainment in rural India, the education of the son (husband of the wife studied) has normally been completed well in advance of marriage which, as will be seen in Table 4.4 below, normally takes place at about age 20. For this reason, it would seem reasonable to assume that, from the standpoint of the household of the son, his educational attainment level is a predetermined variable as far as marriage decisions are concerned. Hence, although EDCIM may be presumed to affect the other measures of marriage services, namely, AMM, AMF and EDCIF, it can reasonably be assumed that it cannot be affected by these other variables.

Second, and again from the perspective of the household of the son (husband), which as explained above in rural India is generally in the position of importing a wife for the son, one might suppose the following chain of causation as a special case of the general interdependence provided for in the model. Given the son's educational attainment level

inherited from the resource allocation decisions of the past, the demand for marriage services by the household determines AMM. Then, given AMM, EDCIM, and the appropriate household and community characteristics, the dowry function combines with the monetary budget and time constraints to determine EDCIF. Finally, given all of these, AMF is determined. Although plausible, since the causal chain hypothesis is simply that, i.e., a hypothesis, its validity has to be tested.

In order to test the validity of the aforementioned causal chain, the alternative simultaneous equation system must be specified. Naturally in order to identify the parameters of such a system, certain restrictions on the parameters of the model have to be imposed. For convenience, we have identified the model by restricting the parameters of certain exogenous variables in each of the equations of the model to zero when such restrictions seemed plausible.

Because the information available, the variables considered relevant, and the expected behavioral patterns all vary between cultivating and non-cultivating households, and also between nuclear and extended households, the specification of all three equations varies among the four types of households, cultivating extended, cultivating nuclear, non-cultivating extended and non-cultivating nuclear. The precise differences in the specification of the different equations for the different sub-samples can be determined from the empirical results for AMM, EDCIF and AMF discussed in Chapter V and reported in Tables 5.5, 5.6 and 5.7, respectively.

While there are some 4000 married women with spouse present, and therefore with information on the husband, in the ARIS sample, in general the data are believed to be less reliable and less relevant for older women. There are several reasons for this belief. First, for older women

there is a greater possibility that the husbands with whom they are currently living may not be their first husbands, and hence that the reported age-at-marriage may not be the age at first marriage. Second, current living arrangements and characteristics of the household and community in which the older women may be living may well not be reflective of those relevant at the time or shortly after marriage. Finally, there is considerable evidence to suggest that the errors in measurement of variables such as age-at-marriage are considerably greater for older women than for younger women. For these reasons we limit ourselves in the choice of sample to that subset of married women with spouse present who have been married for no more than 16 years,[5] and for whom the relevant data on the variables defined in Table 4.4 are available. Moreover, for extended households, where there may be more than one generation of married women with spouse present in the household, we restrict our attention to the wives of sons, specifically to those whose relation to the head of household is stated to be that of daughter-in-law. These restrictions reduce the overall size of our sample to 1109, of whom 728 are from cultivating households and 381 are from non-cultivating households.

Let us turn now to the descriptive statistics for the different subsamples shown in Table 4.5 and in particular to the differences in means between the different subsamples. The first, and indeed rather striking, difference is in AMM between nuclear and extended households. The age at which males living in extended households marry is on the average about four years less than that at which males living in nuclear households marry. Although this might seem to support the view expressed by Davis (1955) that extended households tend to facilitate (subsidize) earlier marriage, the fact that virtually all married couples live in extended

Table 4.4

Definition of Variables Used in the
Empirical Application of the Marriage Module to ARIS Data

A. Endogenous Variables

AMM = age-at-marriage of the male (husband who is the son of the household head in extended households)(in years).

AMF = age-at-marriage of the female (wife who is the daughter-in-law of the household head in extended households)(in years).

EDCIM = educational attainment index of the male.

EDCIF = educational attainment index of the female.

= 1 if illiterate, = 2 if literate or primary, = 3 if some secondary, and = 4 if completed secondary or above.

B. Exogenous Variables

1. Personal Characteristics

AGEIM = age index of male.

AGEIF = age index of female.

= 1 if < 20;	= 5 if 35-44
= 2 if 20-24;	= 6 if 45-54
= 3 if 25-29;	= 7 if 55-64
= 4 if 30-34;	= 8 if 65-74
	= 9 if $\geq$ 75

2. Household Characteristics

RELIGM = Moslem religion

RELIGO = other non-Hindu religions

LAND Size Class of landholding

Table 4.4 (cont.)

1 = no land;
2 = ≤ 1 hectare;
3 = 1.1-2.5 hectares;
4 = 2.6-4.5 hectares;
5 = 4.6-6.5 hectares;
6 = 6.6-8.5 hectares;
7 = 8.6-10.5 hectares;
8 = 10.6-14.5 hectares;
9 = > 14.5 hectares.

HOUSE = value of the house (in thousands of rupees).

AGRILCAP = value of agricultrual machinery (in thousands of rupees).

LIVESTOCK = value of livestock (in thousands of rupees).

YNONLPER = value of permanent non-labor income per capita (in thousands of rupees).

IRRIGP = proportion of irrigated land to total land.

CVIA = rice with high-yielding varieties of seed (HYV); 1 if yes; 0 otherwise.

CVIB = rice without HYV; 1 if yes; 0 otherwise.

CVIC = wheat and other cerals with HYV; 1 if yes; 0 otherwise.

CVID = wheat and other cereals without HYV; 1 if yes; 0 otherwise.

CVIE = other crops with HYV; 1 if yes; 0 otherwise.

WOMENP = proportion of females 15 years and over in the total population of the household.

CHILDP = proportion of children (male and female ≤ 15 in the total population of the household.

PROVIDF = participation in the Provident Fund over all three years of the survey; 1 if yes; 0 otherwise.

3. Community Characteristics

SCHOOL = existence of a school in the village; 1 if yes; 0 otherwise.

FACT = existence of a factory in or near the village; 1 if yes; 0 otherwise.

Table 4.4 (cont.)

VILPOP = size of the village population (in thousands).

MINDIST = minimum distance to a bus or railway station (in kilometers).

TRANSCOST = index of transport costs to the market. (measured by distance to market)

CREDD21 = absence of credit facilities except for money lender in the village; = 1 if yes; 0 otherwise.

CREDD22 = absence of credit facilities except for cooperative or money-lender in village; = 1 if yes; 0 otherwise.

Regional Dummy Variables:

SOUTH = 1 if Kerala or Tamil Nadu; 0 otherwise.

SOUTHCENTRAL = 1 if Andhra Pradesh or Mysore; 0 otherwise.

WEST = 1 if Mahrashtra; 0 otherwise.

CENTRAL = 1 if Madya Pradesh or Uttar Pradesh; 0 otherwise.

EAST = 1 if Assam, Bihar, Orissa or West Bengal; 0 otherwise.

NORTHWEST = 1 if Gujarat, Himachel Pradesh, Kashmir or Rajasthan; 0 otherwise.

Table 4.5

Descriptive Statistics for Variables in
Model of Marriage Services for Different Subsamples of
Ever-Married Women (with Spouse Present) Married for 15 Years or Less
in the ARIS Data for Rural India

(Means and Standard Deviations)

Variable	Cultivating Households		Non-cultivating Households	
	Extended	Nuclear	Extended	Nuclear
Sample Size	479	249	132	249
AMM	20.040	24.273	20.758	24.671
	(4.254)	(6.086)	(5.286)	(5.639)
AMF	15.964	17.197	16.114	17.651
	(2.671)	(3.754)	(2.808)	(3.727)
EDCIM	2.169	1.948	1.934	1.932
	(1.125)	(.955)	(1.081)	(1.023)
EDCIF	1.309	1.277	1.318	1.313
	(.666)	(.706)	(.702)	(.694)
AGEIM	3.113	4.667	3.076	4.602
	(1.162)	(.878)	(1.282)	(.805)
AGEIF	2.269	3.442	2.204	3.478
	(.983)	(.897)	(1.044)	(1.012)
RELIGM	.052	.092		
	(.223)	(.290)		
RELIGO	.008	.008		
	(.091)	(.089)		
LAND	4.944	3.438		
	(2.118)	(1.580)		
HOUSE	6.679	2.860		
	(7.635)	(4.806)		
AGRILCAP	3.020	1.307		
	(5.494)	(2.546)		
LIVESTOCK	2.595	1.301		
	(2.240)	(1.589)		
YNONLPER			.285	.313
			(.283)	(.667)
IRRIGP	.461	.425		
	(.427)	(.451)		
CV3A	.094	.108		
	(.292)	(.311)		
CV3B	.244	.361		
	(.430)	(.481)		
CV3C	.188	.076		
	(.391)	(.266)		
CV3D	.236	.249		
	(.425)	(.433)		
CV3E	.046	.040		
	(.210)	(.196)		
WOMENP	.283		.297	
	(.076)		(.073)	

Table 4.5 (cont.)

Variable	Cultivating Households		Non-cultivating Households	
	Extended	Nuclear	Extended	Nuclear
CHILDP	.232		.169	
	(.158)		(.198)	
PROVIDF	.027	.024	---	.036
	(.163)	(.154)	---	(.187)
SCHOOL	.248	.157	.394	.261
	(.433)	(.364)	(.490)	(.440)
FACT	.098	.144	.136	.157
	(.298)	(.352)	(.344)	(.364)
VILPOP	1.830	2.075	3.146	2.346
	(1.821)	(3.402)	(3.299)	(3.233)
EXTVIS	136.570	112.418	201.970	161.008
	(153.252)	(135.17)	(159.436)	(148.172)
MINDIST	6.457	6.281	5.977	5.859
	(6.420)	(6.438)	(7.446)	(8.029)
TRANSCOST	27.752	19.494	20.985	20.056
	(31.031)	(20.270)	(26.182)	(26.497)
CREDD21	.111	.096	.114	.120
	(.314)	(.296)	(.319)	(.326)
CREDD22	.430	.253	.364	.309
	(.496)	(.436)	(.483)	(.463)
SOUTH	.040	.116	.114	.245
	(.195)	(.321)	(.319)	(.431)
SOUTHCENTRAL	.073	.189	.114	.141
	(.260)	(.392)	(.319)	(.348)
WEST	.048	.068	.008	.044
	(.214)	(.252)	(.087)	(.206)
CENTRAL	.322	.157	.311	.104
	(.468)	(.364)	(.464)	(.306)
EAST	.123	.273	.182	.217
	(.329)	(.446)	(.387)	(.413)
NORTHWEST	.297	.149	.182	.128
	(.457)	(.356)	(.387)	(.335)

Note: Figures in parentheses are standard deviations.

households immediately after marriage casts doubt on the validity of such an explanation. A somewhat different explanation based to a greater extent on the model specified in Chapter III above is that wealthier households who would be better able to hold onto their married sons than less wealthy ones, being wealthier would also demand more marriage services and hence choose lower values of AMM. Note also that the age differential between nuclear and extended households with respect to AMF is considerably smaller, indeed, only a little over one year. Notably, therefore, the age differential between husbands and wives in nuclear households is much greater (slightly over seven years) than that between husbands and wives in extended households (between four and five years). This is explained by the fact that extended households are wealthier than nuclear households; for given dowry this translates into a greater age differential between husband and wife in extended households than in nuclear households.[6] In both cases the average age-at-marriage is slightly higher among those living in non-cultivating households than among those in cultivating households, perhaps reflecting the relatively greater demand for marriage services and children in agricultural households.[7] The lower ages-at-marriage in extended households could also possibly be attributed to the greater demand for marriage services in such households.

Note also that the educational attainment levels of the two marriage partners, EDCIM and EDCIF, our proxies for the quality of marriage services, are higher for extended than for nuclear households although the differences are minimal in the case of non-cultivating households. While EDCIM is on average higher in cultivating households than in non-cultivating households, EDCIF tends to be somewhat lower.

The rather dramatic differences between nuclear and extended households in the means of the asset variables given farther down in Table 4.5,

such as LAND, HOUSE, AGRILCAP and IRRIGP, which, at least in cultivating households, reveal extended households to be wealthier than nuclear households, provide another possible explanation (greater wealth as explained in the model) for the observed greater demand for marriage services in such households. Note also that the higher income cropping patterns, i.e., HYV wheat and cereals, and other crops with HYV, are also more common in extended households than in nuclear ones.

Although in general the community characteristics tend to vary somewhat less from one subsample to another, there are some interesting exceptions. For example, the villages in which non-cultivating households live are more likely than those in which cultivating households live to have a school, a factory, larger populations, more visits from agricultural extension agents, and lower transport costs to the market. Likewise, extended households live in villages that are more likely than those in which nuclear households live to have a school, more visits from the extension agent, higher transport costs to the market and less favorable credit opportunities.

C. The Fertility Module

We turn now to the detailed empirical specification of the fertility model. Although the model as developed in Chapter III was presented in terms of a simultaneous equation framework in which some eighteen variables are determined simultaneously, unfortunately not all of these variables are observable. In particular, there are no observations concerning the allocations of wife-time and other persons-time to the production of Z goods and child services, N, and Q, and the present value of the variables V_1, V_2 and V_3 entering the budget constraint of the wife-mother. Finally, since

not all children born to the ever-married women whose fertility histories are recorded were living in the household at the time of the survey, Q could not be and hence was not measured. In our empirical work, therefore, we necessarily have to restrict our focus to the relatively few variables which are either observable directly or measurable by proxies.

As explained above, for our measure of fertility we employ the ratio of the actual number of surviving children to the potential number of children, given their age-at-marriage and the duration of their marriage, as suggested by Boulier and Rosenzweig (1978). The actual number of surviving children was reported directly and the potential or natural fertility of the woman has been computed on the basis of information on age-at-marriage of the wife, age-at-effective-end-of-the-marriage (defined as the age at death or departure or the husband or woman's age reaching 45), and estimates of potential fertility for different age intervals of rural Indian women in the 1960s from Potter, Jr., Wyon, Parker and Gordon (1965).[8] This measure is referred to as FERT. It is applied to the sample of ever-married women with spouse present of age 35 or older for whom fertility histories would be relatively complete, and for whom all information on the relevant variables designated below and listed in Table 4.6 is complete and internally consistent.

As to the variables used as determinants of FERT we divide the considerations into three basic groups, individual characteristics of the wife-mother and her husband, characteristics of the household, and finally community variables.

Following recent suggestions in the literature,[9] as proxies for individual differences in fertility potential or supply, we include the time interval (in years) between marriage and birth of the first child (CHINT1)

and that between the first and second child (CHINT2). We also include indexes of educational attainment of the wife-mother (EDCIF) and of the husband (EDCIM), the age-at-marriage variables, AMF for the female, and AMM for the male, and finally, the sex ratio of the children (SEXRAT), defined in terms of the number of female live births divided by the total number of live births reported by the wife-mother.

For household variables we include several measures of wealth: the value of the house in thousands of rupees (HOUSE), dummy variables for various sizes of landholdings (LAND2 - LAND6), the values of agricultural and livestock capital again in thousands of rupees (AGRILCAP) and (LIVESTOCK), respectively, the proportion of land irrigated (IRRIGP), the share of rented land in total land (TENANTP) and finally, the average annual value in thousands of rupees of non-labor income per capita over the three sample years (YNONLPER). Other household variables included in the empirical specifications of the model are: participation in the Provident Fund scheme by someone in the household (PROVIDF), dummy variables for non-Hindu religion of the household head, RELIGM for Moslem, and RELIGO for Christian and other non-Hindu, a dummy variable for nuclear as opposed to extended or complex type of household structure (HOUST) and the following dummy variables for the dominant cropping pattern: for rice with high-yielding varieties or HYV (CV3A) for rice without HYV (CV3B), wheat and other grains with HYV (CV3C), wheat, etc. without HYV (CV3D) and other crops with HYV (CV3E).

The community-level variables included are the size of population of the village (VILPOP), the minimum distance from the village to mass transport facilities such as bus or railroad (in kilometers) (MINDIST), the absence of credit facilities other than moneylender from the village (CREDD21) or absence of credit facilities other than coop or moneylender

(CREDD22), and the following dummy variables for regions of India, SOUTH (if Kerala or Tamil Nadu), SOUTHCENTRAL (if Andhra Pradesh or Mysore), WEST (if Maharashtra), CENTRAL (if Madya Pradesh or Uttar Pradesh), EAST (if Assam, Bihar, Orissa or West Bengal), and NORTHWEST (if Gujarat, Himachel Pradesh, Kashmir or Rajasthan).

Since several of the aforementioned household variables are relevant only to women living in cultivating households, and since much of the information on these and some other variables, such as that on HOUSE, RELIGM and RELIGO, is available for cultivating households only, a considerably more limited set of variables is used to determine FERT of non-cultivating households.

For simplicity, we specify a linear relationship between all variables in the model. Since there could well be interactions between household structure (HOUST) and the other exogenous variables in the model [Carter and Merrill (1979), Walther and Nugent (1982)], however, it would seem important to test the null hypotheses that there are no differences in behavior between nuclear and non-nuclear households within both cultivating and non-cultivating households. In both cases the null hypothesis of identical relationships across household types was rejected at the .01 level. Given the significant differences in numerous slope coefficients, in all our subsequent empirical work, we treat our four groups, nuclear cultivating households, extended cultivating households, nuclear non-cultivating households and extended non-cultivating households, as four separate samples to which the empirical model is applied.

Table 4.6 also provides descriptive statistics -- means and standard deviations -- for all available variables included in explaining FERT in each of the four samples. Perhaps the single most striking statistic is

that in all four samples the mean of FERT is well below 0.5, indicating that, despite the relatively large number of children (approximately six) that the average rural Indian woman with completed fertility had at the time of the survey, actual fertility is well below the maximum or potential indicating both that various forms of fertility and survival control are indeed practiced and that there is plenty of room for factors other than sexual opportunity for explaining variations in the number of surviving children across the sampled households.

As in Tables 4.3 and 4.5 some interesting differences in these statistics between household types can be detected. First it can be seen that FERT is higher in nuclear households than in extended households. The significantly higher FERT in nuclear households is in part attributable to the facts (also demonstrated in the Table) that the interval between the first and second children tends to be shorter (i.e., CHINT2 is lower) and that SEXRAT, a fertility-enhancing variable, is higher, for nuclear than for extended households. These results may also be indicative of the fact that sons whose wives have many children and/or a relatively high proportion of female children are encouraged to leave the extended households whereas those with few children are likely to be encouraged to remain in the extended household [Carter and Merrill (1979)]. On the other hand, note that AMF and AMM are both lower for extended households than for nuclear households, tending to raise potential or accumulated natural fertility.

As shown by the respective means of the EDCIF and EDCIM variables and as noted above in Table 4.5 for a different age group, the educational attainment levels of husbands though not of wives are generally somewhat higher among those in cultivating households than among those in non-

cultivating households. The educational attainment levels of wives in nuclear households are rather consistently higher than those in extended households; in the case of their husbands there is no particular pattern to the differences between nuclear and extended households. Extended households are generally wealthier than nuclear households (even on a per capita basis) as reflected in the larger mean for YNONLPER for non-cultivators and for cultivators in the higher averages for LANDD4 - LANDD6, HOUSE, AGRILCAP, LIVESTOCK, and the lower rental share TENANTP. Note, however, that nuclear cultivating households have slightly higher shares of irrigated land (IRRIGP) than extended households. Not surprisingly, as shown by the means for VILPOP and MINDIST, cultivating households, and especially extended ones, tend to live in smaller villages and be somewhat more distant from transport facilities than do those in non-cultivating households. An absence of credit facilities, as measured by higher means of CREDD21 and CREDD22, tends to be more characteristic of extended households than nuclear households.

Also shown in Table 4.6 are the expected signs of the coefficients of the right hand side variables on FERT. Of particular relevance to the model are the signs of AMF, AMM, the wealth variables, PROVIDF, CREDD21 and CREDD22 and the educational attainment variables. AMF would be expected to have a positive effect on FERT because the later the wife gets married the more concern she is likely to have for old-age security and the higher must be her intra-marital fertility rate to achieve any desired number of surviving children.[10] Because living in more intergenerationally complex household structures tends to raise the women's expectations of support from her children [Nugent and Walther (1981), Walther and Nugent (1982)] the influence of AMF might be expected to be larger in extended households

than in nuclear ones. On the other hand, since AMM is inversely related to the household's demand for children, AMM being the variable over which the household head has the greatest control as far as fertility is concerned, one would expect AMM to be inversely related to the level and slope of the household's allocations of resources to the wife and its willingness to increase that allocation with greater fertility. The strength of this relationship, moreover, might be expected to be greater in nuclear households where the (negative) correlation between AMM and the household's demand for fertility would be higher. The signs of the wealth variables, especially those complementary to the use of children services like LAND and LIVESTOCK, would be expected to be positive, and especially so in nuclear households, for the same reasons. An exception might be the value of mechanical equipment and tractors, measured by AGRILCAP, since this form of capital might in general be expected to be labor-displacing, thereby lowering the household's demand for children.

An especially important implication of the model presented in Section II is that participation by the household of the wife-mother in the Provident Fund program which contains both an old-age and a life insurance component would be expected to reduce both the expectation of and the need for transfers from children. Since, as mentioned above, the information available does not identify which member of the household is the participant in the Provident Fund and because participation is a relatively new phenomenon in rural India making it likely in complex or extended households that the sons themselves would be the participants, the effect of PROVIDF on FERT might well be expected to differ between household types, perhaps being negative only in nuclear households. Indeed, since participation in the Fund is available primarily only to unionized workers on

plantations and in factories, etc., with relatively high incomes and wealth, the estimate of PROVIDF may also be biased upward to the extent that it serves as a proxy measure for income and wealth. Because the importance of children as a source of future transfers would be expected to be greater in the absence of credit facilities and hence also in the absence of opportunities for savings for subsequent disinvestment, the effects of CREDD21 and CREDD22 on FERT should be unambiguously positive. Since the intergenerational complexity of household structure serves as a partial substitute for a capital market, again, as indicated in the last column of Table 4.6, the positive effect of CREDD21 and CREDD22 on FERT would be especially likely in nuclear households.

The direction of the effects of educational attainment of the wife-mother EDCIF and also of the husband EDCIM on FERT would depend on whether or not the positive effect of these variables coming by way of the positive influence of their greater knowledge on survival prospects of children (fertility being measured in terms of surviving children) would outweigh the negative influence of such education on the time allocations of parents, especially those of the wife-mother to the production of child services because of their greater earning power in market activities, and on the substitution of quality for quantity of children. Since in extended households, there are likely to be close substitutes for the wife's time in the generation of child services, the negative influence of EDCIF would be more likely to appear in nuclear households than in extended households. The net directions of the effects of most of the other household and community-level variables would be ambiguous because of offsetting influences. For example, the use of high-yielding varieties as in CV3A, CV3C and CV3E might be expected to raise the household's demand for children

Table 4.6

Descriptive Statistics on All Variables in Samples of Ever Married Women (with Spouse Present) of Age 35 and Above in the ARIS Data

Variable / Sample Size:	Cultivating Households		Non-Cultivating Households		Expected Direction of Effect on Fertility
	Nuclear 404	Extended 703	Nuclear 304	Extended 236	
FERT	.438	.391	.427	.409	-
	(.147)	(.156)	(.143)	(2.853)	
CHINT1	3.866	4.041	4.112	3.775	-
	(3.094)	(3.474)	(3.429)	(2.853)	
CHINT2	3.465	3.791	3.306	3.733	-
	(2.192)	(2.946)	(1.913)	(3.572)	
EDCIF	1.250	1.131	1.253	1.191	- in nuclear households
	(.637)	(.474)	(.601)	(.540)	
EDCIM	2.540	2.464	2.283	2.436	?
	(1.062)	(1.128)	(1.090)	(1.096)	
AMF	17.309	16.477	17.418	16.898	+ especially in extended households
	(3.422)	(3.522)	(3.905)	(4.029)	
AMM	24.099	22.821	24.059	22.809	- especially in nuclear households
	(5.790)	(5.875)	(5.552)	(5.452)	
SEXRAT	.478	.411	.468	.438	+
	(.216)	(.215)	(.225)	(.215)	
LANDD2	.215	.107			?
	(.412)	(.310)			
LANDD3	.282	.228			?
	(.451)	(.420)			
LANDD4	.205	.210			+
	(.405)	(.407)			
LANDD5	.116	.159			+ especially in nuclear households
	(.321)	(.366)			
LANDD6	.168	.277			+ especially in nuclear households
	(.375)	(.448)			
HOUSE	5.010	6.819			+
	(6.945)	(8.422)			
AGRILCAP	2.098	2.592			?
	(4.209)	(5.349)			
LIVESTOCK	1.601	2.390			+ especially in nuclear households
	(1.641)	(2.178)			
IRRIGP	.480	.461			+
	(.442)	(.435)			
TENANTP	.059	.039			?
	(.191)	(.144)			

Table 4.6 (cont.)

Variable / Sample Size:	Cultivating Households		Non-Cultivating Households		Expected Direction of Effect on Fertility
	Nuclear 404	Extended 703	Nuclear 304	Extended 236	
YNONLPER			.402	.433	+
			(.656)	(.474)	
PROVIDF	.022	.018	.043	.012	- in nuclear households
	(.148)	(.133)	(.203)	(.112)	
RELIGM	.037	.049			+
	(.189)	(.216)			
RELIGO	.032	.012			?
	(.177)	(.107)			
CV3A	.124	.098			?
	(.330)	(.298)			
CV3B	.282	.256			?
	(.451)	(.437)			
CV3C	.149	.228			?
	(.356)	(.420)			
CV3D	.210	.225			?
	(.408)	(.418)			
CV3E	.072	.044			?
	(.258)	(.205)			
VILPOP	2.191	1.839	3.189	2.939	?
	(3.109)	(1.948)	(4.002)	(3.583)	
MINDIST	5.752	6.314	4.470	4.729	?
	(6.487)	(6.355)	(5.853)	(6.277)	
CREDD21	.094	.105	.089	.102	+ especially in nuclear households
	(.292)	(.306)	(.285)	(.303)	
CREDD22	.379	.417	.391	.415	+
	(.486)	(.493)	(.489)	(.494)	
SOUTH	.158	.053	.270	.093	?
	(.366)	(.224)	(.445)	(.291)	
SOUTHCENTRAL	.074	.080	.053	.051	?
	(.262)	(.272)	(.223)	(.220)	
WEST	.092	.060	.030	.025	?
	(.289)	(.237)	(.170)	(.158)	
CENTRAL	.161	.308	.135	.199	?
	(.368)	(.462)	(.342)	(.400)	
EAST	.159	.147	.128	.148	?
	(.366)	(.355)	(.335)	(.356)	
NORTHWEST	.220	.199	.214	.271	?
	(.415)	(.400)	(.411)	(.446)	

services but could very conceivably raise the uemanu for quality relative to quantity and also, by raising income and wage rates, could shift the $V_1(C)$ and $V_2(C)$ functions upward, thereby decreasing FERT. Also locational variables like VILPOP (MINDIST) might tend to raise (lower) the opportunity cost of the wife-mother's allocation of time to children but, on the other hand, might increase (reduce) the amount of other sources of support V_3 available to her, again leaving the sign of the estimated coefficient ambiguous.

D. Resource Allocation: Cropping Patterns, Input Demand and Expenditure Allocation

As may be recalled from Section D of Chapter III, the resource allocation module, Module D, is divided into two parts, Part I, production and Part II, expenditures. From equations D.7, D.9 and D.10 the endogenous variables to be determined in the production portion of the module are the cropping pattern, profits, and the demand for variable inputs. Likewise, from equations (D.12a - D.12c) the expenditure portion of the module determines the shares of expenditures on consumption, investment and leisure in full income or expenditures. Since Module D is a short-run module, but with data for as many as three years, namely the agricultural years between 1968-69 and 1970-71, the above variables can be thought of as being determined for each of three consecutive years, specifically, 1968-69, 1969-70 and 1970-71.

Naturally, the specification of both the endogenous and exogenous variables in each part of Module D would vary somewhat depending on the type of household. For cultivating households the variables to be determined in the production system are the choice of dominant crop from among

the same six crop-technology alternatives specified above and labeled CV3A - CV3F, agricultural profits, the demand for labor in adult equivalents and the use of material inputs (mainly fertilizer) in agricultural production. Naturally, for non-cultivating households the cropping pattern and fertilizer input variables are irrelevant, leaving only non-labor income and the household's demand for labor to be determined. Likewise, with respect to the vectors of product and factor prices and of household and community characteristics appearing on the right hand sides of D.7, D.9 and D.10, some would naturally be relevant only for cultivating households.

Since both production and expenditure decisions can potentially be influenced by household structure and since the relevant set of household characteristics can vary between nuclear and extended households, in both cases we again provide somewhat different specifications for each of the four types of households identified in previous sections, namely, nuclear cultivating households, extended cultivating households, nuclear non-cultivating households, and extended non-cultivating households.

Consistent with the transcendental logarithmic ("translog") form assumed in equations D.9 and D.10 of Chapter III, the quantitative variables in the production system are defined in terms of logarithms. The complete specification of the endogenous and exogenous variables used in the production portion of Module D for each of the four samples is given in Table 4.7. The table also provides descriptive statistics - means and standard deviations - on all the variables included in the equations of the system for each of these samples. Since the data on agriculture were for the most part available only for the agricultural year 1970-71, the descriptive statisics represent the values for 1970-71 only.

By comparing the means of corresponding variables across samples, one can discern once again the same differences among these samples noted above

Table 4.7

Descriptive Statistics - Means and Standard Deviations (in parentheses) - and Definitions of Variables in the Production System for Non-Cultivating and Cultivating Households by Household Structure Type, 1970-71 in the ARIS Data for Rural India

Variable Name	Definition	Cultivating Households Nuclear	Cultivating Households Extended	Non-cultivating Households Nuclear	Non-cultivating Households Extended
Endogenous Variables:					
CV3A	High-yielding Rice				
	= 1 if yes	.14	.13		
	=0 if no	(.34)	(.34)		
CV3B	Regular Rice				
	= 1 if yes	.35	.32		
	=0 if no	(.48)	(.47)		
CV3C	High-yielding Wheat, Jowar or Maize				
	= 1 if yes	.11	.17		
	= 0 if no	(.31)	(.38)		
CV3D	Regular Wheat, Jowar or Maize				
	= 1 if yes	.22	.19		
	= 0 if no	(.41)	(.40)		
CV3E	Other Crops with High-yielding Varieties				
	= 1 if yes	.05	.05		
	= 0 if no	(.21)	(.21)		
LAGPROF	Agricultural Profits	7.57	8.05		
	(in logarithms)	(1.03)	(.97)		
LYNONL	Non-labor Income			5.04	5.77
	(in logarithms)			(1.76)	(1.82)
LLAB	Total Employment (in logarithms	-.92	-.46	-1.47	-1.14
	of number of adult equivalents)	(1.91)	(1.50)	(.93)	(.94)
LMAT	Materials Input (mainly fertilizers)				
	(in logarithms)				
Exogenous Variables					
LWAGE	Annual Wage Rate	-.15	-.16	-.07	.01
	(in logarithms of rupees)	(1.04)	(1.03)	(.80)	(.83)
LPCVAB	Price of Rice	1.35	1.33		
	(in logarithms)	(1.97)	(1.92)		
LPCVCD	Price Index of Wheat, Jowar & Maize	.65	.82		
	(in logarithms)	(1.22)	(1.28)		
LPCVEF	Price Index of Other Crops	.46	.55		
	(in logarithms)	(1.04)	(1.14)		
LBUS	Value of Business Assets			2.10	2.53
	(in logarithms)			(2.49)	(2.72)
LHOUSE	Value of House	7.47	8.00	7.99	8.05
	(in logarithms)	(1.41)	(1.26)	(1.15)	(1.07)
LLAND	Land under Cultivation in hectares	.53	1.02		
	(in logarithms)	(1.10)	(1.00)		

Table 4.7 (cont.)

Variable Name	Definition	Cultivating Households Nuclear	Cultivating Households Extended	Non-cultivating Households Nuclear	Non-cultivating Households Extended
LIRRIGP	Percentage of Irrigated Land (in logarithms)	2.45 (2.13)	2.61 (2.04)		
LLIVESTOCK	Value of Livestock (in logarithms)	6.06 (2.54)	6.62 (2.45)		
LAGRILCAP	Value of Agricultural Capital (in logarithms)	5.40 (2.56)	6.01 (2.56)		
EDCIMD1	Educational Attainment of Household Head = 1 if primary or below = 0 if otherwise	.30 (.46)	.27 (.44)	.25 (.44)	.28 (.45)
EDCIMD2	= 1 if above primary but below matriculation = 0 if otherwise	.25 (.43)	.30 (.46)	.17 (.38)	.21 (.41)
EDCIMD3	= 1 if matriculation and above = 0 if otherwise	.16 (.37)	.23 (.42)	.12 (.32)	.19 (.37)
AGE H1	Age of Household Head = 1 if below 35 years = 0 if otherwise	.14 (.35)	.11 (.31)	.18 (.38)	.16 (.37)
AGE H2	= 1 if 35-44 years = 0 if otherwise	.33 (.47)	.16 (.37)	.35 (.48)	.20 (.40)
AGE H3	= 1 if 45-54 years = 0 if otherwise	.33 (.47)	.24 (.43)	.30 (.46)	.21 (.41)
AGE H4	= 1 if 55-64 years = 0 if otherwise	.16 (.37)	.30 (.46)	.14 (.35)	.29 (.45)
LTRADE	Commercialization Index (in logarithms)	2.86 (2.03)	3.04 (1.91)		
CREDD21	Absence of Either Bank or Cooperative in Village	.08 (.28)	.09 (.28)	.16 (.37)	.10 (.30)
CREDD22	Absence of Bank in Village	.32 (.47)	.40 (.49)	.33 (.47)	.45 (.50)
PROVIDF	Provident Fund Participation = 1 if yes in all three years = 0 if otherwise	.03 (.16)	.03 (.13)	.05 (.23)	.07 (.26)
BAD WEATHER DUMMY	= 1 if bad = 0 if otherwise	.18 (.38)	.22 (.41)	.22 (.41)	.22 (.41)
LDPROFCULT	Mean of Agricultural Profits of Cultivators in District			8.14 (.65)	8.21 (.59)
MODERN	Modernity Index			3.60 (1.70)	3.73 (1.65)
LVILPOP	Village Population (in logarithms)			.49 (.98)	.71 (1.06)
IDLE	Number of Adults not Working Due to Ill-Health, Disability & Old-Age	.15 (.40)	.33 (.51)	.10 (.34)	.20 (.46)
TRANSCOST	Index of Transport Cost	27.1 (30.0)	20.4 (21.5)	21.00 (23.2)	18.80 (19.4)
MINDIST	Minimum of Distance form Village to Nearest Bus, Railway Station	6.47 (6.41)	6.20 (6.63)	6.40 (8.70)	5.47 (7.34)

Table 4.7 (cont.)

Variable Name	Definition	Cultivating Households Nuclear	Cultivating Households Extended	Non-cultivating Households Nuclear	Non-cultivating Households Extended
HEALTH	Existence of Health Center in Village = 1 if yes = 0 otherwise			.27 (.45)	.41 (.49)
SOUTH	= 1 if Kerala, Tamil Nadu = 0 otherwise	.14 (.35)	.08 (.27)	.27 (.44)	.25 (.44)
SOUTHCENTRAL	= 1 if Andhra Pradesh or Karnataka = 0 otherwise	.14 (.35)	.13 (.34)	.10 (.30)	.07 (.26)
WEST	= 1 if Maharashtra = 0 if otherwise	.09 (.29)	.06 (.24)	.00	.00
CENTRAL	= 1 if Madhya Pradesh or Uttar Pradesh = 0 if otherwise	.19 (.40)	.18 (.38)	.14 (.35)	.22 (.42)
EAST	= 1 if Assam, Bihar, Orissa or West Bengal = 0 if otherwise	.16 (.37)	.28 (.45)	.16 (.36)	.13 (.34)
NORTHWEST	= 1 if Gujarat, Rajasthan, Himachel Pradesh, Jammu or Kashmir = 0 if otherwise	.21 (.41)	.19 (.40)	.21 (.41)	.18 (.38)

in Sections B (for younger women) and C (for older women), and especially in Tables 4.5 and 4.6, respectively. Specifically, the cultivating households tend to be wealthier than non-cultivating households, i.e., they have more non-labor income, more land, more capital (other than the values of house and business), higher educational attainment, and better access to credit and financial institutions. They also tend to demand more labor (both hired and family labor), to have somewhat older household heads, to less likely be affiliated with the Provident Fund, and to be somewhat more distant from transport facilities and from the market than non-cultivating households.

Within both cultivating and non-cultivating household groups, extended households tend to be wealthier than nuclear households, i.e., have more non-labor income or profits, more land, a more valuable house, more business assets, a higher proportion of irrigated land, more livestock and agricultural equipment, higher levels of educational attainment and to have a higher modernity index than nuclear households. Once again, they also tend to have older household heads, demand more labor, be more likely to have wheat produced with high-yielding seed varieties as the dominant crop. Although already observed in the aforementioned tables, especially striking in this table is the considerably poorer access that extended households have to credit and financial markets in relation to nuclear households. Among cultivating households 40 percent of extended households live in villages without a bank relative to only 32 percent of nuclear households. Among non-cultivating households, 45 percent of extended households live in villages without a bank whereas only 32 percent of nuclear households live in villages without a bank.

A new revelation of this table is that extended cultivating households tend to be more commercialized than nuclear cultivating households. This

may be partially explained by the facts (1) that extended households are more likely to fetch prices of wheat and other crops (mainly oil seeds and sugar) - both of which are cash crops - that are relatively higher, but prices of rice - a subsistence crop - which are relatively lower than those of nuclear cultivating households, and (2) that extended households have more land than nuclear households.

Another new finding is that the probability of an adult household member being unable to work because of illness, disability or old-age in the reference year is twice as high in the case of extended households as in that of nuclear households. This latter finding is, no doubt, in part attributable to the fact mentioned in connection with the household structure module that extended household living arrangements tend to provide an efficient means of providing for dependent persons.

In Table 4.8 we name, provide definitions for, and present descriptive statistics on all the variables considered relevant to the empirical specifications of the expenditure share equations (D.12a) - (D.12c) in Chapter III. In this case, because the relevant data is available for all three years, 1968-69 through 1970-71, the descriptive statistics are given on the expenditure share, relative price, and full income (expenditure) variables, for each of the three years. The letters A, B and C at the end of a variable name indicate the years 1968-69, 1969-70 and 1970-71, respectively.

Naturally the magnitudes of the shares of consumption, investment and leisure are likely to be sensitive to the way in which leisure is measured. Since the only information on the leisure consumed by the household is that with respect to the employment or other status of each individual in the household, in measuring household leisure we have had to combine the age and earner status data with some fairly arbitrary assumptions as to which

Table 4.8

Descriptive Statistics - Means and Standard Deviations (in parentheses) - and Definitions of Variables in the Expenditure System for Different Types of Households in the ARIS Data for Rural India.

Variable Name	Definition	Cultivating Households Nuclear	Cultivating Households Extended	Non-cultivating Households Nuclear	Non-cultivating Households Extended
Endogenous Variables:					
CSA	Negative of Consumption Share in Full Expenditure in 1968-69	-.89 (.17)	-.84 (.21)	-.94 (.38)	-.83 (.25)
CSB	Negative of Consumption Share in Full Expenditure in 1969-70	-.88 (.44)	-.82 (.25)	-.94 (.73)	-.83 (.32)
CSC	Negative of Consumption Share in Full Expenditure in 1970-71	-.86 (.24)	-.81 (.20)	-.98 (.63)	-.82 (.22)
ISA	Negative of Investment Share in Full Expenditure in 1968-69	-.06 (.14)	-.06 (.18)	-.05 (.12)	-.05 (.15)
ISB	Negative of Investment Share in Full Expenditure in 1969-70	-.08 (.40)	-.10 (.24)	-.02 (.73)	-.02 (.29)
ISC	Negative of Investment Share in Full Expenditure in 1970-71	-.10 (.23)	-.10 (.20)	-.02 (.55)	-.05 (.16)
LSA	Negative of Leisure Share in Full Expenditure in 1968-69	-.05	-.10	-.01	-.12
LSB	Negative of Leisure Share in Full Expenditure in 1969-70	-.04	-.08	-.04	-.15
LSC	Negative of Leisure Share in Full Expenditure in 1970-71	-.04	-.09	-.00	-.13
Exogenous Variables:					
LPCA	Price of Consumption in 1968-69 (in logarithms)	.00 (.10)	-.00 (.09)	-.02 (.09)	-.02 (.09)
LPCB	Price of Consumption in 1969-70 (in logarithms)	-.01 (.08)	-.00 (.08)	-.01 (.08)	-.00 (.07)
LPCC	Price of Consumption in 1970-71 (in logarithms)	.00 (.10)	.00 (.12)	-.00 (.10)	-.01 (.09)
LPIA	Price of Investment in 1968-69 (in logarithms)	-.42 (.96)	-.29 (1.00)	.28 (.93)	.35 (.72)
LPIB	Price of Investment in 1969-70 (in logarithms)	-.23 (.92)	-.22 (.91)	.43 (.79)	.43 (.77)
LPIC	Price of Investment in 1970-71 (in logarithms)	-.19 (.84)	-.26 (.86)	.31 (.76)	.34 (.70)
LPLA	Price of Leisure in 1968-69 (in logarithms)	-.67 (1.13)	-.54 (1.17)	.40 (.89)	.40 (.77)
LPLB	Price of Leisure in 1969-70 (in logarithms)	-.58 (1.15)	-.57 (1.15)	.51 (.81)	.46 (.78)
LPLC	Price of Leisure in 1970-71 (in logarithms)	-.46 (1.03)	-.54 (1.04)	.40 (.84)	.42 (.73)

Table 4.8 (cont.)

Variable Name	Definition	Cultivating Households Nuclear	Cultivating Households Extended	Non-cultivating Households Nuclear	Non-cultivating Households Extended
LMA	Full Expenditure in 1968-69 (in logarithms)	7.89 (.75)	8.30 (.74)	7.60 (.81)	7.96 (.75)
LMB	Full Expenditure in 1969-70 (in logarithms)	7.95 (.72)	8.39 (.68)	7.70 (.75)	8.08 (.72)
LMC	Full Expenditure in 1970-71 (in logarithms)	8.00 (.73)	8.43 (.68)	7.68 (.72)	8.15 (.75)
CREDD21	Absence of Either Bank or Cooperative in Village = 1 if absent = 0 if otherwise	.09 (.28)	.08 (.28)	.10 (.30)	.14 (.35)
CREDD22	Absence of Bank in Village = 1 if absent = 0 if otherwise	.30 (.46)	.39 (.49)	.33 (.47)	.38 (.49)
PROVIDF	Participation in Provident Fund = 1 if yes in all three years = 0 if otherwise	.03 (.16)	.03 (.17)	.04 (.20)	.03 (.17)
LHOUSE	Value of House (in logarithms)	7.64 (1.23)	8.04 (1.16)	7.99 (1.15)	8.05 (1.07)
AGEH1	Age of Household Head = 1 if below 35 years = 0 if otherwise	.12 (.33)	.10 (.30)	.14 (.35)	.13 (.34)
AGEH2	= 1 if 35-44 years = 0 if otherwise	.36 (.48)	.16 (.37)	.36 (.48)	.16 (.36)
AGEH3	= 1 of 45-54 years = 0 if otherwise	.32 (.47)	.24 (.43)	.32 (.47)	.23 (.42)
AGEH4	= 1 of 55-64 years = 0 if otherwise	.16 (.37)	.30 (.46)	.15 (.35)	.27 (.44)
LFAM	Family Size (in logarithms)	1.73 (.36)	2.09 (.42)	1.64 (.37)	1.88 (.42)
IDLE	Number of Adults Not Working Due to Ill Health, Disability, Old-Age	.08 (.23)	.15 (.34)	.10 (.25)	.18 (.35)
AMS	Average Share of Adult Males in Household: 1968-69 - 1970-71	.11 (.12)	.20 (.11)	.10 (.11)	.20 (.13)
AFS	Average Share of Adult Females in Household: 1968-69 - 1970-71	.26 (.11)	.30 (.10)	.26 (.11)	.30 (.11)
AM14S	Average Share of Males 10-14 in Household: 1968-69 - 1970-71	.09 (.09)	.06).07)	.09 (.10)	.06 (.07)
AF14S	Average Share of Females 10-14 in Household: 1968-69 - 1970-71	.07 (.08)	.05 (.06)	.07 (.08)	.05 (.07)
CSAA	Value of CSA by Leisure Measure A	-.67	-.63	-.49	-.39
CSAB	Value of CSA by Leisure Measure B	-.73	-.65	-.61	-.59
CSAD	Value of CSA by Leisure Measure D	-.94	-.92	-.95	-.92
ISAA	Value of ISA by Leisure Measure A	-.03	-.03	-.02	-.03
ISAB	Value of ISA by Leisure Measure B	-.05	-.05	-.03	-.06
ISAD	Value of ISA by Leisure Measure D	-.06	-.08	-.05	-.08
LSAA	Value of LSA by Leisure Measure A	-.30	-.34	-.49	-.58

Table 4.8 (cont.)

Variable Name	Definition	Cultivating Households Nuclear	Cultivating Households Extended	Non-cultivating Households Nuclear	Non-cultivating Households Extended
LSAB	Value of LSA by Leisure Measure B	-.22	-.30	-.35	-.35
LSAD	Value of LSA by Leisure Measure D	0	0	0	0
CSBA	Value of CSB by Leisure Measure A	-.67		-.52	
CSBB	Value of CSB by Leisure Measure B	-.73		-.63	
CSBD	Value of CSB by Leisure Measure D	-.90		-1.022	
ISBA	Value of ISB by Leisure Measure A	-.07	-.09	-.03	-.03
ISBB	Value of ISB by Leisure Measure B	-.07	-.08	-.04	-.05
ISBD	Value of ISB by Leisure Measure D	-.10	-.12	.02	.02
CSCA	Value of CSC by Leisure Measure A	-.65		-.54	
CSCB	Value of CSC by Leisure Measure B	-.72		-.70	
CSCD	Value of CSC by Leisure Measure D	-.89		-1.03	
ISCA	Value of ISC by Leisure Measure A	-.08	-.09	-.02	-.05
ISCB	Value of ISC by Leisure Measure B	-.08	-.09	-.01	-.04
ISCD	Value of ISC by Leisure Measure D	-.11	-.12	.02	-.01

household members enjoy leisure and how much of it they consume. To measure the sensitivity of the results to such assumptions, we employ four different measures of leisure, each giving a different weight to the relative share of leisure in household expenditures. The four measures of leisure, Measures A-D, are ranked from high to low in the weight that is attached to leisure in total expenditure. All measures of leisure arise from the same household variables but different assumptions are made about how to generate leisure from the common underlying data. Let

E = the number of earners in the household,

H_{10} = the number of members in the household of age 10 years and above,

S_{10} = the number of members in the household of age 10 years and above, who are students,

S_5 = the number of children of age five through nine who are continuing as students,

F = the total size of household.

Measure A

Each household member is assumed to enjoy at least half of his (her) time in leisure (including sleep), whereas members aged 10 or above are all assumed to enjoy also the other half of their time in leisure if they are not working. The total time endowment or potential leisure time of the household is $F + H_{10}$. The quantity of leisure actually consumed is $\frac{1}{2}(F + H_{10} - S_{10} - S_5 - E)$.

Measure B

Each household member aged 10 or above is assumed to possess one unit of leisure. Those household members below 10 years of age are considered

irrelevant and hence are assumed to have neither a time endowment nor leisure use. Students and earners who are at least 10 years old are assumed to use only half their time endowment in studying or working. Under these assumptions, the quantity of household leisure consumed is $(H_{10} - \frac{1}{2}S_{10} - \frac{1}{2}E)$.

Measure C

The assumptions made are the same as those in Measure B above, except that the endowment of each household member of 10 years and above is taken as ½ unit instead of 1 unit. The quantity of leisure consumed is thus $\frac{1}{2}(H_{10} - S_{10} - E)$.

Measure D

Leisure is assumed to be zero, implying that the leisure equation is redundant. We take Measure C which places low but nevertheless significant weight on leisure as being the most realistic for each of the three years. The resulting means of the leisure shares for the years 1968-69, 1969-70 and 1970-71 by this measure are referred to as LSA, LSB and LSC in Table 4.8. At the bottom of the table we give the respective shares of consumption, investment and leisure in each of the three years for each of the alternative leisure measures A, B and D. The LSAB entries, for example, represent the mean leisure shares for each of the household type samples in the year 1968-69 using leisure Measure B above. Since in all cases the negatives of the leisure, consumption and investment shares sum to -1, the leisure shares that are not given in the table can always be calculated as the difference between 1 and the sum of the consumption and investment shares. As expected from the respective definitions, the leisure share is

highest when Measure A is employed and lowest (zero) when Measure D is used.

Let us turn to the means of the expenditure shares on consumption (CS), investment (IS) and leisure (LS) for each of the three years and four samples that are given in this top portion of Table 4.8. One important observation is that, no matter which measure of leisure is employed, there are some fairly substantial changes in expenditure shares from one year to the next. Note, in particular, that for all samples except nuclear non-cultivating households the consumption shares in full income decreased in each successive year. In the case of cultivating households the declining consumption shares was offset by rising investment shares, whereas in the case of extended non-cultivating households the declining consumption shares were in part offset by rising leisure shares. In the exceptional case of nuclear, non-cultivating households, the consumption share rises over time while the investment share declines and the leisure share rises and then falls.

In contrast to what is commonly assumed, the consumption shares are universally lower, in most cases quite substantially, in extended households than in nuclear households. Investment shares, on the other hand, are equally high or higher in extended households than in nuclear households; leisure shares are on average higher in extended households than in nuclear households - in part because of the aforementioned substantially higher probability of having an ill, disabled or old-age dependent in extended households than in nuclear households.

Also note that the consumption shares tend to be lower and the investment shares higher in cultivating households than in non-cultivating households.

Remembering that the constancy of expenditure shares, i.e., that such shares are independent of the levels of full income M, is a necessary assumption for the expenditure share functions to have the simple form given by (D.12a) -(D.12c) of Chapter III, it is of interest to note that the levels of full income were generally rising between 1968-69 and 1970-71, except for the sample of nuclear non-cultivating households. Note also that cultivating households have higher full incomes than non-cultivating households, and extended households have higher full incomes than nuclear households. Since lower consumption shares and higher investment and leisure shares tend therefore to be associated with higher levels of full income, there is good reason to doubt the validity of the commonly utilized linear logarithmic expenditure system (LLES) functions given by (D.12a) - (D.12c).

Other noteworthy results from Table 4.8 are (1) that the price variables tend to vary both from one year to another and from one household type to another, and (2) that extended households once again are larger (i.e., have larger means of LFAM), have more ill, disabled or old age dependents, have older household heads, are wealthier, and have poorer access to credit and financial institutions and have somewhat different age and sex composition (measured by AMS, AFS, AM14S and AF14S) than nuclear households.

The careful reader no doubt may have noted numerous inconsistencies in the sample means for the same variable and apparently the same samples in Tables 4.3 - 4.8 above. It should be pointed out, however, that these inconsistencies are only apparent inasmuch as the samples are not the same. We have already mentioned that the samples used in Tables 4.5 and 4.6 differ almost entirely because the former pertain to young women while the

latter pertain to older women. Those in Tables 4.7 and 4.8, on the other in principle include all households. Because of exclusions for missing and inconsistent data, however, and the different data requirements in the production and expenditure portions of the Allocation Module, Module D, embodied in Tables 4.7 and 4.8, respectively, even the samples used in Tables 4.7 and 4.8 differ to a certain extent, explaining therefore why the corresponding sample means can differ from one another between tables.

Footnotes to Chapter IV

[1]Participation in the Provident Fund may be presumed to become relevant and important only for those participants whose actual or expected participation covers a relatively long period of time. In view of the fact that few rural workers could be expected to have long and stable employment histories in jobs that qualify them for Provident Fund participation, and in the absence of retrospective information on employment histories, the possibility that current participation in the Provident Fund scheme would have significant effects on fertility (especially past) and other forms of behavior would seem rather limited. Another shortcoming of our measure of Provident Fund participation in this respect is that participants are given the right and apparently frequently do withdraw their funds before retirements, hence, in reality not really constituting an old-age pension system even for those who are long term participants [Far East Economic Review (1978)].

[2]The same is true with respect to the value of agricultural machinery and equipment, a variable which was found to be closely correlated with LAND, LIVESTOCK and other variables, and for this reason to add little to the overall explanation of the dependent variables. This explains why this variable has been omitted from the current analysis. In any case, the weakness of the relationship between the various stock of wealth variables and age and other considerations in the model deferred us from specifying the wealth variables as variables jointly determined with household structure in a somewhat larger simultaneous equation model.

[3]This problem is further exacerbated by the fact that, especially in the case of cultivating households, there is a fairly strong positive correlation between education of the household head and PROVIDF. If it were not for the small number of households participating in the Provident Fund in the sample, the distinction could be sharpened by the introduction of additional interaction terms.

[4]The term of participation is important especially because, unlike the provisions of social security in the U.S., retirement and disability benefits of the Provident Fund scheme, are strictly a function of how much one has contributed, the amount contributed being closely related to the number of years covered by the scheme. In general, eligibility for participation in the Provident Fund has been a more recent phenomenon for farming (cultivating) households than for those in non-farming occupations such as civil servants and employees of rural manufacturing and mining establishments.

[5]Another reason for choosing sixteen or less years of marriage as the maximum is that at this point in their life cycles a sufficiently large number of the married couples have split off into nuclear households so as to afford the opportunity to make comparisons in their marriage behavior relative to that of those in extended households. Still another reason for limiting the sample to younger women was to further justify our aforementioned approach of the developing separate theoretical models for marriage and fertility and especially for estimating them separately. Since the

fertility histories are more complete only for older women, whereas the data on the households of younger married women are more relevant to the marriage model, the practice of estimating the marriage model with data from the sample of younger women and the separately developed though, of course, related fertility model with data from the sample of older women [Nugent and Walther (1982)] allows us to mitigate the simultaneous equation bias that otherwise might be present.

[6]Indeed, the greater age differential between husbands and wives in nuclear households than in extended households may contribute to the explanation for the differences in the propensity to partition. For example, it could well be that women who are much younger than their husbands would tend to be more concerned with widowhood and hence attach greater importance to children for old-age security purposes. As a result, such women would be expected to have more children than women closer in age to their husbands. The greater number of children would of course constitute a greater cost to the grandparents of retaining their married sons within the extended household. At the same time, the greater age differential between husband and wife would tend to reduce the importance of transfers from children to the husband and hence reduce the usefulness of living with one's own parents for its demonstration effect on the willingness of one's sons to remain living with their father. Both of these factors would, of course, make it less likely for sons with younger wives to remain with the household of their fathers.

[7]Note also that the proportion of children to total population of the household (CHILDP) is considerably higher in cultivating than in non-cultivating households.

[8]For each year prior to birth of the first child but after marriage and living with the husband present, this is computed by (1) summing (a) the expected number of months of pregnancy wastage over a five year period (ranging from a low of 1.73 for young women to a high of 3.11 for older women) and (b) the number of months in gestation (9 months), (2) dividing this sum into the total number of months in the period, and (3) dividing this number by the number of years in that interval to get the potential fertility per year. For each year after the birth of the first child a third item (c) the average number of months of post partum amenorrhea (ranging from a low of 7.4 for younger women to a high of 13.5 for older women) is added to the total in step (1). These calculations are then applied separately for each year of marriage over the effective lifetime of the marriage, i.e., until death or departure of the husband or until age 45 of the women, whichever occurs first.

[9]See, e.g., Easterlin, Pollak and Wachter (1980), Butz and Habicht (1976) and Easterlin and Crimmins (1981).

[10]It must also be admitted that measurement error in AMF would also tend to have a positive influence on FERT because AMF has a negative influence on accumulated natural fertility which is in the denominator of FERT.

CHAPTER V

ESTIMATION, HYPOTHESES TESTS, EMPIRICAL RESULTS, AND THEIR INTERPRETATION AND IMPLICATIONS FOR ALL MODULES WITH THE ARIS DATA FOR RURAL INDIA

The purpose of this chapter is to describe the estimation procedures, and tests employed and to report and interpret the results obtained in empirical estimation of key relationships contained in each module of the system with the ARIS data utilized in the first part of this study. Chapter VIII below serves the same purpose with respect to the Malaysian Family Life Survey data used in the second part of this study.

In defending the modular approach that has been employed in this study, much was made in Chapters II and III of the facts that the decision-makers would seem to differ from one decision and module to another and that the decisions made in the different modules have very different time horizons and are made at rather different points in time. Nevertheless, these arguments justify modularity only in design of the theoretical models. At the estimation stage, however, the frequently admitted interdependencies among the various decision-makers and decisions, and the likely presence of inadvertant but systematic measurement error in various variables would seem to justify the use of simultaneous equation procedures across modules. Since our ability to specify exactly and unambiguously the time lags, the error structure, and the direction of causality between modules is extremely limited, and because the requirements for identification would then exceed both theoretical knowledge and data availability, simultaneous estimation of the various modules would seem likely to impose more specifi-

cation errors and resulting biases than separate or recursive estimation. Therefore, we deem it important and appropriate to retain modularity even in the estimation stage. We make this approach more pallatible by deliberately choosing different data sets in estimating the different modules. Since the information about household structure and married couples contained in ARIS was almost entirely limited to that of the current household which would be relevant only if marriage, the sample used for estimating the marriage module, is of young women. On the other hand, it seemed appropriate to utilize data collected from households with older married women whose fertlity histories would be relatively complete in estimating the lifetime fertility module, Module C. Finally, time series data for the cross-section of all households seemed relevant for estimating the dynamic production and expenditure portions of the Resource Allocation Module, Module D.

Because of this, we deem it appropriate and necessary to estimate each module separately and hence to conduct the relevant tests and present the relevant results for each module in turn. We follow the same sequence of modules as in the previous chapters, i.e., dealing with all aspects of the Household Structure Module in Section A, all aspects of the Marriage Module in Section B, all aspects of the Fertility Module in Section C and finally all aspects of the Resource Allocation Module in Section D.

A. Household Structure

We begin by suggesting that the reader briefly review Section A of Chapter III in order to refresh his (her) memory concerning the hypothesized effects on our inverse measure of the degree of extension (HOUST1) and headship (HEAD) of all the exogenous variables defined in Table 4.2 and listed in Table 4.3 and again in Tables 5.1 and 5.2 below.

Since both dependent variables, HOUST1 and HEAD, are zero-one dummy, the models are estimated using a maximum likelihood logistic technique. As a result, the estimated coefficients given in Tables 5.1 and 5.2 can be interpreted as the log of the odds of being a household head or of living in a simple or nuclear household. The statistical significance of individual coefficients is based on asymptotic standard errors. For simplicity a linear form has been assumed for all right-hand-side variables excepting the number of years married (YEARSM) for which the square of that variable "YEARSMSQ" is also included.

First, with respect to life-cycle type considerations, even though the process of segmenting the samples by age group has the effect of limiting the extent to which such considerations can be captured by the within-group estimates reported here, it can be seen that generally both the log of the probability of being a head and that of living in a nuclear houshold increase with the number of years married YEARSM, but at a decreasing rate indicated by negative coefficients of YEARSMSQ. It is interesting to note that the effect of YEARSM tends to rise by age when the dependent variable involves headship whereas it tends to decline with age (or stops increasing at younger age groups) when HOUST1 is used. The pattern is similar for both cultivating households (Table 5.1) and non-cultivating households (Table 5.2) though the coefficients are more likely to be statistically significant in the former sample than in the latter. Second, as the number of own children (OWNCHILD) increases, both the log of the probability of headship and that of living in a nuclear household tend to increase. Note that in both samples the effect is stronger among young married males ($\leq$ 34 years of age) and older married males ($\geq$ 55 years of ages) than among middled-aged males.

As expected, the relative absence of financial institutions for saving and borrowing, especially as measured by CREDD22, reduces both the log of the probability of headship and that of living in a nuclear household. Although the measure of capital market underdevelopment is rather poor and the results with respect to CREDD21 are much weaker, the results support the view that the intergenerational household is a partial substitute for well-developed capital markets. The results with respect to proximity to labor markets and hence outside employment, as measured by VILPOP, and the inverse of MINDIST, are somewhat more mixed. MINDIST has the expected negative sign in only six of the fifteen cases, although none is significant at the .05 level. VILPOP has the expected positive sign in only four of the fifteen cases and in five of the remaining eleven cases, the coefficients have the wrong (negative) sign and are significant at the 5 percent level. The latter result could be explained by the fact that village population may well serve as a proxy also for other influences, such as the cost of household formation, which would naturally be expected to have the opposite effect on household structure. Note, however, that the expected directions of the effects are most clearly and consistently obtained for younger married males living in cultivating households.

On the other hand, our measures of agricultural wealth, i.e., larger landholdings (e.g., LANDD4-LANDD5), larger stocks of livestock, housing and irrigation facilities measured by LIVESTOCK, HOUSE and IRRIGP, respectively, in Table 5.1, almost without exception have the expected (negative) signs. Moreover, in the case of LIVESTOCK and HOUSE, they are always statistically significant at the .05 level. And even in the case of LANDD6 and IRRIGP the coefficients are negative and significant for middle-aged married males with only a single exception. Interestingly, the absolute

values of the coefficients of the different wealth variables vary from one age group to another. Notably, HOUSE and to a lesser extent LANDD5 and LIVESTOCK tend to have their largest and most significantly negative effects in the youngest age group, whereas IRRIGP tends to be most significantly negative in the middle-aged groups. Taken together, these results strongly support the hypothesis that agriculturally-oriented wealth tends to exert a cohesive influence on households, thereby tending to decrease both the probability of headship and that of living in nuclear households.

The results with respect to our other measures of capital, primarily human capital, i.e., EDCIMD2-EDCIMD4 and YNONLPER, support the expectation that human capital and other generally more personally controlled assets would tend to raise both the probability of headship and that of living in nuclear households. In the case of YNONLPER, the coefficients are of the (correct) positive sign in all cases except one (non-cultivating males in the 45-54 age group) although they are considerably larger and more significant for cultivating households than for non-cultivating ones. In the case of EDCIM2-EDCIM4, the coefficients have the expected positive sign in 18 of the 21 probability-of-headship regressions in Tables 5.1 and 5.2 but in only 9 of the 24 probability of living in a nuclear household regressions. In other words, the results indicate that the higher the individual adult married male's level of education relative to that of others in the household, the higher is the probability of headship but not necessarily the higher is the probability of living in a nuclear household. Since the departures from expectations in the latter respect are more noticeable and statistically significant in the youngest and oldest age groups than in the intermediate ones, one explanation for the diverging results may be a tendency for younger but more educated adult males to assume headship

earlier in time while living in extended households with their less educated fathers, whereas in the case in which the older males are also relatively well-educated, their managerial expertise and knowledge not only justifies the retention of headship but may also be a relatively important cohesive influence in inducing their sons to remain within the extended household. Although it would be impossible to test this conjecture without a considerably more complex estimation technique, it should be recalled that this explanation is consistent with both the findings of the descriptive literature and the production function influence of household complexity in the formal model presented in Chapter III.

Finally, although the aforementioned qualifications with respect to the ability of the PROVIDF dummy variable to adequately measure the importance of and degree of participation in a formal old-age pension system very considerably undermine the degree to which the coefficient of this variable can capture the effects of an old-age pension program on household structure, the results with respect to PROVIDF in Tables 5.1 and 5.2 are not without interest. The most striking result is that the direction of the effect would seem to be quite different between cultivating and non-cultivating households. The direction of the observed effect is that which would be expected for all age groups in the case of non-cultivating rural Indian households as shown in Table 5.2. The coefficient is significant (at the .05 level), moreover, in the headship regression for the youngest age group, and in the nuclear household regression in the case of married males between 45 and 54 years of age. Somewhat the same pattern among the different age groups can be seen in the case of cultivating households. One explanation for why PROVIDF increases the probability of headship most among younger males is that it is in households in which there is a young

married male it is most likely that the individual affiliated with the Provident Fund is the young male. It is when this is the case that the young male would be most likely to split off to be a household head and live in a nuclear household. The fact that the results for cultivating households are opposite to those expected may be attributable to several factors: (1) the distinct possibility that participation in the Provident Fund may have been a more recent phenomenon in cultivating households than in non-cultivating ones, implying that it would be less likely to exert its expected partitioning influence on the household in the former than in the latter; (2) the fact that the cohesive influence of the greater wealth of cultivating households is sufficient to more than compensate for the effect of PROVIDF, especially considering that those farmers producing crops eligible for affiliation with the Provident Fund, generally plantation owners or managers, are among the most wealthy farmers.

Altogether, the results provide at least some preliminary evidence in support of virtually all the hypothesized relationships. With respect to the influence of participation in the Provident Fund and to a lesser extent also the influence of education and the absence of financial and credit institutions in the community, however, there are also some rather glaring inconsistencies in the results from one age group to another and between cultivating and non-cultivating households for which further explanation is necessary.

If nothing else, these tentative results call attention to an issue which has been swept under the rug by most economists, namely the determinants of household structure. Considering the wide variety of behavioral forms that can, in principle, be affected by the structure of the household, and which have, in fact, been alleged to be influenced by household

Table 5.1

Household Structure Regression Results for
Cultivating Households Obtained from ARIS Data

Dependent Variable / Right Hand Side Variable	Probability of Headship (in logarithms)				Probability of Living in a Nuclear Household (in logarithms)			
Age:	≤ 34	35-44	35-54[1]	≥ 55[2]	≤ 34	35-44	45-54	≥ 55
Intercept	-1.846	-.685	-1.189		-3.504	-2.542	-1.539	-.771
	(.880)	(1.102)	(.928)		(1.205)	(.994)	(1.321)	(1.701)
EDCIM2	.444	1.304	1.155		.264	.421	-.040	.144
	(.226)	(.229)	(.186)		(.289)	(.213)	(.262)	(.327)
EDCIM3	.344	1.493	1.621		-.594	.542	-.255	-.548
	(.253)	(.279)	(.219)		(.386)	(.254)	(.257)	(.335)
EDCIM4	.421	1.752	2.127		-.370	.462	.038	.207
	(.312)	(.341)	(.290)		(.508)	(.326)	(.323)	(.340)
YEARSM	.043	.087	.148		.179	.135	.068	-.039
	(.037)	(.042)	(.032)		(.090)	(.067)	(.073)	(.067)
YEARSMSQ	.000	-.002	-.002		-.005	-.003	-.002	.000
	(.000)	(.001)	(.001)		(.003)	(.002)	(.001)	(.001)
OWNCHILD	.408	.087	.055		.528	.297	.295	.728
	(.072)	(.058)	(.044)		(.106)	(.057)	(.056)	(.089)
LANDD2	.528	.836	.751		.782	1.241	1.301	.692
	(.864)	(1.014)	(.861)		(1.134)	(.810)	(.940)	(1.157)
LANDD3	-.506	-.152	-.175		.024	-.152	.795	-.402
	(.859)	(.986)	(.841)		(1.132)	(.790)	(.928)	(1.157)
LANDD4	-1.141	-1.200	-.981		-.780	-.713	.489	-1.178
	(.872)	(.997)	(.848)		(1.156)	(.801)	(.934)	(1.184)
LANDD5	-1.737	-1.731	-1.444		-1.481	-1.301	.028	-1.546
	(.904)	(1.018)	(.862)		(1.221)	(.825)	(.952)	(1.201)
LANDD6	-1.586	-2.316	-2.082		-1.618	-1.918	-.280	-2.599
	(.901)	(1.031)	(.868)		(1.232)	(.832)	(.953)	(1.248)

Table 5.1 (cont.)

Right Hand Side Variable \ Age:	Probability of Headship (in logarithms) ≤ 34	35-44	35-54[1]	≥ 55[2]	Probability of Living in a Nuclear Household (in logarithms) ≤ 34	35-44	45-54	≥ 55
LIVESTOCK	-.221	-.109	-.160		-.255	-.146	-.284	-.257
	(.061)	(.055)	(.044)		(.096)	(.060)	(.070)	(.075)
HOUSE	-.141	-.100	-.066		-.258	-.065	-.059	-.057
	(.026)	(.018)	(.011)		(.058)	(.019)	(.018)	(.022)
IRRIGP	-.343	-.558	- 684		-.077	-.455	-.536	-.160
	(.227)	(.244)	(.198)		(.310)	(.228)	(.244)	(.287)
VILPOP	.007	-.099	-.090		.045	-.049	.088	.007
	(.052)	(.046)	(.036)		(.069)	(.044)	(.052)	(.041)
MINDIST	-.028	.016	.022		-.034	.018	-.018	-.009
	(.015)	(.017)	(.013)		(.021)	(.015)	(.015)	(.018)
CREDD21	-.144	.403	.039		-.034	-.195	-.410	.210
	(.300)	(.319)	(.267)		(.378)	(.291)	(.368)	(.393)
CREDD22	.108	-.164	-.183		-.446	-.473	-.183	.348
	(.192)	(.205)	(.165)		(.276)	(.205)	(.204)	(.250)
YNONLPER	1.707	1.836	1.458		1.787	1.574	1.501	2.099
	(.214)	(.280)	(.214)		(.304)	(.234)	(.239)	(.269)
PROVIDF	.956	-1.057	-.987		.130	-.291	-.747	-1.922
	(.631)	(.663)	(.480)		(1.177)	(.699)	(.699)	(1.213)
-2 log L	1076.9	745.5	1558.6		694.2	995.0	838.5	
D	.195	.251	.229		.179	.212	.204	
Coefficient of Predictive Accuracy	.442	.278	.382		.683	.225	.187	

Notes: Figures in parentheses represent asymptotic standard errors

1. Because of insufficient observations on all values of dummy variables separate estimates could not be obtained for the 45-54 age subsample.
2. Because of insufficient observations on all values of dummy variables separate estimates could not be obtained for this age group subsample.

Table 5.2

Household Structure Regression Results for
Noncultivating Households Obtained with ARIS Data

Dependent Variables: / Right Hand Side Variable — Age:	Probability of Headship (in logarithms)				Probability of Living in a Nuclear Household (in logarithms)			
	≤ 34	35-44	45-54	> 55	≤ 34	35-44	45-54	≥ 55
Intercept	-1.297	1.118	.827	3.892	-1.795	.210	2.403	1.348
	(.321)	(.644)	(1.414)	(4.968)	(.355)	(.573)	(1.060)	(1.793)
EDCIM2	.281	.114	.041	.799	.072	-.163	-.050	-1.720
	(.280)	(.369)	(.560)	(.874)	(.295)	(.292)	(.320)	(.391)
EDCIM3	-.310	.479	1.407	1.817	-.943	-.173	.476	-1.692
	(.357)	(.465)	(.764)	(1.141)	(.425)	(.342)	(.364)	(.385)
EDCIM4	-.057	-.305	1.587	.432	-.605	-.212	-.877	-1.543
	(.369)	(.470)	(1.039)	(.796)	(.425)	(.403)	(.396)	(.413)
YEARSM	.012	.101	.186	-.037	.070	.128	-.120	.037
	(.041)	(.072)	(.114)	(.226)	(.043)	(.068)	(.075)	(.099)
YEARSMSQ	.000	-.003	-.003	-.001	-.001	-.004	.002	-.002
	(.001)	(.002)	(.002)	(.003)	(.001)	(.002)	(.001)	(.001)
OWNCHILD	.505	.006	-.206	.367	.446	.008	.144	.161
	(.098)	(.095)	(.135)	(.432)	(.099)	(.075)	(.069)	(.108)
VILPOP	-.217	-.061	-.180	-.036	-.202	-.058	-.043	.032
	(.065)	(.034)	(.052)	(.059)	(.077)	(.030)	(.035)	(.031)
MINDIST	.017	.009	.054	.198	.009	-.003	.007	-.043
	(.016)	(.021)	(.052)	(.114)	(.016)	(.016)	(.019)	(.022)
CREDD21	.125	.002	-.623	.729	-.054	.206	-.729	.304
	(.350)	(.542)	(.872)	(1.262)	(.369)	(.425)	(.437)	(.478)
CREDD22	-.005	-.294	-.252	.226	-.279	-.368	-.291	-.156
	(.241)	(.306)	(.550)	(.677)	(.266)	(.243)	(.265)	(.292)

Table 5.2 (cont.)

Dependent Variables: / Right Hand Side Variable	Age:	Probability of Headship (in logarithms)				Probability of Living in a Nuclear Household (in logarithms)			
		≤ 34	35-44	45-54	> 55	≤ 34	35-44	45-54	≥ 55
YNONLPER		.400	.447	.500	1.049	.362	.053	-.018	.888
		(.274)	(.287)	(.256)	(.782)	(.282)	(.260)	(.188)	(.251)
PROVIDF		1.653	.340	--	--	.073	.474	2.608	.763
		(.683)	(.770)	--	--	(.861)	(.630)	(1.138)	(.970)
-2 log L		496.0	331.1	137.7	86.1	433.9	468.0	395.9	337.6
D		.168	.035	.070	.086	.169	.039	.092	.175
Coefficient of Predictive Accuracy		.170	.388	.701	.786	.274	.126	.140	.154

structure, even the tentative and preliminary evidence in support of the simple model proposed in this study may be of considerable importance.

B. Marriage

Once again the reader is referred to Chapter III, in this case Section B of that chapter for a set of hypotheses concerning the expected effects of all exogenous or predetermined variables on each of the three endogenous variables of the Marriage Module, age-at-marriage of the male (AMM), educational attainment of the female (EDCIF) and age-at-marriage of the female (AMF).

Once again we assume for simplicity a linear form for all equations in the model.

Our first task is to test the validity of the hypothesized special variant on the fully simultaneous determination of AMM, EDCIF and AMF, namely that of a causal chain going from AMM to EDCIF to AMF.

The test for recursiveness consists of two parts. The first part is to test, in the context of the following linear system $[I - A]Y + BX + u = 0$, namely,

	AMF	EDCIF	AMM	X	u
AMF	1	$-a_{12}$	$-a_{13}$	b_1	$u_1 = 0$
EDCIF	$-a_{21}$	1	$-a_{23}$	b_2	$u_2 = 0$
AMM	$-a_{31}$	$-a_{32}$	1	b_3	$u_3 = 0$

the validity of the joint restriction that $a_{21} = a_{31} = a_{32} = 0$. The second part of the test is to apply the Hausman (1978) test to determine whether or not the variance-covariance matrix formed by the errors u_1, u_2, u_3, is diagonal, diagonality being a necessary condition for recursivity.

The lack of information on the household of origin of the wife, and hence unavoidably the omission of potentially important variables from the equation for AMF, leads us to believe that the AMF, and possibly also the EDCIF, equations are subject to very considerable specification error, considerably more so than the AMM equation. If so, even if the first part of the recursivity test could not be passed decisively, the inclusion of AMF and EDCIF in the AMM equation might well introduce more specification error into the system as a whole, yielding parameter estimates with less desirable characteristics, than would be the case if the recursivity restrictions were imposed even when unwarranted. For this reason, in selecting a significance level for rejection of the aforementioned joint restrictions, we deliberately choose the .01 level, making it more difficult to reject the restrictions.

The results for the four subsamples under consideration are as follows:

	Cultivating Households		Non-Cultivating Households	
	Extended	Nuclear	Extended	Nuclear
Degrees of Freedom	3,157	3,671	3,343	3,394
F Value	1.96	3.28	2.08	3.04
Significance Level	.1165	.0203	.1013	.0281

Since the joint restrictions on the coefficients of the endogenous variables cannot be rejected at the .01 level in any of the four subsamples, we move to the second step, the Hausman Test. The danger of introducing specification error by allowing for non-zero covariances among the off-diagonal error terms as in the third stage of the seemingly-related regression procedure when the true specification of such covariances would

be zero would seem very slight. Indeed, because of common errors in measurement in the variables included in different equations of the model, one might suppose that more specification error might be introduced by imposing such restrictions even if they would be marginally rejected. For this reason, we choose the .05 level of significance in performing this chi-square test. In this case the restrictions turn out to be rejected at well below the .05 level in all cases. Therefore, for the results reported for the AMM, EDCIF and AMF equations in Tables 5.3, 5.4 and 5.5 respectively, we utilize the estimates of the third stage of the seemingly unrelated regression procedure allowing for non-zero elements in the covariance matrix formed by the interactions of the error terms in the different equations.

With respect to the AMM results given in Table 5.3, it can be seen that, as expected, the larger the size of landholdings, the lower is AMM, although from the t values it can be seen that the coefficients are not significant at the .05 level. Also, as expected, different components of wealth have rather different effects on AMM. On the one hand, assets with considerable complementarity to labor, and especially child labor, and hence marriage services, such as LAND, LIVESTOCK and to a lesser extent YNONLPER, and IRRIGP, all reduce AMM, i.e., increase the demand for marriage services. AGRILCAP, on the other hand, which may well be more of a substitute for labor, has a positive effect on AMM in both extended and nuclear cultivating households.

The pattern of observed responses to differences in cropping patterns also fits expectations. Relatively high-valued crops, such as CV3A and CV3C, have significantly negative coefficients on AMM, whereas low-valued crops, such as other cereals without HYV, have significantly positive coefficients.

In virtually all cases in which there is enough information available to estimate the relevant coefficients, the coefficients of the household composition variables have the expected signs and are highly significant, thereby supporting both the underlying assumption of the model that marriage decisions are determined by household (as opposed to individual) considerations and the more specific hypothesis that the timing of marriage of the son would be positively related to the proportions of females and children in the total population of the household, WOMENP and CHILDP, respectively.

Of particular interest is the result that, at least among cultivating households, participation in the Provident Fund, PROVIDF, significantly raises the age-at-marriage of the male, AMM, not surprisingly by considerably more in nuclear households where it is more clear that the male whose marriage age is to be explained is the person who is the participant in the Provident Fund. The effect is not significant among non-cultivating households but this negative result may well be attributed to an insufficient number of persons participating in that program in these particular subsamples.

From the results for SCHOOL, CREDD21, CREDD22, and MINDIST, it can be seen that, although by no means generally statistically significant, the existence of a school in the village, the absence of credit or banking facilities and the minimum distance to transport depots have different directions of effects in nuclear than in extended households.

A possible explanation for the fact that SCHOOL tends to raise AMM in extended households and especially in extended cultivating households but tends to lower it in nuclear households is that in the latter context, where female or wife-time is rather scarce and therefore commands a high

opportunity cost, schools may tend to lower the cost of marriage services by providing, in effect, child care services, whereas in extended cultivating households the child care services of a school may be less useful and the presence of a school may tend to make school attendance for children more a cultural or legal norm, thereby lowering both the amount of child labor that can be extracted from children and perhaps their reliability as a source of old-age support (due to the effect of education in making children more independent and mobile).

In the case of the dummy variables representing the absence of credit institutions in the village, the effect of CREDD21 on AMM tends to be negative in nuclear households though positive but insignificant in extended households. The explanation for this interesting difference may be attributable to the fact that the institution of the extended household in part serves the function of credit in the form of intrafamiliar intergenerational transfers. Hence, extended households would be expected to be less affected by the lack of credit and other financial institutions than nuclear households. On the other hand, nuclear households living in villages lacking adequate financial institutions may have a greater tendency to invest in marriage services (children) than in physical (purchased) assets because investments of the former kind are less dependent on credit and finance than those of the latter kind.

Finally, it can be seen that the regional dummy variables are frequently significant, once again with some sizable differences between nuclear and extended households. Such differences could, of course, be attributable to interregional differences in any number of factors not included in the empirical specification of the model. One such factor might well be interregional variations in relative wage rates, in this case

of males. Since (from the role of the dowry function in the model) high male wage rates might be expected to be associated with later age-at-marriage, the fact that male wage rates were in 1956-57 (a year quite close to that in which most women and men in the present sample got married) highest in the SOUTH and EAST regions (outside of the North) - regions with the largest positive coefficients - and lowest in the WEST and CENTRAL regions - the regions with the lowest or most negative coefficients,[1] is indeed not inconsistent with this explanation for such differences.

Next, we turn to the results for educational attainment of the wife, EDCIF, given in Table 5.4. Note, first, that EDCIM has a positive and significant influence on EDCIF in every subsample, that influence being somewhat stronger in noncultivating households than in cultivating households. As expected, in cultivating households the asset variables LAND and HOUSE tend to raise EDCIF. Participation in the Provident Fund raises EDCIF, more so in nuclear than in extended households. Favorable community characteristics such as SCHOOL, FACT and VILPOP all tend to raise EDCIF more in nuclear households than in extended households. Once again, there are some significant, though not as striking, differences in the influences of the regional dummy variables across regions.

Finally, and perhaps most importantly because of its relevance for completed fertility, let us turn to the results for age-at-marriage of the female, AMF, given in Table 5.5. The reader should be reminded that because of the lack of information on the household and community characteristics concerning the household of origin of the wife, this equation is undoubtedly subject to some specification error.

Note, first, that in this case where all three of the other marriage services-related variables are included, the effects of such variables are

frequently significant and, if significant, are of the correct signs. For example, AMM exerts a strong positive influence on AMF in all subsamples. As would be predicted from the dowry function, EDCIM is shown to have a negative influence on AMF in three of the four subsamples, and significantly so in the case of nuclear cultivating households. EDCIF, on the other hand, and again as expected, has a positive influence on AMF (i.e., delaying marriage) in three of the four subsamples, and again significantly so in nuclear cultivating households.

The pattern in the effects of the wealth variables on AMF is somewhat similar to that observed above for AMM. LAND, HOUSE and LIVESTOCK, i.e., forms of wealth which are generally rather complementary to labor in general and child labor in particular, tend to reduce AMF while AGRILCAP, which generally tends to substitute for labor, raises AMF. The less precise and more general measure of wealth, YNONLPER (the only measure of wealth available for non-cultivating households) has a weak negative influence on AMF. All of these variables have stronger effects in nuclear households where the sex and age composition of the household, which may be regarded as intervening and complicating factors, are not relevant. In this regard, once again, the reader will note the very significant positive effect of WOMENP and CHILDP on age-at-marriage, in this case on that of the female.

Once again also, there is a significant positive influence of participation in the Provident Fund on age-at-marriage in nuclear cultivating households. With respect to the effects of the community characteristics, presumably for the same reasons given above, the absence of credit tends to raise the demand for marriage services only in nuclear cultivating households. Finally, variations in the magnitude and sign of the coefficients of the regional dummy variables suggest that in this case there may be

somewhat less systematic variation from region to region, but again substantial differences between nuclear and extended households, the effects always being more negative or less positive in extended cultivating households than in nuclear cultivating households.

While because of the omission of information on several of the important variables in the model, both endogenous, such as the magnitude of the dowry, and exogenous, such as household and community characteristics pertaining to the wife's household of origin, and the simple functional form utilized in the present study, the results can only be considered tentative and preliminary. Nevertheless, they provide considerable support for the following hypotheses put forward in the study.

1. Household structure plays an important role in marriage decisions. Marriages tend to occur at younger ages in extended households than in nuclear households. More importantly perhaps, the influence of exogenous variables, such as participation in the Provident Fund, the absence of credit institutions, and the level and composition of wealth, are all likely to be rather different in different household types.

2. We find consistent evidence suggesting that not only the level of wealth but also the composition of wealth have considerable influence over marriage decisions. Those forms of wealth which are most complementary to labor, and especially child labor, are generally negatively related to age-at-marriage, whereas those which serve more like substitutes for labor are positively related to AMM and AMF.

3. The age and sex composition of the household tend to be very significant determinants of marriage decisions in extended households. Indeed, the more women and children in the household relative to the

Table 5.3

Empirical Estimates Obtained from ARIS Data:
Age at Marriage of the Male (AMM)

	Cultivating Households		Non-cultivating Households	
	Extended	Nuclear	Extended	Nuclear
Constant Term	11.4225	-1.3921	8.3271	4.4486
	(8.93)	(.60)	(3.10)	(2.61)
Personal Characteristics				
EDCIM	.0603	-.1211	.1237	.2072
	(.41)	(.35)	(.37)	(.67)
AGEIM	2.2562	5.0630	2.8603	3.8077
	(16.64)	(16.32)	(.59)	(12.02)
RELIGM	-1.4322	.2550		
	(2.23)	(.26)		
RELIGO	-.3660	-.9196		
	(.24)	(.31)		
LAND	-.1001	-.2254		
	(1.24)	(1.07)		
HOUSE	.0337	-.0509		
	(1.57)	(.78)		
AGRILCAP	.0434	.2498		
	(1.52)	(1.88)		
LIVESTOCK	-.2721	-.1772		
	(3.71)	(.78)		
YNONLPER			-2.0763	.2302
			(1.53)	(.54)
IRRIGP	-.7102	.9166		
	(1.78)	(1.30)		
CV3A Rice with HYV	-.9786	-.8772		
	(1.61)	(.79)		
CV3B Rice without HYV	-.5206	.0575		
	(1.06)	(.07)		
CV3C Other Cereals with HYV	-.3949	-1.0273		
	(.74)	(.86)		
CV3D Cereals without HYV	.9272	.9379		
	(2.18)	(1.15)		
CV3E Other Crops without HYV	-.1815	1.6855		
	(.24)	(1.09)		
WOMENP	8.2461		7.0920	
	(4.18)		(1.41)	
CHILDP	6.7387		3.8536	
	(7.00)		(2.98)	
PROVIDF	1.8089	3.9432		.2673
	(2.00)	(2.07)		(.18)
Community Characteristics				
SCHOOL	.6570	-.0023	.8822	-.8904
	(1.77)	(.00)	(.98)	(1.39)
MINDIST	-.0271	.0710	-.0815	-.0381
	(1.08)	(1.63)	(1.27)	(1.01)

Table 5.3

	Cultivating Households		Non-cultivating Households	
	Extended	Nuclear	Extended	Nuclear
TRANSCOST	-.0023	-.0101	.0099	.0396
	(.44)	(.73)	(.58)	(3.71)
FACT	.0873	.0700	.6859	-.8687
	(.17)	(.09)	(.71)	(1.11)
CREDD21	.2908	-1.2778	1.2701	-2.6212
	(.55)	(1.23)	(.95)	(2.78)
CREDD22	-.5667	-.1604	.6550	-.4013
	(1.65)	(.23)	(.73)	(.62)
SOUTH	.9768	3.1965	3.1187	3.7061
	(1.03)	(2.17)	(2.01)	(3.77)
SOUTHERN	1.2318	2.1305	3.3722	3.1980
	(1.67)	(1.52)	(1.94)	(2.92)
WEST	-.5055	1.4016	.3679	1.4969
	(.60)	(.85)	(.10)	(.98)
CENTRAL	-1.6403	1.8112	-.2809	1.8727
	(2.91)	(1.31)	(.20)	(1.61)
EAST	1.2015	4.2648	.1195	3.2320
	(1.75)	(3.01)	(.09)	(3.28)
NORTHWEST	-1.9673	.2492	.0712	.7180
	(3.39)	(.16)	(.05)	(.64)
Degrees of Freedom	449	221	114	232
R^2	.578	.632	.623	.506

Note: Figures in parentheses are t values.

Table 5.4

Empricial Estimates Obtained from ARIS Data:
Educational Attainment of the Female (EDCIF)

	Cultivating Households		Non-cultivating Households	
	Extended	Nuclear	Extended	Nuclear
Constant Term	.3415	.2386	.7937	.8616
	(1.89)	(1.01)	(2.35)	(4.31)
Personal Characteristics				
AMM	.0118	.0149	-.0021	.0061
	(1.63)	(2.64)	(.16)	(.90)
EDCIM	.2205	.1988	.2581	.3026
	(8.50)	(4.98)	(4.33)	(7.64)
AGEIF	-.0574	-.0500	-.0419	-.0854
	(2.09)	(1.32)	(.71)	(2.42)
Household Characteristics				
LAND	.0176	.0195		
	(1.36)	(.87)		
HOUSE	.0085	.0118		
	(2.25)	(1.55)		
YNONLPER			-.0365	-.0139
			(.23)	(.25)
PROVIDF	.3391	1.4239	---	.5916
	(1.95)	(6.42)	---	(2.90)
Community Characteristics				
SCHOOL	-.0307	.1835	.0712	.0106
	(.39)	(1.73)	(.35)	(.11)
FACT	.1058	-.0190	-.0236	.3156
	(1.12)	(.20)	(.13)	(3.13)
VILPOP	.0224	.0600	-.0358	.0413
	(1.33)	(4.41)	(1.43)	(3.09)
EXTVIS	-.0000	.0001	.0010	-.0005
	(.14)	(.37)	(1.88)	(1.71)
SOUTH	.9007	.1962	.5087	.0171
	(5.53)	(1.05)	(1.73)	(.13)
SOUTHERN	-.0043	.0851	.4440	-.1860
	(.03)	(.52)	(1.57)	(1.33)
WEST	.0805	.3481	-.1870	-.0372
	(.53)	(1.85)	(.27)	(.20)
CENTRAL	.1580	.0973	.0640	-.2918
	(1.57)	(.59)	(.25)	(2.01)
EAST	.2910	.2091	-.0862	-.0165
	(2.55)	(1.30)	(.35)	(.13)
NORTHWEST	.2176	.1732	-.2799	-.0547
	(2.20)	(1.05)	(1.16)	(.40)

Table 5.4 (cont.)

	Cultivating Households		Non-cultivating Households	
	Extended	Nuclear	Extended	Nuclear
Degrees of Freedom	462	231	117	233
R^2	.355	.593	.301	.457

Note: Figures in parentheses are t values.

Table 5.5

Empirical Estimates Obtained from ARIS Data:
Age at Marriage of the Female (AMF)

	Cultivating Households		Non-cultivating Households	
	Extended	Nuclear	Extended	Nuclear
Constant Term	7.1637	7.4889	7.6685	5.7257
	(7.43)	(5.25)	(4.57)	(5.39)
Personal Characteristics				
AMM	.3099	.0936	.1873	.2926
	(11.51)	(3.02)	(4.38)	(8.61)
EDCIM	-.0690	-.7023	.1064	-.2172
	(.66)	(3.06)	(.51)	(1.01)
EDCIF	.0649	.7431	-.2666	.4588
	(.39)	(2.31)	(.91)	(1.51)
AGEIF	.7717	2.3097	1.3130	1.4326
	(6.72)	(11.37)	(6.25)	(8.31)
Household Characteristics				
RELIGM	-.8652	.1396		
	(1.98)	(.22)		
RELIGO	-.6878	1.2772		
	(.67)	(.67)		
LAND	.0937	-.2071		
	(1.70)	(1.56)		
HOUSE	-.0092	-.0353		
	(.64)	(1.46)		
AGRILCAP	.0075	.2187		
	(.39)	(2.54)		
LIVESTOCK	.0146	-.1695		
	(.29)	(1.20)		
YNONLPER			-.1838	-.2671
			(.33)	(.98)
IRRIGD	-.0936	.5325		
	(.34)	(1.20)		
CV3A	-.8525	-.5295		
	(2.07)	(.74)		
CV3B	-.5498	-.0716		
	(1.64)	(.13)		
CV3C	-.1666	.2692		
	(.46)	(.35)		
CV3D	-.1484	.8777		
	(.52)	(1.67)		
CV3E	-.4383	1.6452		
	(.86)	(1.66)		
WOMENP	5.5993		8.7191	
	(4.21)		(3.06)	
CHILDP	2.3477		2.8171	
	(3.50)		(2.48)	

Table 5.5 (cont.)

	Cultivating Households		Non-cultivating Households	
	Extended	Nuclear	Extended	Nuclear
PROVIDF	-.4470	3.1052		-.4488
	(.73)	(2.34)		(.46)
Community Characteristics				
MINDIST	-.402	.0684	-.0020	-.0308
	(2.36)	(2.44)	(.05)	(1.30)
TRANSCOST	-.0039	-.0107	-.0034	-.0020
	(1.12)	(1.18)	(.43)	(.29)
CREDD21	.4282	-1.6011	.7228	-.3616
	(1.18)	(2.38)	(1.03)	(.60)
CREDD22	-.1623	-.3186	-.1525	-.3852
	(.70)	(.73)	(.31)	(.93)
SOUTH	.0761	.2555	-.9546	-.0401
	(.12)	(.26)	(1.04)	(.06)
SOUTHCENTRAL	-2.2526	-.9547	-.8927	-1.2686
	(4.45)	(1.04)	(.87)	(1.78)
WEST	-1.4144	-.2635	-.5431	-.8018
	(2.57)	(.25)	(.25)	(.83)
CENTRAL	-.7740	-.4331	-1.2819	.8014
	(2.10)	(.49)	(1.65)	(1.07)
EAST	-.4692	1.2457	-2.2523	.4493
	(1.00)	(1.35)	(2.77)	(.71)
NORTHWEST	-1.2023	-.5738	-.7430	.5433
	(3.05)	(.58)	(.97)	(.76)
Degrees of Freedom	449	222	115	232
R^2	.506	.594	.535	.5400

Note: Figures in parentheses are t values.

total population of the household, the more marriage will tend to be delayed. These results provide strong support for the household as opposed to the individual being the appropriate decision-maker with respect to marriage age.

4. The fact that participation in the Provident Fund has a significant positive influence of both AMM and AMF in nuclear households underscores the potential importance of the old-age security motive in marriage and hence indirectly in fertility behavior of rural households.

5. The signs of the coefficients of AMM, EDCIM, EDCIF and various other variables in the AMF equation are largely consistent with the existence of the dowry function which is an important component of our model of marriage services.

6. From the perspective of the household of destination of the wife, i.e., that of married sons, the hypothesis that causality goes from AMM to EDCIF and finally to AMF is supported.

If as suggested above the age-at-marriage and the educational attainment of one's spouse are to a large extent under the control of the household as a whole and the household head in particular, one important implication for research on fertility behavior might be that the explanation for variations in overall fertility should be broken down into two very different components, one in which differences in potential fertility arising from differences in age-at-marriage, and the education of one's spouse, are analyzed, and then another in which, the individual motivation of the individual partners are considered. As pointed out above, the latter might well be better studied in a model that tries to explain actual fertility relative to potential fertility as determined by age-at-marriage which may

be considered given as far as the individual marriage partners are concerned.

C. Fertility

Once again the reader is referred back to Section C of Chapter III and in particular to Table 4.6 for a set of hypotheses concerning the effects of all right-hand-side variables on our measure of fertility, actual fertility relative to potential fertility, FERT.

Once again, for simplicity a linear form is assumed and the relationship is estimated (for each sample separately) via ordinary least squares.

We turn directly to the empirical estimates given in Table 5.6.

As can be seen by the estimated coefficients of determination given at the bottom of the table, only about one-third of the variation in the ratio of the accumulated number of surviving children to that of the potential number (FERT) across rural Indian women with relatively complete fertility histories is explained by the variables included in the model. This relatively low R^2 indicates that there is plenty of room for improvement. Nevertheless, this degree of explanatory power compares favorably with comparable attempts to explain similar measures elsewhere or other fertility measures in the context of rural India.[13]

Since different levels of unobserved variables between the samples would tend to be reflected in the estimates of the intercepts, not too much should be made of the differences in the estimates of the intercept in the different samples that are revealed in Table 5.6. Also, as noted above the rather large difference between the values of the constant terms for nuclear and extended households may be more reflective of the tendency of sons with many children to be pushed out of extended households rather than

of nuclear households to induce higher fertility rates on the part of women living in them than would extended households.

Consistent with the expectations expressed above and in the last column of Table 4.6, as revealed in all samples of Table 5.6 the signs of CHINT1, CHINT2 are consistently negative and significant, of SEXRAT are positive and in half the cases also significant. Not surprisingly, in several of the cases where the expected signs of the coefficients were ambiguous, as with EDCIM, the cropping pattern and regional dummy variables, and the community-level VILPOP and MINDIST variables, the estimated coefficients are frequently insignificant and vary considerably from one sample to another. Somewhat more surprising and unexpected, but not of great consequence to the proposed model are the observed inconsistencies from one sample to another in the estimated coefficients of TENANTP, RELIGM and RELIGO.

Of greater relevance and importance to the purpose of this study are the following results:

(1) that the influence of AMF on FERT is positive and significant in all samples;

(2) that the coefficient of AMF on FERT is more positive in extended households than in nuclear households where the slope of the $V_2(C)$ function would be expected to be more steeply upward-sloping;

(3) that the influence of EDCIF on FERT is more negative in nuclear households than in extended households;

(4) that the effect of AMM is negative only in nuclear households;

(5) that the influences on FERT of all wealth-related variables which may be thought of as being complementary to child services, such as LAND, HOUSE, LIVESTOCK and IRRIGP, are generally positive while that for AGRILCAP (which may be a net substitute for child-services) is negative;

(6) that the coefficients of household-level child-service-complementary wealth variables like LAND and LIVESTOCK are more positive in nuclear households where the relationship of household wealth and the woman's resources is quite direct where that relationship is more ambiguous and complex;

(7) that the effect of PROVIDF would be more negative in nuclear households than in extended households;

(8) that the coefficients of CREDD21 and CREDD22 are more positive in nuclear cultivating households than in extended cultivating households.

While these results are all very encouraging, in view of the relatively small sample sizes, low significance levels, and the existence in some cases of alternative explanations for these results, they can hardly be taken as definitive. Moreover, the fact that the differences in the size and direction of the coefficients of YNONLPER, CREDD21 and CREDD22 are all opposite to those expected in the case of non-cultivating rural households suggests that the results are considerably less supportive in the case of non-cultivating households. Quite possibly, however, the weaker and less unambiguous results for non-cultivating households can be attributed to the greater heterogeneity with respect to unobserved characteristics and omitted variables among such households.

Taken as a whole, however, the econometric results provided in this section, together with the more descriptive literature reviewed in Chapter II, are supportive of the following propositions:

(1) that women tend to play a rather large role in, and exert a somewhat independent influence on, fertility behavior in rural areas of LDCs than have generally been supposed in existing models,

(2) that household structure influences the strength as well as the direction of various other determinants of fertility behavior, such as

educational attainment, wealth, the presence of credit facilities, cropping patterns, and age-at-marriage of both marriage partners, and

(3) that the existence of formal old-age pension programs and well-developed financial and capital markets can reduce intramarital fertility, especially in nuclear households.

In view of the above findings the following implications for future research may be drawn. First, additional effort should be directed to empirical research with data sets wherein more variables in the model, especially those with respect to quality of children, time allocations of wives, expectational variables such as those of old-age support, and additional retrospective information, could be observed as in the more general equilibrium setting in which the model was developed in Chapter III.

Second, the relative importance of household structure, age of marriage and wealth in explaining actual fertility relative to potential fertility underscores attempts to estimate the overall effects of influences like the importance of taking into consideration the important interdependencies between household structure, marriage, wealth accumulation and fertility in estimating the overall effects on fertility of institutional changes such as the introduction of credit facilities or an old-age pension system into a village.

With regard to policy implications, the most obvious conclusion is that one should be cautious not only because of the aforementioned need for more definitive results and therefore more research, but also because of the likely differences in such behavior between different types of households, and considerable doubt about the welfare consequences of reduced fertility. Moreover, caution is especially warranted because of the fact that many of the policy effects may come rather indirectly by way of other

Table 5.6

Empirical Results for Cumulated Fertility Relative to Potential Fertility for Ever Married Women (with Spouse Present) of 35 Years of Age or More in Rural India

	Cultivating Households		Non-Cultivating Households	
	Nuclear	Extended	Nuclear	Extended
Intercept	.247	.292	.419	-.146
	(2.79)	(4.10)	(7.15)	(1.33)
CHINT1	-.013	-.006	-.013	-.011
	(5.65)	(3.98)	(5.71)	(2.04)
CHINT2	-.016	-.014	-.020	-.008
	(5.37)	(7.35)	(5.21)	(1.79)
EDCIF	-.025	-.003	-.008	-.008
	(1.89)	(.28)	(.55)	(.23)
EDCIM	-.012	.012	.010	.006
	(1.68)	(2.43)	(1.29)	(.38)
AMF	.013	.019	.009	.031
	(5.56)	(7.97)	(4.15)	(6.13)
AMM	-.002	.001	-.003	.001
	(1.35)	(1.23)	(1.96)	(.27)
SEXRAT	.016	.090	.071	.008
	(.53)	(3.83)	(2.20)	(.12)
LANDD2	.102	-.141		
	(1.53)	(2.32)		
LANDD3	.133	-.113		
	(1.95)	(1.88)		
LANDD4	.117	-.135		
	(1.72)	(2.22)		
LANDD5	.154	-.126		
	(2.18)	(2.04)		
LANDD6	.160	-.101		
	(2.26)	(1.64)		
HOUSE	.002	.003		
	(1.32)	(2.03)		
AGRILCAP	-.000	-.001		
	(.07)	(1.27)		
LIVESTOCK	.007	.005		
	(1.46)	(1.73)		
IRRIGP	.032	.016		
	(1.77)	(1.06)		
TENANTP	.107	-.012		
	(2.61)	(.24)		
YNONLPER			-.020	.055
			(1.65)	(1.63)
PROVIDF	-.058	.018	-.029	.003
	(1.99)	(.46)	(.72)	(.02)
RELIGM	-.068	.051		
	(1.88)	(2.14)		
RELIGO	.053	-.069		
	(1.23)	(1.44)		

Table 5.6 (cont.)

	Cultivating Households		Non-Cultivating Households	
	Nuclear	Extended	Nuclear	Extended
CV3A	.021	.027		
	(.75)	(1.14)		
CV3B	-.008	.016		
	(.33)	(.82)		
CV3C	-.050	-.018		
	(1.95)	(.92)		
CV3D	.004	.020		
	(.21)	(1.15)		
CV3E	-.064	-.037		
	(2.04)	(1.36)		
VILPOP	.003	.002	-.005	.003
	(1.23)	(.75)	(2.48)	(.48)
MINDIST	.001	-.001	.001	.001
	(.79)	(.92)	(.80)	(.42)
CREDD21	.019	-.001	-.034	-.019
	(1.36)	(.03)	(1.19)	(.32)
CREDD22	.029	-.010	-.013	.030
	(1.72)	(.80)	(.77)	(.79)
SOUTH	-.055	-.071	.008	-.049
	(1.16)	(2.21)	(.30)	(.68)
SOUTHCENTRAL	-.039	-.099	-.072	.052
	(.81)	(3.95)	(1.87)	(.63)
WEST	.009	-.071	-.070	.075
	(.07)	(2.78)	(1.49)	(.71)
CENTRAL	-.017	-.059	-.012	.036
	(.58)	(3.41)	(.43)	(.69)
EAST	-.006	-.081	-.009	-.019
	(.07)	(3.48)	(.29)	(.33)
NORTHWEST	.013	-.015	.045	.086
	(.47)	(.72)	(1.78)	(1.89)
R^2	.358	.333	.320	.336

effects that could exert offsetting influences. For example, the introduction of savings institutions, credit facilities and old-age pension systems, may well reduce the household's demand for children and hence raise age-at-marriage as pointed out in the previous section and thereby reduce both potential fertility and possibly also as shown above acutal fertility relative to potential fertility directly, but on the other hand, the higher age-at-marriage of the wife-mother may have the effect of increasing her desire for children relative to the potential number she can have given age-at-marriage and the effective duration of marriage.

Because of the dramatic increases in the proportions of elderly people in the rural populations of LDCs that may be expected in the foreseeable future, it is highly likely that such changes will exert considerable stress on the stability of the traditional system of caring for the elderly within intergenerationally extended or complex households. Given also (1) the expressed intent of LDC governemnts to spread old-age pension systems and capital and financial market institutions into rural areas, and (2) the evidence presented here that such policies are more likely to be fertility-reducing in the nuclear households that as shown in Section A of this chapter would seem to be encouraged by such policies than in complex or extended ones, there may indeed be reason for believing that the net effect of such policies on fertility would be negative.

Considering the greater importance of the old-age security motive for wives than for their husbands, and the important role that wives play in the determination of the accumulated number of surviving children relative the potential number (given age-at-marriage and marriage duration), to be effective, however, information about the existence of, eligibility rules for, and the terms and conditions of such programs should be directed to women to a far greater extent than has been the case in the past.

D. Resource Allocation

In Section D of Chapter IV and in particular in Tables 4.7 and 4.8 the empirical specifications of the production and expenditure components of the Resource Allocation Module developed in Section D of Chapter III were given. It was also pointed out that both because the nature of the decisions faced by, and the data available for, different types of households varies, somewhat different specifications of both the production and expenditure components of the Resource Allocation Module are applied to cultivating households than to non-cultivating households.

We present and discuss the empirical results of the production system in subsection 1, and then go on to those of the expenditure system in subsection 2, in each case presenting separate estimates for cultivating and non-cultivating households. Finally, in subsection 3, we discuss the results of joint estimations of the joint system formed by including both the production and expenditure systems.

1. The Production System

In principle, for cultivating households the cropping pattern decision given by equation (D.7) in Chapter II could be thought of as being made either simultaneously with the profit-maximizing input demand functions given by equations (D.9) and (D.10), or recursively in a two-stage process wherein the cropping pattern is decided first on the basis of endowments of fixed factors, location, soil conditions and relative product prices, and then in a second stage the input demands are determined on the basis of the prices of the variable factors, endowments of the fixed factors, various other household and community characteristics, and the cropping pattern determined in the first stage. On the basis of preliminary testing of

whether the input demands and profits could be explained better on the basis of simultaneous determination with product prices as exogenous variables or recursively on the basis of cropping patterns, in practice we have employed the latter two-step procedure. Since in the simultaneous equation procedure it was necessary to estimate the cropping pattern equations via two- or three-stage least squares, in the first step of the two-step procedure for estimating the production system we use ordinary least squares (OLS). Subsequently the equations were reestimated using the multinomial logit procedure, but with little change in either the qualitative character of the results or the outcome of the significance tests. Hence, only the OLS results are reported here.

The resulting OLS estimates for each of the dominant crop variables and household types are presented in Table 5.7. Considering the dummy variable nature of the endogenous variables, the explanatory power of all equations is generally quite satisfactory.

With respect to the regression coefficients it can be seen that those with respect to the logarithms of own price, i.e., the variable LPCVAB in the case of HYV and regular rice production, and LPCVCD in the case of wheat, jowar and maize, the coefficients are highly significant in explaining the cropping pattern. The negative (but insignificant) results obtained for other crops produced with high-yielding varieties HYV) is no doubt attributable to the fact that, because the nature of other crops varies considerably from region to region, any price index of other crops based on a fixed set of weights for all of India is not very meaningful.

Notably, the coefficients of the wealth variables LLAND, LAGRILCAP, LLIVESTOCK and LHOUSE vary quite considerably in sign and magnitude from one crop to another, and even from one asset form to another. While larger

Table 5.7

Empirical Results for Choice of Dominant Crop for Cultivating Households in Rural India for the Year 1970-71, by Household Type (Regression Coefficients and t-values in Parentheses)

Dominant Crop:	CV3A HYV Rice		CV3B Regular Rice		CV3C HYV Wheat Jowar and Maize		CV3D Regular Wheat Jowar and Maize		CV3E Other Crops with HYV	
Household Type: / Variable	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended
Intercept	-.247	-.078	.471	.508	.249	-.006	.579	.435	.019	.111
LPCVAB	.032	.034	.077	.067						
	(5.00)	(6.86)	(9.57)	(10.53)						
LPCVCD					.084	.099	.050	.022		
					(10.65)	(12.69)	(4.53)	(2.38)		
LPCVEF							-.011	-.005		
							(1.51)	(.85)		
LLAND	-.003	.021	-.043	-.034	.009	.006	.052	.005	-.009	-.016
	(.22)	(2.07)	(2.92)	(2.67)	(.97)	(.60)	(3.82)	(.41)	(1.09)	(2.13)
LIRRIGP	.029	.036	-.026	-.051	.026	.029	-.033	-.024	.003	.014
	(5.39)	(8.43)	(3.89)	(9.15)	(5.93)	(6.36)	(5.36)	(4.40)	(.87)	(4.41)
LAGRILCAP	-.014	-.022	-.002	.010	.018	.022	.002	.001	.002	.001
	(2.32)	(4.07)	(.24)	(1.48)	(3.51)	(3.91)	(.31)	(.14)	(.49)	(.33)
LLIVESTOCK	.012	.013	-.002	-.018	-.006	-.011	-.008	-.001	-.002	.005
	(1.99)	(2.86)	(.21)	(2.53)	(1.20)	(1.96)	(1.11)	(.22)	(.55)	(1.28)
LHOUSE	.026	.005	-.009	-.026	.001	.032	-.047	-.001	.007	-.007
	(2.99)	(.60)	(.85)	(2.51)	(.17)	(3.73)	(4.60)	(.12)	(1.19)	(1.17)
LTRADE	-.008	-.004	-.033	-.023	-.023	-.029	-.018	-.018	.015	.010
	(1.42)	(.73)	(4.42)	(3.65)	(4.95)	(5.80)	(2.72)	(3.01)	(4.01)	(2.84)

Table 5.7 (cont.)

Dominant Crop:	CV3A HYV Rice		CV3B Regular Rice		CV3C HYV Wheat Jowar and Maize		CV3D Regular Wheat Jowar and Maize		CV3E Other Crops with HYV	
Household Type:	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended
Variable										
EDUCIM2	.032	-.028	-.029	.091	.001	-.001	-.022	-.113	.011	.001
	(1.19)	(1.14)	(.86)	(2.91)	(.05)	(.06)	(.70)	(3.74)	(.62)	(.03)
EDUCIM3	.021	-.019	-.013	.079	.025	.043	-.036	-.130	.050	.016
	(.69)	(.75)	(.34)	(2.47)	(1.00)	(1.66)	(1.04)	(4.20)	(2.49)	(.89)
EDUCIM4	.045	-.026	-.041	.060	.073	.054	-.088	-.192	.064	.041
	(1.17)	(.91)	(.86)	(1.64)	(2.31)	(1.85)	(1.97)	(5.46)	(2.51)	(1.96)
CREDD21	-.095	-.085	-.049	.063	.022	-.035	.041	-.027	-.008	-.001
	(2.37)	(2.67)	(.97)	(1.54)	(.65)	(1.05)	(.87)	(.66)	(.29)	(.06)
CREDD22	-.132	-.034	.065	.068	-.045	-.027	.015	.006	-.013	-.039
	(4.97)	(1.79)	(1.95)	(2.78)	(2.06)	(1.36)	(.47)	(.26)	(.72)	(2.74)
PROVIDF	-.135	.183	.185	-.059	-.014	-.061	-.027	-.023	-.065	.001
	(1.67)	(3.15)	(1.82)	(.79)	(.21)	(1.00)	(.29)	(.31)	(1.19)	(.03)
SOUTH	.300	.373	.064	.108	-.387	-.342	.124	-.054	-.121	-.153
	(5.45)	(8.40)	(.931)	(1.89)	(8.56)	(7.27)	(1.94)	(.96)	(3.38)	(4.78)
SOUTHCENTRAL	.062	.052	.013	.246	-.282	-.241	.165	-.038	-.115	-.113
	(1.15)	(1.37)	(.19)	(5.03)	(6.38)	(5.98)	(2.63)	(.78)	(3.25)	(4.08)
WEST	.047	.037	.059	-.042	-.305	-.098	.076	.061	.084	-.058
	(.82)	(.79)	(.83)	(.70)	(6.41)	(2.03)	(1.12)	(1.06)	(2.19)	(1.71)
CENTRAL	.093	.041	.014	.169	-.286	-.253	.062	-.033	-.085	-.067
	(1.86)	(1.27)	(.23)	(4.07)	(7.06)	(7.56)	(1.09)	(.83)	(2.57)	(2.85)
EAST	.166	.218	.333	.399	-.336	-.313	-.077	-.173	-.137	-.141
	(3.15)	(5.81)	(5.03)	(8.28)	(7.90)	(8.01)	(1.28)	(3.71)	(4.10)	(5.29)
NORTHWEST	.149	.072	-.153	-.098	-.278	-.173	.319	.132	-.092	-.092
	(3.11)	(2.10)	(2.55)	(2.23)	(6.92)	(4.68)	(5.60)	(2.99)	(2.87)	(3.63)
BADWEATHER	-.006	.007	-.056	-.031	-.040	.009	.008	-.025	.033	.010
	(.21)	(.36)	(1.60)	(1.16)	(1.72)	(.41)	(.23)	(.97)	(1.76)	(.64)
R^2	.197	.232	.340	.339	.345	.343	.232	.128	.130	.069
Sample Size	947	1372	947	1372	947	1372	947	1372	947	1372

land size tends to raise the probability of wheat being the dominant crop, the higher the log of the proportion of land under irrigation (LIRRIGP) the more likely rice, wheat, jowar, maize or other crops with high-yielding varieties of seed, and the less likely those with regular varieties, would be chosen. Likewise, more agricultural equipment tends to raise the probability of the dominant crop being HYV wheat, jowar or maize and lower the probability that it be HYV rice, whereas more livestock seems to have the opposite effect.[2]

A higher commercialization index (LTRADE) tends to raise the probability that other crops (mainly sugar, cotton or oilseeds) produced with high-yielding seed varieties are dominant. Higher levels of education of the household head also seem positively related to the use of high-yielding varieties, in general, and HYV wheat and other crops, in particular. The absence of a bank in the village, i.e., CREDD22, tends to reduce the probability of the dominant crop being crops produced with high-yielding varieties, and to raise the probability of producing rice with regular varieties. Not surprisingly, some very distinct regional specializations are revealed in the results. For example, location in the South raises the probability of HYV rice being the dominant crop and lowers the probability of HYV wheat, jowar, maize and other crops being the dominant crops. Location in the SOUTHCENTRAL region raises the probability of producing rice with regular varieties in extended households and wheat witn regular varieties in nuclear households and lowers the probability of producing wheat, jowar, maize or other crops with high-yielding varieties. Location in the WEST or CENTRAL regions reduces the probability of HYV wheat, jowar or maize being dominant. Location in the East raises the probability that rice via either variety is dominant and lowers that of other crops. Fin-

ally, location in the Northwest raises the probability of either HYV rice or regular wheat, jowar or maize being dominant while lowering the probability of all other crops being dominant.

Finally, and of particular importance with respect to the effects of old-age pension programs and household structure, note that many of the aforementioned effects vary quite considerably from one household type to another. Participation in the Provident Fund scheme tends to raise the probability of growing HYV rice in extended households but lowers it in nuclear households. The absence of credit or financial institutions in the village tend to lower the use of high-yielding varieties more strongly in nuclear households than in extended households. Likewise, higher levels of educational attainment are more likely to raise the use of high-yielding varieties in nuclear households than in extended ones. Whereas in nuclear households the more valuable the house one owns, the more likely the dominant crop will be HYV rice and the less likely it will be regular wheat, jowar or maize, in extended households the more likely it will be HYV wheat, jowar or maize and the less likely it will be regular rice.

There are two main issues to be investigated in the estimation of the second step of the estimation of the production system corresponding to equations (D.9) and (D.10) of Chapter III. Since the number of parameters to be estimated rises approximately with the square of the number of household and community characteristics identified in the vector Z_2 in those equations and also with the complexity of the functional form, estimation of these equations is feasible only when the number of parameters is kept to a managably small number. This can be done either by choosing a simple functional form such as the commonly used Cobb-Douglas form in place of the full translog form or by limiting the number of household characteristics and combinations thereof considered.

We resolve these issues in two separate steps, testing first for the significance of household structure variables and interactions thereof with all other exogenous variables in the system under the assumption that the form of the equations is Cobb-Douglas, and then second, by testing the significance of the extra interaction and other terms that make the system translog instead of Cobb-Douglas.

The significance test for differences in the results of the Cobb-Douglas system between nuclear and extended households consists of introducing the HOUST1 dummy variable and interactions of this variable with all other variables in all equations of the model and testing for the validity of the restriction that the coefficients of all such terms are zero. The outcome of this test was clear cut, the null hypothesis that there were no differences between household types being rejected at the .01 in all equations and for both cultivating and non-cultivating households.[3] Therefore, we proceed directly to separate estimation of the Cobb-Douglas version of the entire system for all four household types, i.e., nuclear cultivating, extended cultivating, nuclear non-cultivating and extended non-cultivating households. The results are presented in Table 5.8.

We begin with the results for cultivating households. Not surprisingly, if the dominant crop is one using high-yielding varieties, as in CV3A, CV3C and CV3E, both agricultural profits and materials (mainly fertilizers) inputs tend to be larger than they would otherwise be. On the other hand, the demand for labor is increased in such circumstances only in nuclear households. As the wage rate increases, both agricultural profits and labor demand are reduced in both household types, the absolute values of the respective elasticities being larger in nuclear households than in extended households. Increases in the logarithms of the values of assets

Table 5.8

Empirical Estimates of the Production System of Profit and Input Demand Functions; by Household Type, in Rural India in 1970-71; Regression Coefficients with T-values (in parentheses)

Dependent Variable:	LAGPROF		LLAB		LMAT		LYNONL		LLAB	
	Cultivating Households						Non-Cultivating Households			
Type of Household: / Variable	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended
Intercept	5.700	5.660	-2.010	-.855	-3.75	-1.44	3.850	-3.650	.967	-.280
CV3A	.069	.072	.485	-.118	1.680	1.520				
	(.88)	(1.14)	(2.04)	(.69)	(6.22)	(6.33)				
CV3B	-.013	.032	.219	-.112	.341	.631				
	(.20)	(.61)	(1.12)	(.80)	(1.53)	(3.19)				
CV3C	.212	.140	-.143	-.051	1.700	.628				
	(2.56)	(2.39)	(.57)	(.33)	(5.92)	(2.85)				
CV3D	-.170	.016	.331	-.032	-.229	-.494				
	(2.69)	(.31)	(1.72)	(.23)	(1.04)	(2.53)				
CV3E	.150	.130	.700	-.078	1.126	1.320				
	(1.44)	(1.65)	(2.72)	(.37)	(3.12)	(4.39)				
LWAGE	-.058	-.056	-.443	-.174	---	---	-.410	-.601	-.009	-.106
	(2.51)	(3.35)	(6.30)	(3.83)	---	---	(2.58)	(2.83)	(.12)	(1.01)
LBUS							.079	-.030	.137	.118
							(2.01)	(.60)	(7.01)	(4.75)
LHOUSE	.165	.173	.090	.005	.234	.420	-.365	-.250	-.127	-.019
	(10.26)	(12.03)	(1.84)	(.14)	(4.23)	(7.37)	(3.75)	(1.68)	(2.65)	(-.26)
LLAND	.498	.545	.335	.181	.458	.457				
	(22.60)	(30.18)	(5.00)	(3.73)	(6.14)	(6.73)				
LIRRIGP	.073	.071	-.008	.033	.165	.258				
	(7.19)	(8.69)	(.27)	(1.50)	(4.70)	(8.34)				
LLIVESTOCK	.000	.004	-.006	.033	-.100	-.049				
	(.03)	(.39)	(.17)	(1.28)	(2.69)	(1.37)				

Table 5.8 (cont.)

Dependent Variable:	LAGPROF		LLAB		LMAT		LYNONL		LLAB	
	Cultivating Households						Non-Cultivating Households			
Type of Household:	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended
Variable										
LAGRILCAP	.029	.022	.045	-.008	.153	.143				
	(2.58)	(2.25)	(1.31)	(.33)	(3.86)	(3.91)				
EDCIMD2	.019	.081	-.030	-.138	.293	.060	.390	.745	.133	-.154
	(.39)	(1.88)	(1.13)	(1.19)	(1.71)	(.37)	(1.79)	(2.38)	(1.24)	(1.00)
EDCIMD3	.076	.150	-.065	-.029	.660	-.052	.625	1.250	.071	-.222
	(1.36)	(3.36)	(.38)	(.24)	(3.45)	(.31)	(2.37)	(3.43)	(.54)	(1.24)
EDCIMD4	.290	.189	-.144	-.136	.792	-.075	1.972	2.339	.189	.249
	(4.01)	(3.58)	(.65)	(.96)	(3.30)	(.40)	(5.62)	(5.24)	(1.09)	(1.12)
AGEH1	-.160	-.071	-.364	-.156	-.196	.137	-.192	-.360	-.193	.013
	(1.42)	(1.30)	(1.06)	(1.06)	(.50)	(.66)	(.35)	(.80)	(.72)	(.06)
AGEH2	-.110	-.091	-.072	-.008	-.133	-.041	-.205	.155	-.279	-.278
	(1.06)	(1.87)	(.22)	(.06)	(.36)	(.22)	(.39)	(.38)	(1.08)	(1.39)
AGEH3	-.142	.006	-.056	.178	-.059	-.077	-.013	.452	-.053	-.103
	(1.34)	(.13)	(.17)	(1.52)	(.16)	(.47)	(.02)	(1.10)	(.20)	(.51)
AGEH4	-.176	-.032	-.110	-.004	-.217	-.039	.488	.306	.056	.188
	(1.60)	(.78)	(.33)	(.04)	(.57)	(.25)	(.88)	(.82)	(.20)	(1.03)
LTRADE	.070	.044	.032	.041	.182	.225				
	(6.81)	(5.21)	(1.03)	(1.80)	(5.10)	(7.08)				
CREDD21	-.291	-.093	.298	-.010	.273	-.409	-.817	-.072	-.232	.170
	(3.76)	(1.60)	(1.27)	(.06)	(1.02)	(1.84)	(2.67)	(.15)	(1.53)	(.69)
CREDD22	-.129	-.013	.127	.047	.066	-.252	-.131	.100	.069	-.002
	(2.65)	(.39)	(.86)	(.51)	(.39)	(1.96)	(.62)	(.33)	(.66)	(.01)
PROVIDF	-.186	-.380	-1.670	-1.600	---	---	.671	.796	-.033	-.688
	(1.27)	(.36)	(3.70)	(5.73)	---	---	(1.45)	(1.48)	(.15)	(2.60)
BADWEATHER	-.051	-.122	-.030	-.289	-.178	-.178	-.189	-1.054	.070	-.092
	(.97)	(3.25)	(.19)	(1.19)	(.99)	(1.25)	(.78)	(2.76)	(.59)	(.49)
LDPROFCULT							.438	.295	-.215	-.190
							(2.26)	(1.04)	(2.24)	(1.36)

Table 5.8 (cont.)

Dependent Variable:	LAGPROF		LLAB		LMAT		LYNONL		LLAB	
	Cultivating Households						Non-Cultivating Households			
Type of Household:	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended	Nuclear	Extended
Variable										
MODERN							.139	.159	-.022	.122
							(2.29)	(1.89)	(.73)	(2.94)
LVILPOP							.246	.463	-.067	.031
							(1.81)	(2.72)	(.99)	(.37)
IDLE	.143	.073	-.063	-.025	---	---	-.164	-.101	-.066	-.013
	(2.09)	(2.17)	(.30)	(.38)	---	---	(.65)	(.37)	(.52)	(.10)
TRANSCOST							-.001	-.001	.004	.001
							(.30)	(.09)	(1.80)	(.19)
MINDIST							.022	-.001	.004	.018
							(1.69)	(.05)	(.56)	(1.77)
HEALTH							-.174	-.189	.490	.582
							(.69)	(.55)	(3.90)	(3.42)
SOUTH	.031	.087	-.224	-.197	1.26	.695	-1.413	-1.320	-.317	-.802
	(.28)	(1.03)	(.66)	(.87)	(3.24)	(2.18)	(3.53)	(2.74)	(1.59)	(3.38)
SOUTHCENTRAL	-.322	-.317	-.696	-.513	.811	.832	-1.517	-.205	.333	.203
	(3.05)	(4.40)	(2.17)	(2.65)	(2.21)	(3.05)	(3.68)	(.31)	(1.63)	(.63)
WEST	-.320	-.447	-.381	.312	.483	.339	-2.78	---	-.492	---
	(2.83)	(5.43)	(1.11)	(1.41)	(1.23)	(1.08)	(1.72)	---	(.61)	---
CENTRAL	.062	-.017	-.186	.017	-.364	-.505	.097	.717	.544	.296
	(.63)	(.28)	(.62)	(.10)	(1.05)	(2.17)	(.27)	(1.59)	(3.10)	(1.33)
EAST	.245	-.032	-.155	-.139	-.704	-.793	-.382	.274	-.302	-.569
	(2.26)	(.43)	(.47)	(.70)	(1.87)	(2.81)	(.97)	(.48)	(1.54)	(2.04)
NORTHWEST	-.118	-.325	.305	.314	.712	.276	.210	1.190	.157	.239
	(1.18)	(4.91)	(1.00)	(1.76)	(2.04)	(1.10)	(.56)	(2.36)	(.84)	(.96)
R^2	.723	.725	.251	.169	.473	.432	.286	.383	.367	.435
Sample Size	919	1339	919	1339	919	1339	367	194	367	194

of all types except livestock raise the logarithms of both profits and material (fertilizer) inputs. The effect on the demand for labor depends on the particular form of the asset. Only more land consistently raises the demand for labor. The elasticities of labor demand with respect to the values of HOUSE, LAND and AGRILCAP tend to be larger in nuclear households than in extended households. Note also that the same patterns tend to hold with respect to the human capital of the household head (EDCIMD2 - EDCIMD4). Specifically, higher levels of educational attainment tend to increase both agricultural profits (LAGPROF) and materials inputs (LMAT) significantly (and more so in nuclear households than in extended households) but to decrease the demand for labor (LLAB). If the household head has less experience (i.e., is younger, as evidenced by higher values for AGEH1 - AGEH4 relative to the omitted variable AGEH5), LAGPROF, LLAB and LMAT are reduced though generally not significantly. The higher the log of the commercialization index LTRADE, the larger are LAGPROF, LLAB, and LMAT. The absence of credit and financial institutions in the village (indicated by positive values of CREDD21 and CREDD22) tends to both decrease profits quite considerably and raise the demand for labor - more so in nuclear households than in extended households - and lowering the demand for material inputs in extended households. Participation in the Provident Fund Scheme (PROVIDF) decreases the demand for labor quite significantly. The incidence of bad weather decreases profits and labor demand more substantially in extended households than in nuclear households. Profits tend to be higher in households with more potential workers unable to work because of illness, disability or old-age. Agricultural profits, labor demand and materials input all tend to be somewhat lower in the low income included regions relative to the high income excluded region (Punjab and Haryana), especially in Southcentral, West and East.

Turning now to the results for non-cultivating households, it can be seen that many of the same patterns hold. For example, higher wage rates tend to reduce both non-wage income and the demand for labor. Likewise, the larger the logarithms of business assets (LBUS) and educational attainment of the household head (EDCIM2 - EDCIM4), the larger are LYNONL and LLAB. Indeed, the effect of EDCIMD2 - EDCIMD4 on the log of non-labor income (LYNONL) is particularly strong, and stronger in extended households than in nuclear ones. On the other hand, the larger the logarithm of the value of one's house, the lower are both LYNONL and LLAB. The effects of very young age of the household head, AGEH1 and AGEH2, on both LYNONL and LLAB, are more negative than in cultivating households, but these negative effects also drop off at younger ages in non-cultivating households than in cultivating households. Notably, the absence of banks and cooperatives from the village (CREDD21) has a much stronger negative effect on nonlabor income in nuclear non-cultivating households than in cultivating households or in extended non-cultivating households.

Participation in the Provident Fund (PROVIDF) raises LYNONL and lowers LLAB. The same is true with respect to the modernity index (MODERN), population size of the village (LVILPOP) and higher levels of agricultural profits of cultivating households in the village (LDPROFCULT). The presence of bad weather once again lowers LYNONL, more so in extended households than in nuclear ones. Interestingly, the presence of a health center in the village, significantly lowers non-labor income but raises employment and hence presumably labor income of non-cultivating households.

We turn now to the second test, namely that for functional form. The reader is reminded of the fact that, despite its common and convenient use, the Cobb-Douglas form used in obtaining the estimates presented in Table

5.8 is quite restrictive. Since the input share (factor demand) functions can simply be derived from the profit function of appropriate form via Hotelling's lemma as shown in Chapter III above, it is sufficient to test the functional form for the profit function. Whatever the final outcome for the test of functional form, estimation of the full translog profit function provides insights into important interactions between the exogenous variables and makes one aware of the restrictive nature of a simple form, such as the Cobb-Douglas function.

We have already seen that household structure contributes significantly to the explanation of production behavior on the part of cultivators and that separate estimation for nuclear and extended households is desirable. Therefore, our test for functional form is undertaken separately for nuclear and extended households. For the null hypothesis that the true form is Cobb-Douglas to be accepted, the coefficients of all interaction terms (including squared terms) must be zero. For extended households, the resulting translog profit function contains 152 interaction terms. Since one interaction coefficient, i.e., that of CREDD21 and CV3E, could not be estimated for nuclear households for lack of positive entries, the translog profit function for nuclear households contains only 151 variables. To reduce the results that need to be presented to manageable dimensions, in Table 5.9 we present the resulting parameter estimates of only the linear terms and those nonlinear terms with coefficients significant at the 1% level in either nuclear or extended households.

The F statistics relevant to the null hypothesis that the true form is Cobb-Douglas are:

Nuclear Households

$F_{151,739} = 3.090$ Prob > F = .0001

Extended Households

$F_{152,158} = 3.912$ Prob > F = .0001

suggesting that the null hypothesis must be rejected for both nuclear and extended households. A perusal of the estimated translog functions reveals that generally interactions found significant in one household category are not significant in the other category. In particular, from the results for the nuclear households it can be seen that seven of the interaction terms found significant are not significant for extended households. Similarly, six of the interaction terms for extended households are not significant for nuclear households. The magnitude of the coefficients for the same variable are in many cases substantially different between household categories. This supports the earlier finding regarding important differences in production behavior between nuclear and extended households.

The interaction terms in the estimated profit functions found significant at the 1% level are indicative of some interesting aspects of the production activities undertaken by nuclear and extended households. These differences are reflected in coefficients which vary in magnitude and sign between nuclear and extended households. The wage rate (LWAGE) and its squared term have the expected negative influence in both cases but the sensitivity to wage rate signals in the labor market tends to be greater in nuclear households than in extended households.

While the interaction of the wage rate and land is negative but not significant for nuclear households which are highly dependent on hired labor, it is positive and significant for extended households which utilize

family workers to a much larger extent. As indicated by the positive influence of the SOUTH - LWAGE interaction term, the influence of the wage rate is less negative in a region like the South where cultivators are less dependent on hired labor than in other regions.

Let us turn to the other effects of the weather variables, land, irrigation, agricultural capital and value of house and interactions thereof on profits, materials inputs and labor demand. The difference between nuclear and extended households with respect to these variables becomes larger when the non-linear terms are included as in Table 5.9 relative to when they are excluded as in Table 5.8. Note, for example, that the advantage of extended households relative to nuclear households with respect to land and irrigation facilities rises substantially from .047 (i.e., .545-.498) and -.002 (.071-.073) in Table 5.8 to .258 (1.119-.861) and .068 (.220-.152) in Table 5.9, respectively. These advantages of extended households relative to nuclear ones are presumably attributable to the lower transactions costs and greater technical efficiency of the former relative to the latter. Note also in Table 5.9 that the interaction term between LLAND and LIRRIGP is slightly higher in extended households (.038) than in nuclear households (.034), and the interaction term between land and livestock is less negative -.029 in extended households relative to -.048 in nuclear ones.

From the negative coefficients of the LLAND and LIRRIGP interactions with CV3A and CV3B, it can be seen that the positive influences of both land and irrigation tend to be weaker when rice is the dominant crop than when other crops are dominant. Whereas the (linear) LLAND term increases profits more strongly in extended households, its squared term has a larger effect on profits in nuclear hosueholds, suggesting that the advantages of

Table 5.9

Partial Results of the Translog Profit Function (LAGPROF) for Nuclear and Extended Cultivating Households in Rural India in 1970-71

Variable	Nuclear Household	Extended Household	Variable	Nuclear Household	Extended Household
Intercept	6.548	5.733	CV3A × LIRRIGP	-.028	-.148
				(.71)	(4.55)
CV3A	.821	.000	CV3A × LLAND	-.006	-.197
	(1.58)	(.00)		(.08)	(2.90)
CV3B	-.396	-.336	CV3B × LLAND	-.060	-.179
	(.97)	(1.05)		(.86)	(3.04)
CV3C	-.225	-1.073	CV3B × LIRRIGP	-.025	-.108
	(.37)	(2.24)		(.88)	(4.58)
CV3D	.034	-.366	CV3D × LLAND	.138	-.150
	(.09)	(1.05)		(2.03)	(2.51)
CV3E	.696	-.118	CV3D × AGRILCAP	-.088	.014
	(.82)	(.20)		(2.50)	(.48)
LWAGE	-.419	-.047	LWAGESQ	-.056	-.035
	(1.94)	(.29)		(3.13)	(2.84)
LHOUSE	-.155	.090	LHOUSESQ	.019	.007
	(1.48)	(1.06)		(3.86)	(1.39)
LLAND	.861	1.119	LLANDSQ	.057	.032
	(5.38)	(8.12)		(3.26)	(2.29)
LIRRIGP	.152	.220	LIRRIGPSQ	.037	.039
	(1.52)	(3.12)		(2.49)	(4.11)
LLIVESTOCK	-.125	-.118	LLIVESTOCKSQ	.035	.025
	(1.46)	(1.68)		(6.46)	(5.53)
LAGRILCAP	-.053	-.048	LAGRILCAP × EDCIMD2	.075	.032
	(.61)	(.70)		(2.46)	(1.17)
EDCIMD2	-.143	.120	EDCIMD2 × LIRRIGP	-.071	-.021
	(.43)	(.36)		(2.86)	(.96)
EDCIMD3	.203	.111	EDCIMD3 × LLIVESTOCK	-.075	-.020
	(.53)	(.32)		(2.42)	(.67)
EDCIMD4	-.462	.502	EDCIMD4 × LIRRIGP	-.117	-.067
	(.93)	(1.31)		(3.27)	(2.43)
AGEH1	-.038	-.041	LIRRIGP × LHOUSE	-.020	-.024
	(.35)	(.81)		(2.02)	(3.06)
AGEH2	-.034	-.035	EDCIMD2 × CV3D	-.325	-.038
	(.34)	(.77)		(2.39)	(.32)
AGEH3	-.010	.010	LTRADE × CV3A	.037	.128
	(.10)	(.26)		(.85)	(3.94)
AGEH4	-.101	-.050	LTRADE × CV3B	.073	.094
	(.96)	(1.31)		(2.47)	(3.62)
LTRADE	-.160	-.128	LTRADESQ	.018	.025
	(1.87)	(1.99)		(2.79)	(5.00)

Table 5.9 (cont.)

Variable	Nuclear Household	Extended Household	Variable	Nuclear Household	Extended Household
CREDD21	.824	-.064	LTRADE × CV3C	-.011	.089
	(1.45)	(.14)		(.25)	(2.88)
CREDD22	-.218	.190	LTRADE × CV3D	.098	.090
	(.69)	(.77)		(3.29)	(3.49)
BAD WEATHER	-.251	-.670	BAD WEATHER × CV3D	-.332	-.374
	(.81)	(2.43)		(2.20)	(2.90)
SOUTH	.126	.00	SOUTH × LWAGE	.262	.442
	(.93)	(.00)		(2.04)	(5.02)
SOUTHCENTRAL	-.265	-.236	LLAND × LWAGE	-.003	.065
	(2.01)	(2.92)		(.12)	(3.11)
WEST	-.098	-.321	LLAND × LIRRIGP	.034	.038
	(.72)	(3.51)		(2.92)	(4.45)
CENTRAL	.173	.027	LLAND × LLIVESTOCK	-.048	-.029
	(1.46)	(.40)		(3.73)	(2.52)
EAST	.355	.078	LLAND × LHOUSE	-.033	-.043
	(2.86)	(1.01)		(1.79)	(2.56)
NORTHWEST	-.115	-.364			
	(.96)	(2.93)			
R^2	.829	.817	Sample Size	919	1339

extended households in terms of technical efficiency, transaction costs and so on tend to diminish at very large sizes of land under cultivation. The positive contribution to profits of irrigation (LIRRIGP) in contrast remains more important in extended households both for the linear and square terms. While the coefficients of the linear terms pertaining to the value of livestock (LLIVESTOCK) and the commercialization index (LTRADE) are weakly negative, these are offset by the positive and more highly significant coefficients of the quadratic version of these variables in both nuclear and extended households. A similar pattern applies to the value of the house variable (LHOUSE) although in this case the coefficient of the linear term is positive for extended households. As in the linear results presented in Table 5.8 the coefficients of LAGRILCAP and LAGRILCAPSQ are not significant. Finally, from the interactions of CV3A, CV3B, CV3C and CV3D with LTRADE it can be seen that the influence of commercialization LTRADE (the positive coefficients of LTRADESQ more than offsetting the negative influence of LTRADE once a certain threshold level of commercialization is attained) tends to be more important for rice, wheat, jowar and maize farmers than for growers of other crops.

With respect to other differences in the coefficients of the linear terms attributable to the introduction of the non-linear terms as in Table 5.9 relative to Table 5.8, note, first, that the coefficients of the various cropping pattern variables CV3A - CV3E and regional dummy variables SOUTH-NORTHWEST become generally insignificant (or at least considerably less significant) whereas previously the coefficients of the high-yielding variety crops CV3A, CV3C and CV3E tended to be positive and those of regular varieties CV3B and CV3D and certain relatively poor regions, SOUTH-CENTRAL, WEST and NORTHWEST, tended to be negative and significant. This

would seem to indicate that, when the contributions of the factors are more fully accounted for as when the translog form is utilized, there tend to be fewer unexplained differences in profits between those cultivating households growing different crops or living in different regions of the country. Note, second, that the positive influences of productive physical forms of wealth, such as land and irrigation become considerably stronger. Third, although the coefficients of the educational dummy variables EDCIMD2 - EDCIMD4 are reduced in significance, the absolute values of those for extended households tend to increase while those for nuclear households tend to decrease.

While the fact that the null hypothesis that the production system, which is made up of the profit, labor demand and material input demand functions, was of Cobb-Douglas form was rejected at the .01 level (suggesting that the more complex translog specification would be requried), when the same test for functional form was applied to the more homogeneous sample of rice farmers, the null hypothesis could not be rejected.[4] Therefore, we deem it unnecessary to belabor the importance of more complex functional forms by presenting the translog results for the remaining equations of the system, namely the labor and materials input demand functions.

2. The Expenditure System

We proceed now to the results obtained from applying the least squares estimation procedure with restrictions across equations given equations D.13a - D.13k+h and those mentioned in the accompanying text of Chapter III to equations D.12a - D.12c with the variables listed in Table 4.8 as the right hand side variables. Due to the adding-up restriction, the three

share equations summing to -1, only two of the three share functions for each year are stochastically independent. Hence, in practice we estimated only the negative consumption and investment share equations, the share of negative leisure falling out as a residual.

As with the production system, the first step is to test the null hypothesis that the coefficients in the share equations are the same for both nuclear and extended households. Despite the sensitivity of the shares to our assumptions with respect to the relative importance of leisure in total expenditures revealed in Table 4.8 above, the null hypothesis of identical equations for nuclear and extended households is rejected at the .01 for both cultivating and non-cultivating households in all cases except that in which Measure D is used, where leisure is assumed to be zero. The results would seem to suggest that as in the results of the production system the behavior of the expenditure system is different for different household types, the difference being understated when as in previous studies leisure is ignored, i.e., when it is assumed to be zero.

Although in carrying out the above tests we have reported the test results for all four leisure measures, because of the large number of samples, estimation procedures, and specifications of the other determining variables, in subsequent discussion we present results only for Measure C, the measure we deem most realistic. The grounds for this choice are that, while at one extreme the assumption of no leisure (Measure D) is unrealistic, at the other extreme, Measures A and B exaggerate the importance of leisure, in the case of A by including children as automatically consuming leisure, and in that of B by including all sleep and rest time as voluntary leisure.

Next, we report the detailed results of the household structure tests, in each case indicating the most important differences in parameter values

between the two types of households. Each of these tests is framed on the ordinary least squares (OLS) estimates of the six expenditure share equations. It may be recalled from Chapter III above that the restrictions implied by linear homogeneity of the direct utility function also require that the coefficients of all full income terms in each of the expenditure share functions be zero. If the expenditure system is estimated with the full income variables included and the coefficients of these terms are found significant, then the assumption regarding linear homogeneity is not sustainable. In order to test for linear homogeneity, therefore, before estimating the linear logarithmic expenditure share functions (LLES) given by equations (D.12a) - (D.12c) above which do not include the full income variables LMA, LMB and LMC we estimate the expenditure system with the three full incomes included. Indeed, since the results given below reveal these terms to be highly significant, and, in fact, the most important determining factors in the system, the necessary assumption for LLES, namely that the underlying direct utility function is linearly homogeneous, is not justified and hence the full income terms are retained. The more easily jusifiable theoretical restrictions, such as those of symmetry, adding-up and homogeneity of degree zero in all incomes and prices, i.e., the postulates of demand theory, however, are satisfied in the estimated expenditure system. Even though the estimated expenditure system inclusive of such terms was not in fact derived from an underlying utility function, the estimated system can still be regarded as derived from utility maximization even though the mathematical form of that utility function is unfortunately not known. The estimating equation that would be derived from a utility functon that does not invoke the linear homogeneity assumption would be highly non-linear. Although non-linear estimation methods are

available, they are not employed here because of the large number of variables involved and the considerably greater complexity that non-linear estimation would entail in such circumstances.

The results for cultivating households using leisure Measure C for the consumption and investment share equations for each of the three years 1968-69 through 1970-71 are given in Table 5.10 and for non-cultivating households in Table 5.11. The reader is reminded of the fact that the dependent variables are actually the negatives of the shares indicated. Therefore, the direction of the effects on the shares themselves are the opposite of those indicated in the tables.

Our discussion of these results proceeds by taking up each of the major determinants in turn, beginning with the prices and ending with the household structure variables.

One would expect the own-price variables of year t to exert stronger influences on the negative shares of the corresponding expenditure item of the same year than those of other years. The sign of the coefficient of own-price depends on whether the elasticity of the quantity demanded in that expenditure category is greater or less than unity (-1). If the elasticity were greater than one, the effect of own-price on the negative of the expenditure share would be positive, if it were unity, the coefficient of own-price would be zero; and if the elasticity were less than unity, the own-price coefficient should be negative. Likewise, the expected signs of the cross-price elasticities are also ambiguous. One might expect considerable difference between the within-period, cross-category elasticities and the within-category, cross-period elasticities.

As can be seen from the results for the rows LPCA through LPLC in Tables 5.10 and 5.11, the results reveal that relatively few of the coeffi-

cients of the price variables are significantly different than zero. Since a zero coefficient implies a unitary elasticity of demand with respect to price, the fact that few coefficients are non-zero does not necessarily imply insensitivity of quantity demanded to price. Of course, the results do indicate that the expenditure shares are rather insensitive to price in both cultivating and non-cultivating households. The exceptions are (1) the coefficients of the consumption goods prices of all three years on the negatives of the consumption and investment shares in 1968-69 of both cultivating and non-cultivating households, (2) the effect of the prices of investment goods and of leisure in 1968-69 on the investment share of that same year in non-cultivating households, (3) the coefficient of the price of consumption in 1970-71 on the consumption and investment shares of cultivating households in 1970-71, and (4) the effects of the leisure price variables of 1969-70 and 1970-71, LPLB and LPLC, respectively, on all or at least most of the share equations for cultivating households.

For convenience in interpreting the signs of the various effects, in our verbal discussion we explain the effects of the variables under consideration on the shares themselves rather than on the negatives of such shares. Hence, the signs of the effects on the shares are opposite to those with respect to negative shares. The fact that five of the six coefficients of the same period investment price indexes in the investment share equations are negative whereas only three of the six coefficients of the consumption price indexes in the consumption share equations and none of the coefficients of the leisure price indexes in the leisure share equations are negative indicates that, by and large, the demand for investment is more sensitive to within-period, own-price than are the demand for consumption which is next most sensitive and the demand for leisure which

is least sensitive. Since five of the nine such within-period, own-price coefficients are negative in non-cultivating households, whereas only three of nine are negative in cultivating households, would seem indicative of somewhat greater sensitivity to prices among non-cultivating than among cultivating households. In terms of significant negative coefficients, however, there is only one of nine in each group. Moreover, the fact that one of the three coefficients of the within-period consumption price on the consumption share is significantly negative and none significantly positive in the case of cultivating households whereas one is significantly positive and none significantly negative in the sample of non-cultivating households may well be indicative of greater sensitivity among cultivating households than among non-cultivating ones with respect to the prices of consumer goods. In the case of investment goods prices and shares, however, the sensitivity of investment demand to price is much greater and more significant among non-cultivators than among cultivators.

With respect to the cross-price, within-period coefficients the following generalizations emerge for both cultivating and non-cultivating households: (1) the coefficients of the within-period consumption prices on the investment shares tend to be positive, (2) the coefficients of within-period investment prices on the negative leisure shares tend to be positive; and (3) the effects of the leisure prices on both the consumption and investment shares tend to be negative.

With respect to the between-period, own-price effect, those of the consumption price on consumption tend to be negative and those of the leisure price tend to be positive in both cultivating and non-cultivating households whereas those of investment price tend to be positive in non-cultivating households but negative in cultivating households.

There are also few significant differences in the price coefficients between nuclear and extended households as demonstrated by the t-values of the coefficients of the price-HOUST1 interaction terms. The differences tend to be somewhat greater with respect to the effects of leisure prices on the various within-period and between-period shares in both cultivating and non-cultivating households. In particular, in nuclear households, the effect of the within-period leisure price is to raise the consumption and/or investment shares and to lower the leisure shares in both cultivating and non-cultivating households. The between-period effects of leisure prices on the leisure shares tend to be more negative in nuclear households than in extended ones.

Notably, as reflected in the coefficients of the HOUST1 dummy variables (without interactions), the consumption shares of nuclear households - both cultivating and non-cultivating - tend to be higher while the investment, and especially the leisure, shares tend to be smaller.

As mentioned earlier, the most striking result is that all expenditure shares are strongly and consistently influenced by the full incomes of the same period and to a lesser extent by those of the other periods. In every case more full income in a particular period lowers the consumption and raises the investment shares of that period; in most instances it also lowers the leisure share of the same period. In all except one case, that of L_{MA} of non-cultivating households, higher full income in year t has the effect of raising the consumption share in years t+1 and/or t+2. These intertemporal influences on full income tend to be stronger and more significant in the samples of cultivating households than in that of non-cultivating households. They can be interpreted as indicating the nature and magnitude of either delayed adjustments to changes in full income or

short-term adjustments to changes in permanent income. Since the results show that the effects of full income in year t on expenditure shares in period t-1 can also be significant, the latter interpretation would seem more plausible. A particularly interesting result, revealed by the coefficients of the interaction terms involving the LM and HOUST1 variables, is that effects of an increase in full income on the various expenditure shares, mainly to decrease the consumption shares and to increase the investment shares in the same period, and vice versa for other periods, are more exaggerated among nuclear households than among extended households. What this seems to suggest is that extended households have greater internal flexibility so as to require considerably less adjustment of the expenditure shares to changes in full income both intratemporally and intertemporally than nuclear households.

The important methodological implication of the coefficients of the logarithms of full income terms is, of course, that the linear logarithmic expenditure system (with its assumption of independence between expenditure shares and full income and which has been used so extensively in the empirical literature) is not valid. For this reason we deem it most <u>in</u>appropriate to delete the LM terms and thereby to reduce the specification to that directly derived from the LLES as in equations D.12a - D.12c of Chapter III.

Another way of seeing the non-constancy of the expenditure shares as the full income variables change is to examine the effects as revealed by the sum of the coefficients of LMA, LMB and LMC when all change together as when there is an increase in permanent income. Notice that in this case the effect of higher permanent income on the consumption shares of each period is negative while that on investment shares is positive. The latter

effect, moreover, more than offsets the former, implying that the effect on leisure shares of each period is also negative. In the case of nuclear households the difference in magnitude between the two effects is smaller with no consistent effect on the leisure share.

While increased permanent full income which is very much human capital-related by virtue of the effect of human capital-related wage rates on full income, has the effect of raising the investment share and lowering the consumption share, increased value of the house (measured by LHOUSE), has just the opposite effect, i.e., it raises the consumption shares significantly in all periods, and lowers both the investment and leisure shares. There are no significant differences in this respect between nuclear and extended households.

From the results of the CREDD21 and CREDD22 terms and their interactions with HOUST1 it can be seen that the absence of credit facilities in the village has a significant influence on expenditure shares only in nuclear non-cultivating households where the consumption shares tend to be increased and investment shares decreased. Similarly, the influence of participation in the Provident Fund program of old-age and disability pension (PROVIDF) affects expenditure shares only in nuclear households. Since even in nuclear households the effect is significant only for the investment share of one year, little should be made of this effect.

Finally, we turn to the effects of the other indicators of household structure, namely, those of the age of the household head (AGEH1 - AGEH4), the size of the family (LFAM), the number of adults not working due to ill-health, disability and old-age (IDLE), and the average shares of adult males, adult females, 10 - 14 year old males and 10 - 14 year old females (AMS, AFS, AM14S, and AF14S, respectively).

Although the coefficients of AGEH1 - AGEH4 and the interactions thereof with HOUST are generally not significant, there is a rather consistent pattern for the effects of younger age-of-head dummy variables, e.g, AGEH1 and AGEH2 on consumption shares to be negative and on investment shares to be positive, especially in nuclear households. The effect of larger family size, on the other hand, is generally to lower the investment shares, and to raise consumption and leisure shares. Once again, these effects are somewhat stronger in nuclear households than in extended households. As IDLE increases, investment shares tend to be reduced and those of leisure (defined to include those not working because disability, ill-health and old-age) tend to be raised. As the proportions of adult males and adult females rise, either consumption or investment shares or both tend to be reduced and the leisure shares increased.

As the proportion of 10 - 14 year old males and females is increased, the investment shares tend to be reduced quite substantially, and those of leisure increased. Not surprisingly, as the proportion of children (the excluded group) increases, the consumption share increases substantially, and the investment share decreases considerably, though less so in nuclear households than in extended households.

Since we have seen that household structure, age at marriage, fertility, cropping patterns, agricultural profits and the cultivating household's demand for both materials and labor, are all affected not only by the value of total wealth but also by the composition of wealth, i.e., land, agricultural capital, livestock, financial assets and human capital all having rather different effects, it is important to explain the determinants not only of the overall investment share but also the individual components thereof.

Because the investment shares tend to be very small and unstable and since what is important for wealth accumulation in the longer run is not the year-to-year variation in investment but rather average investment behavior over a period of years, in disaggregating investment expenditures we deem it more appropriate to deal with three-year totals or averages than the corresponding figures for individual years. Therefore, we conduct our analysis of investment shares by type with data that represent the three-year totals or averages. An additional right-hand-side variable LIIPROF is included. LIIPROF is the logarithm of the coefficient of variation of household-specific agricultural profits over the three years of the sample. In other respects, the analysis remains the same as that which was applied at the aggregate level. Therefore, the new results shown in Table 5.12 which include separately estimated share equations for investment in land, investment in housing, investment in agricultural capital, and investment in financial assets, are comparable with those for the aggregate shares for individual years given in Table 5.10. Investment in human capital is the residual. As before, the results reported pertain to the overall sample of cultivating households but with the complete set of interaction terms with the HOUST1 dummy variable included. Once again, the reader is reminded of the fact that the dependent variables in the regressions are negative shares. In interpreting the effects of the various right-hand-side variables on the shares themselves (i.e., positive shares) we change the sign from those which appear in Table 5.12.

The results are presented in pairs of columns, each pair pertaining to a different dependent variable, the first column in each pair representing the normal coefficient of the variable named in the left, and the second column in the pair representing the coefficient of the interaction term of

that right-hand-side variable with the dummy variable for nuclear household structure (HOUST1).

As before, the strongest influences on the shares are the asset variables, i.e., HOUSE, LAND, AGRILCAP, LIVESTOCK, the full income variable, LM, the family size variable, LFAM, a few of the price variables, and the interactions of all of these. The new variable representing the degree of instability in agricultural profits of each household, LIIPROF, is also quite important in explaining the variation in average shares across rural Indian households.

Once again there are major differences between nuclear and extended households. From the row of coefficients pertaining to the intercept it can be seen that nuclear households are more likely to invest in land than extended households whereas extended households are more likely to have higher investment shares in housing and agricultural capital. By and large, the expenditure shares of nuclear households are much more sensitive to variations in prices than are those of extended households. In particular, the consumption share is raised more and the land share is reduced more by an increase in the land price in nuclear households than in extended households. The price of housing investment (which is heavily dependent on the price of labor (leisure)) has a much more positive influence on both the consumption share and the housing investment share and a more negative influence on the land share in nuclear households than in extended households. Likewise, increases in the prices of agricultural capital and other investment goods tend to reduce the consumption and housing investment shares and to raise the land investment shares in nuclear households but not in extended households.

On the other hand the effects of the wealth variables on expenditure shares are somewhat weaker in nuclear households than in extended house-

holds. Whereas the effect of all asset forms (except livestock) is to raise the consumption share significantly, the magnitude of this effect is smaller in the case in nuclear households. In the exceptional case of livestock, presumably because livestock is often used as a substitute for money as the value of such assets rises, in nuclear households the consumption share also rises. So, too, the reductions in investment shares that are associated with larger existing stocks of land, are much smaller in nuclear households than in extended households. Most importantly, the increase in the investment in land share and decrease in housing investment share brought about by an increase in average full income are considerably smaller in nuclear households than in extended households. Consistent with our earlier results showing greater sensitivity of the behavior in nuclear households to absence of credit and banking facilities in the village, the investment shares of financial instruments and to a lesser extent agricultural capital are reduced by the absence of such facilities in nuclear households but not in extended households. Of particular relevance to this study as can be seen in the results of the PROVIDF row, the consumption and investment in housing shares are raised more by participation in the Provident Fund program in nuclear households than in extended households. Likewise, the investment in land share is reduced more by participation in the Provident Fund in nuclear than in extended households.

Other noteworthy results of Table 5.12 are the following: (1) larger stocks of housing, land and agricultural capital tend to raise the consumption and housing investment shares but to reduce the investment share in land; (2) the effect of larger housing capital is to reduce the share of investment in agricultural capital while that of agricultural assets is to raise the share of agricultural investment;[5] (3) the effect of more live-

stock capital is to lower the shares of investment in agricultural capital and in financial instruments; (4) contrary to the permanent income hypothesis, the effect of greater instability in agricultural profits is to raise the average consumption investment in housing and investment in financial asset shares and to reduce the investment in land share; (5) larger family size raises the average consumption and housing investment shares and reduces the shares of land investment, of agricultural capital investment, and of financial investments, and (6) increases in average full income substantially reduces the consumption share and increases the land investment share substantially and the agricultural and financial investment shares modestly.

The high correlation observed in the table between the direction of the effect on the consumption share and that on the investment in housing share may be explained by the fact that housing investment, in contrast to other types of investment, is closely related to consumption, i.e., of the housing services generated by such investments.

3. Joint Estimation of the Production and Expenditure Systems

As noted in Chapter II above, the production and expenditure systems which have been estimated separately could in principle be thought of as being simultaneously determined. Estimating them simultaneously, of course, complicates the analysis by increasing both the number of equations to be estimated and the number of parameters to be estimated in the reduced form equations. Indeed, because of the large number of interaction terms with household structure that have been considered and been found to be significant in the preceding analysis, the expansion of the size of the system implied by joint estimation is sufficiently great as to make it impractical without certain simplifications.

One such simplification is to exclude the crop choice decision, an important component of the production system. This is done by focussing on the more homogeneous sample of rice farmers, alone. Another is to exclude the household structure interaction terms.

Younas (1982) has estimated the joint system with these two simplifications.[6] Since the results are broadly comparable to those obtained and presented above, and becuase of the previously demonstrated significance of the household structure interaction terms indicating that their exclusion is an important specification error, the results are not reproduced here. It can be asserted, however, that, although there are several quite substantial differences in individual coefficients between the two sets of results, in broad terms and with respect to the old-age pension, credit and household structure variables of particular importance to this study, the results are rather insensitive to the difference in sample and estimation procedure. In broad terms, therefore, the implications derived in Sections 1 and 2 hold also for the jointly estimated system for rice farms.

Table 5.10

Results of Equations of the Expenditure System for Cultivating Households in Rural India with Leisure Measure C by Year without and with Interactions with HOUST1 (Regression Coefficients with Standard Errors in Parentheses)

Right-Hand-Side Variable \ Endogenous Variable	1968-69		1969-70		1970-71	
	-CSA	-ISA	-CSB	-ISB	-CSC	-ISC
Intercept	-1.446	.459	-2.062	1.103	-2.037	1.098
LPCA	-.044	-.011	.050	-.025	-.118	.048
	(.36)	(.10)	(.27)	(.14)	(.97)	(.41)
LPCB	.060	.026	-.017	-.050	.011	-.041
	(.48)	(.24)	(.09)	(.28)	(.08)	(.34)
LPCC	.107	-.107	.074	-.016	.311	-.137
	(1.75)	(1.99)	(.56)	(.18)	(5.03)	(2.30)
LPIA	-.001	.009	-.004	.006	-.002	.004
	(.15)	(1.06)	(.28)	(.44)	(.24)	(.49)
LPIB	-.009	.012	.002	.007	-.011	.012
	(1.00)	(1.47)	(.17)	(.57)	(1.14)	(1.37)
LPIC	.003	-.007	.028	-.023	.016	-.008
	(.30)	(.86)	(1.83)	(1.66)	(1.69)	(.80)
LPLA	.049	.006	.011	-.003	.007	-.004
	(5.84)	(.77)	(.87)	(.21)	(.88)	(.54)
LPLB	.018	-.033	-.007	.045	.015	-.027
	(1.92)	(3.91)	(.49)	(3.25)	(1.52)	(2.87)
LPLC	-.025	.039	.004	-.010	.001	.055
	(2.28)	(4.02)	(.20)	(.61)	(.07)	(5.06)
HOUST1	-.254	-.019	-.688	.422	-.288	.191
	(1.73)	(.14)	(2.98)	(1.99)	(1.93)	(.70)
HOUST1 × LPCA	-.217	.285	-.001	.063	-.381	.384
	(1.06)	(1.58)	(.00)	(.21)	(1.83)	(1.92)
HOUST1 × LPCB	.182	-.146	-.094	.114	.298	-.172
	(.92)	(.84)	(.30)	(.40)	(1.49)	(.89)
HOUST1 × LPCC	.163	-.179	-.087	.041	-.111	-.019
	(1.13)	(1.40)	(.38)	(.20)	(.75)	(.14)
HOUST1 × LPIA	.008	-.011	.022	-.008	.015	-.006
	(.54)	(.86)	(.96)	(.36)	(1.02)	(.40)
HOUST1 × LPIB	.003	-.001	-.048	.031	-.010	.010
	(.24)	(.08)	(2.06)	(1.44)	(.68)	(.67)
HOUST1 × LPIC	-.001	.000	.019	-.020	-.015	.001
	(.04)	(.03)	(.76)	(.90)	(.93)	(.04)
HOUST1 × LPLA	-.021	-.004	-.007	-.005	-.013	-.000
	(1.49)	(.28)	(.32)	(.23)	(.93)	(.01)
HOUST1 × LPLB	-.032	.031	-.004	-.018	-.026	.025
	(1.99)	(2.20)	(.15)	(.79)	(1.57)	(1.62)

Table 5.10 (cont.)

Right-Hand-Side Variable \ Endogenous Variable	1968-69		1969-70		1970-71	
	-CSA	-ISA	-CSB	-ISB	-CSC	-ISC
HOUST1 × LPLC	.043	-.040	.013	.002	.008	-.025
	(2.37)	(2.53)	(.47)	(.08)	(.43)	(1.40)
CREDD21	.010	-.010	.048	-.029	.057	-.025
	(.45)	(.48)	(1.37)	(.90)	(2.51)	(1.16)
CREDD22	-.011	.014	-.004	.006	.025	-.017
	(.89)	(1.30)	(.21)	(.34)	(1.99)	(1.38)
HOUST1 × CREDD21	.023	.000	-.042	.022	-.055	.040
	(.63)	(.01)	(.74)	(.43)	(1.50)	(1.11)
HOUST1 × CREDD22	.038	-.012	.002	-.001	-.040	.028
	(1.80)	(.67)	(.05)	(.04)	(1.89)	(1.35)
LHOUSE	-.024	.009	-.032	.022	-.035	.029
	(3.54)	(1.55)	(3.01)	(2.24)	(5.09)	(4.38)
HOUST1 × LHOUSE	.003	.003	-.008	.012	.007	-.011
	(.30)	(.03)	(.45)	(.78)	(.64)	(1.05)
PROVIDF	-.060	.011	-.022	.022	.029	-.037
	(1.67)	(.36)	(.39)	(.42)	(.79)	(1.04)
HOUST1 × PROVIDF	.061	-.136	-.072	-.008	.007	-.027
	(.98)	(2.49)	(.74)	(.09)	(.11)	(.44)
AGEH1	.023	.001	-.035	.044	.003	.018
	(1.00)	(.03)	(.96)	(1.28)	(.14)	(.78)
AGEH2	.030	-.016	-.002	.013	-.016	.031
	(1.51)	(.89)	(.06)	(.46)	(.81)	(1.56)
AGEH3	-.017	.012	-.011	.013	.014	-.003
	(.98)	(.78)	(.39)	(.50)	(.80)	(.17)
AGEH4	.025	-.017	.008	.003	.041	-.023
	(1.51)	(1.15)	(.31)	(.13)	(2.44)	(1.41)
HOUST1 × AGEH1	.035	-.027	.070	-.077	.063	-.124
	(.68)	(.59)	(.86)	(1.03)	(1.19)	(2.44)
HOUST1 × AGEH2	.026	.002	.028	-.030	.089	-.128
	(.56)	(.04)	(.39)	(.44)	(1.88)	(2.79)
HOUST1 × AGEH3	.049	-.023	-.061	.051	.043	-.062
	(1.10)	(.58)	(.86)	(.78)	(.95)	(1.41)
HOUST1 × AGEH4	-.031	.032	-.048	.017	.057	-.092
	(.69)	(.79)	(.67)	(.25)	(1.23)	(2.05)
LFAM	.042	.070	.091	.153	-.049	.111
	(2.21)	(4.19)	(3.04)	(5.58)	(2.53)	(5.93)
HOUST1 × LFAM	-.077	.043	-.011	.021	-.043	.050
	(2.39)	(1.51)	(.22)	(.44)	(1.31)	(1.57)
IDLE	.014	.036	-.007	.038	.015	.014
	(.78)	(2.20)	(.25)	(1.41)	(.80)	(.75)
HOUST1 × IDLE	-.030	.006	-.001	-.021	-.060	.045
	(.77)	(.18)	(.02)	(.38)	(1.50)	(1.18)
AMS	.200	-.057	.047	.107	-.180	.277
	(3.21)	(1.04)	(.48)	(1.19)	(2.85)	(4.54)

Table 5.10

Right-Hand-Side Variable \ Endogenous Variable	1968-69		1969-70		1970-71	
	-CSA	-ISA	-CSB	-ISB	-CSC	-ISC
HOUST1 × AMS	-.102	.073	.061	-.124	.198	-.195
	(1.06)	(.86)	(.41)	(.89)	(2.03)	(2.07)
AFS	.248	.096	-.108	.307	.076	.099
	(3.58)	(1.58)	(.99)	(3.07)	(1.08)	(1.47)
HOUST1 × AFS	-.201	.090	.214	-.099	.006	.061
	(1.84)	(.93)	(1.25)	(.63)	(.05)	(.57)
AM14S	.024	.013	-.001	.040	-.076	.147
	(.26)	(.16)	(.01)	(.30)	(.82)	(1.64)
HOUST1 × AM14S	.043	-.044	-.286	.309	-.015	.053
	(.33)	(.38)	(1.40)	(1.65)	(.11)	(.42)
AF14S	-.005	.181	.034	.102	-.132	.290
	(.05)	(2.09)	(.22)	(.72)	(1.32)	(3.01)
HOUST1 × AF14S	.092	-.165	.140	-.192	.121	-.172
	(.66)	(1.35)	(.64)	(.96)	(.86)	(1.26)
LMA	.110	-.123	-.026	.035	-.021	.009
	(9.30)	(11.85)	(1.40)	(2.06)	(1.77)	(.76)
LMB	-.051	.049	.270	-.300	-.012	.027
	(3.66)	(3.92)	(12.23)	(14.82)	(.87)	(1.98)
LMC	.015	-.017	-.038	.048	.225	-.243
	(1.04)	(1.35)	(1.69)	(2.35)	(15.49)	(17.35)
HOUST1 × LMA	.003	.030	-.087	.075	-.004	.008
	(.14)	(1.73)	(2.88)	(2.67)	(.20)	(.41)
HOUST1 × LMB	.063	-.049	.278	-.208	-.034	.023
	(2.97)	(2.63)	(8.36)	(6.81)	(1.58)	(1.12)
HOUST1 × LMC	-.016	.010	-.102	.068	.066	-.036
	(.76)	(.52)	(3.01)	(2.18)	(3.03)	(1.72)
R^2	.256	.70	.359	.369	.381	.368
F	.0001	.0001	.0001	.0001	.0001	.0001
N	1561	1561	1561	1561	1561	1561

Notes

1. i = A is for 1968-69, i = B is for 1969-70 and i = C is for 1970-71.
2. For definitions of leisure and expenditure shares see the text.

Table 5.11

Results of Equations of the Expenditure System for Non-Cultivating in Rural India with Leisure Measure C by Year Without and With Interactions with HOUST1 (Regression Coefficients with Standard Errors in Parentheses)

Right-Hand-Side Variable \ Endogenous Variable	1968-69		1969-70		1970-71	
	-CSA	-ISA	-CSB	-ISB	-CSC	-ISC
Intercept	-2.471	.488	-2.26	.914	-2.093	.761
LPCA	-.948	.553	-.856	.793	.087	.092
	(2.25)	(2.64)	(.90)	(.82)	(.11)	(.13)
LPCB	.813	-.194	.359	-.142	.196	.271
	(2.26)	(1.08)	(.44)	(.17)	(.30)	(.45)
LPCC	.659	-.366	.618	-.665	.006	-.310
	(2.34)	(2.61)	(.97)	(1.03)	(.01)	(.65)
LPIA	-.024	.082	.061	-.067	.003	-.031
	(.74)	(5.17)	(.85)	(.92)	(.56)	(.58)
LPIB	.022	-.015	-.105	.103	-.037	.026
	(.81)	(1.10)	(1.69)	(1.63)	(.74)	(.55)
LPIC	.001	-.010	.023	-.037	-.044	.046
	(.02)	(.70)	(.37)	(.59)	(.89)	(.99)
LPLA	.077	-.062	-.001	-.000	-.024	.034
	(2.40)	(3.89)	(.01)	(.00)	(.42)	(.64)
LPLB	-.032	.028	.068	.046	.054	-.026
	(.97)	(1.69)	(.92)	(.61)	(.89)	(.47)
LPLC	.030	.012	.033	-.030	.070	.016
	(.93)	(.78)	(.46)	(.41)	(1.21)	(.30)
HOUST1	-.657	-.055	-.991	.353	-1.209	.396
	(2.40)	(.41)	(1.61)	(.56)	(2.44)	(.86)
HOUST1 × LPCA	-.248	-.314	.375	-.245	.159	-.211
	(.47)	(1.19)	(.31)	(.20)	(.16)	(.24)
HOUST1 × LPCB	.381	.014	1.181	-1.086	.194	-.406
	(.83)	(.06)	(1.14)	(1.03)	(.23)	(.52)
HOUST1 × LPCC	.113	.184	-.719	.414	-.175	.269
	(.31)	(1.03)	(.89)	(.50)	(.27)	(.44)
HOUST1 × LPIA	.011	-.060	-.078	.110	-.044	.055
	(.30)	(3.25)	(.94)	(1.29)	(.65)	(.88)
HOUST1 × LPIB	-.009	.018	.102	-.102	-.012	.014
	(.25)	(.95)	(1.21)	(1.18)	(.17)	(.22)
HOUSE1 × LPIC	-.019	.014	.026	-.023	.017	.008
	(.50)	(.73)	(.31)	(.27)	(.25)	(.13)
HOUST1 × LPLA	-.108	.040	-.019	-.021	.130	-.141
	(2.75)	(2.04)	(.21)	(.23)	(1.82)	(2.13)
HOUST1 × LPLB	.065	-.023	-.064	.029	-.055	.038
	(1.48)	(1.05)	(.65)	(.29)	(.69)	(.52)
HOUST1 × LPLC	-.019	-.011	-.093	.064	-.149	.018
	(.44)	(.52)	(.99)	(.66)	(1.96)	(.26)

Table 5.11 (cont.)

Right-Hand-Side Variable \ Endogenous Variable	1968-69		1969-70		1970-71	
	-CSA	-ISA	-CSB	-ISB	-CSC	-ISC
CREDD21	.049	.027	-.011	.015	.000	.010
	(1.13)	(1.25)	(.11)	(.15)	(.00)	(.14)
CREDD22	.036	.022	.000	.043	.007	-.005
	(1.19)	(1.45)	(.00)	(.63)	(.14)	(.10)
HOUST1 × CREDD21	-.092	-.029	-.373	.372	-.131	.141
	(1.58)	(.99)	(2.85)	(2.79)	(1.24)	(1.44)
HOUSE1 × CREDD22	.032	-.042	-.097	.053	-.001	.006
	(.83)	(2.21)	(1.13)	(.60)	(.01)	(.09)
PROVIDF	-.049	.025	-.038	.009	-.070	-.021
	(.57)	(.58)	(.20)	(.04)	(.45)	(.14)
HOUST1 × PROVIDF	.045	-.115	.022	-.036	.043	.007
	(.43)	(2.20)	(.09)	(.15)	(.22)	(.04)
AGEH1	-.045	-.038	-.126	.045	-.057	.004
	(.87)	(1.51)	(1.10)	(.39)	(.62)	(.05)
AGEH2	-.065	.045	-.014	-.007	-.006	-.016
	(1.42)	(1.96)	(.13)	(.07)	(.07)	(.20)
AGEH3	-.054	.003	-.099	.045	-.051	-.006
	(1.35)	(.13)	(1.11)	(.50)	(.71)	(.09)
AGEH4	-.006	.010	-.049	.001	-.028	-.015
	(.15)	(.51)	(.55)	(.01)	(.39)	(.23)
HOUST1 × AGEH1	.137	.038	.202	-.093	.073	-.056
	(1.60)	(.89)	(1.05)	(.48)	(.47)	(.39)
HOUST1 × AGEH2	.109	-.054	-.046	.034	-.043	-.018
	(1.37)	(1.36)	(.26)	(.19)	(.30)	(.13)
HOUST1 × AGEH3	.172	-.006	.169	-.135	-.028	.017
	(2.29)	(.17)	(1.00)	(.78)	(.20)	(.14)
HOUST1 × AGEH4	.040	.006	-.067	.018	-.054	.033
	(.53)	(.15)	(.39)	(.11)	(.40)	(.26)
LFAM	.013	.064	-.082	.174	.029	.108
	(.30)	(2.89)	(.82)	(1.70)	(.36)	(1.43)
HOUST1 × LFAM	.023	.013	.134	-.037	-.113	.081
	(.40)	(.46)	(1.02)	(.28)	(1.06)	(.82)
IDLE	.053	.012	-.019	.033	.026	.027
	(1.27)	(.60)	(.21)	(.34)	(.35)	(.39)
HOUST1 × IDLE	-.034	.010	.055	.041	.116	-.047
	(.52)	(.32)	(.38)	(.28)	(.99)	(.43)
AMS	.117	.049	.182	-.045	.043	-.007
	(1.26)	(.71)	(.57)	(.14)	(.17)	(.03)
HOUST1 × AMS	-.155	.098	-.408	-.468	.208	-.163
	(.83)	(1.06)	(.98)	(1.10)	(.62)	(.52)
AFS	.251	.210	.193	.172	.301	.018
	(1.68)	(2.83)	(.57)	(.50)	(1.11)	(.07)
HOUST1 × AFS	.222	-.088	.256	-.074	-.288	.205
	(1.16)	(.92)	(.60)	(.17)	(.83)	(.64)

Table 5.11 (cont.)

Right-Hand-Side Variable \ Endogenous Variable	1968-69		1969-70		1970-71	
	-CSA	-ISA	-CSB	-ISB	-CSC	-ISC
AM14S	.072	-.024	-.204	.473	.150	.037
	(.36)	(.24)	(.46)	(1.04)	(.42)	(.11)
HOUST1 × AM14S	-.050	.011	-.212	.066	-.147	.079
	(.21)	(.09)	(.40)	(.12)	(.34)	(.20)
AF14S	.234	-.018	.432	-.223	.063	.230
	(1.02)	(.16)	(.83)	(.42)	(.15)	(.59)
HOUST1 × AF14S	.064	.030	-.347	.551	-.111	.275
	(.24)	(.22)	(.57)	(.88)	(.22)	(.60)
LMA	.200	-.086	-.026	.055	.003	-.022
	(7.89)	(6.87)	(.46)	(.95)	(.07)	(.51)
LMB	-.016	.009	.260	-.330	-.069	.073
	(.53)	(.60)	(3.78)	(4.70)	(1.24)	(1.42)
LMC	-.000	-.017	-.048	.104	.202	-.181
	(.00)	(1.15)	(.72)	(1.55)	(3.79)	(3.66)
HOUST1 × LMA	.175	.027	-.078	.101	-.141	.128
	(5.42)	(1.71)	(1.08)	(1.37)	(2.41)	(2.35)
HOUST1 × LMB	-.061	-.022	.433	-.365	-.130	.118
	(1.52)	(1.12)	(4.76)	(3.94)	(1.77)	(1.73)
HOUST1 × LMC	-.048	.005	-.249	.210	.461	-.324
	(1.26)	(.24)	(2.90)	(2.40)	(6.64)	(5.03)
R^2	.535	.253	.259	.213	.330	.222
F	.0001	.0001	.0001	.0001	.0001	.0001
N	846	846	846	846	846	846

Notes

1. i = A is for 1968-69, i = B is for 1969-70 and i = C is for 1970-71.
2. For definitions of leisure and expenditure shares see the text.

Table 5.12

Results of Equations for Average Negative Expenditure Shares of Cultivating Households in Rural India 1968-69 - 1970-71

Right-Hand-Side Variable \ Interaction with HOUST 1	Average Consumption Share (negative)		Average Investment Shares (Negative)							
			Land		House		Agricultural Capital		Financial Instruments	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Intercept	-8.941	.844	8.120	-3.142	-.001	.278	.219	.192	.091	.139
	(7.69)	(.47)	(6.48)	(1.64)	(.011)	1.86)	(2.44)	(1.40)	(1.20)	(1.20)
LPC	-.380	-.108	-.614	-.056	-.107	-.009	.003	-.029	.009	-.040
	(.90)	(.15)	(1.34)	(.07)	(2.99)	(.15)	(.70)	(.51)	(.32)	(.82)
LPLAND	-.092	-.173	.101	.111	-.005	.001	.003	-.005	.001	.008
	(1.64)	(1.97)	(1.67)	(1.17)	(.98)	(.11)	(.70)	(.72)	(.17)	(1.32)
LPHOUSE	-.031	-.951	.053	.779	.009	-.024	.012	.001	.002	-.001
	(.39)	(7.32)	(.62)	(5.57)	(1.30)	(2.18)	(1.99)	(.13)	(.35)	(.15)
LPFINANCE	-.173	-1.358	.368	.883	-.108	.085	.026	-.043	.019	-.042
	(.27)	(1.40)	(.54)	(.85)	(2.03)	(1.05)	(.54)	(.57)	(.46)	(.66)
LPAGRILCAP	.005	1.107	-.014	-.932	-.014	.028	-.021	.003	.002	.010
	(.05)	(7.36)	(.15)	(5.74)	(1.82)	(2.25)	(3.06)	(.22)	(.27)	(.99)
LPOTHER	-.062	1.216	.104	-1.068	-.012	.033	-.003	.000	-.005	.010
	(.74)	(8.99)	(1.15)	(7.32)	(1.68)	(2.89)	(.41)	(.02)	(.89)	(1.17)
LHOUSE	-.228	.102	.256	-.156	-.021	.018	.007	-.004	-.005	.007
	(4.95)	(1.44)	(5.16)	(2.04)	(5.41)	(3.01)	(2.10)	(.68)	(1.64)	(1.42)
LLAND	-.047	-.015	.061	-.009	-.006	.002	-.002	.003	-.001	.000
	(1.64)	(.27)	(1.99)	(.17)	(2.36)	(.59)	(.93)	(.82)	(.66)	(.10)
LAGRILCAP	-.084	.082	.110	-.110	-.004	.010	-.014	.001	.002	.000
	(2.83)	(1.75)	(3.43)	(2.17)	(1.65)	(2.51)	(5.99)	(.36)	(.82)	(.12)

Table 5.12 (cont.)

Right-Hand-Side Variable \ Interaction with HOUST 1	Average Consumption Share (negative)		Average Investment Shares (Negative)							
			Land		House		Agricultural Capital		Financial Instruments	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
LLIVESTOCK	-.021	-.215	.008	.190	-.001	-.014	.012	-.002	.010	.004
	(.37)	(2.35)	(.13)	(1.92)	(.25)	(1.76)	(2.70)	(.35)	(2.73)	(.74)
LM	1.518	.003	-1.662	.500	.057	-.077	-.049	.002	-.018	-.025
	(13.17)	(.02)	(13.38)	(2.61)	(5.88)	(5.14)	(5.56)	(.04)	(2.46)	(2.12)
LIIPROF	-.096	-.015	.114	-.020	-.005	.007	.002	-.004	-.004	.003
	(3.70)	(.36)	(4.10)	(.44)	(2.40)	(1.90)	(1.13)	(1.31)	(2.39)	(1.25)
PROVIDF	-.304	-.650	.373	.426	-.018	-.071	.021	--.002	-.048	.034
	(1.21)	(1.54)	(1.37)	(1.94)	(.84)	(2.00)	(1.06)	(.05)	(2.95)	(1.24)
AGEH1	.079	-.513	-.091	.512	.014	-.006	-.011	-.056	.000	.012
	(.50)	(1.54)	(.54)	(1.42)	(1.07)	(.20)	(.87)	(2.16)	(.02)	(.55)
AGEH2	.127	-.260	-.152	.289	.012	-.003	.010	-.041	-.012	.036
	(.97)	(.87)	(1.07)	(.89)	(1.13)	(.10)	(.98)	(1.78)	(1.43)	(1.82)
AGEH3	.089	-.320	-.120	.314	.005	.023	.005	-.032	.001	.023
	(.78)	(1.12)	(.98)	(1.02)	(.51)	(.96)	(.57)	(1.44)	(.13)	(1.26)
AGEH4	.186	-.285	-.200	.270	.008	.024	-.005	-.019	-.009	.029
	(1.78)	(.98)	(1.78)	(.86)	(.87)	(.96)	(.66)	(.83)	(1.39)	(1.55)
CREDD21	.121	.060	-.100	-.070	.018	-.012	-.015	.027	-.019	.027
	(.76)	(.23)	(.59)	(.25)	(1.39)	(.57)	(1.24)	(1.31)	(1.92)	(2.61)
CREDD22	-.090	.094	.115	-.106	-.007	.005	-.001	.013	.004	.019
	(1.02)	(.64)	(1.20)	(.67)	(.88)	(.43)	(.21)	(1.14)	(.71)	(1.99)
LFAM	-.702	-.000	.793	-.259	-.017	.055	.049	.009	.012	-.004
	(5.81)	(.00)	(6.09)	(1.12)	(1.64)	(3.07)	(5.25)	(.56)	(1.52)	(.27)
IDLE	-.914	.071	1.331	-.766	.025	-.236	-.045	.173	.030	.152
	(.87)	(.04)	(1.18)	(.42)	(.29)	(.67)	(.56)	(1.33)	(.44)	(1.39)

Table 5.12 (cont.)

Right-Hand-Side Variable \ Interaction with HOUST 1	Average Consumption Share (negative)		Average Investment Shares (Negative)							
			Land		House		Agricultural Capital		Financial Instruments	
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
AMS	-.037	-.246	.046	.277	.012	.018	.031	-.014	.058	-.047
	(.09)	(.38)	(.10)	(.39)	(.35)	(.32)	(.98)	(.28)	(2.15)	(1.10)
AFS	-.294	.161	.488	-.291	-.012	.016	.045	-.026	.041	1.33
	(.62)	(.22)	(.96)	(.36)	(.30)	(.26)	(1.25)	(.46)	(.06)	(1.15)
AM14S	-.443	.962	.427	-.702	.033	-.029	.069	-.210	.043	.052
	(.75)	(1.12)	(.67)	(.76)	(.67)	(.40)	(1.52)	(3.18)	(1.13)	(.93)
AF14S	.101	-.228	-.293	.556	.099	-.128	.055	-.145	.088	-.013
	(.16)	(.25)	(.43)	(.57)	(1.85)	(1.67)	(1.12)	(2.06)	(2.13)	(.23)

Footnotes to Chapter V

[1]See India, Directorate of National Sample Survey (1960, Table 8 and 9).

[2]These results, however, by no means confirm the direction of causality. Instead of the asset structure determining the cropping pattern, the same results could be explained in terms of cropping pattern dictating the technology and hence the asset structure.

[3]See Younas [1982, Chapter 6] for details. Note, however, that when the test for difference in the production system between nuclear and extended households was applied to the sample of rice farms alone, the test outcome that there are significant differences was not sustained.

[4]Again see Younas [1982, Chapter 6] for the results and their interpretation.

[5]While this result might seem counterintuitive, it should be realized that the assets are measured at the end of the third period so that there is a spuriously positive correlation between investment over the three sample periods and end of period capital stock.

[6]The results are available in Younas [1982, Chapter 8].

CHAPTER VI

MAIN CONCLUSIONS WITH REGARD TO THE EMPIRICAL RESULTS OBTAINED FROM RURAL INDIA AND THEIR IMPLICATIONS

The purpose of this chapter is to pull together the most important findings from the analysis of rural Indian households, and to draw implications thereof for theory and policy. Chapter IX below does the same for the results obtained from the MFLS data pertaining to peninsular Malaysian households. Chapter IX also draws some broad comparisons between the two sets of results and some further conclusions.

A. General Findings

Consistent with the implications derived from the review of the descriptive literature presented in Chapter II, the results underscore the validity and importance of the interdependencies between and among household structure, age-at-marriage, fertility, resource allocation and accumulation and wealth. The results, therefore, suggest that appropriate policy inferences, such as those concerning the long-term consequences of institutional changes like the introduction of an old-age pension system into a rural area of a developing country, can be drawn only if those interdependencies are properly accounted for as in the modular theoretical structure developed in Chapter III.

Evidence has also been provided for the main bases for the separation of the modules, namely the fact that different decisions or forms of behavior are made by or influenced by different decision-makers. In particular, certain individual-specific variables like education, years married and the

number of own-children are of considerable significance in explaining household structure which was deemed to be determined in large part by individual males, i.e., fathers and sons. Likewise, intramarital fertility would seem to be quite strongly affected by considerations pertinent to the wife-mother, such as her age, her expectations concerning old-age support, and so on. On the other hand, numerous household variables such as household wealth, the age and sex composition of the household, and the degree of extension of the household are of considerable significance in determining age at marriage and resource allocation and accumulation including investment in land, housing, agricultural capital, human capital and financial capital. Because of the relevance and importance of age-at-marriage to completed fertility, household wealth, participation in the Provident Fund Program, the proportion of women and children in the household and other household variables (as opposed to individual-type variables) which help determine the age-at-marriage of both marriage partners are of special though indirect significance in determining fertility. Our results strongly support the view that traditional models of marriage decisions in which decisions are made on the basis of individual preferences and search mechanisms need to be substantially modified before they can be applied to rural areas of developing countries.

B. Specific Findings of Each Module

With respect to the household structure model, it was found that both the probability of being a household head and that of living in a nuclear household rise with (a) the number of years married (but at a decreasing rate), (b) the number of one's own children, and (c) the presence of financial institutions in the village. In the case of the educational attain-

ment level and participation in the Provident Fund, the predicted effects of increasing the probabilities of headship and of living in a nuclear household are only partially supported. Higher levels of educational attainment generally raise the probability of headship but not the probability of living in nuclear households. This discrepancy may be due to the fact that higher levels of educational attainment in younger males may raise the probability of their being heads of extended households, not just of nuclear households. In the case of the Provident Fund the expected effect of increasing the probabilities of headship and of living in a nuclear household is observed primarily only among non-cultivating males, and especially among young ones. Wealth in the form of non-human capital, at least, has the effect of reducing headship and the probability of living in a nuclear household.

From the results of the model of marriage services it was found that age-at-marriage of both marriage partners tends to be reduced by wealth in forms that may be considered complementary to marriage services including children (child labor), such as land, irrigation, and livestock. Wealth in a form which substitutes for marriage services (and labor in general), such as agricultural machinery and tractors, tends to raise age-at-marriage of the wife. The age-at-marriage of both marriage partners is higher in households with higher percentages of the total household membership in the forms of adult women and of children, thereby being consistent with the hypothesis that, when the existing portfolio of household members is skewed in the direction of those members such as women and children the number of whom can be added to by marriage, the incentive for early marriage of one's sons is reduced. The results of the marriage model also reveal that the effects of village level and institutional variables, such as participation

in the Provident Fund, and the existence of a school or of financial facilities in the village are likely to vary considerably from one household type to another. For example, participation in the Provident Fund raises the age-at-marriage of males primarily only in nuclear cultivating households. The presence of a school in the village raises age-at-marriage of the male in extended cultivating households but reduces it in nuclear cultivating households. Likewise, the presence of financial institutions in the village raises age-at-marriage in nuclear households but lowers it in extended households. Finally, consistent with the dowry function component of the marriage model, age-at-marriage of the female is positively related to age-at-marriage of the male and the educational attainment level of the female and is negatively related to educational attainment of the male and wealth of the importing households, i.e., the household into which the female marries.

The results of the fertility model show that the ratio of actual fertility relative to potential fertility (FERT) is raised by age-at-marriage of the female. Consistent with the hypothesis that the probability of receiving transfers is enhanced by living within an extended household, this effect was found to be considerably stronger in extended households than in nuclear households. On the other hand, since the relationship between the economic and social condition and status of the wife-mother and household characteristics is much weaker and more ambiguous in the case of extended households than in nuclear households, the fertility-reducing effect of educational attainment of the female, of participation in the Provident Fund, and of the availability of financial institutions in the village are all much stronger in, and indeed are largely confined to, nuclear households.

Finally, from the Resource Allocation Model we find that (1) the cropping pattern is in part influenced by wealth, relative prices, the degree of commercialization, educational attainment of the household head, household structure, and the presence of financial institutions in the village, several of which as noted above are, in turn, affected by old-age pension, marriage, fertility and household structure, (2) agricultural profits, and the demands for material and labor inputs are influenced by cropping patterns, relative prices, wealth, household structure, the age and educational attainment of the household head, the presence of financial institutions in the village, and the household's participation in the Provident Fund, and (3) expenditure shares on consumption, leisure and investment are most strongly influenced by full income, the stocks of various forms of wealth, family size and household structure.

Aside from these general findings there are several results obtained in this module that are of particular relevance to the present study.

First, from the production system results emerges the conclusion that, even after accounting for a host of other factors, farms operated by extended households make more profits than do those of nuclear households. This result can be taken as tentative confirmation of the hypothesis embedded in the production function component of the household structure model, Module A of Chapter III, that higher degrees of extension are related to greater technical efficiency and/or to reduced transactions costs.

Second, from the expenditure system results strong evidence is obtained that expenditure shares and their response to numerous exogenous variables vary considerably between nuclear and extended households. Specifically nuclear households tend to be more responsive to prices, to absence of credit and financial facilities in the village, and to participation in the

Provident Fund program than extended households. Extended households on the other hand, are somewhat more responsive to changes in full income and in certain types of asset holdings.

Third, the fact that full income is consistently the most important single determinant of expenditure shares suggests that the use of the linear logarithmic expenditure system, which because of its convenience in estimation has become so popular in recent years, is inappropriate. In particular, as full income rises, the consumption and housing investment shares decline and the shares of investment in land and investment in agricultural capital rise. In the dynamic three-year version of the model, the influences of full income in year t or other year, t-1 or t+1 are also generally important. A rise in full income in year t, tends to raise the consumption share in year t+1.

Fourth, even after holding constant the type of household, household structure indicators, such as family size and the age and sex composition of the household, have significant influences on expenditure share. Larger family, and higher percentages of children in household membership raise the consumption share and lower the investment share.

Fifth, a household's participation in the Provident Fund has the effect of significantly raising its consumption and housing investment shares and of lowering its land and agricultural capital shares, in each case by more so in nuclear households than in extended households.

Finally, the absence of credit or financial facilities in the village has the effect of raising consumption shares and of reducing the shares of financial and agricultural capital investments in full expenditures, again by more so in nuclear households than in extended households.

C. Implications for Future Research and Policy

The most obvious direct conclusion for policy is one of caution. Caution derives from two important findings. The first is that most of the policies analyzed in this study have indirect effects which may go in directions opposite to those of, and which could more than offset, the direct effects. The second is that the effects of such policies tend to vary considerably from one type of household to another, again making it difficult to predict the net direction of the effect on the whole population.

Because of the dramatic increases in the proportions of elderly people in the rural populations of LDCs that may be expected in the foreseeable future, it is highly likely that such changes will exert considerable stress on the stability of the traditional system of caring for the elderly within intergenerationally extended or complex households. Given also (1) the expressed intent of LDC governments to spread old-age pension systems and capital and financial market institutions into rural areas, and (2) the evidence presented here that such policies are more likely to be fertility-reducing in the nuclear households that would seem to be encouraged by such policies than in complex or extended ones, there may indeed be reasons for believing that the net effect of such policies on fertility would be negative.

Considering the greater importance of the old-age security motive for wives than for their husbands, and the important role that wives play in the determination of the accumulated number of surviving children relative the potential number (given age-at-marriage and marriage duration), to be effective, however, information about the existence of, eligibility rules for, and the terms and conditions of such programs should be directed to women to a far greater extent than has been the case in the past.

Perhaps influenced by some of the non-economic literature such as that of Parsons and Davis, there has long been lingering in the literature of development economics a belief that traditional household structure, i.e., the extended household, is unfavorable to the achievement of economic development. The view is based on the presumption that in extended households in contrast to nuclear households incentives are biased in the direction of greater fertility, lower savings and investment, and lower participation in the market, all factors that may be considered counterproductive as far as long term economic development is concerned. Although this study has found ample evidence of significant difference in many forms of behavior between nuclear and extended households, the results can hardly be considered to support the traditional view.

While it may be true that age-at-marriage tends to be younger in extended households, in rural India at least, it is also true that women tend to stop having children earlier in extended households than in nuclear households. While earlier marriage raises the potential completed fertility rate, the ratio of actual to potential fertility is reduced by the degree of extension of the household. Similarly, while there is evidence of differences in savings and investment behavior between nuclear and extended households, there is no evidence to suggest that extended households generally save less than nuclear households. Neither is there evidence to suggest that extened households are less involved in the market. Indeed, just the opposite is the case. Because extended households tend to be wealthier and in particular have more land, they are more likely to be commercial-type farms than subsistence-type farms and to have to rely on hired labor, especially in good agricultural years. Hence, our results would seem to suggest that the traditional bias against extended households

may well be exaggerated and inappropriate. Indeed, the extended household is seen as performing several very useful functions, such as facilitating intergenerational transfers and credit, increasing resource complementarity within the household, reducing transactions costs in labor supervision, and serving as a shock absorber for partially insulating the household from unexpected changes in economic conditions. Since in the long run the introduction of a formal system of old-age pensions would tend to decrease the prevalence of extended households, such consequences need to be carefully considered in the evaluation of such policies. Alternatively attention could be directed toward ways and means of avoiding or at least mitigating such unwanted consequences of an old-age pension system.

CHAPTER VII

APPLICATION OF THE MODULES TO MALAYSIAN DATA

As has been mentioned above, the Malaysian Family Life Survey (MFLS) has been chosen as the second micro data set for use in testing various components of the modelling system developed in Chapter III above.

Since the empirical specifications of the four modules presented in Chapter IV above were tailored specifically to rural India and the ARIS data in particular, some modifications of these empirical specifications are required in order to effectively utilize the MFLS. The purpose of the present chapter is to provide these modifications and the reasons for them.

The presentation is divided into the following sections. In Section A we present the most important differences between Malaysia and rural India relevant to the issues investigated in this study. Section B describes the MFLS data and its main advantages and disadvantages. Section C provides the empirical specifications and descriptive statistics from the MFLS data for all variables used in the various modules, including a new expectations module, Module E.

A. The Malaysian Setting and Differences therein from Rural India

While both Malaysia and India are developing countries, they are certainly representative of rather different kinds of developing countries. The most important differences between them are outlined in the

following paragraphs. Particular attention is given to those differences that are of special relevance to the modelling of the direct and indirect relationships between old-age security and fertility.

The single most striking difference between (rural) India and Malaysia are the levels and rates of economic development experienced in the last several decades. India is the example par excellence of a large populous, extremely poor, relatively closed and rather stagnant LDC. Per capita incomes in rural India are still below $100 per capita and like in India as a whole have been growing only very slowly, probably at less than 1 percent per year since independence. As a result, institutional change has been slight, rural-urban migration has been surprisingly low, financial and insurance markets remain extremely underdeveloped and virtually non-existent in rural areas, and expectations are relatively static.

With population of only 10 million and a ratio of exports to GNP of more than 50 percent, on the other hand, peninsular Malaysia is a much smaller and more open LDC. While also rather poor and stagnant until the late 1950's, Malaysia has grown rapidly since that time, indeed, at 6 percent per annum during the 1960's and at 8 percent per annum during the 1970's. Despite relatively rapid population growth of about 2.7% per annum between 1960 and 1980, by 1980 Malaysia's per capita income had reached $1100, placing it in the upper income echelons of developing countries. As a result, urbanization has been proceeding rapidly; educational attainment has been increasing extremely rapidly;[1] labor force participation of females is considerably higher than in India, and increasing rapidly; savings and investment rates are relatively high, and financial and insurance markets are considerably more developed than

in rural India. Of particular relevance to this study is the fact that marriage age, infant and child mortality and fertility have all been changing rapidly.

Another important difference between India and Malaysia is the greater importance of regional differences in India but greater importance of ethnic differences in Malaysia. Indeed, since one-half of Malaysia's population is Malay, one-third is Chinese and one-tenth is Indian, the Malaysian setting provides an unusually fruitful one for studying the possible differential effects of various policies including the provision of old-age pension systems across different cultural groups. The three aforementioned cultural groups in Malaysia have long been known to differ in many kinds of behavior relevant to this study. For example, their rates of return to education, and school attendance rates differ considerably [Mazumdar (1980)]. Expectations about educational attainment of Malaysian children and their response to the various determinants thereof also vary considerably among ethnic groups [Waite, DeTray and Rindfuss (1983)]. Marriage ages are much higher for Chinese than for Malays and Indians [Lee (1982)]. On the other hand, the age differential in age-at-first marriage tends to be much greater for Malays than for the other groups [Marzuki (1969)]. Chinese women tend to participate in the labor force to a greater extent than Indian and Malay women. Infant mortality and fertility are both higher for Malays than for other ethnic groups [Evers (1977), Veron (1978) and B.-T. Lee (1977)]. Chinese and Indian women are considerably more likely to practice modern forms of birth control [Palmore, Hirsch and Marzuki (1971) and Hirschman (1980)] though Malay women, because they

breastfeed more frequently and for longer periods, have more natural protection through postpartum amenorrhea [DaVanzo and Haaga (1981)]. Although originally they had higher fertility rates, Chinese women (and especially those in urban areas) have reduced their fertility rates more sharply than for other women [Cho, Palmore and Saunders (1968), DaVanzo and Haaga (1981)].

Employment histories have varied quite considerably from one ethnic group to another. Typically, Malays and Chinese have been more likely than Indians to begin their employment histories, and spend substantial portions of their employment careers, in family enterprises [Smith (1983)]. Although Malays remain more likely to be self-employed and employed in agriculture than Chinese or Indians, the non-agricultural share of Malay employment -- little of which is self-employment -- had risen to 54% by 1980 (as compared to 80.4% for Chinese). Of particular relevance to the household structure and marriage modules is that matrilocal marriages (wherein males marry out and live in the households of their wives' parents) are more common -- though by no means the rule -- among Malays than among Chinese or Indians in Malaysia or than virtually everyone in rural India.[2] Divorce and female remarriage rates are also higher among Malays [Swift (1958), Palmore and Marzuki (1969)]. Inheritance laws are somewhat more varied among Malays than among Chinese or Indians, inheritance laws for Malays being in an ambiguous state of transition from the more traditional system (Adat law) of equal inheritance to all surviving children to the Moslem one in which female children are entitled to only one-half the shares inherited by male children [Swift (1965), Kuchiba and Tsubouchi (1968), Hooker (1978)]. Dependence on children for support in old-age, although strong in all ethnic groups,

tends to be less concentrated on sons among Malays than among Chinese or Indians [Kuchiba and Tsubouchi (1968)]. Husband-wife differences in sex preference have been found to be considerably greater among Malays than among other ethnic groups [Coombs and Fernandez (1978)]. There are also very substantial differences in other forms of economic behavior Mazumdar (1980), Young et al. (1980) and in political behavior [Milne (1977), von Varys (1975)]. A number of these differences will be demonstrated below (especially in Tables 7.7 and 7.10).

As a result of those differences, DeTray (1983, p.7) quite appropriately concludes:

> "Longstanding differences in tastes and values among the (Malaysia's) three groups produce unique natural experiments on cultural and ethnic responses to public programs and environmental conditions."

Although somewhat less marked, of special relevance to this study are the differences in both participation in and the nature of the Provident Fund programs of old age and disability insurance between rural India and Peninsular Malaysia. Whereas in rural India only about 2% of the households had someone participating in the Provident Fund program, in Malaysia a much higher percentage of households (perhaps 50%) has someone participating in the scheme. While as of the early 1970's when the ARIS data were collected, eligibility for participation in the Provident Fund was limited to workers in large firms with 20 or more workers in 157 designated industries or classes of enterprises, only one of which -- tea plantations -- was important in rural areas, participation in Malaysia's Provident Fund as of the time of the MFLS was open to all employees outside of fishing. Although India's system at the time of the ARIS survey was available only to employees of large-

enterprises, by virtue of the fact that it is available only for workers making less than 1000 rupees per month [International Social Security Association (1980)], participation in the scheme is not likely to be closely related to wealth or income. As a somewhat purer insurance scheme the potential retirement benefits of participation in the Malaysian Provident Fund must be proportional both to earnings and to the duration of participation in the scheme. For this reason, one may suppose the degree to which insecurity with respect to old-age and disability is reduced by Provident Fund participation is more closely related to wealth and income in Malaysia than in India. Another difference in the old-age pension programs is that Malaysia's program, like that of the U.S., allows retirement benefits to be collected only by those who are actually retired, not just by those above a certain age.[3]

The most important implications of the aforementioned differences between the peninsular Malaysian and rural Indian settings for empirical specification of the various modules for use with the MFLS data are as follows:

(1) Considerably more attention should be given to differences between ethnic groups but less to regional differences in the Malaysian case.

(2) The potential importance of Provident Fund participation in any given household should be measured on a more quantitative basis than by a simple zero, one dummy variable for such participation as in the Indian case. Also, it is relatively more important to distinguish the influences of the potential old age pension benefits from those of income and wealth since such benefits would appear to be more closely correlated with income and wealth in Malaysia than in rural India.

(3) More attention should be given to female labor force participation, and, in view of the rapidity of change, also to changing expectations and circumstances, especially with regard to education of children, and sources of old age support.

B. The Malaysian Family Life Survey (MFLS)

The Malaysian Family Life Survey is a nationally representative sample of 1262 Malaysian households undertaken by Survey Research Malaysia and Rand for U.S. AID in 1976 and 1977. The survey consists of 52 primary sampling units, 49 of which were selected by area probability methods and three of which were purposely selected to give additional representation to Indian households and to fishing communities.

Households in the primary sampling units were first screened for the presence of ever-married women less than 50 years of age. All households with at least one such woman were pooled and then a random sample was taken from the larger sample. Ten survey instruments were administered to each household over a one-year period, some of them in several rounds so as to capture seasonal variations, and other factors.

The questionnaires used in the various instruments of the survey are presented in Butz, DaVanzo, Fernandez, Jones and Spoelstra (1978). For other details on the survey and on some of the findings the reader is referred to Butz and DaVanzo (1978), Jones and Spoelstra (1978), Omar (1978), DeTray (1983), Butz and Stan (1981, 1982), Waite, DeTray and Rindfuss (1983), DaVanzo and Haaga (1981) and Smith (1983). Several checks on the data have found it to be quite reliable.[4] 96 percent of the households included in round 1 in the survey remained in the survey

through the third and final round. Hence, the various instruments are quite complete and the sample coverage is quite consistent across instruments. To their credit the organizers and supervisors of this data collection effort have seen to it that this data set has been made available to a wide variety of researchers.[5]

The reader should be aware of the very different motives behind the ARIS and MFLS data collection efforts. The primary purpose of ARIS was to measure and explain household incomes and expenditures, the various sources of the former and uses of the latter, and their variations from year to year. Interest in fertility was only secondary. On the other hand, in the MFLS the primary focus was on fertility and fertility-related behavior; interest in income and expenditures was minimal. As a result, for ARIS the interviews were directed to the household as a whole whereas most of the MFLS instruments were directed to ever-married women, though some were also directed to their husbands, to the household and the community.

From these differences in purpose and in the specific persons to whom the questionnaries were directed between the two surveys derive the following special advantages of the MFLS data for purposes of the present study:

(1) In contrast to the ARIS data, the MFLS contains information on such fertility-related factors as the time and other sources of support the ever-married females receive for child birth and child care, their practices with respect to breast feeding and contraception, and mortality experience. In contrast to ARIS which surveyed all married women with spouse present, as mentioned above, in MFLS fertility histories were taken only from ever-married females below 50 years of age. Many

of the women sampled, therefore, are sufficiently young that their fertility histories are far from complete.

(2) In contrast to ARIS which had retrospective data only on pregnancies, the MFLS data contains a considerable amount of retrospective information. Indeed, it possesses detailed residential and employment histories, wealth and wealth transfer histories and at least a limited amount of retrospective information on parents and on the households lived in at birth, during youth and at the time of marriage. This retrospective data makes it possible to construct measures of the relevant variables corresponding to the specific time periods in the past when the various decisions under consideration were taken.

(3) Relative to ARIS which contains attitudinal data on only a few items such as the desired number of children, MFLS includes some extremely valuable information on future expectations. Among the more relevant data of this sort are expectations on educational attainment of children (by sex and birth order), the desired number of children (by sex) and the expected sources of support and living arrangements in old age. Moreover, much of this data is available from both the husband and the wife[6] making it possible to measure expectational differences and the differential effects of such expectations on various kinds of behavior.[7]

(4) Instead of merely indicating whether or not a particular household has someone who is a participant of the Provident Fund program as in the ARIS data, MFLS contains quantitative information on the share of old-age support both the husband and wife expect to receive from the Provident Fund.

Some shortcomings of the data for present purposes should also be considered, namely:

(1) From the residential history data it cannot be determined with whom the woman was living in her previous residences.

(2) The survey contains virtually no income data (only wages) and no expenditure data. This makes it impossible to determine savings and investment rates.

(3) Although, in principle, data is available on the dowry, bride price and other capital transfers at or subsequent to marriage, in practice this data is sufficiently incomplete that we deemed it unwise to make use of it.

(4) Despite the aforementioned advantages of the retrospective data, there are also some disadvantages. First, some of the data is insufficiently detailed to permit the appropriate variables to be constructed. For example, in practice, it is not possible to construct measures for the value of the property owned by husbands at the time of marriage or at birth of various children. Similarly, it is not possible to determine the precise structure of the household -- nuclear or extended -- at various points in the past. Second, retrospective data can be subject to sizeable measurement errors. Moreover, the measurement errors involved may be systematic and not just random, as when people tend to underestimate the number of years that have elaspsed since important events like marriage and the birth of the first child.

(5) MFLS contains virtually no data on credit and absolutely no information on prices.

(6) Since the data was not collected at the household level, but rather only from individuals, it is quite possible that aggregations for the purpose of constructing household variables are inaccurate because of the possibility of missing information, double counting and so on.

(7) Household headship is not defined in MFLS. It can only be inferred from age, sex, and occupational status. Such inferences may not always be correct.

(8) Finally, given the complexity of the modelling system, (i.e., the number of equations which in principle might be desired to be estimated simultaneously) and the need to distinguish behavioral responses in different ethnic groups, household types and so on, the sample size is smaller than optimal. As will be shown below, because of necessary exclusions of observations with incomplete or inconsistent data, the sample sizes of all modules are less than 1000. (The reductions in sample size below the 1262 households sampled were largely attributable to missing information on husbands. The reason for non-response of the husband, moreover, is not always clear from the information available.) Once the total samples are separated into different groups, e.g., cultivators and non-cultivators or by ethnic group, they become much smaller. For example, the number of Indians used in one of the subsamples for estimating the fertility module is only 116 and the sample of cultivating households in the various moddules is as small as 310.

C. Empirical Specification of All Modules including the New Expectational Module

The two greatest differences in the systems to be estimated between ARIS and MFLS are (1) that very little of the Income Generation and Expenditure Allocation Module, Module D, can be estimated with MFLS data and (2) that some new intermediary expectational relationships between old-age security expectations and the desired number of children can be estimated. We call this Module E.

Since the purpose, derivation and empirical specification for use with the ARIS data for rural India, of each of the first four modules, i.e., Modules A-D, have been presented and explained in previous chapters, we confine the present discussion to justification of and explanation of any changes in the empirical specification, otherwise proceeding directly to definitions of and descriptive statistics on all variables used in the empirical estimation of the module with the MFLS data. A much more extended presentation is given for the "new" module, Module E, in Section 5 below.

1. The Household Structure Module (Module A)

As has been mentioned in the previous section, household headship is not identified in the MFLS. As a result, all relationships are defined with respect to the ever married female who was the primary respondent in each household surveyed. While it is possible to classify households from the nature of those relationships, in certain cases the results of such a classification may differ from that which would result if all members of the household were defined with respect to the household head. Moreover, since from the existing descriptive literature forms of extension other than those of the stem family type (with married fathers and at least one son living in the same household) seem to be more common in Malay households than in other households, it is deemed appropriate to measure household structure in three complementary ways: once again by the HOUST1 and HEAD dummy variables used in Chapters IV and V above but also by the number of adults (ADULTS).

As in Chapter IV, the HOUST1 dummy variable is constructed in two

steps. First, households are coded according to the Laslett (1973) classification system. The results of the application of this system for all such women, and then for each major ethnic group in Malaysia, are given in Table 7.1. Note that there are some fairly sizeable differences in the incidence of different household types among the three ethnic groups. For example the percentage of Malays living in nuclear households (i.e., with household codes 311, 312, 322, 332, 362, or 430) is considerably higher than those of Indians and Chinese. By the same token, the percentages of multiple households (code 470) are considerably higher for Chinese and Indian households than for Malays. Then, using the results of this classification system, the dummy variable HOUST1 for distinguishing nuclear from intergenerationally extended households is defined as indicated in Table 7.2.

Next, we define in the top section of Table 7.2 the other measures of current household structure, HEAD and ADULTS. As a result we arrive at the three measures of household structure for all households, for non-cultivators and for cultivating households, the means of which are given in Table 7.3. All three measures may be considered complementary. Because of the way they are defined, HOUST1 is an inverse measure primarily of the degree of vertical or intergenerational extension of the household whereas HEAD and ADULTS reflect also other aspects of extension. Although laterally extended households (code 420) are included in HOUST1 = 0, since the number of such households is few, HOUST1 may be considered a relatively reliable measure of intergenerational extension. HEAD is an ever more straight-forward and easily interpretable (inverse) measure of extension, but it is based on the untested assumption that

TABLE 7.1

Distribution of Ever Married Females of Less than 50 Years of Age by type of Household in Malaysia, 1976 (in percent)

Code and Household Type	Total	Malay	Chinese	Indian
130 separated	0.08	0	0.20	0
311 married couple, alone	2.85	3.32	2.41	2.68
312 married couple, children	31.85	36.15	28.77	26.85
322 widow, own children	0.24	0.17	0.40	0
332 separated female, own children	0.16	0	0.40	0
342 divorced female, own children	0.16	0.33	0	0
362 married female, spouse observed, own children	1.11	0.5	2.01	0.67
410 extended upwards	6.26	4.64	8.45	5.37
420 extended laterally	3.72	3.32	3.62	6.04
430 extended downward (but with children less than fifteen years of age)	28.05	31.51	22.13	34.23
440 extended downwards, two generations	0.40	0.83	0	0
460 extended downwards, one, two or three generations	1.98	2.65	1.21	2.01
570 multiple types of extension	15.29	11.61	18.71	16.78
510 secondary units, upward	1.03	0.66	1.61	0
530 seccondary units, downwards one generation	0.32	0.17	0.40	0.67
560 secondary units, downwards one, two, or more generations	0.40	0.50	0.20	0.67
570 secondary units, multiple types	6.10	3.65	9.46	4.03

the oldest male in the household is the household head. Moreover, since non-heads-of-households, i.e., those for whom HEAD = 0, may apply to males who are neither sons nor fathers of household heads, HEAD is not strictly a measure of intergenerational extension. A major disadvantage of HEAD is that there is relatively little variation in it. (As shown in Table 7.3 below, HEAD = 1 in about 90 percent of the cases.) ADULTS, on the other hand, may be considered a broader measure of household extension since it would include both those who are intergenerationally or vertically related and those who are laterally related (or even unrelated) to heads of household.

As in the specification for rural India given in Table 4.2, for explanatory or right hand side variables we include community, household and individual variables. The three community variables included are RURAL, ELECT and DISTBANK, each of which is defined in Table 7.2. The individual variables included are the ethnic dummy variables, CHINESE and INDIAN, MONFOODH , a variable indicating whether or not the husband of the ever-married female is contributing money and/or food to his parents at the time of the survey, OAHS, a dummy variable indicating whether or not the ever-married female expects to live with her children during old age, OWNCHILD, the number of surviving children born to the ever-married female, EDIND a vintage-standardized index of educational attainment, EDUCF and EDUCOM, the number of years of education attained by the ever-married woman and the oldest male in the household, respectively, and PPIH, the expectation of the husband concerning the likelihood of support from pension funds, Provident Fund and retirement or disability insurance during old age. Because of the smaller sample sizes of the MFLS data relative to the ARIS data, especially after the

sample has been divided into non-cultivating and cultivating households, instead of estimating the HOUST1, HEAD and ADULTS relationships separately for each age group of the husband of the ever-married woman, as was done with the ARIS data in Chapters IV and V, we include the number of years married YEARSM and its square YEARSMSQ to account for the life cycle effects on household structure. The household variables included are primarily the wealth measures: BLDG, the number of buildings owned, VALUE, the total value of property owned by household members and LAND, representing the number of acres of land owned by household members. All these measures are defined more precisely in Table 7.2. Because of the aforementioned possiblity of a close association between wealth and PPIH, it is important to distinguish as much as possible between the effects of wealth and PPIH. For this purpose we include both the separate effects of each form of wealth and PPIH and interaction terms between each form of wealth and PPIH.

Since a priori it is unclear as to whether it would be more appropriate to specify the wealth variables in levels or in per capita terms, we have deliberately chosen to treat the wealth variables and their interactions with PPIH in both ways. Furthermore, since in contrast to most other changes in specifications, the subsequent results turned out to be sensitive to this difference, we carry these alternative specifications through several of the other modules as well.

Since the wealth measure LAND is available primarily only for cultivating households, and since the behavioral reactions to certain other variables might be expected to differ markedly between cultivating and non-cultivating households, each of the aforementioned specifications is applied both to all husbands of the ever-married women in the

Table 7.2

Definitions of Variables Used in the Household Structure Model for Use with Malaysian Family Life Survey Data

Endogenous Variables

HOUST1 = 1 if household income is of type 300 but less than 400 or = 430; = 0 otherwise

HEAD = 1 if husband of ever married women is the oldest male in the household; = 0 otherwise

ADULTS = number of adults in household

Predetermined Variables

RURAL = 1 if living in rural area; = 0 otherwise

ELECT = proportion of electrified houses in the community

DISTBANK = distance in miles to the nearest bank, credit or savings institution (average across informants if more than one informant)

CHINESE = 1 if Chinese; = 0 otherwise

INDIAN = 1 if Indian; = 0 otherwise

MONFOODH = 1 if husband contributes money and/or food to his parents; = 0 otherwise

OAHS = 1 if the woman expects to live with her own children during old age

YEARSM = years married (with spouse living)

YEARSMSQ = years married squared

ONWCHILD = number of living children born to the wife (the ever married female interviewed)

EDIND = index of (expected) education of children for household k

$$= \frac{\sum_{j=1}^{n_k} e_{ij,k}/\bar{e}_i}{n_k}$$

where i = age group,
j = individual child,
k = the household,
n = number of children,
and e = expected education in years or actual education if expected education is missing.

The age groups are defined as: 1 if age $\leq$ 3, 2 if 4 $\leq$ age $\leq$ 6, 3 if 7 $\leq$ age $\leq$ 9, 4 if 10 $\leq$ age $\leq$ 12, 5 if 13 $\leq$ age $\leq$ 15, 6 if 16 $\leq$ age $\leq$ 18, 7 if 19 $\leq$ age $\leq$ 21, and 8 if age $\geq$ 22.

EDUCF = number of years of education of the woman

EDUCOM = number of years of education of the oldest male

BLDG = number of buildings owned by household members at the time of the survey

VALUE = total value of the property owned by the household in thousands of Malaysian dollars at the time of the survey

LAND = quantity of land owned by household members (in acres) at the time of the survey

Table 7.2 (cont.)

Predetermined Variables (cont.)

PPIH = expectation of the husband of the ever married woman of support from pension, Provident Fund and insurance during old age. Each such source is coded:
1 = very unlikely, 2 = fairly unlikely, 3 = depends, 4 = fairly likely, 5 = very likely. The codes on the three sources are summed and divided by 3.

BLDGPPIH = interaction term (BLDG × PPIH)
VALUEPPIH = interaction term (VALUE × PPIH)
LANDPPIH = interaction term (LAND × PPIH)
BLDGCAP = BLDG/number of persons in the household
VALCAP = VALUE/number of person in the household
LANDCAP = LAND/number of persons in the household
BLDGCAPPIH = interaction term (BLDGCAP × PPIH)
VALCAPPPIH = interaction term (VALCAP × PPIH)
LANDCAPPPIH = interaction term (LANDCAP × PPIH)

Table 7.3

Sample Size and Means of All Variables
in the Household Structure Module for Malaysia

	Full Sample	Non-Cultivating Households	Cultivating Households
Number of Observations	879	569	310
Endogenous Variables			
HOUST1	0.689	0.680	0.706
HEAD	0.899	0.898	0.900
ADULTS	3.375	3.408	3.316
Right Hand Side Variables			
RURAL	0.606	0.459	0.877
ELECT	0.609	0.730	0.386
DISTBANK	6.705	5.468	8.975
CHINESE	0.365	0.474	0.164
INDIAN	0.125	0.170	0.042
MONFOODH	0.617	0.652	0.552
OAHS	0.149	0.160	0.129
YEARSM	14.20	13.06	16.29
YEARSMSQ	288.4	250.3	358.4
OWNCHILD	4.083	3.944	4.339
EDIND	1.775	1.777	1.772
EDUCF	3.536	4.035	2.619
EDUCOM	7.413	7.783	6.732
BLDG	0.626	0.482	0.890
VALUE	6.636	5.613	8.513
LAND			2.322
PPIH	2.180	2.471	1.647
BLDGPPIH	1.153	1.037	1.368
VALUEPPIH	15.099	14.772	15.699
LANDPPIH			3.340
BLDGCAP	0.114	0.083	0.169
VALCAP	1.181	1.006	1.503
LANDCAP			0.416
BLDCAPPPIH	0.208	0.180	0.257
VALCAPPPIH	2.763	2.738	2.807
LANDCAPPPIH			0.619

sample but also to those in cultivating and non-cultivating households separately.

Means on all variables and sample sizes are given in Table 7.3. By comparing the means of the two types of households, the following differences between cultivating and non-cultivating households can be seen:

(1) Cultivating households live in communities which are only about half as electrified as those inhabited by non-cultivating households.

(2) The incidence of Chinese and Indians among cultivating households is much lower (16.4 percent and 4.2 percent, respectively) than among non-cultivators.

(3) The various indicators of extension, both the direct measures ADULTS, OAHS, and MONFOODH, and the inverse measures, HOUST1 and HEAD, indicate that non-cultivating households are more likely to practice greater extension than cultivating households. (Given the dominance of Malays among cultivating households, this finding is, of course, consistent with the aforementioned tendency for Malays to practice less extension of households than Indians or Chinese.)

(4) The levels of educational attainment of the oldest males and especially of the wives (EDUCOM and EDUCF) are greater for non-cultivators than cultivators. On the other hand, expectations about the educational attainment of children are on average about the same in the two types of households.

(5) On average, the ever-married women in cultivating households have been married about three years longer and have more surviving children than those in non-cultivating households.

(6) While the real, physical wealth variables are all larger on average for cultivating households than for non-cultivating households,

PPIH (the expectation of old-age support from pensions, Provident Fund and insurance) is considerably smaller.

2. The Marriage Module (Module B)

As mentioned above, as was the case with the ARIS data it is unfortunately not possible to utilize information on dowry or brideprice payments even though in this case some such data is available. Hence, as in Chapters IV and V, the empirical estimation of the marriage module has to be limited to the explanation of the observed data on the age and educational attainment levels of the marriage partners at the time of marriage in terms of individual, household and community characteristics of the household in which the married couple was residing primarily at the time of the survey, though in a few cases at other times such as those prior to or at marriage.

Specifically, as in the application to rural India, the three variables to be determined are AMM (age-at-marriage of the male), AMF (age-at-marriage of the female), and EDUCF (the number of years of education of the female). EDUCM (educational attainment of the male) is assumed to be predetermined as far as the marriage decision is concerned.

As was the case with the ARIS data and the Household Structure Module for Malaysia, the three endogenous variables are explained for all households, and then again for non-cultivating and cultivating households. Most of the variables are rather similar to those used in the Marriage Module of Chapter V, most of which have already been described and defined in Table 7.2. Exceptions are a measure of labor force participation before marriage for the female, LF, the educational

attainment levels of the male and female parents of both marriage partners, EDUCFM, EDUCFF, EDUCMM and EDUCFF, the measures of household extension in youth of the husband and wife, IHHH and IHHF, respectively, another measure of wealth, number of rooms in the house, ROOMS, and finally several new community characteristics, i.e., DISTSCH, PCTSED, WAGEF and WAGEM, all of which are defined in Table 7.4.

Sample sizes for the three samples, i.e., all households, non-cultivating households and cultivating households, respectively, for estimating the marriage module equations are given in the first row of Table 7.5. The samples sizes are slightly smaller than in the Household Structure module because of missing information on several of the additional variables. The remainder of Table 7.5 contains means of all variables included in the model for each sample. The most striking new differences between samples that were not already revealed in Table 7.3 are:

(1) Marriage ages of both the male and female AMM and AMF, respectively, are lower for cultivating households than for non-cultivating ones.

(2) Educational attainment levels of husbands and wives and especially of their parents, i.e., EDUCH, EDUCF, EDUCMM, EDUCMF, EDUCFM and EDUCFF, are much lower for cultivating households than for non-cultivating households.

(3) While other wealth measures are higher for cultivating households than for other households, the average number of rooms in the house, ROOMS, are smaller.

(4) Labor force participation rates of females before marriage, LF, and both male and female wage rates, WAGEM and WAGEF, are higher in non-cultivating households than in cultivating households.

Table 7.4

Definition of the Variables Used in the Marriage Module for Malaysia

A. Endogenous Variables
AMM = age-at-marriage of the male (husband)
AMF = age-at-marriage of the female (wife)
EDUCF = number of years of education of the female

B. Predetermined Variables
1. Personal Characteristics
AGEF = age of the female at the time of the survey
AGEH = age of husband at the time of the survey
EDUCH = number of years of education of the husband
LF = index of labor force participation of the female before marriage
EDUCFM = years of education of wife's father
EDUCFF = years of education of wife's mother
EDUCMM = years of education of husband's father
EDUCMF = years of education of husband's mother
CHINESE = 1 if Chinese; = 0 otherwise
INDIAN = 1 if Indian; = 0 otherwise
PPIH = expectation of the husband of the ever marrried woman of the likelihood of support from pension, Provident Fund and insurance during old age. Each such source is coded as indicated in Table 7.2.

2. Household Characteristics
IHHH = proportion of relatives other than brothers and sisters in the husband's household during his youth
IHHF = proportion of relatives other than brothers and sisters in the female's household during her youth
WOMENP = proportion of female adults in the household at the time of the survey
HOUST1 = 1 if nuclear household; = 0 otherwise
INHH = number of relatives in the household at time of marriage
BLDG = number of buildings owned by household members at the time of the survey
ROOMS = number of rooms in the house at the time of marriage
VALUE = total value of the property owned by the household in thousands of Malaysian dollars at the time of the survey
LAND = quantity of land owned by household members (in acres) at the time of the survey
BLDGCAP = BLDG/number of persons in the household
ROOMSCAP = ROOMS/number of persons in the household
VALCAP = VALUE/number of persons in the household
LANDCAP = LAND/number of persons in the household
BLDGPPIH = BLDG × PPIH

Table 7.4 (cont.)

2. Household Characteristics (cont.)
   ROOMSPPIH = ROOMS × PPIH
   VALUEPPIH = VALUE × PPIH
   LANDPPIH = LAND × PPIH
   BLDCAPPPIH = BLDGCAP × PPIH
   ROCAPPPIH = ROOMSCAP × PPIH
   VALCAPPPIH = VALCAP × PPIH
   LANDCAPPPIH = LANDCAP × PPI8H

3. Community Characteristics
   RURAL = 1 if living in rural area; = 0 otherwise
   ELECT = proportion of electrified houses in the community
   DISTBANK = distance in miles to the nearest bank, credit or saving institution
   DISTSCH = distance in miles to the nearest secondary school
   PCTSED = percentage of elegible children enrolled in secondary education
   WAGEF = average monthly wage of women respondents in the community
   WAGEM = average monthly wage of the husbands of respondents in the community.

Table 7.5

Sample Size and Means of All Variables in the Marriage Module for Malaysia

	All Households	Non-Cultivating Households	Cultivating Households
Number of Observations	770	521	249
Endogenous Variables			
AMM	24.357	25.117	22.767
AMF	19.222	19.883	17.839
EDUCF	4.032	4.486	3.084
Right Hand Side Variables			
AGEF	32.891	32.562	33.578
AGEH	38.026	37.797	38.506
EDUCH	5.973	6.380	5.120
LF	1.780	1.823	1.691
EDUCFM	1.786	2.000	1.337
EDUCFF	0.752	0.929	0.382
EDUCMM	1.762	2.042	1.177
EDUCMF	0.655	0.833	0.281
CHINESE	0.428	0.520	0.237
INDIAN	0.138	0.180	0.048
PPIH	2.286	2.542	1.750
IHHH	0.502	0.502	0.503
IHHF	0.495	0.493	0.497
WOMENP	0.293	0.296	0.286
HOUST1	0.649	0.645	0.659
INHH	3.284	3.330	3.189
BLDG	0.636	0.516	0.888
ROOMS	2.910	3.050	2.618
VALUE	6.300	5.482	8.011
LAND			3.599
BLDGCAP	0.113	0.088	1.177
ROOMSCAP	0.534	0.560	0.480
VALCAP	1.094	0.934	1.429
LANDCAP			0.614
RURAL	0.553	0.414	0.843
ELECT	0.646	0.754	0.420
DISTBANK	6.238	5.155	8.506
DISTSCH	2.285	1.981	2.922
PCTSED	80.850	81.665	79.145
WAGEF	150.061	167.837	114.724
WAGEM	348.314	393.992	252.740

3. The Fertility Module (Module C)

Although in the case of the MFLS data, there exists some information on time-use, help received by the wife-mother from others in child care, the practice of birth control and breastfeeding and infant mortality experience, since these issues are of only minor importance to the focus of this study and are being or have been studied intensively by others,[8] we concentrate on the same relationships as in the empirical application of the fertility module to India presented in Chapters IV and V.

Since the demand for child services has both a quantity and quality dimension and quality (at least as measured by expected educational attainment) is more important and more variable from one household to another in contemporary Malaysia than in rural India in the 1960s, in the Malaysian case we focus not only on fertility but also on educational expectations. For fertility we utilize three different measures, two which use the same concept employed in Chapters IV and V above, i.e., of actual fertility relative to natural fertility, FERT1 and FERT2, which are defined in Table 7.6, and one (mainly so as to provide comparability with the more usual measures of fertility), the number of surviving children, OWNCHILD. As noted in the table the difference between FERT1 and FERT2 lies in the difference in the assumptions concerning how natural fertility is measured. For the index of expected educational attainment we use the vintage-standardized index EDIND defined in Table 7.2.

Since in the case of the MFLS data, data on the desired number of children are available for both the wife and the husband, NSTAR and NSTARH, respectively, we include such preferences as predetermined

variables in this module. The inclusion of both NSTAR and NSTARH allows the hypothesis that female preferences are more important in fertility behavior than male preferences to be tested. NSTAR and NSTARH are, in turn, explained in the separate module, Module E, which is described in Section 5 below. Other predetermined variables included in the application of the fertility module to MFLS data are the indexes of the wife's labor force participation before and after marrriage, LF and LF1,[9] respectively, and several additional measures of household structure. All the variables included are defined in Table 7.6. The means and sample sizes for all households, for cultivating and non-cultviating households, and also for Malays, Chinese and Indians separately, are given in Table 7.7.

Of particular relevance in these results are the following:

(1) While OWNCHILD, NSTAR and NSTARH are all considerably higher for those in cultivating households than for those in non-cultivating households, once standardized for natural ferility, both FERT1, and FERT2 are noticeably lower for those in cultivating households than for those in non-cultivating households. The striking difference between OWNCHILD, on the one hand, and FERT1 and FERT2, on the other, can be attributed to the fact that women in cultivating households tend to be somewhat older, i.e., have higher AGEF, have had longer durations of marriage, i.e., have higher values of YEARSM, and have more nearly completed fertility histories than those in non-cultivating households.

(2) Since Malays make up more than 75 percent of all cultivators, not surprisingly, and for the same reason the actual fertility to natural fertility measures, i.e., FERT1 and FERT2, are considerably lower for Malays than for Chinese and Indians. The values of FERT1 and FERT2

Table 7.6

Definitions of Variables Used in the Fertility Module for Use with Malaysian Family Life Survey Data

Endogenous Variables

FERT1 = actual number of surviving children/potential number of children given age at marriage, duration of marriage and age-specific estimates of natural fertility from Coale and Trussell (1974).

FERT2 = same as FERT1 except that the natural fertility estimates came from India as estimated by Potter, Wyon, Parker and Gordon (1965).

OWNCHILD = number of surviving children.

EDIND = index of expected education of children (see Table 7.2 for details.

Predetermined Variables

1. Individual Characteristics

NSTAR = number of children desired by the female*

NSTARH = number of children desired by the male*

CHINESE = 1 if Chinese; = 0 otherwise

INDIA = 1 if Indian; = 0 otherwise

AGEF = age of female (wife)

AGEH = age of male (husband)

F2 = 1 if first two children are female; = 0 otherwise

YEARSM = number of years married

YEARSMSQ = number of years married squared

EDUCF = number of years of education of female

EDUCH = number of years of education of male

LF = index of labor force participation of the female before marriage

LF1 = index of labor force participation of the female after marriage

PPI = expectation of the wife of the likelihood of support from pension, Provident Fund and insurance during old age. Each such source is coded and then averaged as indicated in Table 7.2.

2. Household Characteristics

WOMENP = females over 15 as percent of total number of household members

HOUST1 = 1 if nuclear household; = 0 otherwise

REL10MAR = percentage of relatives less than 10 years old in the household at the time of marriage

INHH = number of relatives (other than the woman and her husband) in the household at the time of marriage

BLDG = number of buildings owned by household members

Table 7.6 (cont.)

2. Household Characteristics (cont.)
   VALUE = total value of the property owned by the household in thousands of Malaysian dollars
   LAND = quantity of land owned by household members (in acres)
   BLDGCAP = BLDG/number of household members
   VALCAP = VALUE/number of household members
   LANDCAP = LAND/number of household members
   BLDGPPI = BLDG × PPI
   VALUEPPI = VALUE × PPI
   LANDPPI = LAND × PPI
   BLDCAPPPI = BLDCAP × PPI
   VALCAPPPI = VALCAP × PPI
   LANDCAPPPI = LANDCAP × PPI
3. Community Characteristics
   RURAL = 1 if living in rural area, = 0 otherwise
   ELECT = proportion of electrified houses in the community
   DISTBANK = distance in miles to the nearest bank, credit or savings institution
   DISTSCH = distance in miles to the nearest secondary school
   PCTSED = percentage of eligible children enrolled in secondary education
   DISTFPLAN = distance in miles to the nearest family planning clinic
   DISTSTOWN = distance in miles to the nearest community at least the size of a small town
   WAGEF = average montly wage of female respondents in the community
   WAGEM = average monthly wage of husbands of the female respondents in the community

Note: * indicates that NSTAR and NSTARH are constructed from answers by wives and their husbands to questions concerning the number of children desired of each sex separately and then without sex preference "if you started your married life all over again and you could decide what children to have".

Table 7.7

Sample Size and Means of All Variables in the Fertility Module with Malaysian Family Life Survey Data

	All Households	Non-Cultivators	Cultivators	Chinese	Indians	Malays
Sample Size	874	562	312	332	116	426
Means of Endogenous Variables						
FERT1	0.604	0.646	0.528	0.700	0.602	0.530
FERT2	0.806	0.859	0.710	0.932	0.800	0.708
OWNCHILD	4.362	4.148	4.747	4.395	4.647	4.258
EDIND	1.797	1.797	1.799	1.742	1.690	1.870
Means of Predetermined Variables						
NSTAR	4.191	3.972	4.587	3.973	3.172	4.638
NSTARH	4.445	4.212	4.865	4.208	3.129	4.988
CHINESE	0.380	0.486	0.189	--	--	--
INDIAN	0.133	0.176	0.054	--	--	--
AGEF	33.89	33.28	34.99	34.57	33.67	33.10
AGEH	39.65	39.04	40.75	39.39	40.57	39.60
F2	0.220	0.217	0.224	0.196	0.207	0.242
YEARSM	14.93	13.65	17.23	13.93	15.56	15.54
YEARSMSQ	304.99	262.12	382.19	269.94	318.37	328.66
EDUCF	3.606	4.164	2.603	3.922	3.793	3.310
EDUCH	5.483	5.984	4.580	6.012	6.112	4.899
LF	1.728	1.776	1.641	2.063	1.767	1.455
LF1	1.787	1.665	2.06	1.681	2.052	1.798
PPI	1.990	2.211	1.593	2.059	3.118	1.630
HOUST1	0.686	0.671	0.715	0.581	0.664	0.775
REL10MAR	0.082	0.075	0.095	0.073	0.073	0.091
INHH	3.238	3.322	3.089	3.789	3.095	2.847
BLDGCAP	0.114	0.088	0.161	0.107	0.040	0.140
VALCAP	1.025	0.856	1.329	1.402	0.387	0.906
LANDCAP	0.245	0.060	0.579	0.274	0.063	0.293
RURAL	0.588	0.436	0.862	0.428	0.534	0.728
ELECT	0.622	0.740	0.409	0.798	0.647	0.478
DISTBANK	6.452	5.239	8.639	5.622	5.696	7.305
DISTSCH	2.397	2.023	3.071	1.743	4.434	2.351
PCTSED	80.47	81.82	78.04	81.34	74.21	81.50
DISTFPLAN	1.117	0.911	1.490	0.619	1.571	1.382
DISTSTOWN	5.675	3.850	8.962	2.509	5.129	8.291
WAGEF	146.7	164.8	114.0	158.3	176.5	129.5
WAGEM	333.6	385.7	239.8	460.5	356.6	228.4

Table 7.8

Sample Size and Means of All Variables
in the LF1 Equation for Malaysia

	All Households	Nuclear Households HOUST1 = 1	Extended Households HOUST1 = 0
Sample Size	947	636	311
Means of all Variables			
Endogenous Variable LF1	1.794	1.780	1.823
Individual Characteristics			
AMF	19.513	19.222	20.109
AMM	25.388	25.407	25.347
EDUCF	3.701	3.355	4.408
EDUCM	5.535	5.212	6.196
EDUCFM	1.662	1.544	1.904
EDUCFF	0.662	0.549	0.894
EDUCMM	1.585	1.448	1.865
EDUCMF	0.562	0.558	0.569
LF	1.733	1.687	1.830
CHINESE	0.378	0.321	0.495
INDIAN	0.126	0.123	0.131
PPIH	2.207	2.186	2.249
PRSH	2.244	2.161	2.414
MONFOODH	0.622	0.580	0.707
CHILDH	3.823	3.811	3.845
OAHS	0.150	0.134	0.183
Household Characteristics			
YEARSM	14.359	15.212	12.615
YEARSMSQ	294.313	312.287	256.557
AGEOM	42.475	40.428	46.662
RELIOMAR	0.080	0.083	0.072
BLDG	0.664	0.624	0.745
ROOMS	2.776	2.612	3.112
VALUE	6.098	5.370	7.588
LAND	1.430	1.104	2.097
BLDGCAP	0.119	0.124	0.108
ROOMSCAP	0.512	0.537	0.461
VALCAP	1.083	1.072	1.107
LANDCAP	0.237	0.200	0.311
AGR	0.361	0.371	0.341

Table 7.8 (cont.)

	All Households	Nuclear Households HOUST1 = 1	Extended Households HOUST1 = 0
Community Characteristics			
RURAL	0.589	0.613	0.540
ELECT	0.618	0.588	0.678
DISTBANK	6.474	6.646	6.124
DISTMD	3.439	3.668	2.973
DISTSCH	2.372	2.435	2.244
DISTSTOWN	5.606	6.003	4.794
PCTSED	80.519	80.360	80.844

Note: All variables are defined as in Tables 7.2, 7.4 and 7.6 except the following:

PRSH = index representing the husband's expectations on the likelihood of support from profits and rents during old age. Coded as for PPIH in Table 7.2.

CHILDH = index representing the husband's expectations on the likelihood of support from children during old age. Coded as for PPIH in Table 7.2.

AGR = 1 if cultivator; = 0 otherwise.

DISTMD = distance in miles from the nearest doctor.

are, for groups in Malaysia, noticeably lower than for those reported in Table 4.6 above for rural India. Once again the difference may be attributed to the sizeable difference in age-at-marriage of the female, AMF, between the rural Indian and peninsular Malaysian samples, being about 17 in rural India and over 19 in Malaysia as shown in Tables 4.6 and 7.5, respectively.

(3) What is particularly surprising, however, is that, despite their older age and longer durations of marriage, Malay women have fewer surviving children on average (4.258) than either Chinese (4.395) or Indians (4.647). On the other hand, Malay parents have greater expectations about educational attainment of their children, EDIND, than do Chinese or Indians. The latter comparison contrasts with that respect to actual educational attainment of the ever-married women and her husband, EDUCF and EDUCH, in which case it is the Malays who have the lower levels of education.

(4) Whereas for Malays the desired numbers of children, NSTAR AND NSTARH, exceeds the actual number of surviving children, OWNCHILD, for Indians the reverse is true.

(5) Whereas the expected probability of the first two children being girls, F2, by the laws of nature should be about 0.25, for Chinese and Indians in the sample the actual mean of F2 is about 0.20, strongly suggesting that, consistent with their strong sex preference in favor of males, Chinese and Indian parents provide considerably better nutrition and health care to their male children than to their female children, thereby allowing a higher percentage of males to survive.

(6) While the average female labor force participation rate before marriage, LF, for Malays is well below those for Indians and especially

Chinese, those after marriage LF1 are higher for Malays than for Chinese. Chinese women clearly tend to work more before marriage, to get married later, but then to have much higher ratios of actual to natural fertility, FERT1 and FERT2, and to work less after marriage.

(7) Malay women have very low expectations of support from pensions, Provident Fund and insurance, PPI, relative to those of Chinese and especially Indians.

(8) While both male and female wage rates are much lower in communities inhabited by the Malay women surveyed than in those inhabited by their Chinese and Indian counterparts, the ratio of female to male wage rates WAGEF to WAGEH is higher for Malays than for Indians or especially Chinese.

(9) While Malays live in communities that are clearly more rural, less electrified, more distant from banks and from communities as large as small towns, their communites are closer to family planning clinics than Indians and have higher secondary school attendance than those in which Indians and Chinese live.

(10) With respect to physical wealth Malays, on average, possess more buildings and land per capita than either Chinese or Indians and assets of higher value per capita than Indians but not Chinese.

4. The Resource Allocation Module (Module D)

For reasons given above, the only aspect of resource allocation relevant to Module D which can be estimated with the MFLS data is the labor force participation rate after marriage LF1.

Since both LF1 and most of the explanatory variables included in the econometric specification of the model have already been defined in

Tables 7.2, 7.4 or 7.5 above, in Table 7.8 we provide definitions only for the four new explanatory variables included in the model, the husband's expectations of old age support from profits and children, PRSH and CHILDH, respectively, a dummy variable for cultivating households, AGR and the distance to the nearest doctor, DISTMD. Table 7.8 also gives both the sample sizes for all households, and for nuclear and extended households separately, and the means of all variables for each such sample.

As shown in the table, extended family households have better educated wives and husbands and parents thereof than nuclear households. They also have higher LF1, LF, wealth in terms of levels, (but not in per capita terms) BLDG, ROOMS, VALUE and LAND, expectations of support during old age from pensions, Provident Fund and insurance, PPIH, profits and rent, PRSH, and from children CHILDH and OAHS, and tend to have husbands and wives that have been married for fewer years but also to have older males in the household than nuclear households.

5. The Expectations Module (Module E)

The purpose of the expectations module is to develop a more detailed theoretical rationale for the demand for children of the wife and the husband represented by NSTAR and NSTARH, respectively, which incorporates also expectations of old-age support from children. Besides simply providing more detail, the focus on the desired fertility variables NSTAR and NSTARH may be advantageous in the sense that such a focus allows the analyst to more safely ignore the supply considerations which are likely to be relevant in the determination of actual fertility or even actual fertility relative to natural fertility [Easterlin and

Crimmins (1981), Easterlin, Pollak and Wachter (1980)]. Since supply factors are in practice difficult to account for adequately [Crimmins and Easterlin (1983)], empirical estimates of models involving actual fertility are likely to be subject to biases of unknown direction and magnitude.

Although the present focus is exclusively on "desires" (or the "demand") for children, the relationships between such desires and expectations with respect to household structure span some of the same space as that in Module C for actual fertility. A certain amount of duplication is therefore inevitable. The presentation of the module is organized as follows: the general features of the model are discussed in Section (a); the full-fledged model is given in Section (b); the comparative static properties of the model are derived in Section (c) and the empirical specification is given in Section (d). The reader interested neither in the theoretical structure of the model nor in the formal derivation of its implications may turn directly to Section (d).

(a) General Features

Following Leibenstein (1957) children may be thought of as providing utility for consumption, for immediate production (child labor) or for future consumption (the old-age security motive).

In addition to these rather essential elements of the demand for children per se, in developing countries there are a number of structural elements which could affect these sources of demand in a significant way. As has been pointed out in previous chapters, household structure is one such element. As a result, parents living in one type of household could well demand different numbers of children than those

living in nuclear households, even after accounting for other differences between different types of households. Various explanations have been given as to why women in extended households might have more or less children than those in nuclear households [Compare, e.g., Caldwell (1976) who pointed to the disintegration of the extended household as a necessary condition for a reduction in fertility with Cain (1982) who suggested that extended households provide their individual members with networks of support such that the security provided by other members of an extended household can substitute for the security provided by children.]

However, in other circumstances, the net influence of extended households on the demand for children would depend very considerably on the existing generational structure of the household. A household that is extended laterally or upwards may demand more children because of its need for a broad base of support for such time as the members of that generation become dependent. Also decisions to have children are related to the kinds of households in which they want to live in the future. If they want to live in extended households, for example so as to avoid farm fragmentation [DeVany and Sanchez (1977, 1979)], parents would probably demand a greater number of children.

Finally, an essential and pervasive element to consider is the uncertainty faced by parents at the time they make their decisions on fertility. It seems reasonable that parents would adjust their behavior both to the state in which they would like to end up and the likelihood of that state. When the question of security is addressed, uncertainty is a fundamental issue. Since, as explained in Chapter I above, conditions in developing countries are generally less predictable than in

developed countries, in such cases children may be regarded as a hedge against unforeseen calamities. As a result, the uncertainty element is intertwined with household structure.

The effect of household structure on the demand for children may be different, therefore, depending on the relative importance of the household's security and consumption motives. If the potential parents are living in an extended family, they may feel more secure about their future and consequently demand fewer children as sources of future support. At the same time, however, if extended families have more aged members of the family to support later on, parents in such households may demand more children. Similarly, if extended households are desired because they provide security against foreseen illnesses, and natural or man-made catastrophes, parents may tend to have a greater demand for children.

There would seem good reason, therefore, to relate expectations of future household structure to the demand for children. In the following section we construct a simple Beckerian model with the following features: (1) children are a form of capital on which parents can rely to hedge against the uncertainty of their old-age, and (2) household structure may be an integral component of the determination of the degree of insecurity and the demand for children.

(b) The Model

In contrast to the model presented in the Fertility Module in Section C of Chapter III, for the present we make no distinction between male and female. There are simply parents who, at the beginning of their child-bearing period, look forward to a life consisting of two

segments: productive age (period 1) and the old-age (period 2). During period 1, the parents are in their prime; they are working and raising young children. In period 2, they are not working, but their children are active grown-ups. In both periods, the parents derive utility from consumption. Let C_1 be the consumption during period 1 and C_2 the consumption in period 2. Moreover, assume that period 1 contains no uncertainty in the sense that parents are gifted with perfect foresight for this segment of their life: they live in a certain type of household and have a given job which provides them with a given income.

Period 2, however, is subject to uncertainty. Parents become dependent and less in control; they may not know whether they will be living by themselves in a nuclear household or with their adult children and other relatives in an extended household. As explained above, an extended household provides more security against illness, deprivation, loneliness and loss of property. This is not to say, however, that in reality parents living by themselves are completely helpless since, even when they do not live with their parents, children or others can still help them with remittances and frequent visits. Suppose, for simplicity, that household structure during old-age can be represented by two exclusive states of the uncertain world. Let A represent the state in which aged parents live in an extended household and assume that, as such, it is the more secure state. Let B be the less secure state in which they live in a nuclear household.

Following Lancaster (1966, 1971) and DeVany and Sanchez (1977), a state-dependent approach is adopted. Assuming that the parents would live both periods, their consumption vectors would be: $C_A = (K, C_1, C_{2A})$ and $C_B = (K, C_1, C_{2B})$ where K represents the direct utility of chil-

dren in the first period, C_1 is the consumption of other sevices during period 1, C_{2A} represents consumption in the second period if state A occurs and C_{2B} is the second period consumption if state B occurs. Over time, the parents attach subjective probabilities to the occurence of each state, π_A and π_B. These probabilities would be affected by factors such as the experienced mortality of family members, migration decisions, various community characteristics, wealth, and inheritance laws. In contrast to DeVany and Sanchez, it is assumed that this probability assignment process is exogenous. In reality, this process is bound to be influenced by elements that are endogenous to the model, such as loyalty and the quality of children. But to simplify the model, it can be argued that their role is minor compared to the importance of the other determinants.

Hence at the beginning of period 1, the expected utility of the parents can be represented by:

$$V = EU = \pi_A U_A(C_A) + \pi_B U_B(C_B) \tag{7.1}$$

$$= \pi_A U_A(K, C_1, C_{2A}) + \pi_B U_B(K, C_1\ C_{2B})$$

with $$\pi_A + \pi_B = 1 \tag{7.2}$$

For simplicity, we assume that utility is of the von Neumann-Morgenstern form and is independent of the state which occurs. Moreover, we also assume that the utility function is additive[10] with respect to its temporal arguments. The expected utility becomes:

$$V = EU = U(k, C_1) + \pi_A U(C_2 A) + \pi_B U(C_2 B) \tag{7.3}$$

The consumption of the second period in turn depends on some other variables. We assume that it depends on the number and quality of children and on the market goods and services for aged people acquired during the first period but stored for use in the second one. Thus

$$C_{2i} = C_{2u}(N, Q, X) \qquad \text{for each } i,\ i = A, B \tag{7.4}$$

where $\frac{\partial C_2}{\partial N}, \frac{\partial C_2}{\partial Q}, \frac{\partial C_2}{\partial X} > 0$.

In other words, the parents' consumption in the second period is 'produced' with the help of the number and quality of children and market goods. This production function includes the role of non-monetary help, such as personal attention, shelter, company, and security. It is obvious that the 'production functions' are different for each state of the world. Thus, in extended households, children living at home may provide more physical and sustained help than those living away. As in Lancaster (1971, 1981), the transformation or "production" function is assumed to be objective and known to all parents, as would be the case when there are certain societal norms that are known to everybody [Kuran (1983a)]. Hence, parents would have a good idea of the consumption in old-age that could be obtained with a certain number of children, a certain quality of children and a certain quantity of goods or assets. When trying to maximize their expected utility, the parents are subject to a budget constraint. The present value of the expenditures on children, consumption, assets and stored market goods have to be at most equal to the present value of the resources over the lifetime. These

resources would include a given wealth or income stream for the first period and the expected monetary help from children for the second period. If X could not be acquired during that period, the income constraint for the first period would be:

$$p_N N + p_Q Q + p_{C1} C_1 = I \tag{7.5}$$

where I is the present value of the parents' lifetime earnings and p_N, p_Q and p_C are the fixed prices for N, Q and C_1, respectively.

In the case where X represents the quantity of assets or storable goods acquired in the first period but used in the second, the first period constraint would be written as:

$$p_N N + p_Q Q + p_C C + p_X X = I \tag{7.6}$$

where p_X is the fixed price of X.

Likewise, in the case where X is acquired during that period, the constraint for period 2 would be:

$$p_X X = r_A NQ \qquad \text{in state } A \tag{7.7a}$$

$$p_X X = r_B NQ \qquad \text{in state } B \tag{7.7b}$$

where $r_A NQ$ and $r_B NQ$ represent the present values of the second-period contributions of children to parents in states A and B, respectively. Note that these contributions are dependent on the number as well as the quality of children. The mix of the contribution of each element may differ according to which state prevails. By combining (7.7a) with (7.7b), the constraint for the second period can be rewritten as:

$$p_X X = \pi_A r_A NQ + \pi_B r_B NQ = (\pi_A r_A + \pi_B r_B)NQ \tag{7.8}$$

Thus, the parents' expenditures on market goods and services in the second period are equal to the expected contribution of children.

To allow for the possibility that the market goods, X, could be acquired in the first period for use in the second, and also to maintain simplicity, we assume that the first and second period constraints can be combined into a single intertemporal constraint. When this is done, the complete model thus becomes:

$$\text{Max } U(N,Q,C_1) + AU(C_{2A}(N,Q,X)) + BU(C_{2B}(N,Q,X)) \tag{7.9}$$

subject to

$$p_N N + p_Q Q + p_C C_1 + p_X X = I + (\pi_A r_A + \pi_B r_B)NQ \tag{7.10}$$

The contraint is assumed to hold as an equality and all regularity conditions[12] are assumed to hold as well. Under these conditions, a solution exists characterized by the following first-order conditions:

$$\frac{\partial U}{\partial N} + \pi_A U' \frac{\partial C_{2A}}{\partial N} + \pi_B U' \frac{\partial C_{2B}}{\partial N} + \lambda((\pi_A r_A + \pi_B r_B)Q - p_N) = 0 \tag{7.11}$$

$$\frac{\partial U}{\partial Q} + \pi_A U' \frac{\partial C_{2A}}{\partial Q} + \pi_B U' \frac{\partial C_{2B}}{\partial Q} + \lambda((\pi_A r_A + \pi_B r_B)N - p_Q) = 0 \tag{7.12}$$

$$\frac{\partial U}{\partial C_1} - \lambda p_C = 0 \tag{7.13}$$

$$\pi_A U' \frac{\partial C_{2A}}{\partial X} + \pi_B U' \frac{\partial C_{2B}}{\partial X} - \lambda p_X = 0 \tag{7.14}$$

The first two conditions require that the total marginal utility of an extra child, N, (or of an extra unit of quality, Q) which includes

its marginal utility in the first period and its expected contribution to the marginal utility of the second period, be equal to the implicit price of N(Q). The implicit price of N is dependent on Q and that of Q on N. This dependence comes from the interdependence of N and Q on the contribution side and is characteristic of quantity-quality interactions as in Becker and Lewis (1973). In other words, parents can increase the contributions they receive from children either by increasing the number or the quality of children or both. The dependence of the implicit prices of N and Q on the choice variables N and Q, themselves, is what distinguishes this model from the pure and more common consumption model of child services. For the model to make sense, the implicit prices should be positive.

Equation (7.13) simply requires the shadow price of consumption, λp_C, to be equal to the marginal utility of consumption. Similarly equation (7.14) requires the shadow price of market goods, λp_X, to be equal to the probability-weighted indirect marginal utilities generated by the use of market goods in satisfying consumption in period 2 in each of the two different possible states of nature A and B.

(c) Derivation of Hypotheses

From the first-order conditions, the demand functions for N, Q, C_1 and X, dependent on the exogenous variables I, p_N, p_Q, p_X, p_C, π_A, r_A, r_B could, in principle, be derived. However, this derivation is not as immediate, obvious or easy as in the usual consumption models, because of the interdependence between N and Q through the implicit prices.

Hypotheses can be derived by carrying out comparative statics exercises which depict the changes in the demands at the optimum, given

changes in the exogenous variables. For this purpose, the implicit function theorem is applied. Since this study is primarily concerned with effects on the number of children, we restrict our attention to the comparative static results for N.

The derivations are detailed in Kan (1983, Appendix 2.2). From the Jacobian matrix of the first-order conditions given by equations (7.11)-(7.14), it can be seen that the border consists of the implicit prices of N and Q and the market prices of C_1 and X.

The only definite results that can be drawn from the comparative static exercises are that the income-compensated own-price effects, are negative, indicating that as the price of N increases, holding utility constant, the desired number of children would decrease. These results are guaranteed by the second-order condition which requires the Jacobian to be negative semi-definite. The Marshallian price effects, on the other hand, cannot be determined unambiguously because of the a priori undetermined income effect. Depending on the utility function, this income effect can be either positive or negative and may overwhelm the price-effect. Similarly, the directions of the cross-price effects and even of the income-compensated cross-price effects cannot be determined unambiguously without imposing restrictions on the Hessian [King (1982), Rosenzweig and Wolpin (1980)]. Commonly the restriction of separability in the utility function is imposed for this purpose. Separability in the utility function implies that the marginal utility of good i is independent of the quantity consumed of any other good. When the classes of goods in the utility function are very broadly defined, this assumption may not be unrealistic. However, in this case, even if additive separability were imposed, there would still be interdependence

between N, Q and X through the production or transformation functions C_{2A} and C_{2B}, so that the direction of the different effects of changes in the exogenous variables could still not be determined with any degree of confidence.

Thus, these effects in the form of the familiar Slutsky equations can be written as:

$$\frac{dN}{dp_N} = \frac{\lambda D_{11}}{D} + N\frac{D_{51}}{D} \gtrless 0 \qquad \text{with } \frac{dN}{dp_N}\Big|_{U=\bar{U}} = \frac{\lambda D_{11}}{D} < 0 \tag{7.15}$$

$$\frac{dN}{dp_Q} = \frac{\lambda D_{21}}{D} + Q\frac{D_{51}}{D} \gtrless 0 \tag{7.16}$$

$$\frac{dN}{dp_C} = \frac{\lambda D_{31}}{D} + X\frac{D_{51}}{D} \gtrless 0 \tag{7.17}$$

$$\frac{dN}{dp_X} = \frac{\lambda D_{41}}{D} + C\frac{D_{51}}{D} \gtrless 0 \tag{7.18}$$

$$\frac{dN}{dI} = -\frac{D_{51}}{D} \tag{7.19}$$

$$\frac{dN}{dr_A} = -\lambda\pi AQ\frac{D_{11}}{D} - \lambda\pi AN\frac{D_{21}}{D} - NQ\frac{D_{51}}{D} \gtrless 0 \tag{7.20}$$

$$\frac{dN}{d\pi_A} = a\frac{D_{11}}{D} + b\frac{D_{21}}{D} + c\frac{D_{41}}{D} + d\frac{D_{51}}{D} \gtrless 0 \tag{7.21}$$

where $a = -U'\frac{\partial C_{2A}}{\partial N} - \lambda r_A Q + U'\frac{\partial C_{2B}}{\partial N} + \lambda r_B Q$

$$b = -U'\frac{\partial C_{2A}}{\partial Q} - \lambda r_B N + U'\frac{\partial C_{2B}}{\partial Q} + \lambda r_B N$$

$$c = -U'\frac{\partial C_{2A}}{\partial X} + U'\frac{\partial C_{2B}}{\partial X}$$

$$d = (r_A - r_B)NQ$$

All the price effects, therefore, have two components, the first, which is a pure substitution effect and, the second, which is the income effect. Note that even the last two effects which result from changes in expectations with respect to the rate of return from children in state A and the probability of the future state of nature, π_A, still turn out to consist of price and income effects.

Since the direction of these effects cannot be determined unambiguously, it is left to the empirical analysis to determine them. However, it is still possible to form a priori expectations on their direction. If N is a normal good (as most economists would like it to be), the income effect would be positive, i.e., $dN/dI > 0$. In turn, those would imply that $dN/dp_N < 0$, and hence that the own-price effect is negative.

If we could assume that the utility-compensated cross-price effects are positive, that is

$$\frac{dN}{dp_Q}\Big|_{U=\bar{U}} > 0 \ , \ \frac{dN}{dp_X}\Big|_{U=\bar{U}} > 0 \ , \ \frac{dN}{dp_C}\Big|_{U=\bar{U}} > 0 \ ,$$

it would be implied that Q, X and C_1 would be substitutes for N. This is, of course, consistent with the view that the number and the quality of children are substitutes for one another. Moreover, in this model, even if the utility-compensated cross-price effects are positive, the uncompensated effects would still be ambiguous because of the contradicting income effect.

A priori, it would also be difficult to determine the direction of the effects of changes in the state-dependent contributions r_A and r_B and in the probabilities of the two states. To see this, note, for example, that the effect of a change in r_A on N can be decomposed into

two parts: the first, a negative own-price effect, and the other the cross-price effects. The first effect is straightforward because an increase in r_A, the contribution of children in state A implies, ceteris paribus, a decrease in the implicit price of N. It also implies that the implicit price of Q would decrease because of the interdependence between N and Q on the contribution side. This latter effect accounts for the part that corresponds to the cross-effect. The two effects have opposite influences and it is not obvious which one is dominant. However, it would seem reasonable that the own-price effect would dominate the cross-effect, so that a change in r_A would result in a direct change in N.

Similarly, a change in π_A, the parents' subjective probability of the occurence of state A, can be decomposed into an own-price effect and cross-effects. But, the direction of these effects cannot be determined easily because a change in π_A implies an inverse change in π_B and all the effects are modified by these counterbalancing changes. An increase or decrease in A means that there is a change in the contribution to utility by consumption in the two states. It also means that the implicit prices of N and Q change. The different own and cross-effects represent the adjustments caused by these changes.

Summarizing the a priori hypotheses, we have:

H1: $$\frac{dN}{dI} > 0 .$$

A change in the parents' lifetime income should change the number of children demanded in the same direction.

H2: $$\frac{dN}{dp_N} < 0$$

The own-price effect should be negative, i.e., a change in the price of the number of children in one direction should change the number of children demanded in the other direction.

H3: $$\frac{dN}{dp_Q}\Big|_{U=\bar{U}} > 0 \ , \ \frac{dN}{dp_X}\Big|_{U=\bar{U}} > 0 \ , \ \frac{dN}{dp_C}\Big|_{U=\bar{U}} > 0$$

The compensated cross-price effect should be positive. This means that, if the same utility level were maintained, a change in the prices of Q, X, and C would imply a change in the same direction in the number of children demanded.

Hypotheses 2 and 3 pertain only to the compensated effects. The complete effects, which also include the corresponding income effects, cannot be determined because neither the direction nor the magnitude of these income effects can be ascertained a priori.

H4: $$\frac{dN}{dr_A} \ , \ \frac{dN}{dr_B} > 0$$

A change in the state-specific contribution rate of the children should cause a change in the number of the demanded children in the same direction.

H5: $$\frac{dN}{d\pi_A} \gtreqless 0$$

The effect on the number of children demanded of a change in the subjective probability of the occurence of either state could be in either direction.

In general, therefore, what the theoretical model yields is a demand function for number of children which would depend on the values of a number of exogenous variables.

$$N = N(p_N, p_Q, p_X, p_C, I, r_A, r_B, \pi_A) \tag{7.22}$$

Once the parameters of such a model would be determined, the validity of the aforementioned hypotheses could be determined and various policy experiments could be performed. Since in most cases, however, the direction of the overall effects cannot be determined a priori, the importance of empirical estimation of the model is underscored.

(d) Econometric Specification

The purpose of the present section is to translate the aforementioned model of the demand for children into a specific equational structure relevant for application to the MFLS data. From the above presentation of the model, equation (7.22) would seem to be a reduced form equation; hence, estimation of the model would seem to be perfectly straight-forward. Indeed, ordinary least squares (OLS) would seem to be sufficient.

In practice, however, the expectations of child contributions r_A, r_B and the state probabilities π_A and π_B are endogenous and strongly interrelated, thereby requiring the use of a simultaneous equation estimation procedure. A further complication derives from the fact that the measures of most such variables available in MFLS are limited and discontinuous in nature, again requiring more sophisticated estimation procedures.

The model is specified as being composed of the following elements or individual equations:

(1) the desired number of children for the husband and wife, NSTARH and NSTAR, respectively;

(2) the expectations of the husband and wife, separately, of the likelihood of support from children during old-age, CHILDH and CHILD, respectively;

(3) expectations of the husband and wife, separately, of the likelihood of support during old age from savings, SAVINGSH and SAVINGS, respectively;

(4) expectations of the husband and wife, separately, of the likelihood of support during old age from work, WORKH and WORK, respectively;

(5) expectations of the husband and wife, separately, of the likelihood of support during old age from pensions and the Provident Fund, PPH and PP, respectively.

Once again the reader is reminded of the modular character of the overall modelling framework. As was shown in Tables 7.6 and 7.7 of Section 3 above, fertility is modelled as a decision in which the wife-mother plays a relatively dominating role. Variables like household structure, HOUST1, labor force participation after marriage, LF1, years married, YEARSM and YEARSMSQ, and NSTARH and NSTAR all appear as right hand side variables in the model but are determined in other modules. In turn, HOUST1 is the dependent variable in the household structure model specified in Tables 7.2 and 7.3 of Section 1. LF1 is explained in the equation of the resource allocation module specified in Table 7.8 of Section 4 above. YEARSM and YEARSMSQ can be computed from the chronological ages of the husband and wife, AGEH and AGE, and their ages-at-marriage, AMM and AMF. respectively, as determined in the marriage module specified for Malaysia in Tables 7.4 and 7.5 of Section 2 above.

The function of the expectations module is primarily to explain NSTARH and NSTAR. In doing so, it uses CHILDH and CHILD, SAVINGSH and SAVINGS, WORKH and WORK and PPH and PP. This is because the expectations of support in old age of all sources are interdependent. Whereas in the applications of the previous modules to both Malaysia and rural India, PPI and PPIH have been defined somewhat more broadly so as to include insurance in addition to pensions and the Provident Fund, the variables used here, i.e., PPH and PP, do not include insurance. Another difference in the treatment of the Provident Fund variable is that whereas PPIH and PPI have been assumed to be exogenous, since they are themselves expectation variables, here in the expectations module PPH and PP are treated as endogenous variables.

The individual equations of the model are now specified one at a time, beginning with the desired numbers of children of husbands and wives, NSTARH and NSTAR, respectively.

The Desired Number of Children, NSTARH and NSTAR

Since as noted in the footnote to Table 7.6 above, NSTARH and NSTAR, are measures of the number of children whihc married men and women at different phases of their life cycle say they would like to have if they were to start all over again, there may be a systematic tendency of people at different ages, to report high or low relative to the average. To account for such a bias, AGEH and AGE are included. Another possible source of bias is from actual fertility to desired number of children. Knodel and Prachuabmoh (1973), however, have investigated this issue and found it not to be an important source of bias in measures of the desired number of children. An important con-

sideration is that NSTARH and NSTAR are both discrete variables limited in their range.

The categories of these discrete variables may be thought of as summarizing certain ranges of values of an underlying latent continuous variable, N^*. When N^* is within a certain interval, i.e., between two threshold values: $\tau_J < N^* < \tau_{J+1}$, the discrete observed variable NSTAR takes the integer value J. On the other hand, if N^* exceeds the next higher threshold value, NSTAR takes the integer value J+1. N^*, the continuous latent variable is hypothesized to be dependent on a set of variables.

What remains is to identify the measures and proxies used to represent the exogenous variables in the aforementioned theoretical model, i.e., the prices of number of children, quality of children, marketable assets, and consumption, p_N, p_Q, p_X and p_C, respectively, the present value of lifetime income, I, the probability of living in an extended household, π_A, and the expected support from children in extended and nuclear households, r_A and r_B, respectively.

We use the distance to the nearest family planning center DISTFPLAN as an inverse proxy measure of p_N. Since every community sampled in MFLS had a primary school but not necessarily a secondary school, we use distance to the nearest secondary school DISTSCH as a proxy measure for p_Q. The distance from the nearest community at least as large as a small town DISTSTOWN is used as a measure for p_X, and the proportion of houses in the community that are electrified as an inverse measure of p_C. Several variables are used as proxies for I, the number of rooms in the house at the time of marraige, ROOMS, the monthly wage rate of the husband and wife in their first job, FIRSTWH and FIRSTWW, respec-

tively, and the value of all property owned by the husband at the time of the survey, VALUEH. π_A is measured by the variable indicating whether or not the wife expects to live with her children during her old age OAHS.[13] The contributions from children, r_A and r_B, are measured by the likelihood of support from children during old age, CHILDH for husbands and CHILD for wives. Because the alternative sources of old-age support are substitutes for support from children, SAVINGSH, WORKH and PPH are included in the NSTARH equation and SAVINGS, WORK and PP in the NSTAR equation.

Finally, to account for ethnic, regional and educational factors which may affect tastes and preferences for children we include the number of relatives living in the house at the time of marriage, INHH, the dummy variables CHINESE, INDIAN, and RURAL, and the educational attainment variables EDUCH and EDUCF. To account for possible systematic measurement error in NSTARH and NSTAR, we also include AGEH in the NSTARH equation and AGE in the NSTAR equation.

In short then, the equation for NSTARH is as follows:

$$NSTARH = B_{12}CHILDH_i + B_{13}SAVINGSH_i + B_{14}WORKH_i + B_{15}PPH_i + \gamma X_i + \varepsilon_{i1}$$

where X is the vector consisting of a constant, AGEH, CHINESE, DISTFPLAN, DISTSTOWN, DISTSCH, EDUCH, ELECT, FIRSTWH, INDIAN, INHH, OAHS, ROOMS, RURAL and VALUEH, and ε_{i1} is the error term.

The equation for NSTAR is, of course, similar but uses CHILD, instead of CHILDH, WORK instead of WORKH, AGE instead of AGEH, EDUCF instead of EDUCH and FIRSTWW instead of FIRSTWH.

Expectations on the Likelihood of Husbands and Wives of Support from Children, Savings, Work and the Provident Fund

The variables measuring the expectations of the likelihood of support from various sources during old-age are indexes constructed from parental opinions on the likelihood of such support. Since some of those surveyed may already have been receiving some such forms of support, and there may be other life-cycle biases in such opinions, it is important to introduce a number of different variables to control for such biases.

Another important characteristic of all these likelihood-of-support variables is that they are measured only in the discrete categories "very unlikely, fairly unlikely, depends, fairly likely and very likely," which have then been coded into integer values as indicated for PPIH in Table 7.2. Once again this means that all such variables are integer step approximations to underlying continuous latent variables.

As mentioned above, we consider and attempt to explain the expectations of the likelihood of support during old age for four different sources of such support, and to do so separately for both husbands and wives. The four different sources are: children (CHILDH and CHILD for males and females respectively), savings (SAVINGSH and SAVINGS), work (WORKH and WORK), and the Provident Fund (PPH and PP). The specification of the variables appearing on the right hand sides of such equations is now discussed one at a time. In all such cases we shall pro-

vide the specification only for the husband's expectations. The corresponding equation for the wife is identical, except that data on the wife is used instead of data for the husband whenever such is available.

We begin with CHILDH. Since the existence of a demonstration effect wherein the likelihood of support from children is increased if parents contribute money and food to their own parents, the dummy variable for such contributions to the husband's parents (MONFOODH) is included as a right-hand-side variable. The number of rooms and the number of adult relatives in the house at the time of marriage (ROOMS and INHH) are included to account for wealth and household structure at the time of marriage. Both would be expected to have positive influences on CHILDH. Distance to the nearest market (DISTMARK) is used as an inverse proxy measure for the availability of market goods and services for the elderly. DISTMARK should therefore be expected to have a positive effect on CHILDH. Also included is the wife's expectation of living with her children in old age (OAHS). This variable should therefore be expected to have a positive influence on CHILDH. Given the aforementioned likelihood of interdependence between the different sources of old age support, SAVINGSH, WORKH and PPH are also included. We would expect most but not necessarily all[14] of these effects on CHILDH to be negative. WAGEH is included as a proxy for lifetime returns on human capital. It would be expected to reduce CHILDH. The control variables included in the equation are dummy variables for ethnicity, i.e., CHINESE and INDIAN, and for location, RURAL.

The variables included on the right hand side of the SAVINGSH equation are: the likelihood of support from the Provident Fund (PPH), age of the husband (AGEH), the educational attainment level of the

husband (EDUCH), VALUE as a measure of non-human wealth, INHH as a life-cycle-standardized measure of the degree of household extension, dummy variables for ethnicity (CHINESE and INDIAN) and for location (RURAL), distance to the nearest bank, credit or savings institution (DISTBANK) as a measure of difficulty of access to financial and savings institutions, distance to the nearest secondary school (DISTSCH) and the proportion of houses in the community which are electrified (ELECT).

The variables included on the right hand side of the WORKH equation are: AGEH, CHINESE, INDIAN, RURAL, VALUE, FIRSTWH, a dummy variable for agricultural workers, AGR, (since retirement generally comes much later for such workers, ability to work being associated with higher prestige for the elderly), a dummy variable for current illness or incapacity, ILL, (since such factors would decrease the expectation of support from work during old age) PPH, DISTSCH and ELECT.

Finally, variables used on the right hand side to explain variation in PPH include the level of educational attainment (EDUCH), the wage rate at entry to the labor force (FIRSTW), the dummy variables for ethnicity (CHINESE and INDIAN), location (RURAL) and sector of employment of <u>both</u> spouses, SERVICE (for service workers), PROD (for production workers), PROF (for professional workers), AGR (for agricultural workers), RUBBER (for rubber workers) and NP (for non-productive workers).

The Entire System of Equations and its Method of Estimation

In the previous section, each individual equation of the econometric system was presented separately. The purpose of this section is to put the equations together so as to give the reader a perspective on

the system as a whole and its estimation process. Actually, as noted above there are two different systems, one for the wife's expectations and one for her husband's. Since the two systems are virtually identical, however, we present only the system for the wife's expectational variables.

$$PP_i^* = x_i'\tilde{\gamma}_1 + \varepsilon_{i1} \qquad i = 1,\ldots, N$$

$$WORK_i^* = \beta_{12}PP_i^* + x_i'\tilde{\gamma}_2 + \varepsilon_{i2} \tag{7.20}$$

$$SAVINGS_i^* = \beta_{13}PP_i^* + x_i'\tilde{\gamma}_3 + \varepsilon_{i3}$$

$$CHILD_i^* = \beta_{14}PP_i^* + \beta_{24}WORK_i^* + \beta_{34}SAVINGS_i + x_i'\tilde{\gamma}_4 + \varepsilon_{i4} \tag{7.20}$$

$$NSTAR_i^* = \beta_{15}PP_i^* + \beta_{25}WORK_i^* + \beta_{35}SAVINGS_i^* + \beta_{45}CHILD_i^* + x_i'\tilde{\gamma}_5 + \varepsilon_{i5}$$

$x_i' = (x_{i1}, x_{i2},\ldots x_{ik})$ vector of k exogenous variables

$$\tilde{\gamma}_i = \begin{pmatrix} \gamma_{i1} \\ \gamma_{i2} \\ \vdots \\ \gamma_{ik} \end{pmatrix} \qquad \text{and} \quad \varepsilon_i = \begin{pmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \varepsilon_{i3} \\ \varepsilon_{i4} \\ \varepsilon_{i5} \end{pmatrix} \sim N(0,\Sigma)$$

has a multivariate normal distribution with mean 0 and covariance Σ.

The starred variables PP_i^*, $WORK_i^*$, $SAVINGS_i^*$, $CHILD_i^*$, and $NSTAR_i^*$ are continuous latent variables representing respectively the propensities

to expect support during old age from different sources (provident fund and pension, work, savings, children) and the demand for children. These propensities are regression functions of measured exogenous variables $x_1, \ldots, x_k$ with residuals $\varepsilon_1, \ldots, \varepsilon_5$. These residuals are assumed to have a normal distribution with mean 0 and covariance Σ.

To each starred variable corresponds an observed discrete indicator, respectively PP_i, $WORK_i$, $SAVINGS_i$, $CHILD_i$ and $NSTAR_i$ which takes on an integer value J if and only if

$$\tau_J < y_i^* \leq \tau_{J+1} \qquad y_i^* = \{PP_i^*, WORK_i^*, SAVING_i^*, CHILD_i^*, NSTAR^*\}$$

$$\Leftrightarrow \frac{1}{\sigma_{\varepsilon j}^2}\left[\tau_J - x_i'\tilde{\gamma}_j - \Sigma_k \tilde{\beta}_{kj}\tilde{\tilde{y}}_{kj}^*\right. < \varepsilon_{ij} \leq \frac{1}{\sigma_{\varepsilon j}^2}\left[\tau_{J+1} - x_i'\tilde{\gamma}_j - \Sigma_k \tilde{\beta}_{kj}\tilde{\tilde{y}}_{kj}^*\right]$$

$$j = 1, \ldots, 5$$

where $\tilde{\tilde{y}}_{kj}^*$ represents the endogenous latent variables included on the right hand side of equation j, $\tilde{\beta}_{kj}$ are the corresponding coeffients, τ_J is a certain threshold that the continuous latent variable must exceed for the corresponding observed indicator to take on the value J. The limiting thresholds are defined as $-\infty$ and $+\infty$.

Thus, the entire model is a recursive system of simultaneous polytomous choice equations and can be written in the more compact form:

$$Y_i^* = Y_i^* B + x_i \Gamma + \varepsilon_i \tag{7.21}$$

where Y_i^* is the 1×5 row vector of endogenous variables, x_i is the 1×k row vector of exogenous variables, I-B is a 5×5 matrix, Γ is a k×5 matrix and ε_i is the 1×5 row vector of residuals. The ε_i's are i.i.d. and follow a $N(0,\Sigma)$ distribution. It should be noted that the matrix B,

with the given specification of the model, i.e., recursivity, is upper triangular.

The reduced form of system (7.21) can be written as

$$Y_i^* = x_i\pi + u_i \tag{7.22}$$

where $\pi = \Gamma(I-B)^{-1}$ and $u_i = \varepsilon_i(I-B)^{-1}$.

u_i follows a normal distribution with mean 0 and covariance $[(I-B)^{-1}]'\Sigma(I-B)^{-1} = V$.

The conditions for identification of the generic system from which (7.21) can be derived, and which is described by Lee (1981), are similar to those exposed in Lee (1977). In general, this means that B and Γ can be identified under rank conditions and suitable normalization rules. These normalization rules usually involve elements of the covariance matrix and also the threshold values in this context.[15]

In order to assure that the estimates would possess the desirable properties, the model should be estimated with maximum likelihood methods. In the present case, the likelihood function would be defined, for observation i by:

$$L_i = \text{Prob}\{PP_i = J_{i1},\ WORK_i = J_{i2},\ SAVINGS_i = J_{i3},$$

$$CHILD_i = J_{i4},\ NSTAR_i = J_{i5}\}$$

For N observations, the sample likelihood would be $L = \pi_{i=1}^{N} L_i$. The application of maximum likelihood methods to this situation would therefore be excessively complicated and expensive. It is for precisely this

situation that Lee (1981) proposed the following method: the model (7.22) is estimated by a single equation probit maximum likelihood method. The structural parameters are then estimated in the second stage. Each equation is specified as

$$y_i^* = R_i\delta_0 + Y_i^0\delta_1 + \varepsilon_i \tag{7.23}$$

where Y_i^0 is a subvector of endogenous variables other than y_i^* in Y_i^*.

Equation (7.23) can be modified so as to take the form:

$$y_i^* = R_i\delta_0 + (x_i\pi^0)\delta_1 + v_i$$

since $$Y_i^0 = x_i\pi^0 + u_i^0$$

Once the consistent estimates of $\hat{\pi}^0$ are derived in the first stage, the second stage in the procedure is to estimate (δ_0,δ_1) from

$$y_i = R_i\delta_0 + (x_i\hat{\pi}^0)\delta_1 + \omega_i \tag{7.24}$$

$$\omega_i = v_i + x_i(\pi^0 - \hat{\pi}^0)\delta_1$$

Equation (7.24) is again estimated by probit.

Under general conditions, this estimation method yields consistent and asymptotically normal estimates. The method is used here with the assumption that $\Sigma = I$, i.e., the residuals of the regressions in model (2) are uncorrelated one with another and their variances are normalized to 1. This assumption may be regarded as a strong identification restriction.

The system (7.21) is then very similar to the usual recursive system. If the y_i^* are observable, OLS would be the optimal method. But here, the true dependent variables are latent.

Therefore, we utilize a method derived from Lee's two-step procedure but applied to each single equation separately. More specifically, the first equation is estimated with a polytomous probit. With the estimates obtained, the predicted continuous dependent variable is constructed and its predicted value is then used as an instrument variable in the second equation. Thus, each equation is estimated, using as instruments for the endogenous variables included in the right hand side, their predicted values obtained from previous equations. Following Lee, the estimates are consistent and asymptotically normal so that the usual tests of significance may be performed asymptotically.

Definition of Variables and Descriptive Statistics

All variables used in the Expectations Module are defined in Table 7.9. Frequencies on the endogenous variables are given by ethnic group in Table 7.10 and by location (rural-urban) in Table 7.11.

The differences in means among ethnic groups in regard to NSTAR and NSTARH have already been discussed. The frequencies simply add a little bit more information about other aspects of the inter-group differences in the intra-group distributions with respect to these variables.

From the frequencies for CHILD and CHILDH the differences between husbands and wives in terms of their expectations of the likelihood of support from children during their old age are highlighted. Whereas only 2.84 percent of the ever-married women in the sample thought such

support "very unlikely", 6.58 percent of their husbands thought this. At the other end of the scale, 76 percent of the women versus less than 66 percent of the men thought that such support was at least fairly likely. In the case of Chinese the percentage thinking such support at least "fairly likely" is 83.5 among women and 77.4 among men. Among Indians the gap in this respect is largest, 74.1 percent for women versus only 45.1 percent for men. Less than 70 percent of Malay women, however, consider support from children in old-age at least "fairly likely".

Striking ethnic and sex differences can also be seen in Table 7.10 for the likelihood of support from the work of oneself or one's spouse. Whereas for Malays more than 20 percent of both wives and their husbands think such sources of support to be "very likely" and for Chinese more than 17 percent think so, in the case of Indians the corresponding percentages are less than 2 percent for wives and 0 percent for husbands.

In the case of old-age support from savings, 22.7 percent of Chinese women and 27.9 percent of Chinese men think such support "very likely". This contrasts with Indian women and men for whom the corresponding percentages are 6.2 and 9.8, respectively.

Expectations of support from pensions and the Provident Fund in old age are rated as "very unlikely" or "fairly unlikely" by 59.3 percent of Malay women, 47.2 percent of Malay men, 42.5 percent and 39.9 percent of Chinese women and men, respectively, but by only 5.3 percent of Indian women and less than 1.0 percent of Indian men.

Means on all variables, endogenous and exogenous alike, used in the module are given in Table 7.12. Note in this table the higher incidence

of illness among the sampled women than among their husbands, ILL and ILLH, and the substantial differences in occupational status. In the latter respect note that 27.2 percent of the ever-married women were classified as non-productive NP as opposed to only 6.3 percent of their husbands. The husbands, on the other hand, were more likely than their wives to be production workers: 14.1 percent versus 10.4 percent, professionals: 8.0 percent versus 4.6 percent, rubber workers: 6.7 percent versus 2.5 percent, and self-employed: 7.8 percent versus 3.1 percent.

Table 7.9

Definitions of All Variables Used in the Expectations Module for Application to MFLS Data

Endogenous Variables

NSTAR = desired number of children of the ever-married woman

NSTARH = desired number of children of the ever-married husband

CHILD = index of expectations of the ever-married woman of the likelihood of support from children during old age. Coded as follows: 1 if "very unlikely", 2 if "fairly unlikely", 3 if "depends", 4 if "fairly likely" and 5 if "very likely".

CHILDH = index of expectations of the husband of the likelihood of support from children during old age. Coded as for CHILD.

SAVINGS = index of expectations of the ever-married woman of the likelihood of support from savings during old age. Coded as for CHILD.

SAVINGSH = index of expectations of the husband of the likelihood of support from savings during old age. Coded as for CHILD.

WORK = index of expectations of the ever-married woman of the likelihood of support from work of either spouse during old age. Coded as for CHILD.

WORKH = index of expectations of the husband of the likelihood of support from work of either spouse during old age. Coded as for CHILD.

PP = index of expectations of the ever-married woman of the likelihood of support from the Provident Fund. Coded as for CHILD.

PPH = index of expectations of the husband of the likelihood of support from the Provident Fund. Coded as for CHILD.

Predetermined or Right Hand Side Variables

AGEF(H) = age of the ever-married woman (husband) at the time of the survey.

AGRF(H) = 1 if the ever-married woman (husband) is working in the agricultural sector; = 0 otherwise.

CHINESEF(H) = 1 if the ever-married woman (husband) is Chinese; = 0 otherwise.

DISTBANK = distance to the nearest bank in miles.

DISTFPLAN = distance to the nearest family planning clinic in miles.

DISTMARK = distance to the nearest market in miles.

DISTSTOWN = distance to the nearest community as large as small town in miles.

DISTSCH = distance to the nearest secondary school in miles.

EDUCF(H) = number of years of education completed of the ever-married woman (husband).

ELECT = proportion of houses in the community electrified.

FIRSTW(H) = monthly salary of the ever-married woman (husband) in her (his) first job.

ILL(H) = 1 if the ever-married woman (husband) was ill during the previous 12 months; = 0 otherwise.

Table 7.9 (cont.)

Predetermined or Right Hand Side Variables (cont.)

INDIANF(H) = 1 if the ever-married woman (husband) is Indian; = 0 otherwise.

INHH = number of adult relatives in the household at the time of marriage.

MONFOOD(H) = 1 if the ever-married woman (husband) contributes money and food to her (his) parents; = 0 otherwise.

NP(H) = 1 if the ever-married woman (husband) is non-productive; = 0 otherwise.

OAHS = 1 if the ever-married woman expects to live with her children during her old age; = 0 otherwise.

PCTSED = percentage of children of eligible age attending secondary school in the community.

PROD(H) = 1 if ever-married woman (husband) is in the manufacturing or production sector; = 0 otherwise.

PROF(H) = 1 if ever-married woman (husband) is a professional; = 0 otherwise.

ROOMS = number of rooms in the house at the time of marriage.

RURAL = 1 if the household is in a rural area; = 0 otherwise.

RUBBER(H) = 1 if the ever-married woman (husband) works on a rubber plantation; = 0 otherwise.

SELF(H) = 1 if the ever-married woman (husband) is self-employed; = 0 otherwise.

SERVICE)H) = 1 if the ever-married woman (husband) is a service worker; = 0 otherwise.

VALUEH = total value of the property owned by the husband at the time of the survey.

YRSILL(H) = number of years of illness of the ever-married woman (husband) if she (he) was ill during the 12 month preceding the survey.

Table 7.10

Frequencies of the Dependent Variables by
Ethnicity in Percent of Column Total

	Ethnic Group				Ethnic Group		
NSTAR	Malay	Chinese	Indian	NSTARH	Malay	Chinese	Indian
1	4.08	2.47	0.89	1	5.34	1.17	3.57
2	9.24	12.05	33.04	2	7.12	10.85	33.93
3	11.96	12.05	29.46	3	8.01	16.13	30.36
4	30.98	49.59	30.36	4	28.19	43.11	26.79
5	20.65	13.15	4.46	5	21.07	12.61	2.68
6	23.10	10.68	1.78	6	30.27	16.13	2.68
CHILD				CHILDH			
1	2.99	3.01	1.79	1	4.15	6.45	14.29
2	2.72	3.29	5.36	2	4.45	4.11	8.04
3	24.46	10.14	18.75	3	30.86	12.02	32.14
4	36.96	25.75	45.54	4	31.45	24.05	25.89
5	32.88	57.81	28.57	5	29.08	53.37	19.34
SAVINGS				SAVINGSH			
1	31.52	37.53	35.71	1	29.38	34.90	31.25
2	10.33	9.59	4.46	2	8.61	6.45	4.46
3	18.75	12.05	33.93	3	16.91	10.26	26.79
4	24.18	18.08	19.64	4	26.41	20.53	27.68
5	15.22	22.74	6.25	5	18.69	27.86	9.82

Table 7.10 (cont.)

PP	Ethnic Group		
	Malay	Chinese	Indian
1	6.25	4.66	2.68
2	52.99	37.81	2.68
3	9.24	10.41	5.36
4	11.96	36.16	44.66
5	9.24	5.21	19.64
6	10.33	5.75	24.98

PPH	Ethnic Group		
	Malay	Chinese	Indian
1	4.75	7.33	0.00
2	42.43	32.55	0.89
3	7.42	5.87	5.36
4	13.65	40.76	48.21
5	10.09	4.11	9.82
6	21.66	9.38	35.91

WORK			
1	14.95	16.99	25.89
2	8.97	13.70	21.43
3	23.10	30.41	26.79
4	26.09	17.53	24.11
5	26.90	21.37	1.79

WORKH			
1	15.43	19.65	22.32
2	8.90	11.44	32.14
3	25.82	34.90	31.25
4	29.67	16.42	14.29
5	20.18	17.60	0.0

Table 7.11

Frequencies of the Dependent Variables by Location in Percent of Column Total

	Ever-married Woman				Ever-married Husband		
NSTAR	Urban	Rural	Total	NSTARH	Urban	Rural	Total
1	3.13	2.81	2.96	1	4.41	2.34	3.29
2	18.80	9.31	13.61	2	16.53	9.13	12.53
3	14.62	14.07	14.37	3	17.36	12.41	14.68
4	40.21	37.88	38.94	4	35.26	33.72	34.43
5	12.01	17.97	15.27	5	12.95	16.39	14.81
6	11.23	17.97	14.91	6	13.50	26.00	20.25
CHILD				CHILDH			
1	3.13	2.60	2.84	1	9.37	4.22	6.58
2	3.39	3.25	3.31	2	4.96	4.68	4.81
3	16.19	18.61	17.52	3	23.69	22.25	22.91
4	32.11	34.20	33.25	4	26.72	28.10	27.47
5	45.17	41.34	43.08	5	35.26	40.75	38.23
PP				PPH			
1	30.29	38.31	34.68	1	26.45	36.77	32.02
2	8.09	10.17	9.23	2	5.51	8.43	7.09
3	16.45	19.05	17.87	3	14.88	15.93	15.44
4	22.19	19.91	20.95	4	23.69	24.36	24.05
5	22.98	12.55	17.28	5	29.48	14.52	21.39

Table 7.11 (cont.)

	Ever-married Woman				Ever-married Husband		
WORK	Urban	Rural	Total	WORKH	Urban	Rural	Total
1	19.58	15.37	17.28	1	22.59	14.52	18.23
2	18.02	8.23	12.66	2	16.25	10.77	13.29
3	26.63	26.84	26.75	3	32.23	29.04	30.51
4	19.84	24.03	22.13	4	17.08	25.76	21.77
5	15.93	25.54	21.18	5	11.85	19.91	16.20
PP				PPH			
1	3.66	6.28	5.09	1	3.86	6.32	5.19
2	28.98	48.70	38.76	2	17.63	44.73	32.28
3	10.18	8.44	9.23	3	4.68	7.96	6.46
4	28.98	24.89	26.75	4	33.33	27.63	30.25
5	12.01	6.28	8.88	5	9.64	5.62	7.47
6	16.19	5.41	10.30	6	30.85	7.73	18.35

Table 7.12
Means of All Variables Used in the
Expectations Module for Application to Malaysia

Endogenous Variables

Variable	Means	Variable	Means
NSTAR	3.95	NSTARH	4.06
CHILD	4.10	CHILDH	3.86
SAVINGS	2.77	SAVINGSH	2.96
WORK	3.17	WORKH	3.04
PP	3.25	PPH	3.58

Predetermined Variables

Variable	Means	Variable	Means
AGEF	32.951	AGEH	38.018
AGRF	0.322	AGRH	0.327
CHINESEF	0.432	CHINESEH	0.432
DISTBANK	6.167	DISTFPLAN	1.048
DISTMARK	2.439	DISTSTOWN	5.019
DISTSCH	2.242	ELECT	0.648
EDUCF	3.978	EDUCH	6.040
FIRSTW	44.889	FIRSTWH	78.838
ILL	0.194	ILLH	0.147
INDIANF	0.132	INDIANH	0.142
INH	3.367	INHH	3.324
MONFOOD	0.540	MONFOODH	0.639
NP	0.272	NPH	0.063
OAHS	0.155	PCTSED	81.143
PROD	0.104	PRODH	0.141
PROF	0.046	PROFH	0.080
ROOMS	2.938	RURAL	0.547
RUBBER	0.025	RUBBERH	0.067
SELF	0.031	SELFH	0.078
SERVICE	0.200	SERVICEH	0.246
VALUE	9.873	VALUEH	9.873
YRSILL	1.247	YRSILLH	0.910

Footnotes to Chapter VII

[1]Enrollment rates at the primary school level have risen from 85% in 1970 to 96% in 1980 and the percentage of primary students proceeding to secondary school has risen from 43% in 1965 to 84% in 1980.

[2]Frequently, the household in which newlyweds choose to live immediately after marriage is that with the greatest wealth and the most living space. See, e.g., Swift (1965), Palmore, Klein and bin Marzuki (1970).

[3]In both cases, however, participants are allowed to borrow funds in advance of retirement to meet certain emergencies.

[4]See, for example, Haaga (1981) and Smith (1983).

[5]All too often such data is treated as confidential or personal property by the data collectors, thereby limiting the extent to which researchers can cross-check each other's results and take full advantage of the substantial data collection efforts that have been made.

[6]This is an enormous improvement over the ARIS data since in that survey it was not clear from which member(s) of the household the attitudes were taken.

[7]This information is especially important and relevant for Malaysia in view of the findings of Coombs and Fernandez (1978) suggesting that Malaysian husbands and wives quite frequently disagree on the desired number and sex of children and other matters. It also should allow us to test for the relative importance of such preferences on actual fertility.

[8]See especially DaVanzo and Butz (1981).

[9]Labor force participation decisions are, for reasons given in Chapter II above, assumed to be made at the household level.

[10]This assumption implies that there is separability with respect to the temporal arguments. Although common, the assumption is not very realistic since the utility of receiving a million dollars in the future would be likely to depend on the utility of the income received today. However, since the longer the time periods considered, the more realistic the assumption becomes, the fact that each of our periods is relatively long (half a human lifetime), makes the assumption not altogether inappropriate in this context.

[11]Lancaster, moreover, specified this function to be linear, a further restriction which is avoided here.

[12]Specifically, the utility function to be maximized is assumed to be concave, twice differentiable, and its domain must be strictly positive and the prices non-negative.

[13]This measure is available in MFLS only for the ever-married women. However, it is unlikely that their husband's responses would have differed from theirs.

[14]The reason why some effects could be positive is that there could exist some goal-gradient effects. Because the likelihood variables do not measure amount or relative importance of such support, there is no necessary reason for the likelihood of one such source to reduce that of another.

[15]The idea behind these identification conditions is easy to understand. The model described in (2) would be a usual simultaneous equation system if the Y_i^* variables were observed. It is not surprising then that the usual necessary and sufficient rank condition still applies. However, these continuous variables are latent and instead, discrete variables are observed, their discrete values corresponding to ranges of the continuous variables. The introduction of threshold values which are to be estimated increases the number of parameters and therefore, identification requires restrictions or normalization of these values and of some elements of the covariance matrix.

Chapter VIII

EMPIRICAL RESULTS AND THEIR INTERPRETATION FOR MALAYSIA

The purpose of this chapter is to present and interpret the empirical results obtained for all modules when the MFLS data described in the previous chapter are used. Whereas, in principle, the econometric specifications of the modules developed should be estimated simultaneously, in practice it would be virtually impossible to do so. This is primarily because of two considerations: (1) in view of the large number of variables which would be endogenous in the system as a whole, it would be extremely difficult to identify all the parameters of such models, and (2), because of the fact that different estimation procedures are involved in different modules, it would be impossible to employ a single procedure that would be appropriate for all modules. Even if it were possible to do so, the fact that simultaneous estimation would introduce the distinct possibility of very substantial specification error would make it undesirable to do. Hence, as was the case with the empirical estimation of the various modules for rural India reported in Chapter V above, each module is estimated separately, treating the variables that appear in a particular module but determined in other modules as predetermined in that particular module. We begin with the Household Structure Module in Section A and conclude with the Expectations Module in Section E.

A. Household Structure

The empirical results for the three measures of household structure, namely the logarithm of the probability of living in a nuclear

household, HOUST1, that of being the household head, HEAD, and the number of adults, ADULTS, are presented in Tables 8.1, 8.2 and 8.3, respectively. Coefficients whose values are significant at the 1 percent level are indicated by double asterisks and those that are significant at the 10 percent level by a single asterisk.

Since HOUST1 and HEAD are simple zero-one type dummy variables, the parameters of these estimating equations are estimated by Logit, a maximum likelihood logistic procedure wherein the predicted values of the dependent variables are constrained to take on the values zero or one. The ADULTS equation on the other hand is estimated by ordinary least squares (OLS).

As was the case for rural India given in Chapter V above, the results indicate that household structure is strongly influenced by position in the life cycle. This can be seen in the highly significant coefficients on the number of years married variable YEARSM in all three household structure equations and on its square YEARSMSQ in the HOUST1 and ADULTS equations. The results indicate that the logs of the probabilities of living in a nuclear household (HOUST1) or of being a household head (HEAD) increase with years married, but in the case of HOUST1 at a decreasing rate in all households. In both cases the steepness of these increases (or in the decreases in the degree of household extension) is somewhat sharper in cultivating households than in other households. Consistent with these results, the number of adults living in the household (ADULTS) decreases with YEARSM, but, in contrast to the case for HOUST1 and HEAD, does so more sharply in non-cultivating households than in cultivating households.

Table 8.1

Logit Estimates of HOUST1 Equation with MFLS Data

Right-Hand Side Variables	All Households Specification 1	All Households Specification 2	Non-Cultivating Households Specification 1	Non-Cultivating Households Specification 2	Cultivating Households Specification 1	Cultivating Households Specification 2
INTERCEPT	1.465**	0.693	1.669**	1.343*	1.257	-0.124
RURAL	-0.139	-0.263	-0.030	-0.113	-0.166	-0.215
ELECT	-0.463	-0.346	-0.594	-0.635	-0.297	-0.228
DISTBANK	-0.009	-0.010	-0.009	-0.011	-0.002	-0.013
CHINESE	-0.557**	-0.512**	-0.745**	-0.807**	-0.329	-0.377
INDIAN	-0.770**	-0.399	-0.816**	-0.613*	-1.452*	-0.592
MONFOODH	-0.490**	-0.478**	-0.454*	-0.461*	-0.601**	-0.541*
OAHS	-0.310	-0.253	-0.488*	-0.402*	0.149	0.198
YEARSM	0.134**	0.121**	0.130**	0.120**	0.149**	0.129*
YEARSMSQ	-0.003*	-0.003**	-0.004**	-0.003**	-0.003*	-0.004*
OWNCHILD	0.055	0.085*	0.099*	0.101*	0.018	0.129*
EDIND	0.278*	0.193*	0.220*	0.152	0.402	0.231
EDUCF	-0.003	0.000	-0.005	-0.003	-0.024	-0.013
EDUCOM	-0.088**	-0.087**	-0.052*	-0.056*	-0.162*	-0.140**
BLDG	-0.590*		-0.917*		-0.205	
VALUE	-0.022		-0.008		-0.026	
LAND					-0.006	
PPIH	-0.014	0.111	-0.095	0.007	0.165	0.125
BLDG·PPIH	0.004		0.094		-0.017	
VALUE·PPIH	0.007		0.004		0.006*	
LAND·PPIH					0.019	
BLDGCAP		2.697*		-1.011		7.141*
VALCAP		-0.072		-0.065		-0.196
LANDCAP						-0.207
BLDGCAP·PPIH		-0.603		0.453		-1.112
VALCAP·PPIH		0.028		0.010		0.070
LANDCAP·PPIH						0.058
N	879	879	569	569	310	310
Rank Correlation between Predicted Probability and Response	0.414	0.398	0.422	0.405	0.455	0.491

Notes: *indicates significant at 10 percent level.
**indicates significant at 1 percent level.
Specification 1 uses levels of wealth BLDG, VALUE and LAND.
Specification 2 uses per capita wealth BLDGCAP, VALCAP and LANDCAP.

Table 8.2

Logit Estimates of Equation for HEAD with MFLS Data

Right-Hand Side Variables	All Households Specification 1	All Households Specification 2	Non-Cultivating Households Specification 1	Non-Cultivating Households Specification 2	Cultivating Households Specification 1	Cultivating Households Specification 2
INTERCEPT	1.978**	1.160	2.734**	1.998*	1.345	2.900
RURAL	-0.306	-0.360	0.124	0.081	-1.837*	-1.898*
ELECT	0.278	0.472	-0.014	0.097	0.431	0.233
DISTBANK	0.011	0.008	0.006	0.003	0.027	-0.003
CHINESE	-0.905**	-0.865**	-1.239**	-1.238*	-1.227*	-1.471*
INDIAN	-1.552**	-1.082**	-1.676**	-1.365**	-4.447**	-1.697
MONFOODH	-0.050	-0.022	0.031	0.060	0.043	-0.173
OAHS	-0.006	-0.026	-0.141	-0.118	0.078	0.163
YEARSM	0.213**	0.194**	0.183*	0.172*	0.276**	0.212*
YEARSMSQ	-0.002	0.002	-0.001	-0.001	-0.003	-0.002
OWNCHILD	-0.040	0.002	-0.017	-0.005	-0.157	0.019
EDIND	-0.039	-0.160	-0.245	-0.291	0.317	-0.175
EDUCF	0.051	0.059	0.043	0.059	0.041	0.046
EDUCOM	-0.139**	-0.141**	-0.091	-0.096*	-0.264*	-0.245**
BLDG	0.107		-0.169*		1.653	
VALUE	-0.055*		-0.036		-0.020	
LAND					-0.284**	
PPIH	0.214*	0.314*	0.045	0.145	1.802	0.390
BLDG·PPIH	-.380		-0.347		-1.633	
VALUE·PPIH	0.023*		0.025*		0.016	
LAND·PPIH					0.121*	
BLDGCAP		5.949*		4.115		5.791
VALCAP		-0.204*		-0.101		0.173
LANDCAP						-1.646*
BLDGCAP·PPIH		-2.113*		-1.827		-0.884
VALCAP·PPIH		0.085*		0.072*		0.083
LANDCAP·PPIH						1.088*
N	879	879	569	569	310	310
Rank Correlation between Predicted Proability and Response	0.632	0.613	0.620	0.602	0.788	0.785

Notes: *indicates coefficients that are significant at the 10 percent level.
**indicates coefficients that are significant at the 1 percent level.
Specification 1 uses the levels of wealth variables.
Specification 2 uses the per capita wealth variables.

Table 8.3

OLS Estimates of Number of Adults (ADULTS) Equation with MFLS Data

Right-Hand Side Variables	Full Sample Specification 1	Full Sample Specification 2	Non-Cultivating Households Specification 1	Non-Cultivating Households Specification 2	Cultivating Households Specification 1	Cultivating Households Specification 2
INTERCEPT	1.855**	2.311**	1.895**	2.159**	1.813**	2.502**
RURAL	0.076	0.155	0.055	0.076	0.310	0.357
ELECT	0.540**	0.473**	0.607*	0.626*	0.405	0.385
DISTBANK	0.015*	0.015*	0.021*	0.020*	-0.002	0.006
CHINESE	0.426**	0.434**	0.469**	0.531**	-0.033	0.103
INDIAN	0.666**	0.450**	0.603**	0.490**	0.791*	0.266
MONFOODH	-0.055	-0.058	-0.130	-0.120	0.176	0.126
OAHS	0.168	0.132	0.176	0.139	0.124	0.128
YEARSM	-0.093**	-0.086**	-0.130**	-0.126**	-0.079**	-0.062*
YEARSMSQ	0.004**	0.004**	0.005**	0.006**	0.002**	0.003**
OWNCHILD	0.103**	0.084**	0.103**	0.101**	0.123**	0.045
EDIND	-0.150*	-0.101*	-0.153**	-0.109*	-0.214*	-0.108
EDUCF	-0.037*	-0.038*	-0.035	-0.039*	-0.029	-0.028
EDUCOM	0.141**	0.145**	0.131**	0.140**	0.142**	0.137**
BLDG	0.212		0.175		0.348	
VALUE	0.023		0.039**		0.025*	
LAND					-0.022	
PPIH	-0.117*	-0.197**	-0.080	-0.155*	-.130	-0.128
BLDG·PPIH	0.168		0.106		0.102	
VALUE·PPIH	-0.009*		-0.012*		-0.007*	
LAND·PPIH					0.003	
BLDGCAP		-1.888*		-1.061		-2.602*
VALCAP		0.024		0.026		0.080
LANDCAP						-0.170
BLDGCAP·PPIH		0.745		0.446		0.516
VALCAP·PPIH		-0.025		-0.020		-0.036*
LANDCAP·PPIH						0.014
N	879	879	569	569	310	310
R^2	0.324	0.307	0.340	0.318	0.365	0.352

Notes: See Tables 8.1 and 8.2.

As hypothesized, as shown in Table 8.1, the number of own children (OWNCHILD) increases the log of the probability of living in a nuclear household (HOUST1), especially in non-cultivating households. However, in the case of HEAD and ADULTS as shown in Table 8.2 and 8.3, the coefficients have the "wrong" signs and in the latter case they are statistically significant. This latter result, however, is probably tautological in the sense that the greater the number of own children, the greater would be the number of such children over 15 years of age who thereby qualify as adults. Hence, this latter result should be disregarded.

It was hypothesized that the higher the educational expectation of one's children (EDIND), the better would be their extrahousehold employment opportunities and hence the lower the likelihood of support from them during old age. As a result one would expect a positive relationship between EDIND and both HOUST1 and HEAD, and a negative one between EDIND and ADULTS. The results given in Tables 8.1 and 8.3 show that, at least for HOUST1 and ADULTS, such expectations are fulfilled. The reason why the expectation is not fulfilled for HEAD may have to do with a negative simultaneous equation bias arising from the fact that EDIND has been rising rapidly over time, meaning that it would be negatively related to age of the male, HEAD being defined as the oldest male.

Given that the sample of ever-married women surveyed is made up primarily of young women, on the basis of the considerations given in Chapters III and V above and for more or less the same reasons given for EDIND, one would expect EDUCF, as a proxy for education of the young couple, (since EDUCF is quite highly correlated with EDUCM) to raise HEAD and HOUST1 and to decrease ADULTS. On the other hand, education of

the oldest male should raise the value to adult children or other relative of living and working with him and hence should raise ADULTS but lower HEAD and HOUST1. As can be seen from Table 8.1-8.3, most of these expectations are fulfilled. Indeed, in the latter case, almost always the signs are correct and the coefficients statistically significant. In the former case the only exception is with respect to the influence of EDUCF on HEAD where the results are positive but insignificant. Since OAHS may be thought of as an expectation of future household extension and MONFOODH as a current practice consistent with the inducement of both current and future household extension, the variables OAHS and MONFOODH would be expected to be negatively related to HOUST1 and HEAD and positively related to ADULTS. The results indicate that OAHS does in fact reduce HOUST1 and HEAD, except in cultivating households, and raises ADULTS in all households.[1] MONFOODH reduces HOUST1 significantly but has no significant effect on HEAD or ADULTS.

By comparing the results of column 1 with column 2 for each sample in all three tables (Tables 8.1-8.3), one can see that the results are generally rather sensitive to the particular measure of wealth employed. Typically, when <u>levels</u> of the wealth variables, i.e., when BLDG, LAND and VALUE are used, the effects on HOUST1 and HEAD are negative and those on ADULTS are positive, implying that the degree of extension decreases with the level of wealth. On the other hand, when wealth is defined in <u>per capita</u> terms, HOUST1 and HEAD tend to be positively affected and ADULTS negatively affected by the wealth variables. Therefore, the results would seem to suggest that, when wealth is defined in terms of levels, as was suggested in earlier chapters (because of the effect of such wealth on potential inheritance and on the labor produc-

tivity of household members) increased wealth increases the incentives for different generations to live together. When defined in per capita terms however, the preferences for privacy seem to dominate over the aforementioned cohesive factors and the degree of extension is reduced. Since the strength of these different effects of wealth would be expected to vary from one form of wealth to another, the overall direction of the effects of wealth, no matter whether defined in terms of levels or per capita, could be expected to vary from one form of wealth to another. Notably the coefficients of LAND and LANDCAP are the most consistently negative in their effects on HOUST1 and HEAD. Since the binding effect of the inheritance motive would tend to be strong only with respect to intergenerational extension, it is not surprising to find somewhat more consistently positive effects of the levels of wealth variables on the degree of extension when the purer measure of intergenerational household extension HOUST1 is employed than when the measure of extension is ADULTS which includes also lateral forms of extension. There are, however, some notable exceptions to all these generalizations. Indeed, it must be emphasized that there are very few cases in which all forms of wealth have the same effects.

Of particular relevance to the present study are the coefficients of PPIH and of the wealth interaction terms involving PPIH. The results show that the coefficients of PPIH on HEAD are consistently positive and those on ADULTS consistently negative. The coefficients of PPIH in the HOUST1 equation are positive in four of the six cases, but significant in none. The results of the wealth-PPIH interaction terms are more mixed. In the case of HOUST1, six of the seven levels of wealth-PPIH interaction coefficients (one of which is significant at the .10 level) and five of the seven per capita wealth-PPIH interaction coefficients are

positive. In the case of HEAD only four of seven of the wealth-PPIH interaction coefficients are positive in both the level of wealth and per capita wealth cases, but in each case three of the four positive coefficients are statistically significant. In the case of the ADULTS equation given in Table 8.3, under both specifications only three of the seven interaction coefficients are negative. In the levels of wealth specification all three of the negative coefficients of the wealth-PPIH interaction terms are significant. In general, these results may be interpreted as indicating that an increase in expectations of old-age support from pensions, Provident Fund and insurance would tend to decrease the degree of household extension. The decrease in extension is more noticeable when the measure of household extension is limited to that of intergenerational extension. In wealthier households, however, there seem to be a number of other sometimes offsetting influences so that the overall effect on household structure is less clear-cut.

Next we turn to the variables serving as proxies for lack of access to financial markets and insurance and credit institutions, RURAL and DISTBANK. As hypothesized in previous chapters, higher values of RURAL and DISTBANK should increase the demand for household extension as a substitute mechanism for insurance and credit. The consistently negative coefficients of RURAL and DISTBANK in the HOUST1 equation and their consistently positive coefficients in the ADULTS equation provides substantial support for this hypothesized determinant of household structure. The effects of these variables in the HEAD eqaution are much weaker but this can in part be attributed to the aforementioned unfortunately <u>very</u> small variation in the variable HEAD itself. This factor

of course suggests that more attention should be paid to the results of Tables 8.1 and 8.3 than to Table 8.2.

One of the stronger and perhaps more surprising findings in the results of Tables 8.1 and 8.3 is with respect to the ELECT variable. Its effect on HOUST1 is consistently negative, and that on ADULTS consistently positive. In both cases the effects are somewhat stronger in non-cultivating households than in cultivating households. Various interpretations of these results may be suggested. One that relates particularly closely to the theoretical model developed in Chapter III above proceeds from the interpretation that electrification of the houses in the village (ELECT) would tend to augment the value of existing capital (especially non-agricultural capital) and hence raise the marginal productivity of labor. Greater emphasis on electrical machinery relative to crude forms of capital would also tend to raise the importance of proper maintenance and the potential costs of misuse of such capital by workers, and induce households to utilize more household labor as opposed to labor hired in the market in an effort to save on supervision costs.

Finally, note that, even after accounting for other exogenous influences, both the CHINESE and INDIAN dummy variables are consistently negative in the HOUST1 and HEAD equations and positive in the ADULTS equation. These results indicate clearly that the aforementioned greater propensities of Chinese and Indians to live in extended households stand up even after accounting for the influences of interethnic differences in educational levels, age, wealth and community characteristics.

B. The Marriage Module

As stressed in previous chapters, the Marriage Module is the main vehicle whereby parents can influence the fertility behavior of their

children. Since age-at-marriage is inversely related to the quantity of marriage services, the effects of various predetermined variables on age-at-marriage of the marriage partners can be interpreted in terms of factors which raise or lower the household's demand for marriage services, so as to relate directly to the way in which the theoretical model was posed. The quality of marriage services is measured in the empirical application of the model by the educational attainment levels of the respective marriage partners, i.e., EDUCF in the case of the female and EDUCH in the case of the male.

For convenience, however, we focus only on the age-at-marriage, variables i.e., AMM for the male and AMF for the female, and the educational variables, EDUCM and EDUCF, leaving it up to the interested reader to carry the interpretation of the results back to the quantity and quality of marriage services. Based on (a) the results of the tests for recursivity among the variables AMM, EDUCF and AMF in the application of the Marriage Module to the rural Indian data, and the plausibility of the assumptions, (b) that the educational attainment level of the son is determined prior to the marriage decisions, and (c) that AMM followed by EDUCF and finally AMF would be the sequence in which the marriage decisions would be made, we retain the same assumptions in applying the model to the Malaysian data.

We begin, therefore, with the regression results of the age-at-marriage of the male (AMM) equation in Table 8.4 and follow this with EDUCF in Table 8.5 and the AMF results in Table 8.6.

1. Age at Marriage of the Male (AMM)

First, consider the results in Table 8.4 concerning the effect of the personal characteristics of the husband such as his educational

Table 8.4

Empirical Estimation of Regression Coefficients in Age at Marriage of the Husband Equation (AMM)

Right-Hand Side Variables	All Households Specification 1	All Households Specification 2	Non-Cultivating Households Specification 1	Non-Cultivating Households Specification 2	Cultivating Households Specification 1	Cultivating Households Specification 2
INTERCEPT	15.714**	13.781**	14.751**	12.883**	15.994**	14.754**
Community Variables						
RURAL	-0.807*	-0.903*	-0.080	-0.251	-0.459	-0.467
ELECT	0.010	0.482	-0.327	0.123	-0.367	-0.204
DISTBANK	0.008	0.008	-0.005	-0.001	-0.022	-0.038
DISTSCH	0.179*	0.214**	0.016	0.076	0.378**	0.393**
PCTSED	0.006	0.008	0.014	0.015	-0.007	0.002
WAGEF	-0.003	-0.003	-0.003	-0.004*	-0.006	-0.005
WAGEM	0.001	0.001	0.001	0.001	0.004*	0.003
Household Variables						
CHINESE	2.257**	2.163**	2.715**	2.346**	1.071	1.091
INDIAN	0.650	0.924*	1.261*	1.357*	-1.699	-1.672
INHH	-0.154**	-0.165**	-0.195**	-0.204	-0.051	-0.083
WOMENP	1.745	-0.260	1.558*	0.131*	1.697	-2.761
HOUST1	0.148	-0.270	0.088	-0.225	0.061	-0.764
BLDG	-1.167*	2.341	-1.674*	-0.626	-0.410	3.965
ROOMS	0.267	3.764**	0.126	3.426**	0.691*	4.621**
VALUE	0.009	-0.172	0.074	0.142	-0.020	-0.195
LAND					-0.021	0.281
BLDG·PPIH	0.197	-0.271	0.252	0.234	0.173	0.536
ROOMS·PPIH	-0.045	-0.710	0.004	-0.582*	-0.256	-0.952
VALUE·PPIH	-0.003	0.039	-0.017	-0.014	-0.004	-0.019
LAND·PPIH					-0.011	-0.152
Individual Characteristics						
PPIH	0.246	0.608**	0.236	0.590*	0.793	0.736
IHHH	-0.335	-0.536	-0.544	-0.967	-0.280	0.030
AGEM	0.143**	0.160**	0.175**	0.193**	0.097**	0.120**
EDUCH	0.144**	0.115**	0.130*	0.095*	0.184*	0.171*
EDUCMM	0.157*	0.156*	0.154*	0.145*	0.148	0.153
EDUCMF	0.056	0.080	0.039	0.075	-0.062	-0.024
N	770	770	521	521	249	249
R^2	0.245	0.268	0.282	0.301	0.160	0.202

Notes: See Tables 8.1 ad 8.2.

attainment level, EDUCH, the education of his parents and his age. By referring to the row corresponding to EDUCH in Table 8.4, it can be seen that each year of educational attainment of the husband increases his age-at-marriage by more than 0.1 years, considerably more so among cultivating households than among non-cultivators. Higher levels of education of the husband's mother and especially father, EDUCMM and EDUCMF, respectively, also tend to raise AMM, though generally not as much. The significantly positive effect of AGEH on AMM is probably indicative of systematic recall error about age-at-marriage. Specifically, it would suggest that the older the current age of the husband, the more he would tend to underestimate the number of years since marriage and hence to overestimate AMM. The inclusion of AGEM can hence be interpreted as a procedure for controlling for systematic measurement error in AMM.

Next, let us consider the effects of household structure on AMM. Note that the index of household extension during his youth, IHHH, tends to lower AMM, at least in non-cultivating households. So too, does the degree of extension of the household at the time of marriage, INHH, especially in non-cultivating households. In contrast to the results for rural India (where the current classification of household structure HOUST1 was the only available measure of household extension), the coefficients of HOUST1 on AMM are no longer significant and even their signs vary from one case and specification to another. Another measure of household structure is WOMENP, the number of adult women relative to the population of the household. Although the coefficients are rather unstable between specifications and samples, note also that the ratio of the number of adult women to the total population of the household,

WOMENP, tends to raise AMM among non-cultivating households. This latter result corroborates the finding for rural India suggesting that, in a context in which wives marry into the son's household, a shortage of women in the household can motivate the household to have the son get married at a younger age. Not surprisingly, this effect does not arise among cultivating households since the vast majority of such are of Malay ethnicity and the pattern of a wife to marry into her husband's household is much less common among Malays.

Next, we consider the effects of the various kinds of wealth included in the empirical specification of the model. As was the case with respect to household structure, both the magnitude and direction of the influence of these variables could be expected to vary from one form of wealth to another. Not surprisingly, therefore, coefficients vary in magnitude and sign among the different wealth measures BLDG, ROOMS, VALUE and LAND. They also vary to some extent depending on whether the variables are measured in levels or in per capita terms. While there is still a tendency for the more agricultural-oriented wealth measures BLDG and LAND to reduce AMM, these results obtain only when wealth is measured in levels as in Specification 1. The effects of other wealth measures, however, especially ROOMS, and when measured in per capita terms, are positive rather than negative. The ROOMS measure is, moreover, a better measure than the others in that it is the only one which is measured at the time of marriage.

Next we turn to the variables involving the male index of old-age support from pensions, Provident Fund and insurance (PPIH). The PPIH-wealth interaction terms tend to partially offset the aforementioned direct effects of the different individual forms of wealth on AMM.

However, the coefficients are generally not significant. More consistent in sign, and significant in the case in which the per capita wealth specification is used, are the coefficients of the PPIH variable by itself. The results indicate that an increase in the PPIH index of one point (on a 5 point scale) tends to increase AMM by somewhere between a quarter year and three-quarters of a year.

As to other variables, the strongest such influences are the CHINESE and INDIAN dummy variables. The fact that these are significantly positive in both the total sample and in the non-cultivating household subsample indicates that in such cases, even after accounting for the many community, household and individual factors which as noted in the previous chapter vary among ethnic groups, age-at-marriage of the male is approximately one year higher for Indians and perhaps two years higher for Chinese than for Malays (the excluded reference group). Not surprisingly, as indicated by the negative coefficient of the RURAL dummy variable, AMM is also lower in rural households. As in the case of rural India, the proximity to school variable, as reflected in the significantly positive coefficient associated with its inverse measure, DISTSCH, has the effect of lowering AMM rather than raising it as might have been expected. As before, this effect is stronger among cultivating households than among non-cultivating households. Finally, and consistent with the dowry function hypothesis stated in Chapter III, the age-at-marriage of the male is lower, the higher is the female wage rate (WAGEF) relative to the male wage rate (WAGEM). This is because, according to the supply and demand analysis of Figure 3.1 above, the male would have to offer more marriage services (i.e., lower AMM) the higher is the price of wife services relative to that of husband services for any given AMF and dowry.

2. Educational Attainment of the Wife (EDUCF)

Next we turn to the regression results for educational attainment of the wife EDUCF given in Table 8.5. The fact that the coefficient on AMM is positive and significant, at least in the subsample of non-cultivating households, suggests that males who are older at marriage tend to be matched with more educated wives. Another significant determinant of EDUCF is EDUCH, indicating that more educated husbands also tend to be matched with more educated wives. This is consistent with both the dowry function in the marriage model and what is known as assortative mating by Becker (1981) and others. Not surprisingly, the educational attainment levels of the wife's parents also positively influence her own level of educational attainment.

The significantly positive coefficient on AGFF is somewhat more than counterbalanced by the significantly negative one on AGEM. The former can perhaps be interpreted as again reflecting systematic measurement error in the reporting of educational attainment, older women tending to overcount the number of years of education they have received. On the other hand, the negative coefficient on AGEM can perhaps be interpreted as a vintage effect, where ceteris paribus because of the rapid spread of education in the last several decades, older men tend to have less educated wives.

The results of Table 8.5 also reveal some significant effects of household structure on the educational attainment level of the wife. Of particular interest is a sharp difference in the direction of the influences of the various measures of household structure between cultvating and non-cultivating households. In the case of non-cultivating households, the higher the degree of extension of household in the wife's

Table 8.5

Estimates of Regression Coefficients of the Educational Attainment of the Wife (EDUCF) Equation

Right-Hand Side Variables	All Households Specification 1	All Households Specification 2	Non-Cultivating Households Specification 1	Non-Cultivating Households Specification 2	Cultivating Households Specification 1	Cultivating Households Specification 2
INTERCEPT	1.197	1.483	0.961	0.943	0.702	2.202
Community Variables						
RURAL	-0.234	-0.270	-0.167	-0.184	0.092	0.011
ELECT	0.545	0.405	0.618	0.384	0.712	0.921*
DISTBANK	-0.000	-0.001	-0.015	-0.020	0.022	0.030
DISTSCH	-0.018	-0.020	-0.036	-0.042	0.013	0.005
DCTSED	0.001	0.001	-0.012	-0.012	0.025*	0.024*
WAGEF	0.002*	0.002*	0.001	0.001	0.012*	0.011*
WAGEM	0.001*	0.001*	0.001*	0.001*	-0.001	-0.000
Household Variables						
CHINESE	-1.183**	-1.218**	-1.343**	-1.371**	-1.180**	-0.894*
INDIAN	-0.967**	-0.993**	-1.131	-1.150**	-1.030	-1.061
INHH	-0.015	-0.011	-0.011	-0.013	-0.010	0.015
WOMENP	1.250*	1.206	2.572**	2.497**	-0.942	-1.495
HOUST1	-0.124	-0.167	-0.192	-0.219	-0.170	-0.407
BLDG	-0.378	-2.921*	-0.676	-3.865	0.329	-0.743
ROOMS	-0.060	-0.443	-0.114	-0.377	0.146	-0.075
VALUE	-0.009	0.012	-0.002	0.015	0.002	-0.005
LAND					0.053	0.374
BLDG·PPIH	0.180	1.150*	0.243	1.296*	-0.000	0.558
ROOMS·PPIH	0.041	0.234	0.045	0.167	0.085	0.422
VALUE·PPIH	0.009	0.022	0.013	0.020	0.004	0.026
LAND·PPIH					-0.013	-0.104
PPIH	-0.029	-0.021	-0.075	0.028	0.072	0.042
Individual Variables						
IHH	0.104	0.092	0.351	0.392	-0.466	-0.708
AGEF	0.055*	0.057*	0.099*	0.103*	-0.058	-0.067
EDUCH	0.381**	0.379**	0.410**	0.411*	0.231**	0.232**
EDUCFM	0.102**	0.107	0.130**	0.139**	0.045	0.032
EDUCFF	0.133**	0.117**	0.144**	0.132*	-0.042	-0.013
AGEH	-0.170**	-0.172**	-0.206**	-0.208**	-0.073	-0.062
AMM	0.169**	0.168**	0.215**	0.213**	0.669	0.057
N	770	770	521	521	249	249
R^2	0.606	0.608	0.648	0.647	0.525	0.521

Notes: See Tables 8.1 and 8.2.

youth (IHH) and the higher current household extension (the lower HOUST1), the greater is EDUCF. The same also applies to the higher ratio of adult women in the household WOMENP. This result may be interpreted as indicating that the more women in the household, the more likely the importing household would want to substitute quality for quantity by selecting a wife with more education. On the other hand, in cultivating households just the opposite patterns emerge, i.e., EDUCF is negatively influenced by higher IHH and WOMENP. The latter result may be attributed to the domination of this sample by Malays, for whom household extension is less common and cultural patterns are quite different but whose wives are more educated.

Next, we turn to the wealth and old-age pension effects. Quite surprisingly the coefficients of most of the wealth variables tend to be negative though generally not significantly so. An exception, however, occurs with respect to the LAND variable (defined in terms of levels as in Specification 1). In these cases the coefficients are positive, but again not significant. Even though the PPIH coefficients are small, negative and insignificant, some of the wealth-PPIH interaction variables are positive and significant.

The INDIAN, and especially CHINESE, dummy variables are negative and significant, indicating that, even after accounting for all the other included factors which vary among ethnic groups, Indian and Chinese wives tend to be less educated than Malay wives. Finally, EDUCF tends to be higher <u>ceteris paribus</u> in communities with higher female wage rates, WAGEF, higher secondary school enrollment rates, PCTSED, (among cultivating households only) and greater electrification, ELECT.

3. Age-at-Marriage of the Female (AMF)

Last, but certainly not least in importance, are the empirical estimates of the regression coefficients of the age-at-marriage of the female (AMF) equation shown in Table 8.6.

First we consider the effects of individual characteristics on AMF. As would be predicted on the basis of the dowry function relationship articulated in Chapter III but also assortative mating, the results indicate that AMF is positively and significantly affected by AMM and EDUCF. The effect of female education in delaying age-at-marriage of the female, however, is much weaker, and not statistically significant, in the case of cultivating households. Educational attainment of the husband and of the wife's father, EDUCH and EDUCFM, respectively, both have small but generally significant positive influences on AMF, though in the latter case not among cultivating households. The latter effect is no doubt partly explained by the extremely low and rather invariant educational attainment levels of parents of adults in cultivating households. One should consider that these effects on AMF are direct effects over and above the indirect positive effects of these variables that operate through their effects on EDUCF and the effect of EDUCF on AMF. The positive coefficient on AGEF probably reflects the same kind of measurement error bias due to improper recall as was mentioned above with respect to the effect of AGEM on AMM. Older women tend to overestimate age-at-marriage AMF.

Next turn to the household structure effects on AMF. Both the degree of household extension of the husband's household at the time of marriage (INHH) and that at the current time (the inverse of HOUST1) are positively related to AMF, in the former case more so among cultivating

Table 8.6

Estimates of the Regression Coefficients in the AMF Equation for Malaysia

Right-Hand Side Variables	All Households Specification 1	All Households Specification 2	Non-Cultivating Households Specification 1	Non-Cultivating Households Specification 2	Cultivating Households Specification 1	Cultivating Households Specification 2
INTERCEPT	5.217**	4.721**	5.533**	5.703**	5.375*	2.700
Community Variables						
RURAL	-0.235	-0.261	-0.160	-0.175	0.448	0.642
ELECT	-0.249	-0.002	-0.565	-0.298	0.251	0.182
DISTBANK	0.030*	0.030*	0.007	0.013	0.052	0.036
DISTSCH	-0.042	-0.027	-0.086	-0.071	0.006	0.032
PCTSED	0.007	0.008	0.009	0.009	-0.005	0.002
WAGEF	0.001	0.001	-0.001	-0.001	0.001	0.001
WAGEM	0.000	0.000	0.000	0.000	0.002	0.002
Household Variables						
CHINESE	1.440**	1.552**	1.812**	1.861**	1.231*	1.122*
INDIAN	-0.386	-0.230	-0.043	0.045	-0.896	-0.935
INHH	0.020	0.018	0.002	0.007	0.115*	0.078
HOUST1	-0.260	-0.547*	-0.315	-0.585*	0.033	-0.249
BLDG	0.109	4.639**	0.799	5.982*	-1.732*	-2.038*
ROOMS	0.186	1.720*	0.256	1.400*	0.142	2.789*
VALUE	-0.049	-0.278*	-0.074*	-0.352*	-0.019	-0.136
LAND					-0.039	-0.314
BLDG·PPIH	0.011	-0.733	-0.172	-1.019	0.585*	-0.007
ROOMS·PPIH	-0.024	-0.247	-0.039	-0.014	-0.120	-0.935
VALUE·PPIH	0.011*	0.053*	0.017*	0.072*	0.001	0.018
LAND·PPIH					0.007	0.070
Individual Characteristics						
PPIH	0.155	0.350*	0.329	0.347*	-0.028	0.547*
IHH	-0.466	-0.481	-0.801*	-0.861*	0.168	0.458
AGEF	0.038**	0.049**	0.037*	0.048**	0.032	0.040
EDUCH	0.081*	0.069*	0.059	0.045	0.103	0.107
EDUCFM	0.058	0.058*	0.104*	0.101*	-0.095	-0.069
EDUCFF	0.007	-0.010	-0.025	-0.037	0.011	-0.052
LF	1.146**	1.097**	1.058*	1.026	1.211**	1.175**
AMM	0.327**	0.315**	0.315**	0.300**	0.346**	0.334**
EDUCF	0.235**	0.231**	0.267**	0.261**	0.110	0.093
N	770	770	521	521	249	249
R^2	0.546	0.560	0.567	0.576	0.468	0.475

Note: See Tables 8.1 and 8.2

households than among non-cultivating households, and in the latter case vice versa. The index of household extension in youth (the household of origin of the wife), IHH, on the other hand, tends to lower AMF quite significantly, at least in the case of non-cultivating households. These results suggest that, in the Malaysian context at least, the more extended the existing household, the lower is the marginal utility of wife services, and hence the greater AMF tends to be. By the same token, however, greater extension of the household of origin would tend to reduce the marginal utility of daughter-services; hence, IHH lowers AMF.

Of the various wealth measures, as mentioned above only ROOMS is a measure of wealth at the time of marriage. As such it is probably the most relevant as far as the determination of AMF is concerned, though LAND may also be quite relevant in as much as it may not have changed a great deal. It should also be considered that the different wealth variables measure quite different things as far as marriage age is concerned. ROOMS and BLDG relate more directly to housing space, while LAND and BLDG in the case of cultivating households would relate primarily to agricultural assets, and are assets that would tend to be conducive to greater use of labor, thereby making marriage services more valuable. VALUE, on the other hand, is the only wealth measure that would include financial and other more mobile forms of capital. In the light of the fact that the different wealth measures capture very different aspects or influences of wealth, the fact that the direction of the effects differ from one measure to another and one sample to another should not be surprising. Of particular interest is that the more agriculturally oriented measures LAND and BLDG have negative influences

on AMF among cultivating households. On the other hand, among non-cultivating households ROOMS and BLDG tend to raise AMF, and VALUE tends to reduce it.

Notably, the expectations by the husband of old-age support from pensions, Provident Fund and insurance, PPIH, has a significantly positive influence on AMF, even after accounting for the indirect positive influence of PPIH via its influences on AMM and EDUCF. Several of the PPIH-wealth interaction terms are negative but in no cases significantly so. In the case of the VALUE-PPIH interaction terms, the coefficients are significantly positive in the case of non-cultivating households.

While few of the community characteristic variables have significant effects on AMF, the CHINESE dummy variable is significantly positive, indicating that, as in the case of males, Chinese tend to get married almost two years later than Malays or Indians.

C. The Fertility Module

The purpose of this section is to report and analyse the results of the Fertility Module as estimated with MFLS data. As pointed out in the previous chapter, in the case of the empirical application to Malaysia, we conceive of the fertility or child services module as having two components: the quantity of child services -- defined in terms of the number of surviving children -- and the quality of child services.

Quantity is measured alternatively as the number of surviving children, (OWNCHILD), or as the ratio of the actual number of surviving children to the potential number of children or "natural fertility", given age-at-marriage, and duration of marriage, and age-specific estimates of natural fertility. The latter are obtained from two different

sources, i.e., from Coale and Trussell (1974) and from Potter, Wyon, Parker and Gordon (1965). Both the ratio of actual to natural fertility as calculated from the Coale and Trussell schedule (FERT1) and that calculated from the Potter, Wyon, Parker and Gordon schedule (FERT2) have been used as dependent variables. However, since the results with FERT1 and FERT2 turned out to be very similar one to another, for the quantity of child services we present results only for OWNCHILD and FERT2. The FERT2 results are presented in preference to those of FERT1 since it is the FERT2 measure which is directly comparable to the results for FERT reported in Chapter V above for rural India since FERT was based on the same natural fertility schedules.

For the quality of child services we use the educational attainment expectations index EDIND defined in Table 7.5 above. Since we conceive of parental expectations of educational attainment of their children being formed immediately after expectations with respect to various sources of old-age support and the desired number of children (the variables determined in the Expectations Module discussed in Section E below), we begin our discussion of the empirical results with EDIND.

Since in the EDIND and fertility regressions, the results were much less sensitive to whether or not the wealth variables were defined in terms of levels (as in Specification 1) or in per-capita terms (as in Specification 2), to save space we present the results only for Specification 2.

1. Expectations of Children's Educational Attainment (EDIND)

The equation for EDIND is assumed to be a reduced form equation, i.e., with NSTAR and NSTARH and others of the right-hand side variables

that happen to be determined in other modules of our modelling system treated as predetermined as far as the formation of EDIND is concerned. Once EDIND is determined, we then treat it as predetermined in the fertility equations OWNCHILD and FERT. Since EDIND is a continuous variable, for simplicity and convenience it is estimated via ordinary least squares.

The results for EDIND are presented in Table 8.7, for all households, and for each of the three major ethnic groups separately. The results for the Indian subsample can perhaps be ignored since (in part because of the small sample) none of the coefficients are statistically significant.

One of the more striking features of these results is the sizeable difference between Malays and Chinese. This can be seen in several ways. First, it can be seen in the significant dummy variables for CHINESE (and INDIAN) in the full sample i.e., the "All Households" column in the table, and the significant difference in the values of the intercepts in the Malay and Chinese subsamples. These results show that the tendency noted in Chapter 7, i.e., for Malays to have higher expectations with respect to their children's education than Chinese or Indians, holds even after accounting for the effects of intergroup differences in age, education, wealth, household structure and community characteristics. Even more importantly, however, are the differences between Chinese and Malays with respect to several important regression coefficients. The levels of educational attainment of parents EDUCF (for the wife-mother) and EDUCH (for the husband-father) have significantly positive effects on EDIND only for Chinese. Similarly, the effects of both the expectations of old-age support from pensions,

Table 8.7

Estimates of Regression Coefficients in the Equation for the Expectations of Education Index (EDIND) with MFLS Data

	All Households	Malays	Chinese	Indians
Community Variables				
INTERCEPT	1.168**	1.756**	0.373	2.009*
RURAL	0.037	0.098	0.040	0.136
ELECT	-0.037	-0.165	-0.007	0.414
DISTBANK	-0.003	-0.017*	0.003	-0.012
DISTFPLAN	0.017	0.044	-0.033	-0.083
DISTSCH	-0.014	-0.024	-0.002	0.019
DISTSTOWN	0.003	0.007	0.007	-0.016
PCTSED	0.003	-0.000	0.004	0.008
WAGEF	0.000		-0.000	0.001
WAGEH	0.001		0.001	-0.001
Household Variables				
CHINESE	-0.155*	--	--	--
INDIAN	-0.242**	--	--	--
INHH	-0.006	-0.015	0.006	-0.021
HOUST1	0.050	0.003	0.096*	0.174
RELIOMAR	0.314*	0.355	0.126	1.070
BLDGCAP	-1.011*	-1.444*	0.959	-5.866
VALCAP	0.030	0.051	-0.012	0.194
LANDCAP	0.025	-0.034	0.021	-1.017
BLDGCAP·PPI	0.373**	0.307*	-0.321	2.807
VALCAP·PPI	-0.006	-0.017	0.006	-0.056
LANDCAP·PPI	-0.013	0.045	-0.013	0.278
Individual Variables				
PPI	0.019	0.025	0.072*	0.004
YEARSM	0.084**	0.105**	0.060**	0.041
YEARSMSQ	-0.002**	-0.002**	-0.001**	-0.001
AGEF	-0.020*	-0.030	-0.006	-0.032
AGEH	0.003	0.008	-0.002	0.007
EDUCF	0.028**	-0.001	0.044**	0.041
EDUCH	0.024**	0.019	0.029**	0.006
F2	-0.018	-0.058	0.020	-0.059
NSTAR	0.027*	0.028	0.029	-0.051
NSTARH	-0.008	-0.008	-0.012	-0.027
LF	-0.015	-0.002	-0.007	-0.039
LF1	-0.039	-0.119	0.047	-0.099
N	874	426	332	116
R^2	0.195	0.217	0.232	0.427

Notes: For definitions of variables see Table 7.5 above.
*indicates coefficients that are significant at the 10 percent level.
**indicates coefficients that are significant at the 1 percent level.

Provident Fund and insurance, PPI, and nuclear household structure on EDIND, are positive only for Chinese. Likewise, the effect of the per capita wealth variable BLDGCAP is negative only in the case of Malays and perhaps Indians but positive for Chinese. Conversely, the BLDGCAP-PPI interaction term raises EDIND in Malay and Indian households but lowers it in Chinese households.

While the overall explanatory power of the EDIND regression equations is low and the results quite unstable from sample to sample, of greatest relevance to the old-age security focus of this study are the positive effects of both the wife's desired fertility NSTAR on EDIND among both Malays and Chinese and of PPI and its interactions with BLDGCAP. These results tend to support the conjecture stated in Section D of Chapter II that the introduction of an old-age pension system might raise expectations (desires) with respect to children's education.

2. The Number of Surviving Children (OWNCHILD)

The OLS estimates of the OWNCHILD equation are presented in Table 8.8. Once again, they are presented for all women, and then separately for Malays, Chinese and Indians. By and large, the explanatory power of these regression equations is quite good.

With respect to the full sample, the importance of the following variables stand out: the community characteristics - RURAL, DISTSTOWN; the wealth variables - BLDGCAP and VALCAP; and also, PPI, YEARSM and YEARSMSQ, AGEF, EDUCF, F2, NSTAR and EDIND. Not surprisingly, the strongest of all determinants are the life cycle variables years married (YEARSM, YEARSMSQ) and the wife's age, AGEF. As expected, the older the woman is, and the more years she has been married, the more surviving children she is likely to have at the time of the survey.

The positive coefficient on the RURAL dummy variable indicates that the number of surviving children is higher for all women living in rural areas. On the other hand, as indicated by the negative one on DISTSTOWN, the further the woman's residence from a community at least as large as a small town, the lower the number of surviving children she is likely to have. This suggests that women living in the more remote rural areas are not likely to have as high fertility as those relatively close to towns or cities and hence to active labor markets. While this could be explained in a number of ways, one possible explanation relates to the old-age security theme. Women in remote rural areas for lack of local opportunities for employment especially in the modern sector, might expect their children to migrate to cities and hence be less reliable sources of old-age support than in the case of women living in rural areas but near towns and employment opportunities who could expect their children to stay nearby and hence to be more reliable sources of support later on in life.

In contrast to the results for rural India, the different forms of wealth both expressed in levels (not shown) and in per capita terms (as shown) all have negative influences on OWNCHILD. This difference may be explained in terms of the different degrees of development of financial and capital markets and different degrees of ability to convert accumulations of wealth into old-age support. In rural India where capital markets are very underdeveloped such possibilities for converting wealth accumulations directly into old-age support are rather remote. Increased wealth via the inheritance motive, therefore, increases the woman's ability to count on the reliability of her children and also enhances her ability to produce surviving children, thereby increasing

OWNCHILD. On the other hand, in Malaysia, where wealth can more easily and efficiently be converted directly to old-age support, increased wealth may substitute for children in the satisfaction of the old-age security motive.

Human capital endowment, at least as represented by the educational attainment of the wife EDUCF, also has a significantly negative effect on OWNCHILD. This indicates that the fertility-reducing effects of such education on tastes for children and the shadow price of the wife's time, more than compensate for the expected positive effect of wife's education on the survival prospects of children, and hence on the demand for surviving children as a result of the reduction in the price (cost) of surviving children.

In contrast to the expectations of the aforementioned well-known quantity-quality substitution model of Becker and Lewis (1973), the results indicate that the educational attainment index EDIND has a significantly <u>positive</u> effect on OWNCHILD. A possible explanation for this, that is also consistent with the theoretical model of fertility presented in Chapter III, is that, from the wife-mother's perspective, the provision of educational services to her children increases the value of any quantity that she "produces". Hence, the higher is EDIND, the higher are the benefits to the wife of having a given quantity of children.

Another result that flies in the face of much conventional wisdom is that with respect to the effect of female labor force participation after marriage (LF1). Notably, LF1 does not significantly reduce fertility. Pre-marital labor force participation of the wife (LF) even has a positive (though weak) effect on fertility. These results would seem

to indicate that, in the Malaysian context at least, female labor force participation on balance has little net effect on fertility. This is not to say that it may not have important effects on child-spacing. In general, however, it would seem either that number of children is not time-intensive in the developing country context, as for example Caldwell (1982) has argued, or that working women can either get enough help from relatives and friends in child care so as to substitute for their own time in child care, or while reducing the time available for child care, compensate for this by the extra income they earn part of which can be used to increase the use of market goods as substitutes for the time of household members in child care. The extra income earned may also increase both the wife's and the household's demand for (and supply of) surviving children.

Central to the main theme of the study is, of course, the significantly negative effect of PPI on OWNCHILD. According to the result for this coefficient alone, an increase in the PPI index from 1 "very <u>un</u>likely" to 5 "very likely" would decrease the number of surviving children by approximately 0.75. In wealthy households, however, the positive effects of the wealth-PPI interaction terms would tend to offset or at least to mitigate this influence.

Three other aspects of these results shown in Table 8.8 are worthy of note:

(a) the differences in the values of the coefficients of the dummy variable for the first two children being female (F2) across the different samples.

It will be recalled from the previous chapter that the sex preference in favor of males was said to be much weaker among Malays than among Chinese or Indians. We also noted that the probability of F2 was

Table 8.8

Regression Coefficients for Number of Surviving Children (OWNCHILD) with MFLS Data

	All Women	Malays	Chinese	Indians
Community Variables				
INTERCEPT	0.378	-0.721	1.578	0.478
RURAL	0.671**	0.927**	0.429	1.352
ELECT	0.076	-0.150	-0.285	-3.375*
DISTBANK	0.000	0.012	-0.016	-0.191*
DISTFPLAN	-0.035	0.027	0.191	0.038
DISTSCH	-0.015	0.040	-0.057	-0.176
DISTSTOWN	-0.042**	-0.028*	-0.037*	-0.013
PCTSED	-0.002	0.009	-0.010	0.010
WAGEF	-0.003	-0.002	-0.002*	-0.002
WAGEM	0.000	0.003*	0.000	0.001
Household Variables				
CHINESE	0.206	--	--	--
INDIAN	0.291	--	--	--
INHH	-0.013	-0.035	-0.018	0.077
HOUST1	0.097	0.267	0.067	0.274
RELIOMAR	0.468	0.841	0.383	-0.922*
BLDGCAP	-7.401**	-9.889**	-2.596	-12.137
VALCAP	-0.103*	-0.160*	-0.201*	0.942
LANDCAP	-0.053	-0.311	-0.045	4.087
BLDGCAP·PPI	1.008*	1.112	0.193	1.691
VALCAP·PPI	0.028	0.061	0.049*	-0.243
LANDCAP·PPI	0.022	0.017	0.016	-1.349
PPI	-0.184**	-0.377**	-0.161	0.415
Individual Variables				
YEARSM	0.253**	0.138**	0.307**	0.441**
YEARSMSQ	-0.003**	-0.001	-0.003**	-0.009**
AGE	0.051**	0.062*	0.067*	0.013
AGEH	-0.016	0.003	-0.084**	0.017
EDUCF	-0.082**	-0.093*	-0.072*	-0.002
EDUCH	-0.000	0.003	0.027	-0.067
F2	0.320*	0.014	0.508*	0.839
NSTAR	0.102**	0.074*	0.202**	0.116
NSTARH	0.052	0.000	0.163**	0.103
LF	0.036	0.038	0.053	-0.059
LF1	-0.023	-0.102	0.080	0.257
EDIND	0.316**	0.544**	0.270*	-0.404*
N	874	426	332	116
R^2	0.584	0.593	0.711	0.620

Notes: See Table 8.7

abnormally low among both Chinese and Indians (but not among Malays), a painfully tell-tale sign or a strong preference for males in nutrition and survival of infancy and childhood. As a result, one would expect a less positive influence of F2 among Malays than among Chinese or Indians. This is, indeed, precisely what the results show.

(b) the coefficients of NSTAR and NSTARH.

As noted in Chapter III and motivated by the findings of the descriptive literature reviewed in Chapter II, the somewhat unorthodox aspect of our theoretical model of the relationship between old-age security and fertility is that the woman is given a crucial role in this relationship. Much support from other studies for such an innovation has been given. Additional evidence from the Malaysian sample itself is, moreover, close at hand. Indeed, the fact that the coefficient of the wife's desires for fertility, NSTAR, is larger and more significant than that of the husband, NSTARH, is one important piece of evidence in support of this view. Others are that the influence of wife's expectations about old-age support from pensions, Provident Fund and insurance, PPI, is considerably stronger and more negative than that of PPIH which was experimented with in another regression run (not shown because it was similar in other respects).

(c) inter-ethnic group differences.

By comparing the results given for the different ethnic group samples, one can again see numerous aspects of behavioral differences. The coefficients with respect to YEARSM, RURAL, DISTBANK, BLDGCAP, VALCAP, PPI, AGEH, NSTAR, NSTARH, LF1, EDIND and as mentioned above, F2, are all quite different from one ethnic sample to another.

3. Actual Fertility Relative to Natural Fertility (FERT2)

The results for FERT2 are given in Table 8.9. Although FERT2 is a very different measure of fertility behavior than OWNCHILD, the results are in many ways similar. For example, the coefficients of RURAL are again positive and significant and those of DISTSTOWN significantly negative. So, too, the coefficients of WAGEM, AGE, F2, NSTAR, LF and EDIND tend to be positive and those of WAGEF, BLDGCAP, PPI and AGEH negative.

There are, however, some important differences. The most important differences are those with respect to YEARSM which are now negative instead of positive, thereby indicating that, when measured relative to natural fertility, the fertility rate declines with years of marriage. Once again, even after accounting for all sorts of differences in characteristics from one ethnic group to another, the inter-ethnic group differences in fertility turn out to be quite sizeable.

D. Female Labor Force Participation

As mentioned above, the only component of Module D, The Resource Allocation Module, that is both relevant to the present study and operationally feasible with the MFLS data is female labor force participation. As mentioned in the previous chapter, two measures of female labor force participation have been constructed: one prior to marriage (LF) and one subsequent to marriage (LF1).

The purpose of the present section is to explain variations across households in LF1, given LF, ages-at-marriage of both marriage partners, various expectational measures, wealth, position in the life cycle, and various other individual, household and community characteristics. It is to be recalled that female labor force participation decisions are

Table 8.9

Regression Results for Actual Fertility
Relative to Natural Fertility (FERT2) with MFLS Data

	All Women	Malays	Chinese	Indians
Community Variables				
INTERCEPT	1.137**	1.012**	1.262	1.043*
RURAL	0.099**	0.074	0.117*	0.200
ELECT	0.001	-0.033	-0.084	-0.180
DISTBANK	-0.000	-0.001	-0.004	-0.009
DISTFPLAN	-0.000	0.002	0.039	-0.003
DISTSCH	-0.002	0.009	-0.018	-0.010
DISTSTOWN	-0.007**	-0.005*	-0.009*	-0.012
PCTSED	0.000	0.002*	-0.002	0.007
WAGEF	-0.001*	-0.001	-0.001	-0.001
WAGEM	0.001*	0.001	0.001*	0.001
Household Variables				
CHINESE	0.147**	--	--	--
INDIAN	0.072*	--	--	--
INHH	-0.006*	-0.004	-0.009	0.000
HOUST1	-0.001	0.001	-0.002	0.077
RELIOMAR	0.132	0.146	0.107	-0.077
BLDGCAP	-1.441**	-1.367**	-0.909	-3.596*
VALCAP	0.014	-0.000	-0.000	0.259*
LANDCAP	-0.010	-0.015	-0.010	1.561
BLDGCAP·PPI	0.286*	0.123	0.248	0.934
VALCAP·PPI	-0.007*	-0.003	-0.004	-0.074*
LANDCAP·PPI	0.000	-0.010	0.001	-0.471
Individual Variables				
PPI	-0.012*	-0.018*	-0.027*	0.030
YEARSM	-0.055**	-0.041**	-0.087**	-0.038*
YEARSMSQ	0.001*	0.001**	0.002**	0.001
AGE	0.006*	0.001	0.020**	0.001
AGEM	-0.008**	-0.004	-0.013**	-0.003
EDUCF	-0.003	0.000	-0.011*	0.013
EDUCM	-0.008**	0.001	-0.010*	-0.022
F2	0.078**	0.031	0.096*	0.135*
NSTAR	0.015**	0.006*	0.050**	0.036
NSTARH	0.014**	0.006*	0.033**	0.015
LF	0.033**	0.048*	0.026	0.039
LF1	-0.001	-0.036*	0.038	0.023
EDIND	0.056**	0.056**	0.077*	-0.007
N	874	426	332	116
R^2	0.389	0.374	0.425	0.415

Notes: See Table 8.7

considered to be decisions made by the household as a whole or by the household head on behalf of the household. Hence, the female labor force participation decision is not treated as determined simultaneously with fertility.

OLS estimates of LF1 for all households and then separately for nuclear and extended households are presented in Table 8.10. While the explanatory power (measured by the value of R^2) is relatively low in all equations and relatively few coefficients are statistically significant, the results are not without interest and relevance.

First, note that pre-marital labor force experience (LF) has a rather strong positive influence on post-marital labor force experience (LF1) and that this influence is stronger in extended households than in nuclear ones. Second, note that, even after accounting for the influence of LF on LF1, age-at-marriage of the female (AMF) also positively affects LF1. With the influence of AMF positive but that of AMM weakly negative, it is clear that the farther apart the ages of the marriage partners (the higher AMM and lower AMF), the lower would be the labor force participation of the wife during marriage.

Third, education of the wife has little influence on LF1 although this may be due to a cancelling out of differences in effects in different types of households, e.g., the effect being somewhat positive in extended households and somewhat negative in nuclear households. The results also indicate that education of the husband and of the parents of both husband and wife have little effect on LF1.

Fourth, consistent with the stylized facts on female labor force participation in developing countries,[2] LF1 is higher in agricultural

Table 8.10

OLS Estimates of the Equation for the Average Labor Force Participation of Married Women with MFLS Data

Right Hand Variables	All Households	Nuclear Households	Extended Households
INTERCEPT	0.999*	1.046**	1.191*
RURAL	0.030	0.115	-0.086
ELECT	-0.316**	-0.235*	-0.492*
DISTBANK	-0.007	-0.010	-0.001
DISTMEDIC	-0.017*	-0.015	-0.019
DISTSCH	0.037**	0.035*	0.036
DISTSTOWN	0.016**	0.017**	0.013
PCTSED	-0.001	-0.000	-0.002
CHINESE	0.078	0.074	0.167
INDIAN	0.317**	0.361**	0.269
AGEOM	0.002	0.011	-0.002
YEARSM	0.014	-0.002	0.027
YEARSMSQ	-0.000	-0.000	-0.000
RELIOMAR	-0.276*	-0.464*	0.269
RELIONOW	-0.035	--	-0.309
AGR	0.242	0.267**	0.282*
BLDG	0.190	0.289*	-0.240
ROOMS	-0.062*	-0.037	-0.112*
VALUE	-0.000	-0.008	0.003
LAND	-0.013	-0.012	-0.014
BLDG·PPI	-0.069*	-0.107*	0.065
ROOMS·PPI	0.01*	0.009	0.011
VALUE·PPI	-0.000	0.001	-0.002
LAND·PPI	0.000	-0.002	0.001
PPIH	0.033*	0.010	-0.110
PRSH	0.004	-0.006	0.020
CHILDH	0.030	0.038	0.009
MONFOODH	0.029	0.028	0.012
OAHS	0.058	0.034	0.063
AMF	0.023**	0.018*	0.030*
AMM	-0.007	-0.015	-0.002
EDUCF	-0.004	-0.018	0.015
EDUCH	0.009	-0.010	0.030*
EDUCMM	0.014	0.020	0.015
EDUCMF	0.000	0.006	0.001
EDUCFM	-0.013	-0.012	-0.011
EDUCFF	0.008	0.015	-0.002
LF	0.162**	0.114**	0.222**
N	947	636	311
R^2	0.185	0.206	0.246

Notes: For definitions of variables, see Table 7.9.
* indicates coefficients that are significant at the 10 percent level.
** indicates coefficients that are significant at the 1 percent level.

households (i.e., the coefficient of AGR is positive) and is negatively affected by ROOMS which, because it is measured at the time of marriage, is perhaps the best single measure of wealth. On the other hand, the number of buildings (primarily important among agriculturalists), BLDG, has a positive effect on LF1.

Fifth, consistent with the higher LF1 among agricultural households, community characteristics like less electrification, less proximity to secondary schools and to towns and hence labor markets tend to be associated with greater labor productivity.

Sixth, women living at the time of marriage in households possessing more relatives less than ten years of age (higher REL10MAR) have lower labor force participation, presumably because they are more needed for child care activities. Even after accounting for the various differences in the many personal, household and community characteristics among different ethnic groups, as demonstrated by the coefficient of INDIAN, Indian women have significantly higher labor force participation rates than either Chinese or Malays.

Finally, in the sample as a whole at least, a higher index of expectations of old-age support from pensions, Provident Fund and insurance by the husband, PPIH, tends to raise LF1. For households which own buildings, however, this effect is more than offset by the negative effect of BLDGPPI on LF1.

E. The Expectations Module

The results of the estimation of this module will be presented one equation at a time, starting with the determination of the expectations on the likelihood of support from pensions and Provident Fund of the

wife and husband, PP and PPH, respectively.[3] In the recursive system that has been specified, this equation has only exogenous independent variables. The estimated value of this dependent variable is in turn a right-hand-side variable in the subsequent equations. The results of these equations are discussed in order, starting with those with least interdependence and concluding with those with the greatest interdependence, namely the desired number of children (NSTAR and NSTARH). In all cases the significance of the coefficients is based on the asymptotic standard error.

1. Expectations on the Likelihood of Support from Pensions and Provident Fund (PP and PPH)

In the equations for PP and PPH, the dependent variables are discrete variables indicating the relevant respondent's subjective probability of getting support from pension and Provident Fund systems. As was explained previously, these discrete variables represent ranges of values of latent continuous dependent variables which may be interpreted as the propensity to expect support from these sources.

In the results for the equation for such expectations on the part of the women respondents, PP, shown in Table 8.11, when the effects of individual characteristics are examined, the differences among ethnic groups are obvious. Even after accounting for the various other factors which may vary among ethnic groups, Indians tend to be significantly more certain of receiving support from pension and the Provident Fund than Malays and Chinese. This result was pretty much expected since Indians work in greater proportions as professionals and workers in rubber plantations, the two occupations with the most developed pension

Table 8.11

Empirical Estimates of the Equation for Expectations of the Likelihood of Old-Age Support from Pensions and Provident Fund of Women (PP) and Men (PPH)

Right Hand Side Variable	Parameter Values	
	PP	PPH
INTERCEPT	0.178	0.583*
EDUCF	0.036**	0.044**
FIRSTWW(H)	0.204	0.700*
RURAL	-0.031	-0.318**
ELECT	0.759**	0.984**
CHINESE	-0.148	-0.671**
INDIAN	0.886**	0.531**
AGRF	0.337	0.140
AGRH	0.562**	0.500*
NPF	0.352*	0.329
NPH	0.776**	0.634*
PRODF	0.323	0.197
PRODH	0.836**	0.661**
PROFF	0.705*	0.596*
PROFH	1.300**	0.947**
RUBBERF	0.935**	0.679*
RUBBERH	1.066**	0.969**
SERVICEF	0.288	0.129
SERVICEH	0.848**	0.765**
TAU1	1.764**	1.567**
TAU2	2.056**	1.789**
TAU3	3.012**	2.871**
TAU4	3.491**	3.212**
Sample Size	845	790
Log Likelihood	-1157.486	-1057.211

Notes: For definitions of variables see Table 7.

* indicates coefficients that are significant at the 10 percent level.

** indicates coefficients that are significant at the 1 percent level.

The TAUs are the threshold values separating the ranges of values of the dependent variable, which corresponds to successive integer values of the observed indicator.

and Provident Fund plans. On the other hand, Chinese, who are traditionally in sectors not as well covered by these plans, such as commerce and self employment, have the lowest expectations of this source of old-age support. The positive coefficient of EDUCF, the level of education of the wife, which may be considered a proxy for lifetime earnings, indicates that the higher is EDUCF, the higher also is PP. A higher initial wage rate (FIRSTWW) also raises the expectations of old-age support from pensions. The coefficients of the RURAL and ELECT variables, which relate to the degree of development of the community in which the respondents are living, have the expected effect: individuals living in urban areas, where such pension schemes are more widespread, seem to have higher expectations of old-age support in the form of pensions. Also, as expected, both the profession of the woman respondent and that of her husband have important influences on the determination of PP. It should be noted that, compared with the self employed category (the excluded or referecne group category), all other professional categories have significantly higher expectations. It is interesting to see that indeed rubber workers and professionals (including teachers), have the highest such expectations. As mentioned above, it is in these two categories that the social security systems are most prevalent. It should also be noticed that the husbands' professions have stronger effects on the determination of the wives' expectations with respect to PP than do their own professions. This is not altogether surprising since Malaysian women are still very much dependent on their husbands for financial support.

The results for the equation for husbands' expectations by the husband of old-age support from pensions and Provident Fund (PPH) are very similar.

The signs of all the coefficients are identical; only their magnitudes differ. Chinese husbands and those living in rural areas are the most pessimistic about old-age support from pensions and Provident Fund. Once again, the occupational dummy variables are important: husbands who are professionals or rubber workers tend to have higher expectations of PPH and especially when their wives are also professionals or rubber workers. However, as expected, the wife's occupation is less important in the determination of the husband's expectations than is husband's own occupation.

Summing up the results of this first equation, it can be said that the expectations on the likelihood of support from pension and Provident Fund systems are determined in a very similar way for the men and women in the sample. These expectations appear to be determined in large part by the couples' occupation and other characteristics. Individuals who are Indian, who themselves or their spouses are professionals or rubber workers, and who live in urban areas and have a higher earning profile, tend to have much higher expectations on the likelihood of getting support from old-age security systems. These results underscore the extent to which these systems are concentrated in urban sectors and areas.

2. Expectations on the Likelihood of Old-Age Support from Work (WORK and WORKH)

The results of the equation for WORK in Table 8.12 indicate, as would seem reasonable, that older women and those who are ill have lower expectations of support from work. Older women not only are more likely to foresee a termination of labor force participation in the future but

Table 8.12

Empirical Estimates of the Likelihood of Support from Work of the Wife (WORK) and the Husband (WORKH)

Right Hand Side Variable	Parameter Values	
	Women (WORK)	Men (WORKH)
INTERCEPT	1.717**	1.024**
AGE(H)	-0.016**	--
AGR(H)	0.307**	0.153
CHINESE	-0.042	-0.084
DISTSCH	0.023	0.018
ELECT	-0.320*	
FIRSTWW(H)	-0.764*	1.190**
ILL(H)	-0.125	-0.238*
INDIAN	-0.663**	-0.734**
PP(H)	-0.009	0.026
RURAL		0.185*
VALUEH		0.004
TAU1	0.440**	0.449**
TAU2	1.185**	1.299**
TAU3	1.862**	2.027**
Sample Size	845	790
Log Likelihood	-1288.337	-1193.748

Note: See Table 8.11.

also are less likely to have been active in the labor force than younger women. Chinese, and especially Indian, women appear to be less inclined to expect old-age support from their work. This again may be due to the fact that female labor force participation is lower among them than among Malays.

The variable ELECT, which indicates the degree of electrification of the community, also has a negative influence on WORK. This may be surprising, considering that more developed environments would be expected to offer more varied opportunities for work, and hence to increase WORK. However, ELECT could also be considered to be an inverse measure of the price of other goods and services. As such an increase in ELECT would lower such prices and give rise to an income effect which dominates the substitution effect, thereby reducing hours worked and hence the value of the expectations of WORK. ELECT could also be supposed to increase the desirability of home life and work and hence to decrease modern sector employment and expectations with respect to WORK.

The positive coefficient of AGRW, a variable indicating whether or not the respondent is an agricultural worker, indicates that individuals are likely to work more hours and for more years in the agricultural sector than in other sectors, thereby increasing expectations with respect to WORK. Moreover, in rural areas, and especially in agriculture, able individuals are expected to work because all the available labor force is needed. Besides, older individuals may even take pride in their ability to work.

The variable DISTSCH, the distance to the nearest secondary school, which may be considered to represent the price of the quality of children, also has a positive sign. Since quality of children is a substi-

tute source of old-age support, a high price of qualtiy could be expected to increase parental expectations of old-age support from work. The wage variable also has a positive, though not significant, influence. A higher wage (FIRSTWW) would be likely to induce the individual to stay on her job longer and to take advantage of the job's rewards, thereby making old-age support from work more likely. Finally, it can be seen that PP, the estimated expectations of old-age support from pensions and Provident Fund, has an insignificantly negative influence on WORK. Thus, it seems that women form their expectations on whether or not they can rely on support from work during their old-age quite independently from whether or not they expect to receive support from the old-age security systems.

The results for the WORKH equation (also shown in Table 8.12) are for the most part similar. The introduction of the VALUEH variable, which represents the husband's wealth, shows that such wealth has a negative influence on the expectations of old-age support from work. Contrary to the results for the wives, however, the wage variable has a negative effect, and PPH a positive, though insignificant, effect. The negative wage effect may be due to a preference for leisure at retirement time, analogous to a backward-bending labor supply effect over the lifetime.

The results also indicate that rural agricultural workers and Malays have a higher tendency to rely on their own work for support in old-age. The fact that these workers are also among the least well-covered by pension systems helps explain why there has not yet been any noticeable shift away from work toward earlier retirement, a phenomenon that has become widely observed in developed countries. This may also

be attributable to the relatively young age profile of the respondents. They are not yet approaching old-age and hence have not experienced the disincentives for work during old-age that arise in most pension systems including Malaysia's Provident Fund.

3. Expectations on the Likelihood of Support from Savings (SAVINGS and SAVINGSH)

By examining the equation for SAVINGS in Table 8.13, it is noted that younger respondents are less likely to be supported by their savings than others. This is understandable since they have had less time to accumulate assets. Chinese and Indian women also seem to rely less on savings than Malays. As indicated by the coefficients of RURAL, rural inhabitants also do not count much on their savings. Women who have lived in larger households at the time of their marriage also are shown to have lower expectations of SAVINGS. This finding may be explained by the sense of material security and stability that extended households impart to such women. The distance to the nearest bank (DISTBANK), a proxy for the cost of access to financial institutions, tends to reduce SAVINGS (as would be expected) although the coefficient is not statistically significant.

Since women with higher levels of education would be more likely to earn higher wages and thus more inclined to save, the fact that such women have higher expectations of being supported by their savings is expected. Similarly, the VALUE variable, which represents the couple's wealth, has a positive effect on SAVINGS. Also having positive effects are ELECT which thereby reinforces the difference in expectations of old-age support from savings between urban and rural areas, and the

Table 8.13

Empirical Estimates of the Equation for Expectations of the Likelihood of Old-Age Support from Savings of the Wife (SAVINGS) and of the Husband (SAVINGSH)

Right Hand Side Variable	Parameter Values	
	Women (SAVINGS)	Men (SAVINGSH)
INTERCEPT	-0.178	0.691*
AGE(H)	-0.008*	-0.026**
CHINESE	-0.101	0.138
DISTBANK	-0.001	0.005
DISTSCH	0.035*	0.029*
EDUCF(H)	0.070**	0.040*
ELECT	0.296	-0.164
INDIAN	-0.589**	-0.449*
INHH	-0.028*	-0.015
PP(H)	0.250*	0.335*
RURAL	-0.207	-0.566*
VALUE	0.004*	0.005**
TAU1	0.262**	0.213**
TAU2	0.762	0.649
TAU3	1.484	1.402
Sample Size	845	790
Log Likelihood	-1218.201	-1124.430

Note: See Table 8.11.

distance to the nearest secondary school (DISTSCH), the proxy for the price of the quality of children. The latter result suggests that there is substitution between the quality of children and savings. Finally, the expectations on the support from pensions and the Provident Fund (PP) have a significant direct influence on SAVINGS. Thus, instead of a substitution effect between savings and pensions, the existence of a goal-gradient effect is suggested, wherein once individuals are led to think about more security in old-age, they start preparing more deliberately for it.

The results for the SAVINGSH equation, i.e., those for the sample of husbands and also shown in Table 8.13, are quite similar to those for women. The only notable differences are that there is slightly less demarcation among ethnic groups, and that the influences of the wealth variable and PPH are strengthened.

In recapitulation, from Table 8.13 it appears that the tendency to rely on savings for support in old-age is associated positively with wealth, lifetime earnings, smaller initial sizes of households and greater optimism on the likelihood of getting support from pensions and the Provident Fund.

4. Expectations on the Likelihood of Old-Age Support from Children (CHILD and CHILDH)

Examining the estimates of the CHILD equation in Table 8.14, one can see that Chinese respondents are significantly more certain and Indians less certain of getting old-age support from their children. This finding can be explained by the importance that the Chinese culture puts on children's loyalty to their parents. The same feature would be expected to characterize the Indian culture. Indians in Malaysia,

Table 8.14

Empirical Estimates of the Equation for Expectations of the Likelihood of Old-Age Support from Children of the Wife (CHILD) and of the Husband (CHILDH)

Right Hand Side Variable	Parameter Values	
	Women (CHILD)	Men (CHILDH)
INTERCEPT	1.936**	1.402**
CHINESE	0.464**	0.549**
DISTMARK	0.003	-0.018*
FIRSTWW(H)	-0.529	-0.364
INDIAN	-0.651**	-0.528*
INHH	-0.014	0.024
MONFOOD(H)	0.204*	0.040
OAHS	0.311**	0.162
PP(H)	0.265*	0.099
ROOMS	-0.049*	-0.041*
RURAL	-0.153	0.036
SAVINGS(H)	-0.516**	-0.467**
WORK(H)	-0.348*	0.067
TAU1	0.368**	0.312**
TAU2	1.232**	1.163**
TAU3	2.187**	1.938**
Sample Size	845	790
Log Likelihood	-1011.569	-1039.015

Notes: See Table 8.11.

however, are either more educated and thus more modern, or tend to be covered by pension systems so that the reliance on children for old-age support is attenuated. It can be seen, however, that the influence of tradition and example is still strong: if the respondent contributes money and food to her own parents (MONFOOD), she is more likely to expect support from her own children. Also, quite trivially, if a woman expects to live with her children during her old-age (OAHS), she is more certain of their monetary support. On the other hand, the more extended the structure of the household at the time of the couple's marriage, the lower are the expectations on CHILD. This may be due to the insecurity-reducing effect of living in an extended household, especially considering the greater wealth that extended households tend to possess, in both cases reducing the importance of support from cnildren. Consistent with the latter interpretation is the finding that the coefficient of the wealth variable ROOMS is negative. The coefficient of the wage variable FIRSTWW also has the expected negative sign, indicating that women with higher wages are not as inclined to rely on their children as those with lower wages. Similarly, the coefficient of RURAL is negative but insignificant.

With regard to the influence of expectations of alternative sources of old-age support, it is interesting to see from the negative coefficients of WORK and SAVINGS that work and especially savings seem to be substitutes for support from children whereas expectations of support from Provident Funds and pensions appear to be their complements! It may be conjectured that, if one were to hold constant all the indirect effects, there would once again be goal-recognition and goal-gradient effects in operation. Specifically, the result may indicate that women

who are more certain of being supported by pensions and Provident Fund may become more aware of old-age security and thus of the security that their own children can provide.

The results of the estimation of the parallel expectations of support from children (CHILDH) equation, which are also given in Table 8.14, differ somewhat from those of CHILD. MONFOODH loses its significance and the extension of the initial household INHH has a positive (though insignificant) influence on the husband's expectations of old-age support from children. Since these variables are both different aspects of household extension, it is not surprising that, when the influence of the one aspect declines, it is compensated for by a rise in the influence of the other. A more important difference in the results for husbands vis à vis their wives is that, of the several alternative sources of support, only SAVINGSH has a significant influence on CHILDH.

In summary, individuals who tend to rely on their children's support are more likely to be Chinese and already contributing support to their own parents. They also appear to have been less wealthy at the time of their marriage. Women seem to consider savings and work as substitute sources of support to that from children but expectations of old-age support from pension systems tend to reinforce their expectations of support from children. In the case of men, however, the influences of both pension systems and work on the expectations of support from children are negligible.

5. Number of Children Demanded (NSTAR and NSTARH)

The equations for NSTAR and NSTARH are of course the most important ones in the Expectations Module since they constitute the main site for

testing the hypotheses and conjectures drawn from the theoretical model. The empirical estimates for both equations are given in Table 8.15.

By examining the results for the desired number of children on the part of the wife (NSTAR), it can be seen that among the individual characteristics, the race variables seem to have the greatest influence: Chinese and Indian women tend to demand fewer children than Malays as the cross-frequencies presented in the previous chapter had already shown. Since the AGEF and RURAL variables have insignificant effects, it can be inferred that, after controlling for other differences between older and younger women, and between those in rural and urban areas, these differences are no longer significant as far as NSTAR is concerned.

The most important coefficient in the equation for purposes of the present study is that of CHILD, which is the estimate of the wife's index of expectations concerning the likelihood of old-age support from children. The values of CHILD in this equation are the predicted values obtained from the CHILD equation presented in Table 8.14. The fact that this coefficient is relatively large and statistically significant (at the 5 percent level) provides strong support for the importance of the old-age security motive. Indeed, the result indicates that an increase in the index of such expectations of 1.5 (on a 5 point scale) would raise the desired number of children of the wife by one child.

While the second most important coefficient, namely that of PP is positive (possibly indicative once again of a goal-gradient effect) but insignificant, it should be pointed out that this direct effect on NSTAR is offset by a number of other more indirect influences going in various different directions. These are (a) the positive effect of PP on CHILD in Table 8.14 and the positive effect of CHILD on NSTAR in Table 8.15;

Table 8.15

Empirical Estimates of the Equation for Number of Children Desired of the Wife (NSTAR) and of the Husband (NSTARH)

Right Hand Side Variable	Parameter Values	
	Women (NSTAR)	Men (NSTARH)
INTERCEPT	0.688	1.571
AGEF(H)	-0.016	0.064*
CHILD(H)	0.676*	-0.867*
CHINESE	-1.101*	-0.097
DISTFPLAN	-0.025	-0.021
DISTSCH	0.155	-0.072*
DISTSTOWN	0.014*	0.008
EDUCF(H)	0.286	-0.117*
ELECT	1.768	0.579*
FIRSTWW(H)	0.169	-0.322
INDIAN	-2.853	-0.322
INHH	-0.105	0.043
OAHS	-0.115	0.140
PP(H)	0.757	0.748*
ROOMS	0.032	-0.028
RURAL	-0.564	1.478*
SAVINGS(H)	-4.163	1.772
VALUE(H)	0.017	-0.010
WORK(H)	0.415*	0.273
TAU1	0.943**	0.888**
TAU2	1.465**	1.444**
TAU3	2.596**	2.457**
TAU4	3.170**	2.954**
Sample Size	845	790
Log Likelihood	-1277.817	-1212.293

Notes: See Table 8.11.

(b) the positive effect of PP on SAVINGS in Table 8.13 and the strong negative effects of SAVINGS on CHILD in Table 8.14 and NSTAR in Table 8.15; and (c) the same positive effect of PP on SAVINGS in Table 8.13 combined with the negative effect of SAVINGS on CHILD in Table 8.14 the positive effect of CHILD on NSTAR in Table 8.15.

The distance to the nearest family planning center (DISTFPLAN), representing the price of the number of children, has the conjectured negative influence. Similarly, the distance to the nearest secondary school (DISTSCH), a proxy for the price of the quality of children, has the hypothesized positive effect. Neither of these effects, however, is statistically significant. The expected positive relation between number of children demanded and the price of other assets, represented by the distance to the nearest small town (DISTSTOWN), seems to be verified. However, the price of other consumption goods, whose proxy is the electrification index (ELECT), does not appear to have the conjectured influence. It was thought that the lower that price is, i.e., the greater degree of electrification, the lower the number of children that would be demanded as consumption would shift to other goods and services. The result obtained can be interpreted as indicating that the income effect overwhelms this substitution effect. Given the dominance of other goods and services in the typical household budget, and the fact that the income effect is weighted by the relative budget share of such goods, this is hardly surprising.

The fact that the coefficients of EDUCF, FIRSTWW, ROOMS and VALUE are all positive indicates that the wealth or income effects on NSTAR are generally positive. The effects of initial and expected future household structure, as measrued by INHH and OAHS, respectively, are

negative but insignificant. Once again, however, it must be recalled that since the effect of OAHS on CHILD in Table 8.14 was significantly positive and that of CHILD on NSTAR significantly positive, the indirect positive effect of OAHS could well dominate the small and insignificantly negative direct effect.

Turning to the results for the husband's desired number of children, NSTARH, also given in Table 8.15, note that the price effects are very similar to those for the women revealed in the NSTAR results. Some interesting differences, however, show up in the role of some of the various individual characteristics. The ethnicity variables CHINESE and INDIAN become insignificant whereas the AGEH and RURAL variables acquire importance. Moreover, the income effects indicated by the coefficients of EDUCH, VALUE, ROOMS and FIRSTWH become negative, and the effects of INHH and OAHS become positive.

More importantly, in contrast to the situation for the wives, the husbands' demand for children turns out to be influenced negatively by their expectations on the support from children (CHILDH) but positively by all other sources of old-age support.

The dramatic differences with respect to the effects of expectations of the likelihood of old-age support from children on the desired number of children between husbands and wives strongly supports the hypothesis drawn from various pieces of evidence and based on various different arguments that the old-age security motive for children is likely to be much stronger in women than in men. Indeed, this result may be considered a validation of the assumption embedded in the theoretical model of fertility in Chapter III in which both the fertility "decision" and the old-age security motive for fertility were depicted as being those of the woman.

Summary and Conclusion of the Results of the Expectations Module

Having examined and discussed the results of the individual equations of the Expectations Module, it may be desirable to draw a somewhat broader picture of the implications that can be derived from these results.

To get to the determination of the demand for children, and the importance of old-age security motive which constitutes the main object of the analysis, a system was built emphasizing the formation of parents' expectations on the probable sources of support for old-age. The estimation was carried out on samples for husbands and wives, separately. This procedure was based on the hypothesis that, at least in the initial stages of utility and expectations formation, individuals are relatively autonomous. In actual fertility and educational investment behavior as represented in Section C above, the expectations and desires of both husbands and wives were given a role.

In general, the results presented in this section suggest that the process of expectations formation is quite similar for men and women. Generally, higher subjective probabilities of getting support from pensions and Provident Fund are associated with Indians, professionals or rubber workers, and higher levels of education. On the other hand, reliance on the couple's work for old-age support seems to be greater in rural areas among agricultural workers and for Malays than for others. Savings as a source of old-age support seems to be counted on more heavily by wealthier, more educated couples who head smaller households. It is interesting to note that expectations of support from pensions and the Provident Fund appear to have a negative effect on the expectations of old-age support from savings but not on the expectations of such support from work.

As for the reliance on children, it seems that Chinese are much more inclined to expect support from children than Indians or Malays. Higher expectations are also related to less initial wealth, larger future households and the demonstration effect arising from the respondents' contributions to their own parents. These expectations, the women's especially, seem to be reinforced by the likely support from pensions and the Provident Funds. On the other hand, the expectations of support from savings in old-age appear to have a rather negative influence on the expectations of support from children.

In contrast to the expectations formation process, the determinants of the desired number of children would seem to be quite different between men and women. Although the estimates of the price effects on the desired number of children vary little between males and females, the income effects and the role played by expectations of the various sources of old-age support tend to vary considerably between men and women. Hence, the results tend to point out that the demand for children on the part of women is motivated more by the likelihood of old-age support from children whereas that on the part of men is less driven by the security motive and more influenced by other factors.

Tracing through the effect of expectations concerning old-age support coming from pensions and the Provident Fund on the demand for children, the main mechanism for realizing a reduction of the old-age security motive is through its relation with the support coming from savings. Greater reliance on these systems tends to increase the reliance on savings, which may be considered as an alternative source of old-age support to children, thereby reducing their desired number. This chain of causality works for women but for men breaks down at the last link (the NSTARH equation).

Footnotes to Chapter VIII

[1]Admittedly however, the causality in this relationship could just as well be reversed. In other words, current household structure could be considered to condition future household structure. By currently living in an extended household with their parents, one generation demonstrates to their children that the children should in turn choose to live in an extended household with their parents. While the simultaneous equation bias arising from the failure to account for this feedback in estimating the effect of OAHS on the HOUST1, HEAD and ADULTS suggests that this coefficient is biased, since the other coefficients in the equation turn out to be very little affected by the exclusion of OAHS from the estimating equation, the influence of such a specification error would seem to be confined to the value of this coefficient itself.

[2]See especially, Standing (1978).

[3]At this point, for greater specificity and detail, given the rather universally low value of the insurance component in the expectations of old-age support from pensions, Provident Fund and insurance, PPI and PPIH, the insurance component is hereafter dropped. This accounts for the substitution of PP and PPH for PPI and PPIH.

[4]It is to be underscored that the value of PP used in this regression is not the actual values of PP but rather are those estimated from the equation of PP in Table 8.11.

CHAPTER IX

MALAYSIAN RESULTS AND SIMULATIONS, THEIR COMPARISON WITH THOSE FROM RURAL INDIA, AND FURTHER CONCLUSIONS

The purposes of this chapter are (1) to assimilate the findings for Malaysia reported separately by module in the previous chapter, (2) to simulate the direct as well as indirect effects of the further expansion of the old-age pension system on fertility, (3) to make some comparisons between the results obtained with the use of the Malaysian data with those obtained in Chapter V with the ARIS data for rural India, and (4) to draw some final conclusions and implications for both policy and further research. Each of these purposes is dealt with in turn, the first and second in separate sections, A and B respectively, and the third and fourth in Section C.

A. Assimilation of the Malaysian Results for the Different Modules

The results for Malaysia, in general, underscore the interdependencies among the various modules. Fertility behavior, for example, has effects in current household structure (e.g., on HOUST1) and yet household structure, in turn, has significant effects on age-at-marriage of both marriage partners, on female labor force participation and on a variety of expectations with respect to sources of old-age support. Likewise, age-at-marriage of the wife affects fertility (OWNCHILD) as well as the ratio of actual fertility to natural fertility (FERT) and female labor force participation (LF1).

The Malaysian results provide strong empirical support for a number of the innovations in modelling that have been introduced in this study. For

example, the significance of the many household variables in determining age-at-marriage of the marriage partners provides considerable support for the view that marriage decisions are, at least to a large extent, household decisions even in a relatively highly developed and rapidly modernizing developing country like Malaysia. Another example is the evidence provided in the results of the Fertility Module suggesting that the wife's "demand for", or desired number of, children (NSTAR) has a stronger influence on actual fertility (OWNCHILD) than that of the husband (NSTARH), thereby supporting our view that the wife plays a large role in fertility "decisions". Also, in the results of the Expectations Module, considerable evidence was provided for our hypothesis that it is the wife-mother for whom the old-age security motive for children is most important.

We turn now to a brief review of the major empirical findings for Malaysia, one module at a time, beginning with household structure and culminating with expectations and the desired number of children.

1. Household Structure

Consistent with the anthropological and sociological literature on the subject, the strongest single influence on household structure is position in the life cycle. This is reflected by the strong, relatively stable, and highly significant coefficients of years of marriage YEARSM and its square YEARSMSQ on the measures of household structure HOUST1 and ADULTS as shown in the results for Malaysia given in Tables 8.1-8.3. Also, the number of children (OWNCHILD) that any young couple has tends to reduce the probability that such a couple would be living in an extended household (i.e., it tends to raise HOUST1). Greater educational attainment on the part of the young couple, moreover, tends to increase its independence and hence to decrease ADULTS. Even stronger evidence is provided for a household

extension-reducing effect of greater parental expectations of educational attainment of children (EDIND). On the other hand, the higher is the educational attainment level of the household head (EDUCOM), the more likely others are to live with him in an extended household perhaps as a result of the greater managerial skills that his education may have afforded him.

Substantial evidence was also presented for the existence of intergenerational continuity in household structure. For example, both current transfers to parents (MONFOODH) and expectations of extended household living arrangements during old-age (OAHS) are significantly negatively related to HOUST1. The effects of the level-of-wealth variables on household structure, as indicated by the results for Specification 1 in the HOUST1 equation, are to lower HOUST1 (though not necessarily to increase ADULTS). When the wealth variables are defined in per capita terms, however, their effects on HOUST1 are generally positive.

While the pensions, Provident Fund and insurance expectations variable for men, PPIH, has little effect on HOUST1, and even the direction of the effect is ambiguous because of the revealed differences in sign from one specification to another and one sample to another, the effects of PPIH on ADULTS are highly significant. The ordinary direct effects of PPIH on HOUST1 are supplemented by the interaction effects of PPIH with the different wealth measures. The nature of these interaction effects is much more mixed. The signs of the coefficients often vary from one form of wealth-PPIH interaction term to another, from one specification of the wealth variables to another, and/or from one sample to another.

Finally, the results indicate that, even after accounting for differences in educational attainment, wealth, education, age, and location

between the different ethnic groups, Chinese and Indians were found to be much more likely to be living in extended households than Malays.

2. Marriage Services

The Malaysian results for the Marriage Module consisting of equations for ages-at-marriage of the husband and wife and education of the wife were given in Tables 8.4-8.6. As suggested in the literature and argued in Chapters II and III above, the results for the Malaysian sample indicate that various aspects of household structure exert significant influences on the quantity and quality of marriage services as reflected in the ages-at-marriage of the two marriage partners and their educational attainment levels. For example, both the index of household extension during the husband's youth (IHHH) and that at marriage (INHH) tend to reduce age-at-marriage of the male (AMM). Likewise, the wife's index of extension during her youth (IHH) raises her educational attainment level (EDUCF) and reduces her age-at-marriage (AMF). INHH, on the other hand, has the opposite effects on EDUCF and AMF. Another relevant indicator of household structure is the share of adult women in the household (WOMENP). A higher value of WOMENP tends to have the effect of increasing AMM and EDUCF (the latter in cultivating households only).

The higher the educational attainment levels of both the husband (EDUCH) and his parents (EDUCMM and EDUCMF) the higher his age-at-marriage (AMM) would be. Likewise, the higher EDUCH, and the education of her parents the higher would be the wife's educational level EDUCF, at least among non-cultivating households. Finally, the higher are EDUCF and the education of her parents (EDUCFM and EDUCFF), the higher is the wife's age-at-marriage (AMF).

There is rather strong evidence that different forms of wealth have rather different effects on all three variables determined in the Marriage Module. Specifically, the ROOMS variable, which measures the number of rooms in the house at the time of marriage, raises AMM and AMF but lowers EDUCF. The number of buildings (BLDG), on the other hand, lowers AMM and EDUCF and raises AMF. The influence of the value of assets (VALUE) on AMM and EDUCF is less clear-cut; but it clearly reduces AMF.

The male expectations of support from pensions, the Provident Fund and insurance (PPIH) tends to raise AMM and AMF and to lower EDUCF. In each case, however, there are also PPIH-wealth interaction terms which may offset these effects, implying that the effects may be rather different for people with different asset portfolios.

Finally, even after allowing for many differences in personal, household and community characteristics between the different ethnic groups in Malaysia, (1) Chinese and Indian men tend to get married later than others, (2) Chinese and Indian men are more likely than Malay men to choose wives who are less educated, and (3) Chinese but not Indian women tend to get married later than Malays.

3. Child Services

Of greatest relevance and importance to the purposes of the study are the results of the Fertility or Child Services Module. The Malaysian results for this module were presented in Tables 8.7, 8.8 and 8.9. The longer is the effective duration of marriage the higher are the number of surviving children, (OWNCHILD), and expectations concerning the educational attainment of such children (EDIND), but the lower is the ratio of actual to natural fertility (FERT).

Not surprisingly, both husbands' and wives' education, EDUCH and EDUCF, respectively, tend to raise EDIND. EDUCF tends to lower both OWNCHILD and FERT, but in the latter case only among Chinese.

The number of buildings per capita (BLDGCAP) and to a lesser extent the total value of assets per capita (VALCAP) reduces both the quantity and quality of child services, the former as measured by EDIND, and the latter as measured by OWNCHILD and FERT. The wife's expectations about old-age support from pensions, Provident Fund and insurance (PPI) were shown to increase EDIND but to decrease OWNCHILD and FERT, especially among Malays. These direct effects of PPI are supplemented with PPI-BLDGCAP interaction effects which are positive on all three of the endogenous variables in the Fertility Module (i.e., on EDIND, OWNCHILD and FERT).

The effects of female labor force participation rates both before and after marriage on the quantity and quality of child services are much weaker than generally supposed. This finding suggests either the lack of female time intensity in child bearing and rearing in the developing country context or that there are numerous close substitutes for the wife's time in such activities. Also somewhat surprising is the finding that EDIND has a relatively strong <u>positive</u> effect on OWNCHILD and FERT. Such a finding, however, can be explained by the fact that from the wife's perspective, and in a situation in which the educational attainment of her children is the responsibility of other parties (such as her husband or the government), increased expectations of educational attainment would enhance the value of any given quantity of children and hence induce her to want more surviving children. As such, in contrast to the implications of the Becker-Lewis quantity-quality model, there would be no trade-off between quantity and quality. Rather than being substitutes for one another, they would be seen by the wife-mother as complements.

Consistent with the assertion of lower sex preference in favor of male children among Malays than among Chinese or Indians, the effect of the dummy variable for the first two children being females (F2) is insignificantly different than zero for Malays but significantly positive for Chinese and Indians.

As already mentioned, an important finding is that the wife's preference for number of children (NSTAR) has a larger and more significant effect on both OWNCHILD and FERT than that of her husband (NSTARH). This finding provides empirical support, both for the separation of the Fertility Module from the Marriage and Resource Allocation Modules and for designing the Fertility Module equations as if they are decisions of the wife.

Finally, Chinese and Indians have lower expectations for educational attainment of their children than Malays but also higher levels of OWNCHILD and FERT.

4. Female Labor Force Participation

The weakest link in the empirical evidence from the Malaysian data with respect to the modelling system developed in Chapter III (and extended in Chapter VII) is that concerning the Resource Allocation and Accumulation Module, Module D. This weakness is directly attributable to the fact that the Malaysian Family Life Survey, which formed the data base for the Malaysian portion of the study, contained no data on savings, investment, consumption and so on. As a result, the only variable that we have been able to explain from this portion of the system is the female labor force participation rate (LF1). The results for the LF1 equation presented in Table 8.10 revealed that the average proportion of time spent by the wife

in the labor force after marriage (LF1) is positively related to the following factors:

(a) the lower are the wealth variables ROOMS, VALUE and LAND and the interactions of BLDG and VALUE with expectations of old-age support from pensions (PPI),

(b) the higher are age-at-marriage of the wife (AMF) and her premarital labor force participation (LF),

(c) the higher is PPI,

(d) the household is Indian, and

(e) the greater is distance between her community and the nearest town, market, and secondary school (DISTSTOWN and DISTSCH) and the lower the percentage of houses in the community that have electricity (ELECT).

5. Expectations of Old-Age Support and the Desired Number of Children

The single most important advance in the empirical analysis vis à vis that which was accomplished with the ARIS data for rural India in the first part of this study is with respect to expectations of old-age support and desires for children. The existence of expectational data in MFLS concerning the likelihood of various sources of old-age support allows us to test the hypotheses developed in Chapter 7 in regard to (a) the way in which expectations of old-age support are formed, (b) the nature of the interdependence among the different sources of such support, and (c) their effects on the desired number of children. The determinants and effects of such expectations, moreover, are traced for wives and husbands, separately.

The empirical results presented in Tables 8.11-8.15 support the following propositions of relevance to the primary focus of this study:

(1) The processes of expectations formation concerning the likelihood of different sources of old-age support are similar between men and women.

(2) There are, however, distinct differences in such expectations from one ethnic group and location to another reflecting the importance of both cultural and environmental conditions in the determination of expectations of various sources of old-age support. For example, Indians, rubber workers and professional workers are more likely to have higher expectations of old-age support from pensions (PP and PPH) than are others. On the other hand, old-age support from the work of oneself or one's spouse (WORK and WORKH) tends to be more expected by agricultural workers and by Malays than by others. Savings as a source of old-age support (SAVINGS) is considered more likely among wealthier, more highly educated persons living in smaller households. Finally, old-age support from children (CHILD) is deemed more likely by Chinese parents and by those living in relatively poor households that are currently practicing some forms of household extension and/or which expect to do so in the future.

(3) Instead of all sources of old-age being substitutes for one another, given the initial conditions of contemporary Malaysian households, in reality some sources are complementary to others. In particular, when the likelihood of old-age support from pensions (PP) rises, that with respect to savings (SAVINGS) falls but that from work (WORK) rises. The net (overall) effects of one such source of old-age support on another can be very different than the direct or gross effects. For example, while the direct effect of PP on CHILD is positive, this may be more than offset by the negative effects operating indirectly through the effects of PP on WORK and SAVINGS.

(4) With respect to the determinants of the desired number of children, there is less similarity between men and women. While the effects of the variables measuring prices are quite similar between women and men, the

effects of income-like variables and expectations concerning the various sources of old-age support are remarkably different. While the demand for children on the part of women (NSTAR) is positively affected by expectations of support from children (CHILD), that of men (NSTARH) is negatively affected by CHILDH. Likewise, whereas NSTAR is significantly raised by an increase in WORK or a decrease in SAVINGS, this is not the case with NSTARH.

B. Some Crude Simulations of the Direct and Indirect Effects of Increased Expectations of Old-Age Support from Pensions

The purpose of this section is to report the results of a simple attempt to quantify the direct and indirect effects on fertility of a hypothetical increase in expectations of old-age support from pensions and the Provident Fund (PPI or PPIH).

We begin with the direct effects. These could be calculated with the regression results of Tables 8.8 or 8.9. For convenience of calculation, especially with respect to the indirect effects, we deliberately choose to use the results of the OWNCHILD regression given in Table 8.8.

As shown in Table 7.7 above, the sample mean of the wife's expectations with respect to the index of old-age support from pensions, Provident Fund and insurance (PPI) was about 2 on a five point scale. The mean value was somewhat higher among non-cultivating households than among cultivating households and among Chinese than among Malays. PPI was quite a bit higher (3.118), on average, among Indians. The hypothetical experiment is to give all women in the sample a value of PPI of 3.0. Naturally, while this means raising the value of PPI for the majority of women in the sample, for some women this involves reductions in the observation-specific values of PPI.

The effects of the change in PPI can then be simulated by comparing the predicted values of OWNCHILD among members of the sample in two different situations: one, in which all right-hand side variables take on their actual or observed values, and, the other, in which the same actual or observed values are used for all right-hand side variables except PPI, in which case each observation (member of the sample) is given a value of 3.0 for PPI.

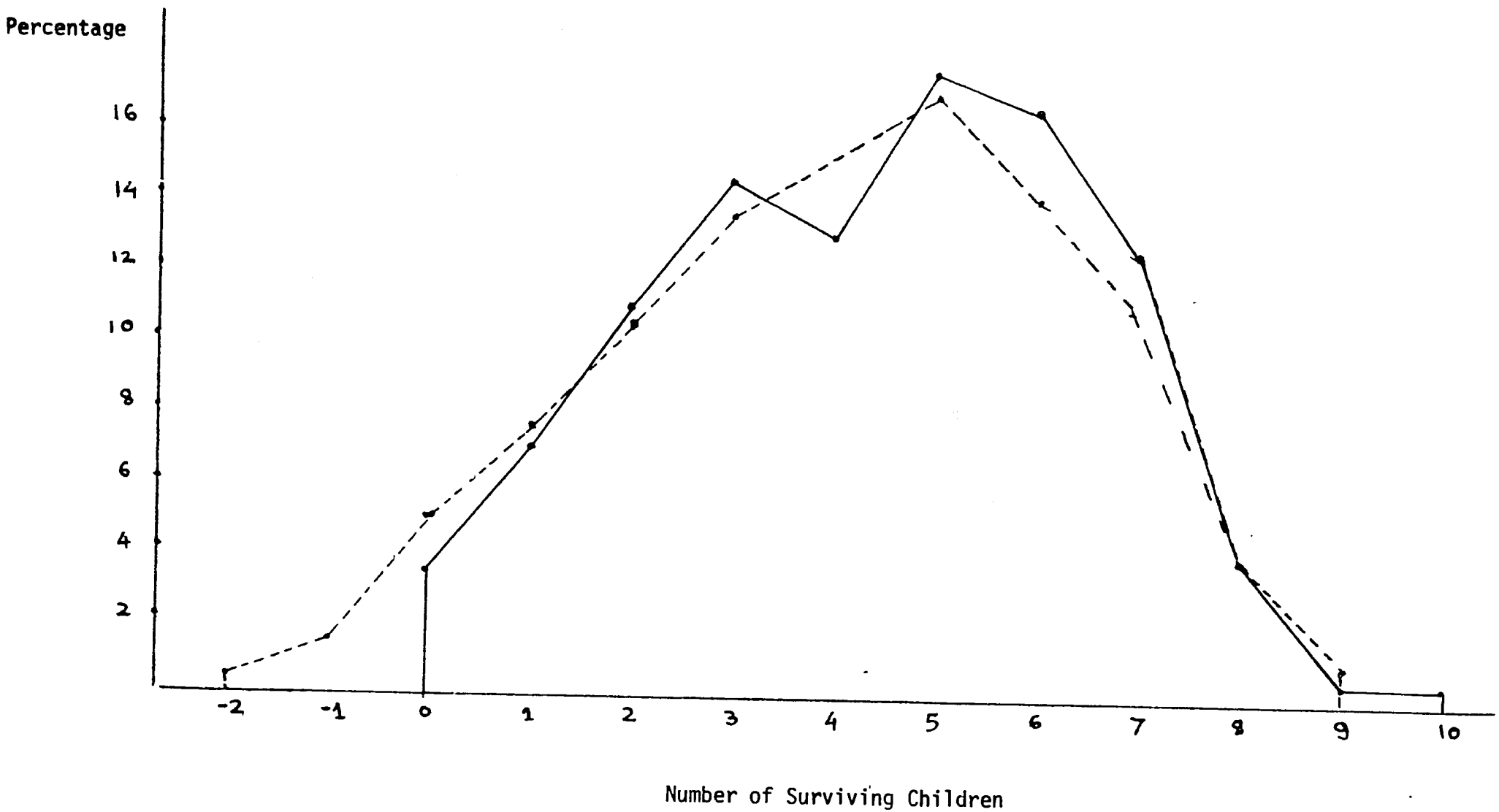
The result of this simple experiment is shown in Figure 9.1. This figure summarizes the frequency distributions on the number of surviving children in the sample of Malaysian ever-married women in each of these two situations. The solid lines join the points representing the approximate percentages of the women actually having the numbers of surviving children indicated on the horizontal axis when each member of the sample is assigned his/her actual values for all right-hand side variables. Similarly, the dotted line is used to approximate the corresponding frequency distribution in the case in which all other variables except PPI take on their actual values and all members of the sample are assigned a value of 3.0 for PPI.

Although (a) this experiment captures only the direct effect of the changes in PPI (that are generally in an upward direction but sometimes in a downward direction) and (b) the magnitude of the simulated policy change is rather modest, the simulated effects are quite apparent. Note in particular that the distribution is cutoff at the upper end, nine being the highest number of surviving children to be attained in any significant numbers in the "simulated" distribution instead of ten as in the "actual" distribution. The frequencies of five, six and seven surviving children are also reduced somewhat. At the other end, of the scale, note that the frequencies of those with one, zero and even "-1" and "-2"[1] children are

Figure 9.1

Actual and Simulated Fertility Distributions (Number of Surviving Children) in MFLS Women: Simulation based on Giving All Women a Value of the PPI Expectations Index of 3, i.e., a Likelihood of Old-Age Support from Pension, Provident Fund and Insurance of "It Depends" (neither likely nor unlikely)

Code: ———— Actual Distribution
--------- Simulated Distribution



increased significantly. The emphasis on changes at the bottom end of the distribution arises primarily from the fact that, for women with no wealth, who are typically also the youngest women and those with the fewest children, the total direct effect is limited to that represented by the significantly negative coefficient on PPI of -0.184 shown in the "All Women" column in the regression results for the OWNCHILD equation in Table 8.8. For women from households with various kinds of assets this negative effect would be partially, or perhaps even more than, offset by the positive effects of the increased PPI operating through the wealth-PPI interaction terms BLDGCAP·PPI, VALCAP·PPI and LANDCAP·PPI. Hence, the results would seem to suggest that it would be primarily the poorest women whose numbers of surviving children would be most sharply reduced by the spreading of a pension system. Whether a pension system would tend to spread to the poorest people is, of course, another matter. As has been mentioned repeatedly, and experience in various countries has suggested, typically old-age pension systems are confined to relatively well-off households with the political clout to "demand" such systems.

As noted above, this simulation captures only the direct influence of PPI on the number of surviving children. Additional indirect influences would come by way of the influences of PPI or PPIH on expectations of old-age support from SAVINGS(H), WORK(H), AND CHILD(H) and their effects on NSTAR and NSTARH which in turn affect OWNCHILD. Likewise, other indirect influences would come by way of the effects of PPI on marriage ages of the marriage partners and hence on YEARSM, on household structure, female labor force participation, and educational attainment expectations of parents for their children. In the following paragraphs and in Table 9.1 we attempt to quantify these effects.

Table 9.1

The Effects of a Unit Increase in PPI(H)

on the Number of Surviving Children

Type of Effect	Change in Variable		Coefficient of the Variable in the OWNCHILD Equation	Magnitude
Direct Effect				-0.184
Indirect Effects				
via NSTAR	-0.190	·	0.102	-0.019
via NSTARH	-0.100	·	0.052	-0.005
via HOUST1	-0.014	·	0.097	-0.001
via YEARSM	-0.238	·	0.253	-0.060
via EDUCF	0.014	·	-0.082	-0.001
via EDIND	-0.002	·	0.316	-0.001
Total Indirect				-0.088
Total Effect				-0.272

Source: Tables 8.1, 8.4-8.8, and 8.10-8.15.

See Text.

We start at the top of Table 9.1 with the aforementioned direct effect of PPI on the number of surviving children of -0.184. Next, we calculate the indirect effect coming by way of NSTAR and the intermediary links of WORK, SAVINGS, CHILD and NSTAR from the Expectations Module as presented in Tables 8.11-8.15. We assume that the hypothetical increase in PPI(H) of unity implies also an increase in PP or PPH of 1.0. (This correspondence is only approximate because of the difference in construction of the PP(H) and PPI(H) indexes).[2] For women, an increase in PP of 1, from Table 8.12 would decrease the expectational index WORK by 0.009, and, from Table 8.13, it would increase the expectational index SAVINGS by 0.250. From Table 8.14 the increase in PP of 1.0 would raise CHILD directly by 0.265 but the indirect effects of the increased PP on SAVINGS would decrease CHILD by about 0.129 (0.516 (from Table 8.14) × 0.250 (from Table 8.13)). There would be another small indirect positive effect of 0.003 of PP on CHILD computed by way of multiplying the change in WORK of -0.009 by the -0.348 effect of WORK on CHILD. The net increase in CHILD would, therefore, be about 0.139. From the equation for NSTAR in Table 8.15, the effects of a unit increase in PP would consist of: (a) the direct positive effect of 0.757, (b) an indirect positive effect via CHILD of 0.093 (the aforementioned increase in CHILD of 0.139 multiplied by the coefficients of CHILD of 0.676), and (c) an indirect negative effect of PP through SAVINGS of -1.041. The net effect on NSTAR would therefore be the sum of these three effects, or a decrease of about 0.190. This accounts for the second entry of the "Change in Variable" column of Table 9.1.

Repeating these same steps but using the results given for men in the corresponding portions of the same tables, the net effect of the increase in PPH of 1.0 on NSTARH turns out to be a decrease of 0.100. This becomes the third entry in the "Change in Variable" column of Table 9.1.

Similarly, with reference to the Tables 8.1, 8.4, 8.5, 8.6, 8.7, 8.8 and 8.10 one can approximate the remaining indirect effects of an unitary increase in PPI(H) on OWNHCHILD shown in Table 9.1. Since in the aforementioned underlying results interaction terms between PPI and the various wealth measures were allowed for, to capture the complete effects one would have to include also the effects of the interaction terms. These effects would, of course, vary from household to household depending on the household's portfolio of assets. Since few of these interaction coefficients were statistically significant, and for simplicity, we ignore them. Our results, therefore, may be interpreted as representing the effects for a household with no such assets. It should also be recalled that in all the aforementioned tables of Chapter 8 there are alternative sets of estimates to choose from in carrying out such computations. There are estimates from Specifications 1 and 2 (with the wealth variables measured in levels in the first case and in per capita terms in the second) and also estimates based on the whole sample and others based on different portions of the sample. The results could well be rather different for some combinations of such choices. Our own experiment with a few such combinations revealed rather similar results overall, differences in individual coefficients tending to offset each other in the various steps. For simplicity, in the remaining calculations of Table 9.1, we use the results of Specification 1 (when there is a choice) and for the full sample.

The fourth entry in the "Change in Variable" column of Table 9.1 is the estimate from Table 8.1 of the effect of the unit increase in PPIH on household structure (measured by HOUST1) of -0.014. Using the results of Table 8.4 to combine the indirect effect of PPIH on age-at-marriage of the male (AMM) via HOUST1 with the direct effect on AMM, the net effect on AMM

becomes 0.244. Likewise, by combining the indirect effects via HOUST1 and AMM with the direct effect on the educational attainment of the wife (EDUCF) from the results of Table 8.5, our estimate of the net effect of the unit increase of PPIH on EDUCF shown in the fifth entry of the "Change in Variable" column of Table 9.1 becomes 0.014. From Table 8.6, the direct plus indirect effects via HOUST1, AMM and EDUCF of the unit increase in PPIH on age-at-marriage of the female is 0.238. This is the entry for YEARSM in Table 9.1. Similarly from Table 8.7, the net effect on the expectations of educational attainment of children is calculated to be -0.002. From Table 8.10 the direct plus indirect effects on the wife's labor force participation (LF1) can be calculated. The net of these effects is an increase of 0.037.

Finally, the results of Table 8.8 can be used to approximate the direct plus indirect effects of all of the above on the actual number of children. The results are shown in the last column of Table 9.1. The indirect effects, of which that through AMF and hence YEARSM and those operating through the various expectational variables to and through NSTAR are the most important, are all negative, and sum to -0.088. Together with the direct effect of -0.184, this gives us an estimate of the overall reduction in number of surviving children resulting from the unit increase in PPI(H) of 0.272. Since this reduction in surviving children of .272 is not with respect to completed fertility but rather is in terms of actual numbers of surviving children of women most of whom have not yet finished having children, such a reduction is relatively significant.

A number of limitations in this calculation procedure should be considered. First, many of the parameter estimates utilized in these calculations were subject to rather large standard errors, and several may be

biased in one direction or another because of various possible specification errors. Second, as demonstrated with respect to the two different ways of defining the wealth variables, the results are, at least in certain cases, sensitive to relatively small changes in specification. Third, since the definitions of PP and PPH involve thresholds which distinguish one integer value from another, it is not appropriate to treat the changes in likelihood values as if they are continuous. Fourth, one could easily conceive of there being other indirect effects which have not been captured. One such example would be any effects from PP or PPI and/or HOUST1 and/or AMM and AMF to the expectation of the wife of living jointly with her children in her old-age (OAHS) (Note that OAHS was treated as an exogenous variable throughout the analysis.) Effects on savings and investment rates, investment allocations and hence on the wealth variables would be another example. Fifth, as pointed out above, these calculations ignore the effects of the various wealth-PPI interaction terms. In other words, even at best, the results apply only to the rather unrealistic case of a household without any assets. Sixth, to more adequately capture the effect of the hypothesized policy change in PPI, the various equations would have to be estimated simultaneously and then subjected to an identical policy change as in the simulation experiment of the direct effect alone given in Figure 9.1 above. Finally, since PP(H) and PPI(H) are in fact expectational variables, it is not entirely accurate to treat them as a policy variable that can be increased by fiat. It is an even greater departure from reality to assume that the expectational indexes of the husband and wife could be manuevered so as to change by exactly the same magnitude. Nevertheless, for want of (a) a larger sample, (b) the ability to sufficiently identify the many parameters in the many equations of the model, were they to be estimated simultaneously in recursive blocks, and

(c) practical estimation procedures for simultaneously dealing with the econometric problems confronted in different portions of the modelling system, such as those of limited dependent variables, non-linearities in variables, errors-in-variables and so on, there is probably nothing much better that can be done at present. What these limitations suggest, however, is that the calculations should be considered illustrative only. It is probably safe to conclude that the overall effect of an increase in PPI of 1.0 could be fairly substantial but it is also not likely to be extremely large. It is also probably quite correct to conclude that the indirect effects, only some of which are presently captured, could well be as important as the direct effects.

C. Comparisons between the Results Obtained for Rural India and Peninsular Malaysia and Some Further Conclusions

There are both similarities and differences between the results of the two microdata sets used in this study.

Many of the differences are directly attributable to differences in the nature of the data sets and to differences in the people sampled. Indeed, it is these differences which make each of the empirical studies interesting in its own right and complementary to one another. Whereas the rural Indian data were especially weak on expectational and retrospective information, they were especially rich in providing information on production, profits, income and expenditures, and wealth. By the same token, the MFLS contained virtually no data on the ARIS area of strength, income and expenditures, but exceptionally rich retrospective and expectational data. Similarly, whereas ARIS is confined to rural areas and has preponderance of cultivating households and extended households, as a national survey MFLS

contains both rural and urban households but is heavily weighted toward nuclear households. Whereas the number of households participating in the Provident Fund or other old-age insurance programs in rural India is too small to yield reliable estimates of its effect, the number expecting old-age support from such sources in Malaysia is quite adequate. Because of the overwhelming preponderance of nuclear households in the MFLS sample, but a better balance of household types in the ARIS sample, the latter is much more useful when it comes to estimating the effects of household structure. For these reasons, much of the difference between the two portions of the study is attributable to emphases on difference issues, rendering the Malaysian results rather complementary to those of India.

These general and rather fundamental differences in emphasis and scope translate into a number of more specific differences that are worthy of note. The Indian results have provided sharper results with respect to both the determinants and effects of household structure. Of particular interest and relevance to the main focus of the study is the finding that nuclear households tend to be much more sensitive to price and price-like variables and also to the presence or absence of institutions like banks, schools, extension agents and affiliation with the Provident Fund than extended households. Evidence was also provided suggesting that extended households are either more efficient or have lower transactions costs than nuclear households. On the other hand, the results showed that larger households, and those with higher percentages of women and children in the household, tend to have lower savings rates. Since the Malaysian data contain households with a greater variety of ethnic and occupational characteristics, the Malaysian results have (in a rather complementary way) shown that, even in similar locations and types of households, behavioral

patterns and responses to policy changes can vary considerably from one ethnic or occupational group to another. The results of the Expectations Module go even further in suggesting that even within the same households, both the determinants and the effects of expectational variables and in particular the effects on the desired number of children, may vary considerably between husbands and wives.

From these complementary findings, therefore, emerges the conclusion that the effects of policy changes are likely to vary not only between different types of households but even within households. This calls attention to the need for more serious investigation into the way in which different individuals in the household relate to one another and to the decisions made in and by households and to the interdependencies among institutions, expectations formation, household composition and behavior.

A more specific difference in the results obtained from the two data sets is that the wealth effects on many of the variables under investigation tended to vary between the two cases. Wealth effects on the degree of household extension, for example tended to be more strongly positive in rural India than Malaysia. Likewise, greater wealth tended to reduce age-at-marriage in the rural Indian sample considerably more strongly than in the Malaysian sample. This raises the question of why the wealth effects should be so different. Is it due to differences in levels of wealth, the overall effect of wealth on such things being a nonlinear one? Is it due to differences in the composition of wealth? Or is it due to differences in credit and other institutions, or to differences in culture, tastes and so on?

While the answers to such questions are quite unclear at this point, what <u>is</u> clear and very consistent between the two sets of results is that

the wealth effects on these various forms of behavior investigated in this study are very different from one type of asset to another.

Above all, the two sets of results are in agreement on the following principal themes of the study:

(1) There is considerable interdependence among household structure, marriage, resource allocation and fertility decisions and that expectations with respect to the likelihood of various sources of old-age support are rather central to these interdependencies.

(2) Despite the massive evidence in favor of interdependencies among the decisions with respect to marriage, fertility, education, labor force participation, savings and investment and household living arrangements, there is also strong evidence to suggest that different decisions are made by different individuals or subgroups in the household. As a result, the tendency among economists at least, to treat all such decisions as if they are made in a simultaneous equation context is a gross misspecification that may well render the conclusions of such studies invalid. In particular, women seem to play a considerably larger role in fertility behavior than in other areas of decision making.

(3) Numerous insights from the descriptive literature that have been incorporated in the different models developed in this study have been supported in the empirical results.

(4) Given the breadth of scope of the relationships treated in this study and the dearth of solid analytical foundations for such analyses, both the theoretical and empirical results should be considered exploratory and far from definitive in their conclusions and validity. Hopefully, however, they provide a somewhat more solid base for future work and even a crude conceptual framework and empirical base for evaluating policies in the subject area investigated in this study.

With respect to further research, the importance of testing the same sorts of hypotheses in other institutional and cultural settings can hardly be understated. With data from only rural India and Malaysia one cannot claim generality. Even more importantly, efforts should be made in future studies to relax some of the major constraints on this study and especially some of the major shortcomings of the data with respect to its usefulness in examining the effects of old-age pensions.

In particular, it would be important to utilize a data set containing better retrospective information on the wife's household of origin before marriage and more about the household immediately after marriage. It also would be important to have access to data on expectations not just concerning the likelihood of the various sources but also their quantitative importance. In view of the many different but closely related factors that need to be accounted for, to really do justice to the old-age security motive and the effects of old-age pension systems on savings, investment, labor force participation, household structure, marriage and fertility behavior, a specially designed survey is no doubt required. Hopefully, the present study has helped to identify the data requirements for such a study. As stated in the introduction, old-age security is a prime concern to the average citizen of developing countries. It can only become more important as the age distribution of developing country populations moves in favor of the elderly. These changes are likely to put severe pressures on the existing traditional methods for catering to old-age security needs. A better understanding of the benefits and costs of alternative policies is essential if welfare of these citizens is to be improved.

Footnotes to Chapter IX

[1]Negative numbers of children are, of course, an impossibility; these values could be reassigned as 0.

[2]PPI(H) and PP(H) differ in that the former is the average of 3 indexes, one for old-age support from pensions, one from the Provident Fund and one from insurance while the latter is the average of only the first two indexes. Since the insurance index is almost invariably very low, the PPI(H) indexes are generally lower than the PP(H) indexes. Moreover, as a result, an increase in the score on the Provident Fund index alone would have less impact on PPI(H) than on PP(H).

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