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City University of New York PH.D. 1985

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12/14/84 — date

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THE CITY UNIVERSITY OF NEW YORK.

Abstract

SOCIOECONOMIC DETERMINANTS
OF FERTILITY IN PAKISTAN

by

DILSHAD A. KHAWAJA

Advisor: Professor Michael Grossman

Pakistan, with the population of roughly 97 million, is seriously concerned about its rapidly growing birth rate for the last two decades or so. The average woman in Pakistan has more than 6 children and the population growth rate is almost 3 percent a year.

We used the theory of household production function in order to study the fertility behavior of people in Pakistan. The data set used for the thesis, the Pakistan Fertility Survey (PFS) 1975, was available from the World Fertility Survey (WFS) based in london.

This thesis analyzes the potential impact of various socioeconomic factors on fertility. Ordinary Least Squares (OLS) technique was employed to test the effectiveness of above mentioned factors on fertility. Our principal research findings include the following:

1. Family income had a positive effect on family size. Couples who were working in the occupations

associated with a high standard of living preferred to have a large family size.

2. Education of both husband and wife incorporated a negative effect on fertility which exhibited the shift of the taste of an educated family away from the quantity of children.

3. Labor force participation of wife displayed a positive association with fertility. This was indicative of women's ability to join the role of mother with work in the areas where cottage industry is present. However, women working away from home tended to have a small family size.

4. Age of wife at marriage exhibited a negative impact on fertility as expected. This reduces the duration of marriage which in turn curtails the fertile period and hence lowers fertility.

5. Infant/child mortality had a negative influence on fertility in term of the number of living children. However, it was positively associated with the number of children ever born.

6. The number of living sons was associated with large family size. This implied that the preference for male children is strong in Pakistan. Families keep on producing children in order to have a large proportion of sons in the family.

7. Parents living in urban areas had a positive impact on fertility compared with those living in rural areas. This may be due to the fact that parents consider their children's future more open in the urban society compared with rural.

8. Couples living in the nuclear family system inclined to have a large family size compared with those living in the extended or joint family system.

9. The impact of contraceptive knowledge and use on fertility behavior was also ambiguous.

ACKNOWLEDGEMENTS

The Completion of this dissertation would not have been possible without the help of many others. I would like to take this opportunity to thank the members of the committee; Professor Grossman, Professor Muller and Professor Laibman for their invaluable guidance and support through the research and writing of this dissertation.

I would also like to thank my friends and colleagues who directly or indirectly provided the guidance that moved me along to this point.

Last, but certainly not least, most of thanks go to my family for providing the encouragement, motivation and financial support. I would like to dedicate this work to my mother who would have been so proud of me today if she were alive, to my father and brothers whom I love the most, and my wife and daughters; Saliha and Rabia.

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CHAPTER 1

INTRODUCTION

Pakistan is faced with severe population problems like many others of the Third World countries ever since its birth in 1947. Population in the area is growing at a very rapid rate. Data on population growth rates are available for the area since 1881, when the first regular census was taken in the subcontinent. The annual rate of growth of population in the area which now is known as Pakistan increased from 1.6 percent in 1911 to 2.9 percent in 1972, according to a report by the Population Planning Council of Pakistan.[1] The rapid growth in population is linked to a decrease in the death rate and the uncontrolled fertility rate. Improved health conditions and better general medical facilities[2] over the period are also considered, among other socioeconomic factors, as positive determinants of fertility in Pakistan. In the 1951 census, the total population of Pakistan was 33.7 million whereas in 1980 it rose to 82 million. A United Nations study produced the estimates that Pakistan's

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1. See, Pakistan Fertility Survey-First Report. Islamabad: Planning Council of Pakistan, October 1976.

2. Family planning will be considered separately.

population would reach 107 million in 1990 and 134 million by the year 2000.[3]

Since the reduction of the population growth rate is an explicit policy of many developing nations, Pakistan is seriously concerned about this rapidly growing rate of population. The information on vital statistics through the Civil Registration System has been inadequate. However, during the 1960's, Pakistan had started collecting data on vital rates on a regular basis. Two projects were initiated for this purpose. Population Growth Estimation (PGE) was originated in 1962 in order to estimate birth rates and the death rates in Pakistan through a dual system of registration and the surveys were conducted in the selected sample areas. This project yielded estimates on vital rates for the years 1962 through 1965. A similar project, Population Growth Survey (PGS), was also conducted on the same basis as for PGE. Besides these two Projects, a number of other surveys were also carried out including the National Impact Survey (NIS) 1968, the Household, Economic and Demographic Survey (HED) 1973, and finally the Pakistan Fertility Survey (PFS) 1975.

According to a United Nations study,[4] the crude birth rate per 1000 population in Pakistan has dropped from 51 in 1960 to 44 in 1980. This indicates that there has been

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3. See, World Development Report 1982. United Nations, New York: Oxford University Press 1982.

4. Ibid.

a 15 percent decrease in the crude birth rate. However, the crude death rate has gone down more in the same time period. It was 24 per 1000 population in 1960 and 16 percent per 1000 population in 1980, which shows a 33.3 percent reduction in the crude death rate.

Theoretical and empirical studies for developed countries show that a decline in fertility is associated with changes in economic development and prosperity. However, studies on less developed countries suggest that fertility decline can be attributed to socioeconomic factors: education, health, family planning, urbanization, etc., etc. According to Ronald Freedman's application of classic fertility transition theory to European population.[5]

> Changes in macro-developmental variables; urbanization, industrialization, literacy and the like resulted in a shift from major dependence on relatively self-contained local institutions to dependence on larger social, economic and political units..... The family gave up many functions to larger specialized institution and the non-familial institutions were of growing importance.

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5. Ronald Freedman "Theories of Fertility Decline", Social Forces Vol.58, No. 2 (1979).

A great deal of work has been done in regard to analyzing fertility behavior and developing measures to control fertility in developing countries. particularly in Pakistan.[6]

We have used Robert Willis' model as a basis of our study in chapter 3. In this model, we have described the behavior of a typical family toward the consumption of household "commodities" including children. Child services composed of number of children as well as the quality of children constitute one of the household commodities. Parent's satisfaction is derived through the consumption of household commodities. However, the utility function of parents is subject to income and time constraints. Chapter 3 concludes with the optimization of utility through the best allocation of time at home, goods and services. Chapter 4 describes the nature, source, and the quality of the data set acquired for our analysis. We have elaborated, in detail, the variables used in our empirical research. We have defined and generated a number of variables that would be most suitable for our research plan. Chapter 5 presents the results from various regressions used in our empirical analysis. This chapter discusses and tests the effectiveness of various socioeconomic factors on family size using the data set described in chapter 4. For this purpose we will make use of Ordinary Least Squares (OLS) technique throughout

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6. See next chapter for the review of the literature.

our empirical analysis. The last chapter 6, summarizes the results and states their policy implications with regard to the control of fertility in developing nations in general and in Pakistan in particular.

CHAPTER 2

REVIEW OF THE LITERATURE

In this chapter we will discuss a number of issues that fertility analysts have frequently debated in the literature. These include; women's labor force participation, role of educated wife or mother in a family, role of cottage industry in the area, the preference for sons, the effect of age of marriage on fertility, child mortality, and breastfeeding. Our objective is to reveal their separate effects on fertility and the interactions among them.

In developing countries, as elsewhere, the existence of an alternative role for women, other than that of wife-mother, is an important element in determining fertility behavior. Rafigul Huda Chaudhry (1979) argues that such an alternative role is lacking in developing nations, including Pakistan. This might be one of the factors responsible for high fertility in Pakistan. The negative impact of female labor force participation on fertility is well known to analysts in human resource economics.[1]

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1. See Jacob Mincer (1962) and Nasra Shah, Abbasi N., and Alam Iqbal (1976).

Labor force participation gives married women an opportunity to spend their time outside the home environment which they may consider as an alternative to the companionship of children. For unmarried women, however, employment outside the home means something different. It may provide them with better recreation facilities, social and economic rewards, and the opportunity to delay marriage.

It is a well known fact that women with higher education are more likely to work, as compared to those without any formal education or with a lower level of education. [Education raises the value of time that working women spend at home.] Women's time spent at home is an important input in bearing and rearing children. As the value of the mother's time rises, the cost of having another child also rises. Thus, according to the demand theory of fertility, working women tend to have fewer children (although of higher quality) as long as children are assumed to be normal goods.

Female labor force participation may not encourage reduction of fertility in the developing countries, especially Pakistan, for a variety of reasons. First, women working in cottage industries (as is common in Pakistan) may not have a reason to limit their fertility, compared to non-working women, since they can take care of children while they are on the job. Second, working women living in extended families do not have to worry about their children

because the social burden of child rearing is shared by other relatives in the household.[2]

M. Karim (1974) has pointed out that the extended family system plays a very important role in decision making by couples regarding fertility. In societies like Pakistan, new couples do not form independent nuclear families right after their marriage. It is common for young brides to join their husbands' families, thereby creating a new extended family or expanding an existing one, for social, economic, and cultural reasons.

The extended family system prevails in both the rural and urban areas, according to a report by the Pakistan Population Council.[3] Although the nuclear family system is also becoming popular, especially in the urban areas, even nuclear families are tied to each other, socially and psychologically, through a broader kinship. This behavior is quite common in rural areas and regions, where the tribal system still prevails. Regardless of their family system, people usually marry at an early age (the minimum legal age

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2. See Karim, M. "Fertility Differentials by Family Type," Pakistan Development Review, Vol. 3, No. 2, Summer 1974.

3. Population Planning Council of Pakistan "Pakistan Fertility Survey-First Report" Islamabad October, 1976.

for marriage is 18 for boys and 16 for girls). Young wives in extended families have less control over decision making regarding fertility. Grandparents in rural areas would like to see more children born, without any consideration for the economic obligations of parenthood. Their Preference for at least one male child in the family compels a couple to keep on producing children until a son is born.

Interestingly, Hashimi (1965) and Nage (1965), using the NIS data set on Pakistan, found that fertility is higher in nuclear families than in extended families. Hashimi observed that this may be due to the lack of privacy available to couples living in extended families. Occurrence of sexual union depends on not only the desire of a couple, but also the availability of room and privacy (availability of a separate room per couple in the joint family system is rare). Living in a crowded household, a couple may have to wait for an opportune time for sexual union and such an occasion may not coincide with the time of ovulation in the menstrual cycle of females. This argument increases the probability of sexual union and conception in nuclear families. Nage (1965) suggested more or less the same reason for lower coital frequency by couples living in the extended family system.

Dennis N. DeTray (1979) describes two competing theories to explain the behavior of couples in determining their fertility. One is called "Natural Fertility Theory" (also

known as supply theory) and the other is "Demand or Consumer Choice" theory. Societies with a "natural fertility" population do not try to limit the number of births by any scientific method. In other words, the whole population is non-contraceptive. By this definition of natural fertility, Henry Louis (1972) argues that it is difficult to mention even one region as a natural fertility population in the whole world. So there is virtually no population existing as a true natural fertility population. Richard A. Easterlin and others (1976) argued, differently. While all countries in the modern world have some sort of contraceptive supplies, one can consider a nation to have a natural fertility population if people do not make any observable attempt, using scientific methods, to limit their fertility, despite availability of contraception. Households are unconcerned about family size and have no plans to achieve a so-called ideal number of children even if ample supplies of contraceptives are made available. Demand theory (an alternative theory), in contrast, is used to explain fertility behavior in societies where households use some form of modern contraceptives in order to achieve a desired family size.

DeTray (1979), through some empirical tests, concluded that Pakistan has a "natural fertility" population. People do not seem to plan their family size. They are somewhat unconcerned about choosing the number of children they would like to have. However, we wish to ascertain whether or not

demand theories can better explain the fertility behavior of households.

Elsewhere (1977) DeTray and others [Afzal (1976); Amobi (1980)] argued that the age of marriage is an important determinant of fertility behavior in a society like Pakistan where people have little or no desire to limit family size except for medical reasons and children can be produced only after marriage (childbearing outside marriage is illegal, socially unacceptable, and virtually non-existent). Raising the age of marriage, as a policy move, may have some encouraging results in reducing fertility, for it reduces the duration of marriage and the time span of exposure to childbearing for women. However, such a policy may not be very successful if couples have already decided their fertility preferences. They would space their children closer in order to reach the desired family size. A question might be raised that late marrying couples who are trying to have their children closer together may reach the end of the fertile period. Therefore, the effect of age of marriage on fertility depends on how late a couple marry. It is interesting to see that people in Pakistan usually marry at an early age. Population Planning Council of Pakistan reported that 97% percent of all ever married women got married for the first time before age 25.[4] In view of these facts we believe that couples even if marrying relatively late have a long enough fertile period to achieve any desired

4. See Appendix C table C-1

family size. Ken Amobi (1980), however, using an African data set, found a positive association between the duration of marriage and fertility.

One of the reasons why people marry at an early age and have a longer duration of marriage is that they may have past experience of high infant and child mortality rates. They plan to have enough children so that there are at least some surviving male children at the end of the childbearing time span. It is argued that households consciously or unconsciously insure against any possible loss of children by having a few more than their ideal number in order to make sure a certain number survives. DeTray (1977) argued that if fertility preference determined the age of marriage rather than the other way around, infant and child mortality rates would have a negative effect on the age at which couples chose to marry. Iqbal Alam (1974) found a strong positive relationship between infant and child mortality and subsequent fertility for women with a small number of living children or living sons.

Breastfeeding behavior can also be considered a determinant of fertility in societies like Pakistan, for it is common there.[5] Various population studies have found that a longer lactation period helps reduce the probability of

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5. In the sample used for the Pakistan Fertility Survey, more than 80 percent of respondents (ever married women) who had at least one live birth breastfed their children.

conception (though it is not considered a scientific contraception method). Zeba A. Sathar (1979) argues:

> A shorter length of breastfeeding as measured for its duration during the last closed birth interval (if breastfeeding in the last closed birth interval is at all reflective of the length of breastfeeding after most other births) is associated with a longer period of risk of conception over the duration of marriage.

However, the Population Planning Council of Pakistan pointed out that breastfeeding behavior itself is affected by the level of education and the number of surviving children. A preliminary analysis of the data set from PFS 1975 shows that respondents with higher fertility (four or more live births) tend to have a greater mean length of breastfeeding than those with lower fertility.[6]

Most of the developing nations with population problems have initiated family planning programs directed at reducing fertility. Analysis of determination of fertility provides a test of the effectiveness of these programs. The "Family Planning Program," in Pakistan was introduced in the mid sixties. The prime objective of this government-sponsored project has been to spread information about effective/scientific contraception, persuade people to practice it and make contraceptives available to those couples who would like to use them.

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6. Population Planning Council of Pakistan "Pakistan Fertility Survey-First Report" Islamabad October, 1976.

CHAPTER 3

AN ECONOMIC MODEL OF FERTILITY

Analyzing the behavior of fertility in terms of economic theory, especially in underdeveloped or developing countries, is very complex. A great deal of research has been done on this subject [Ben-Porath (1974), DeTray (1974), Michael (1974), Schultz (1969), and Willis (1973)] following the pioneer work of Gary S. Becker (1960). He developed the theory that households, as rational decision making agents, try to maximize their utility function through home-produced goods (household commodities). The household commodities are produced partly with market purchased goods and services and partly with the own time of each adult member of the household. Households are assumed to derive satisfaction from consuming household commodities: health status, education, quality of meals, recreation, number of children, quality of children, prestige, love, and companionship. For example, "good health" is considered to be a household commodity which yields satisfaction. However, this commodity is produced in the household by some combination of time spent by the individual seeking good health and market purchased goods and services like medical care.1

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1. Michael Grossman "On The Concept of Health and Demand for Health," Journal of Political Economy Vol. 80, No. 2 (March-April 1972).

Household Utility Function

$$U = U(Z_1, Z_2, Z_3, \ldots\ldots Z_n) \qquad (1)$$

OR $$U = U\left(\sum_{i=1}^{n} Z_i\right) \qquad i = 1\ldots\ldots n$$

where;

Z_i = ith household commodity.

The household utility function is limited in term of income resources and the total time available to the household.

The production function of the ith household commodity can be written as:

$$Z_i = F^i (t_i, x_i)$$

$$t_i = (t_{ij}) \qquad j = 1\ldots\ldots v$$

$$x_i = (x_{ij}) \qquad k = 1\ldots\ldots m \qquad (2)$$

Each household commodity Z_i is produced by an m vector of market goods and services X_i and time t_i spent by v members of the household.

Household Fertility Model

In the context of the household production function, childbearing is considered to be a household commodity which is produced by a combination of time spent by the wife at home and purchased goods and services. Similarly, the quality of the ith child, generated through certain characteristics of the child,[2] is also produced by the household. Parents get direct or indirect satisfaction from children. Parents obtain good feelings from having a child; this is the direct satisfaction produced by children. Parents also get indirect satisfaction from children participating in a family business or becoming a source of income in the future.[3]

Since we are concerned with determination of the fertility behavior of households, we can rewrite the household utility function as;

$$U = U(C, Z)$$

OR

$$U = (N, Q, Z) \qquad (3)$$

---

2. Characteristics of the child include: sex, education, health status, future income of the child, etc.

3. Future income of the child may not be considered a strong source of satisfaction affecting the utility function of a household in developed economies. However, in developing economies, it plays a very important role, especially in the absence of social security and pension systems.

where;

C = stock of child services.

Z = some combination of all other household commodities.

N = number of children.

Q = quality of children.

One Period Static Model

Parents are supposed to adopt a lifetime utility plan for the number of children, quality of children, and other household activities (household commodities) that they are going to produce and consume with their money income and the time spent at home. This utility function reflects the tastes and preferences of all family members whereas the husband and wife are the sole decision makers. A typical household can increase the production of "child services" (C), either by increasing the number of children (N) or by investing more resources in the quality (Q) of existing children.

Child services (C) are not directly produced though the inputs of time and market-purchased goods and services, but are generated through the two home-produced commodities,

number of children (N) and the quality of existing children (Q). The production function of "child services" can, therefore, be written as:

$$C = C(N, Q) \tag{4}$$

Alternatively, we can write the production function of child services C, as follows:

$$C = C(N, Q) = F(t_C, x_C) \tag{5}$$

The production function of all other commodities can be written as;

$$Z = G(t_Z, x_Z) \tag{6}$$

where:

t_C = time input devoted to children by parents;

x_C = market purchased goods and services used in the production of "child services";

t_Z = time spent by parents in order to produce other household commodities;

x_Z = goods and services used in the production of household commodities other than child services.

It is important to assume here that each of the above production functions is linearly homogeneous. There is no

joint production.[4] The resources which are devoted to child services (C) can not jointly produce other commodities. Similarly, resources devoted to all other commodities can not be used for child services. Parents are assumed to demand the same level of quality for each child.[5]

Resource Constraints

Households can not spend more than lifetime earnings plus any initial endowment or wealth transfer (inheritance, dowries, etc.). It is assumed that the level of utility that a household can obtain is limited to the family's lifetime resources in terms of time and market goods and services. We also assume that a family's lifetime earnings are composed of earnings by the wife and the husband. We do not include earnings by children, because lifetime earnings by children are a dimension of quality of children.[6] The household allocates its total time resources to market work and

4. This assumption is made in order to avoid some complications of joint production models. See Michael Grossman (1971),"The Economics of Joint Production in Household". Report No. 7145 Center Math. Studies Business and the Economics. University of Chicago, September, 1971.

5. For the discussion of different quality of each child, see Gary S. Becker and Tomes Nigel. "Child Endowments and the Quantity and Quality of Children." Journal of Political Economy. Vol. 84, No. 4 Part II (Aug. 1976).

6. For a discussion on the quality of children and parents' investment in children, see Dennis N. DeTray "The Interaction Between Parents' Investment in Children and Family Size: An Economic Analysis," R-1003 RF. Santa Monica, Calif: Rand Corporation, May 1972.

household production. However, the husband devotes all his time to market work because he is assumed to be unproductive at home.[7] The household's lifetime earnings "I" can be divided into two categories: market earned income by husband and wife, and non-earned wealth. Let us refer to husband's lifetime earnings together with non-earned wealth as husband's lifetime income or wealth, "H". This can be treated as an exogenous factor in our model. However, the household's lifetime income can be defined as;

$$I = H + W\,L \tag{7}$$

Where; W = Average hourly wage rate received by wife.

L = Number of hours she (wife) works in labor market, during marital life cycle.

Market purchased goods and services as inputs to the household production function are limited to the household's lifetime earnings. Thus we can write the income constraint as:

$$I = H + W\,L = P\,X \tag{8}$$

Where: P = price index of market goods X[8]

---

7. See the discussion on productivity of husband at home in Robert J. Willis "A New Approach to the Economic Theory of Fertility Behavior," Journal of Political Economy. Vol. 81, No. 2 (March-April 1973, Supplement 2):14-69.

8. It is assumed that the structure of relative market prices remains the same compared to the market wage rate so that various goods and services can be used as inputs to household production function without changing the price index.

Time Constraint

It is mentioned earlier that the husband devotes all his time resources to the marketplace. The wife allocates her total time resources, T,[9] between market work, L and the household production function, t. Therefore, we can write her time constraint as:

$$T = t + L \tag{9}$$

Market purchased goods and services, X, and time used in the household production function are allocated to the production of child services and other household commodities, and production functions are linearly homogeneous. Thus:

$$X = X_C + X_Z \tag{10}$$

$$t = t_C + t_Z \tag{11}$$

9. T is defined as wife's life span after marriage. It is treated as an exogenous factor. Wife's allocation of time between market work, "L", and household production, "t" depends on her relative wage rate in the labor market, which in turn, depends on her stock of human capital including health status and education.

Since time can be exchanged for market goods and services at the market wage rate, we can combine the income constraint (8) and the time constraint (9) to arrive at the "full wealth" constraint (12). This can also be defined as the family's real lifetime consumption in terms of the shadow prices. (For derivations see Appendix A.)

$$R = \Pi_C C + \Pi_Z Z = \Pi_C N Q + \Pi_Z Z \qquad (12)$$

where:

Π_C = Shadow price of producing child services;

Π_Z = Shadow price of producing other commodities non-related to children.

It is important to note here that the family's lifetime income or "full wealth" (R) and the cost of childrearing Π_C depend on some exogenous variables, for example, the husband's lifetime earnings, non-earned wealth, the wife's life span after marriage (duration of marriage), and the market value of her time (which depends on education). The number of children, quality of children, and other household commodities demanded depend on family's full wealth R, the shadow prices of child services Π_C, and other commodities Π_Z. An exogenous change in the husband's lifetime income may affect demand for children through the ensuing changes in the family's lifetime income and the shadow price of children.

Household Demand Functions

Demand functions for the number of children N, the quality of given children Q, and other household commodities Z can be derived by maximizing the utility function (3) subject to the full wealth constraint (12). We can write the Langrangian expression as follows:

$$L = U (N, Q, Z) + [\Pi_C N Q + \Pi_Z Z - R] \qquad (13)$$

First order conditions for the optimum levels of N, Q, and Z are:

$$dL/dN = U_n - \lambda \Pi_C Q = 0$$

$$dL/dQ = U_q - \lambda \Pi_C N = 0$$

$$dL/dZ = U_z - \lambda \Pi_Z = 0$$

$$dL/d\lambda = \Pi_C N Q + \Pi_Z Z - R = 0 \qquad (14)$$

The optimal outputs of N, Q, and Z can be obtained by solving, simultaneously, the above set of equations, Thus:

$$C = C (R, \Pi_C, \Pi_Z) \qquad C = N Q$$

OR $N = N (R, \Pi_C, \Pi_Z)$ and

$$Q = Q (R, \Pi_C, \Pi_Z)$$

$$Z = Z (R, \Pi_C, \Pi_Z) \qquad (15)$$

By rearranging the set of equations (14), we can obtain the following relationship of N, Q, and Z:

$$- \lambda = U_c/\Pi_c \; Q = U_q/\Pi_n \; N = U_z/\Pi_z \qquad (16)$$

This condition means that for the three household commodities, the ratios of their marginal utilities to their respective costs are equal to each other. Under the conventional competitive assumptions of production function, the prices of commodities should be equal to their respective marginal costs in equilibrium. Thus, in our model:

$$P_n = \Pi_c \; Q$$

$$P_q = \Pi_c \; N \quad \text{and}$$

$$P_z = \Pi_z \qquad (17)$$

are the relationships which conform to the conventional theory. However, the price of having another child and the quality of given children are not independent of each other, because of the multiplicative nature of this model. For instance, an increase in the cost of having an additional child, will have not only a negative impact on the number of children, but also a positive effect on the quality of children. This is because N enters as a component of the

relative price of quality ($P_q = \Pi_c N$), which may reduce the price of quality to some extent. In other words, a substitution between N and Q occurs for any exogenous change in the system.

An increase in the household's resources, or "full wealth," may lead to substitution from N to Q, raising the ratio of Q/N, if tastes are biased toward Q. This is because relative costs P_n and P_q do not remain constant even though Π_c is held constant.

CHAPTER 4

EMPIRICAL METHODOLOGY AND TECHNIQUE

Our objective in this chapter is to define and generate variables of interest which are best suited to explain the issues raised by the fertility model described in the last chapter. Included are generated non-stochastic variables used to study determination of fertility.

Data and the Source

Our research plan required use of the data collected during the Pakistan Fertility Survey (1975). The PFS 1975 was gathered on a sample basis for the whole country during 1975. This survey was a part of the set of surveys being conducted in various parts of the world under the guidance of the World Fertility Survey (WFS). The WFS program was launched with the technical assistance of the International Union for the Scientific Study of Population (IUSSP) and the International Statistical Institute (ISI). Financial assistance was provided by the United Nations Fund for Population Activities (UNFPA) and the United States Agency for International Development (USAID).

The PFS 1975 generated data designed to be internationally comparable in order to make comparisons of fertility in different parts of the world. The survey

provides a wide variety of information on the level of and trends in fertility, factors affecting fertility behavior, and infant-child mortality, as well as data on knowledge and use of contraception in relation to socioeconomic variables including education, age, occupation, work status, type of place of residence, place of childhood residence, age at first marriage, duration of marriage, number of children, number of surviving children, breastfeeding behavior and so on. (A complete list of variables is given in the Appendix B.)

The PFS 1975 is based on a national sample of ever married women aged 10-50 years, living in private households in all areas of Punjab, Sind, North Western Frontier Provinces (NWFP), and Baluchistan.[1] The original random sample of 6,000 ever married women covered approximately 93.2 percent of the population. The rest could not be studied due to inaccessibility of different parts of the country. However, the final survey contained 4,952 ever married women aged 10-49 years, after women with a reported age of 50 years were deleted. In any case, it is a proper probability survey sample, and is therefore suitable for producing national statistical estimates.

Population Planning Council of Pakistan has reported that approximately 25.5 percent of the population lived in

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1. These are the four provinces of Pakistan.

urban areas at the time of the survey.[2] However, approximately 40 percent of the PFS sample was allocated to the urban population, since it was expected that the urban population would be more heterogenous than the rural population with regard to demographic and socioeconomic characteristics.

The data produced in PFS 1975 is quite reliable for the study. It was conducted under the strict guidance of an internationally reputed agency.[3] However, it lacks some variables of importance for the present analysis. For example, the direct measure of family income (full wealth) most often used in this type of study is not available in the data set. In order to overcome this type of problem, and improve the quality and precision of the research, we have measured certain factors indirectly, using proxy and dummy variables. Each of them will be described as it is introduced.

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2. Population Planning Council of Pakistan, "Pakistan Fertility Survey-First Report," World Fertility Survey. Islamabad: Population Planning Council of Pakistan, October 1976.

3. International Statistical Institute (ISI) and International Union for the Scientific Study of Population (IUSSP).

DEFINITIONS OF VARIABLES

1. Size of Family

The fertility behavior of a typical family is defined through two variables. For example, the number of children ever born to a family (CHILDB) and the number of surviving children (CHILDN) in the household (at the time of the survey). The attitude of a typical household toward desired family size was also investigated using various variables. For example, households were asked questions about the ideal number of children, desire for future births, and preference for having the next child a boy or a girl, etc. (See Table 1 for the statistical analysis of selected variables.)

2. Family Income

Household lifetime earnings (full wealth) is considered one of the most important determinants of family size. The direction of impact of a family's earning power on fertility behavior is debatable. We assume that the number of children is a normal good for parents. Families would like to have a large family size as income increases. Therefore, we can expect a positive relationship between family size and

TABLE 1

BRIEF DESCRIPTION OF VARIABLES

NAME OF VARIABLE	DESCRIPTION	MEAN	VARIANCE	S.DEV
CHILDB	Number of children ever born.	4.19	10.23	3.19
CHILDN	Number of surviving children.	3.23	6.31	2.51
AGEM	Age of wife at marriage.	16.01	10.55	3.25
DM	Duration of marriage.	14.34	96.38	9.82
EDUW	Dummy for wife who had secondary education and higher.	.02	.02	.15
EDUH	Dummy for husband who had seconary education and higher.	.14	.12	.35
OCCUPW	Dummy for wife who had occupation associated with high standard of living.	.13	.11	.33
OCCUPH	Dummy for husband who had occupation associated with high standard of living.	.61	.24	.49
MRI	Infant/child mortality rate defined as the ratio of the number of surviving children and the number of children ever born.	.18	.06	.24
WORKW	Dummy for wife who worked after marriage.	.19	.15	.39
WORKHOME	Dummy for wife who worked at home after marriage.	.11	.09	.31
WORKOUT	Dummy for wife who worked away from home after marriage.	.81	.15	.39

TABLE 1 Continued

BRIEF DESCRIPTION OF VARIABLES

NAME OF VARIABLE	DESCRIPTION	MEAN	VARIANCE	S.DEV
PSON	Proportion of sons in the family.	.36	.09	.31
SON2+	Presence of at two sons in the family.			
BRSTC	The number of months of breasfeeding in the last closed birth interval.	.37	1134.67	33.59
RESIDU	Dummy for family who lived in the urban area.	.39	.24	.49
RESIDV	Dummy for wife who lived spent her childhood in the village.	.71	.21	.45
FAMILY	Dummy for family who lived in the joint family system.	.55	.25	.49
EXPOSE	Dummy for family who had exposure to family planning through mass media.	.57	.49	.25
CONTACT	Dummy for family who had contact with family planning personnel.	.56	.25	.49
EVERUSE	Dummy for wife who had ever used any method of contraceptives.	.12	.10	.32
CURUSE	Dummy for wife who currently used any method of contraceptives.	.06	.05	.24
NOTUSE	Dummy for wife who did not currently use any method of contraceptives.	.61	.24	.49

earning power of a household. However, some empirical studies, especially in developed countries, show opposite results. This argument has been the focal point of population studies in general, and of household utility theories in particular. If we include quality of children as a separate factor in the household utility function, households seem to substitute quality for quantity as their income rises. Analysis of the effect of economic power of a typical household on quality of children is beyond the scope of this study, for we do not have a direct or indirect measure of the quality of children in the data set.

While there is no direct measure of the present observed income of either husband, wife or both, we can assume that families know their permanent income when they make their fertility decisions, based on the following reasoning:

Following the work by Mincer (1974) and Willis (1974), we assume that the life cycle earnings of the husband are a function of education, occupation, labor market experience, and the region of residence. According to Pakistani tradition, people often get married after completing formal and/or higher education, and entering an appropriate occupation of their choice. Thus the lifetime earnings of husband are to some extent determined at or even before the time of marriage.

We have used occupation of husband as a proxy for family income in our study. We also could have used occupation of

both husband and wife as indicators of family income, but it should be noted that in societies like Pakistan, husbands are still considered as the main providers. In rural areas where it is common for women to help their husbands on the farms, they are usually not paid directly but compensation is included in their husbands' wages and salaries.

Therefore, in any case, husband's occupation may be directly associated with the standard of living of a typical family. We have used two categories for standard of living based on various types of occupations as reported in our data set. It is expected that large family size is associated with a high standard of living of family, on the assumption that people do not substitute quality for quantity of children in developing countries.

3. Education:

Education of both husband and wife is expected to influence fertility behavior; however, the direction of their influences may be different. The education of the

husband, is positively associated with his lifetime earnings, for a person with higher education tends to work in an occupation associated with a higher standard of living. The wife's education, however, is treated as a price variable. More educated women tend to work outside the home, have better knowledge of contraception, and hence fewer children, as they use contraceptives more frequently. The wife's education is used to measure her stock of human capital at the time of marriage. It is assumed to affect her tastes and preferences toward fertility control, as well as her earning capacity, and may therefore, have a negative impact on the number of children, whereas the education level of the husband should have a positive influence, if any, on the number of children.

4. Contraceptive Knowledge and Use:

Family planning programs may also play a decisive role in fertility decline in less developed countries. The family planning program in Pakistan was introduced two decades before in the early 1960's. Our aim is to capture not only the effectiveness of a government sponsored program (similar to those in most developing countries) but also other social

and cultural factors which are directly or indirectly responsible for changing attitudes of families toward desired family size. Popularity of family planning services, the awareness of their existence among mostly uneducated masses, and a proper contact for people who desire to use services will be discussed.

Background Variables:

In the literature on the economics of fertility, social and cultural factors, as well as economic factors, play an important role in determining fertility behavior

5. Infant/Child Mortality

Infant and child mortality rates are high in developing countries because of the lack of nutrition and health facilities. Our plan included investigation of the impact of the mortality rate on family size. Households which experience a larger number of deaths in the family tend to have a larger family size, for they end up producing more children than their ideal in order to offset any possible death in the future. We expect that a larger infant/child mortality rate has a positive impact on the number of children ever born but a negative impact on the number of surviving children.

6. Place of Residence and Family Type

Current place of residence, childhood place of residence, the ethnic background of both husband and wife, and family type are some of these factors that we intend to

use in analyzing fertility behavior. For example, we expect that families residing in cities as opposed to villages would be likely to have a smaller family size for a variety of reasons.

7. Labor Force Participation of Women

Reduction in family size may also be attributed to improvement in the standard of living, breakup of kinship domination, and rising aspiration for socioeconomic mobility. The wife's labor force participation and work oustside the home are some of the important factors which may help reduce fertility. Therefore, we expect that working mothers would like to have fewer children because it becomes difficult for them to maintain a balance between the job and rearing children.

8. The Age of Wife at Marriage

Age at marriage is also assumed to be an important determinant of fertility. Higher age at marriage may be associated with a small family size but its impact on fertility may be offset if couples have already determined the desired number of children for their whole marital life.

A couple wishing to have a larger family would space its pregnancies more narrowly.

In summary, the basic and the foremost objective of our empirical research is to investigate various socioeconomic factors that are responsible for the changing behavior of people regarding their fertility decisions. We expect to observe that family income, parents' education, and labor force participation of women are among the economic factors which can make the difference in fertility behavior. Age of women at marriage, duration of marriage, infant/child mortality experience, knowledge and use of contraception, type of place of residence, family system, sex ratio of surviving children and preference for male children are some of the socioeconomic factors which can be responsible for changing behavior of people with regard to fertility. We discuss the outcome of our empirical research in the next chapter.

CHAPTER 5

EMPIRICAL ANALYSIS: RESULTS FROM PAKISTAN DATA SET

1. FAMILY INCOME:

As stated in the last chapter, the data used for our study did not have a direct measure of family income. In order to overcome this problem, we used the occupation of husband as a proxy for family's standard of living. We anticipated that family income should have a positive influence on fertility level, especially in underdeveloped countries. We classified occupation of husband into two categories; one group of occupations associated with a high standard of living, and the other with a low standard of living. The dummy variable OCCUPH is a proxy for high standard of living for husband. The regression coefficient is positive for OCCUPH (Table 2). This implies that the families with a higher standard of living would like to have a larger family size. The positive impact of family income is not surprising in countries like Pakistan, for people do not usually consider child quality as one of the factors entering in their utility function. This result conforms to our expectation in this respect. Families with higher income are likely to have larger family size. This shows that the number of children is a normal good, demand for which varies directly with family income. The positive association

TABLE 2

THE EFFECT OF FAMILY INCOME, EDUCATION, AND OTHER FACTORS ON FERTILITY.

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.389 (-1.691)***	-.440 (-1.658)***
OCCUPW	.099 (.432)	.159 (.777)
EDUH	-.261 (-1.554)****	-.191 (-1.285)
OCCUPH	.264 (1.556)****	.278 (1.849)***
MRI	.974 (2.539)*	-2.082 (-6.131)*
DM	.220 (24.949)*	.190 (24.356)*
CONSTANT	.877 (4.260)*	.971 (5.330)*
Statistic	126.330	109.379
R Squared	.535	.499
N	667	667

* Significant at α less than .01
** Significant at .01 < α < .05
*** Significant at .05 < α < .10
**** Significant at .10 < α < .15

of family income with the number of surviving children is also indicative of the ability of families with a high standard of living to have a high survival rate.

2. Education:

It is important to mention here that education in Pakistan is still not very popular. Based on the sample acquired for our research, 75 percent of the population (includes both men and women) is illiterate. The situation gets even worse when we segregate literacy by sex and region. The Pakistan Fertility Survey 1975 shows that only 15 percent of ever married women can read and write whereas their spouses have a 46 percent literacy rate. We expected that education of wife as well as husband depresses fertility level to some extent. This is largely because educated families are more likely to be sensitive to changing economic and social conditions. They supposedly have better understanding regarding the advantages of small family size and the disadvantages of a large family. Therefore, they are likely to practice family planning more constantly. However, the nature of the impact of education of husband may be different from that of wife. Our investigation shows results as expected (Table 2). Fertility measured either by the number of children ever born 'CHILDB' or the number of living children 'CHILDN', is negatively affected by the

education of husband. However, the impact of education on the number of children ever born is more profound than on the number of living children. This implies that higher education in Pakistan discourages fertility. This may stem from the fact that educated families, in general, have better knowledge about family planning and therefore use more contraceptives. Thus education has more effect on births than on survival.

According to the economic theory of the household, education of wife serves as a measure of the value of her time. The higher the education the higher the value of her time. As the more educated women can obtain a better wage rate if they work, they are more likely to work than other women because the value of their time in the labor force is higher than its value at home. A finding from the World Fertility Survey states that:[1]

> More educated women tend to marry later, to be employed outside the home, and to practice contraception effectively.

The Pakistan Population Planning Council of Pakistan envisages the same picture. Women aged 15-49 years with no formal education had the highest number of children ever born (4.4), and those with secondary and higher education had the least number of children (2.9).[2] Thus, small size of family is associated with educated mothers. Our investigation

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1. The Christian Science Monitor Thursday August 9, 1984.
2. See Appendix C, Table C-1.

reveals the same picture. Higher education EDUW of mother has a negative influence on family size (Table 2). The regression coefficients are statistically significant. This implies that education of mothers can be one of the important ingredients influencing family size.

3. Occupation of Wife:

Generally speaking, education is directly associated with the nature of one's occupation. Persons with higher education tend to fall in to the group of occupations with a high standard of living. We would expect that women who work in occupations with a high standard of living end up with small family size. Women in occupations with high standard of living are represented by a dummy variable OCCUPW. (The same classification was used for husband's standard of living) In fact, this variable tends to explore the effect of standard of living of a family regardless of the work status of women. (See below for the labor force participation of women and its impact on family size.) This has a positive influence on fertility and the regression coefficient is statistically significant (Table 2). The occupation of wife OCCUPW, like the occupation of husband OCCUPH, when used in the regression equations reflects the high standard of living of the family. This suggests that families with higher

income are likely to have a large family size. But this apparent result is not maintained when we further elaborate other variables describing the work status of women and the location of their work in conjunction with occupation of wife. The impact of labor force participation of women on family size is discussed below.

4. Infant Mortality Experience and Fertility:

We have mentioned in the review of the literature that families in underdeveloped countries are often found to have high infant/child mortality rates (MRI) compared with developed countries. High infant/child mortality in underdeveloped or developing nations can be attributed to the lack of access to modern medical facilities, especially in the rural areas. According to the World Development Report 1982",[3] in Pakistan there was only one physician available for every 3,780 persons and one qualified nurse for every 10,000 persons in 1977. Households, intentionally or unintentionally, seem to produce more than enough children to ensure that the desired number of children survives in case

3. United Nations. World Development Report 1982. New York: Oxford University Press, 1982 (pp. 110-159).

one or more infants die. This leaves them with more than enough children to satisfy their family size goal as they reach the age of completed fertility. This situation is depicted in our analysis through various factors of interest. We expected that the high number of deaths in the family would have a positive impact on fertility. This seems to be plausible because families are likely to replace any death in the household with new births. However, Afzal Mohammad (1976) points out that a positive association between children ever born and the number of children who died does not provide sufficient evidence as to whether a large number of children ever born is the cause or an effect of death of children.

Infant/child mortality rate MRI is one factor which can better explain the behavior of families regarding fertility. The fear of high mortality leads people to high fertility. MRI is used in the set of equations in table 2. The regression coefficient is positive for the number of children ever born "CHILDB", and negative for the number of living children "CHILDN". Both regression coefficients are statistically significant. The empirical evidence from our study seems to be plausible. Couples with the experience of high infant/child mortality tend to have a large number of children to ensure that a desired number survives. This behavior conforms to the evidence from the second equation in table 2 with the number of living children "CHILDN" as dependent variable. High mortality rate is associated with

a lower number of living/surviving children.

We have not used stillbirths in the calculation of the above variables. The frequency of miscarriages may be quite high, but there was no information on this in our data set. The main reason for this may be that in primitive societies like Pakistan, women do not like to speak about the history of their miscarriages and stillbirths, even to female interviewers. We can not be sure that the above relationship would be unaffected by stillbirths but it seems plausible that this would be so.

5. Age of Wife at Marriage and Duration:

The impact of age of wife at marriage on fertility level has been frequently debated by fertility analysts. The importance of this factor is derived from the fact that if women choose to marry at an older age the duration of marital life is shorter, implying that the time span of the risk of conception is short and fertility therefore is lower. The empirical analysis conforms to our hypothesis in this respect. The duration of marriage DM or the years since marriage is positively associated with fertility (Table 2). The above mentioned results imply that longer duration of marriage brings forth a larger family size and vise versa.

TABLE 3

THE EFFECT OF AGE OF WIFE AT MARRIAGE ON FERTILITY.

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.493 (-2.158)**	-.416 (-2.079)**
OCCUPW	.086 (.385)	.038 (.193)
EDUH	-.368 (-2.736)**	-.244 (-1.695)***
OCCUPH	.261 (1.585)****	.267 (1.847)***
AGEM	-.041 (-1.782)***	-.032 (-1.630)***
DM	.205 (22.707)*	.161 (20.286)*
CONSTANT	1.415 (3.034)*	1.000 (2.448)*
F-Statistic	107.416	97.267
R Squared	.566	.541
N	667	667

The higher age of marriage AGEM is related to lower fertility (Table 3). This is consistent with the fact that couples who choose to marry at an older age have fewer years of risk of conception. Therefore they may end up with a small family size. Fertility declines with age but this has little impact until the 30's. (See below for actual at marriage in Pakistan). The variable AGEM has a negative impact on fertility although it does not have strong statistical result.

It should be mentioned here that both variables, age of marriage AGEM, and the duration of marriage DM, are used simultaneously in equation 3. We find that the age of marriage has a negative influence on fertility when the duration of marriage is held constant, whereas the duration of marriage has a positive impact on fertility when the age of marriage is held constant. In all other equations in our research, however, only the duration of marriage DM is used. This factor, alone, seems to play a vital role in determining fertility behavior. This, in fact, reflects the true picture of social life in Pakistan. Couples usually marry at an early age. (See the review of the literature above) The minimum legal age for marriage is 18 for boys and 16 for girls. People barely wait beyond these ages to get married. The evidence from the Pakistan Fertility Survey-First Report shows that 91 percent of all ever married women get married before they reach the age of 20 years.

6. Labor Force Participation of Women:

It might be expected that participation in the labor force discourages childbearing for a variety of reasons. First of all, it becomes difficult for women to manage both the job and the care of their children, especially in the early years of life. Secondly, it is difficult, if not impossible, for pregnant women to take a leave from the job, particularly in the professional categories. Thirdly, working women find themselves alternative sources of satisfaction outside the home environment beside children. Fourthly, working women enjoy a better role in the household in general, and in decision making regarding fertility in particular.

Ironically, the evidence from our study shows the opposite situation. The dummy variable WORKW is used for women who were working for compensation compared with those who either did not work, or were not paid directly or indirectly. The regression coefficient is positive (Table 4). This suggests that working women are likely to have a large family. Before questioning this finding it is indispensable to investigate the working conditions for women in Pakistan. The finding is upheld by the use of another important factor which defines the place of work of women. Working conditions for women in Pakistan are described by the location of work. The dummy variable WORKHOME is used for women who worked at home in the set of

TABLE 4

THE EFFECT OF LABOR FORCE PARTICIPATION OF WOMEN ON FERTILITY.

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.410 (-1.781)***	-.353 (-1.729)***
OCCUPW	-1.182 (-1.390)	-.633 (-.841)
EDUH	-.264 (-1.573)***	-.193 (-1.297)
OCCUPH	.267 (1.573)***	.279 (1.859)***
MRI	.899 (2.329)*	-2.128 (-6.220)*
DM	.219 (24.947)*	.189 (24.338)*
WORKW	1.301 (1.567)****	.804 (1.093)
CONSTANT	.876 (4.261)*	.970 (5.328)*
F-Statistic	108.875	93.952
R Squared	.536	.499
N	667	667

equations in Table 5. The regression coefficient for WORKHOME is positive and statistically significant. The empirical work here demonstrates that women working at home are more likely to have a large family size compared to those working outside the home.

It is also important that more than 75 percent of Pakistan's population is confined to the countryside. The working arrangements for women either in cottage industries or on the farms define the situation more clearly. Women working in cottage industries do not find difficulty in rearing their children, because the environment is suitable for combining childrearing with work. Other family members (usually grandparents) act as sitters. This implies that working status of mothers either does not affect their fertility behavior or has an effect quite opposite to our expectations. (The education level of women working in cottage industries and on the farms is relatively low compared with women working in professional or skilled categories, but that is separately accounted for in variable no. 2).

In order to check and reinforce our inference from the above evidence, we redefined the variable for the location of work for working women. We used a dummy variable for women working away from home WORKOUT in the same equations in Table 5. The empirical evidence indicates that our hypothesis regarding the working women's attitude towards fertility is correct. It is difficult for mothers to work

TABLE 5

THE EFFECT OF WOMEN WORKING AT HOME AND AWAY FROM HOME ON FERTILITY.

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.262 (-1.088)	-.229 (-1.077)
OCCUPW	-1.816 (-2.010)**	-1.159 (-1.448)****
EDUH	-.261 (-1.558)****	-.190 (-1.282)
OCCUPH	.244 (1.438)****	.260 (1.732)***
MRI	.890 (2.310)*	-2.136 (-6.255)*
DM	.219 (24.996)*	.189 (24.376)*
WORKHOME	.963 (2.088)**	.799 (1.908)**
WORKOUT	-1.275 (-1.539)****	-.782 (-1.066)
CONSTANT	2.146 (2.515)*	1.748 (2.312)*
Statistic	96.240	82.993
R Squared	.539	.502
N	667	667

outside as well as take care of their children at the same time. Therefore, if women choose to work outside the home environment, they would be diverted from having a large family compared to those who are either not working, or working at home.

In view of these arguments, we can conclude that women even if working may end up with a large family size because of the type and location of work.

7. Sex Composition and Preference for Son:

As we have stated earlier, a large portion of population is still illiterate and living in rural areas in Pakistan. Families prefer to have a larger proportion of sons in the household because they are expected to contribute more than girls to family income. Parents have to give a dowry when a girl is married. The law of inheritance in the country requires families to distribute wealth among all children including daughters whether married or unmarried even though they will no longer be members of the same family after they get married. The desire for male children may be universal in underdeveloped as well as developed countries. However, the

intensity of this desire and preference may differ from culture to culture, and region to region. In modern, industrialized, and economically developed nations, this desire is becoming less and less important, but in developing nations, preference for sons is still associated with economic security in old age. Adequate pension and social security systems are lacking. Women generally either do not choose to work or are not allowed to contribute by paid work to the economic well-being of the household. In these circumstances, parents naturally look to their older male children for economic assistance in their old age.

In the sub-continent of Indo-Pakistan this phenomenon goes back through centuries. During British rule, families with a large number of sons used to be awarded land, cattle, and the like. The desire for sons is still common even in the absence of such an award system. However, this is one aspect of the story. The desire for male children is also embedded in the culture for social and economic reasons. Due to the lack of comprehensive social security systems or other social welfare programs for the elderly, economic dependence on older male children works as a pension for parents.

TABLE 6

THE EFFECT OF PROPORTION OF SONS ON FERTILITY

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.376 (-1.663)***	-.326 (-1.641)***
OCCUPW	.055 (.241)	.110 (.553)
EDUH	-.248 (-1.498)****	-.177 (-1.217)
OCCUPH	.214 (1.276)	.223 (1.519)****
MRI	1.386 (3.576)*	-1.638 (-4.814)*
DM	.209 (23.357)*	.178 (22.702)*
PSON	1.172 (4.728)*	1.264 (5.812)*
CONSTANT	.573 (2.694)*	.643 (3.445)*
F-Statistic	114.982	103.236
R Squared	.550	.523
N	667	667

TABLE 7

THE EFFECT OF SONS IN THE FAMILY ON FERTILITY

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.153 (-.775)	-.120 (-.700)
OCCUPW	-.035 (-.175)	.034 (.195)
EDUH	-.301 (-2.089)**	-.229 (-1.826)***
OCCUPH	.065 (.444)	.092 (.725)
MRI	1.651 (4.965)*	-1.452 (-5.031)*
DM	.149 (16.870)*	.124 (16.176)*
SON2+	2.483 (15.354)*	2.312 (16.476)*
CONSTANT	.721 (4.071)*	.825 (5.373)*
F-Statistic	180.482	170.950
R Squared	.657	.645
N	667	667

Our hypotheses in this respect was confirmed by the evidence from our empirical analysis. Families that desire a large proportion of sons in the household end up with a large family size, sometime larger than they originally planned. We expected that the presence of male children results in a large number of children in the household. This effect is measured by the factor the proportion of living sons in the family PSON. The regression coefficient for PSON is positive for both CHILDB and CHILDN (Table 6). This suggests that a larger proportion of sons in the family is related to a higher fertility level. The result is highly significant. The direct relationship between fertility and the proportion of sons in the family is indicative of the realization that families in underdeveloped countries do prefer boys over girls based on the prices of boys and girls. We assume that parent are likely to price boys lower than girls based on various socioeconomic factors (see Welch, and Ben-Porath 1976).

This phenomenon is reinforced by the use of another variable. We expect to observe that families with two or more living sons have a large family size. We used another set of equations in table 7 for families with two or more living sons SON2+. This variable has a positive and statistically significant impact on fertility.

8. Breastfeeding Behavior and Fertility:

It is generally noticed that women in developing countries are more likely to breastfeed their children than those in developed nations. The reason for breastfeeding in developed countries may be different from those in developed countries. The report from John Hopkins University states that "breastfeeding, in general, reduces the risk of conception and delays the return of fertility".[4] The impact of breastfeeding on fertility can be explained in the following way. Biologically, breastfeeding delays menstruation and inhibits ovulation. This biological process may work through the nutrition level. The nutrition level is depleted for nursing mothers, which may cause the cessation of ovulation. This in turn reduces the likelihood of pregnancy and hence controls fertility. However, this is still an unreliable method of family planning. But we can expect that the shorter the length of breastfeeding the higher the fertility unless contraceptive use increases fast enough to counteract this effect. Breastfeeding behavior is measured through two ways in our sample; breastfeeding in open Birth Interval OBI and in the Last Closed Birth Interval

4. The John Hopkins University. Population Report Series J No 24. Family Planning programs, Population Information Programs. Maryland: The John Hopkins University, Baltimore, Nov-Dec 1981.

TABLE 8

THE EFFECT OF BREASTFEEDING BEHAVIOR ON FERTILITY

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.416 (-1.954)**	-.366 (-1.984)**
OCCUPW	.139 (.654)	.198 (1.070)
EDUH	-.235 (-1.514)****	-.166 (-1.229)
OCCUPH	.202 (1.287)	.217 (1.590)****
MRI	.963 (2.713)*	-2.094 (-6.805)*
DM	.181 (20.327)*	.152 (19.659)*
BRSTC	-.023 (-10.623)*	-.022 (-12.058)*
CONSTANT	2.271 (9.822)*	2.342 (11.688)*
F-Statistic	142.756	135.034
R Squared	.603	.589
N	667	667

LCBI. The birth intervals are generally measured as the number of months between the first and second child, the second and third, and so on.

The length of open birth interval OBI, is defined as the number of months between the date of marriage and the date of interview if the mother had no birth. In case of one or more births, it is the number of months between the date the last child was born and the date of interview.

Last closed birth interval LCBI is usually measured as the number of months between the birth dates of last and next to last child in case of two or more births in the case of no pregnancy. However, if woman is pregnant with no live birth before, the LCBI is measured as the number of months between the date of marriage and the expected date of delivery.

Therefore, breastfeeding in OBI is calculated as the number of months that a woman breastfed her last born child. By the same token, breastfeeding in LCBI is measured as the number of months of breastfeeding in the LCBI.

The measure of breastfeeding in the last closed birth interval BRSTC reveals that most mothers breastfeed their infants. If a women had a long period of lactation in the last closed birth iterval, she probably had a long lactation period in the previous closed birth intervals. It seems to be plausible to use only this measure in our research plan. We included only those women who had at least one birth. In our data set, there were 1389 women who did not have a birth

and only 153 women did not breastfeed. Therefore, we anticipated that there would be a potential impact of breastfeeding on the risk of conception, and a longer period of lactation should result in a smaller family size. (Assuming fetal loss is unaffected).

The empirical work demonstrates that our hypothesis in this respect is correct. Breastfeeding in the LCBI has a negative influence on fertility (Table 8). The regression coefficient is statistically significant.

9. Parent's Place of Residence:

It is generally argued that parents' type of residence may have a striking impact on fertility behavior. Our hypothesis in this respect was that people living in rural areas would have a larger families compared with those living in urban areas. Our belief was based on the fact that the population in rural areas is relatively less educated and has less access to modern facilities, recreation, etc. However, we found quite the opposite results. A dummy variable urban vs rural RESIDU was used as an independent variable in Table 9. It shows that families living in urban

TABLE 9

THE EFFECT OF TYPE OF PLACE OF RESIDENCE ON FERTILITY.

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.449 (-1.950)**	-.404 (-1.985)**
OCCUPW	.093 (.403)	.151 (.745)
EDUH	-.325 (-1.921)**	-.259 (-1.735)***
OCCUPH	.275 (1.625)***	.289 (1.936)**
MRI	1.083 (2.815)*	-1.967 (-5.789)*
DM	.218 (24.677)*	.187 (24.085)*
RESIDU	.492 (2.509)*	.525 (3.027)*
CONSTANT	.541 (2.209)**	.613 (2.835)*
F-Statistic	110.053	96.223
R Squared	.539	.505
N	667	667

TABLE 10

THE EFFECT OF MOTHERS' CHILDHOOD PLACE OF RESIDENCE ON FERTILITY

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.461 (-1.987)**	-.420 (-2.048)**
OCCUPW	.075 (.323)	.131 (.641)
EDUH	-.288 (-1.716)***	-.221 (-1.492)****
OCCUPH	.258 (1.526)****	.271 (1.813)***
MRI	1.025 (2.671)*	-2.027 (-5.981)*
DM	.218 (24.821)*	.188 (24.238)*
RESIDV	-.372 (-2.087)**	-.414 (-2.630)*
CONSTANT	1.022 (4.714)*	1.132 (5.914)*
F-Statistic	109.458	95.583
R Squared	.538	.504
N	667	667

areas are likely to have large families. Ironically, the regression coefficient for RESIDU is statistically significant. In order to confirm our findings we used another set of equations in Table 10 with a factor which expresses the childhood place of residence of mothers. This is a kind of background factor which explains the behavior of mothers based on the environment that they come from. A dummy variable RESIDV was used for women who spent their childhood in a village. The empirical evidence from this set of equations (Table 10) conforms to the previous one (Table 9). This implies that women who spent their childhood in a village are likely to have a smaller number of children than those from a city childhood residence.

The above findings are the opposite situation of what we would expect. There is not a simple explanation for this paradox. One can attempt to explain the attitude of parents towards the future of their children in the urban vs rural areas. Obviously, families see the future of their children more bright and open in urban than in rural areas. However, we can not close the doors to further exploration of this unexpected finding. The question can be raised whether or not the nutrition level of women in villages is poor enough to reduce fertility.

10: Family Type and its Impact on Fertility:

Analyzing nuclear vs joint family systems, we had an opportunity to look at fertility behavior for people living in various circumstances. One can imagine that couples living in one family unit are likely to have fewer children than those who are living in an extended family system. This is because it is easier for couples in a joint family system to combine the responsibilities from work and home since the responsibilities of rearing children are shared by the other members of the household.

The extended or joint family system is very common in developing societies like Pakistan for a number of reasons. People, socially or culturally, are tied to each other, even if they live separately, and this even extends to considering the wishes of their elders in fertility decisions. We have mentioned in the review of the literature that newlywed couples generally do not form a nuclear family. They either join an already existing joint family or form a new one. It is considered socially reproachable if a couple wants to live separate from an existing joint family provided that there is no obvious reason for them to do so. A dummy variable FAMILY was used to investigate the influence of family type on fertility. The regression results in this respect do not conform to our hypothesis (Table 11). Couples in nuclear families have a larger family size compared with those in an

TABLE 11

THE EFFECT OF FAMILY SYSTEM ON FERTILITY

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.387 (-1.703)***	-.338 (-1.680)***
OCCUPW	.066 (.289)	.129 (.639)
EDUH	-.262 (-1.582)****	-.192 (-1.309)
OCCUPH	.287 (1.710)***	.298 (2.003)**
MRI	1.012 (2.667)*	-2.050 (-6.107)*
DM	.211 (23.718)*	.183 (23.135)*
FAMILY	-.685 (-4.185)*	-.599 (-4.133)*
CONSTANT	1.387 (5.851)*	1.417 (6.752)*
F-Statistic	113.497	98.479
R Squared	.547	.511
N	667	667

extended family system. In other words, couples living in a joint family system are likely to have a smaller families. This seems to be another paradox in our study. The review of the demographic literature, however, revealed the fact that our empirical evidence was conformed to findings of other similar studies. (See Nage; 1965, Hashimi; 1965)

As a matter of fact, while Hashimi did not use the PFS data set, the one he did use was very similar to it in respect to various socioeconomic variables. Therefore, it is not surprising to get results opposite to our hypothesis.

We tend to agree with the explanation for this paradox given by Hashimi and others (See the review of the literature), namely, it seems to be somewhat difficult for couples living in a joint family system to engage in frequent sexual intercourse because of the unavailability of privacy. Nuclear families, however, do not face such a problem, which can be one of the reasons for large family size in the nuclear family system.

11. Contraceptive Knowledge and Use

Most of developing nations are actively engaged in family planning programs in order to keep population growth at a reasonable level. This is believed to be an essential ingredient for their economic development. The degree of program intensity and the approach towards fulfilling the goals of family planning differ from country to country. A family planning program is such a delicate institution in government that it can cause political and social unrest in the country. Yet this is one important program which, if used with wisdom and planning, can be effective in lowering fertility of individual families and consequently, lowering the population growth rate.

In order to capture the effectiveness of the family planning program in Pakistan, we used various aspects of family planning services. First, in order to explore the impact of propaganda for family planning, the variable EXPOSE was used in the set of equations in table 12. EXPOSE is used for families which had some kind of exposure to family planning through all sorts of mass media. The regression coefficient is positive, but it is not statistically significant. This implies that the family planning exposure through mass media does not significantly affect fertility behavior. Second, we investigated the availability of family planning personnel and their contact with the public. We used the dummy variable CONTACT for women who met family

TABLE 12

THE EFFECT OF EXPOSURE TO FAMILY PLANNING THROUGH MASS MEDIA ON FERTILITY.

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.397 (-1.712)***	-.364 (-1.776)***
OCCUPW	.099 (.429)	.157 (.768)
EDUH	-.264 (-1.569)****	-.201 (-1.352)
OCCUPH	.265 (1.558)****	.279 (1.858)***
MRI	.972 (2.530)*	-2.089 (-6.150)*
DM	.220 (24.890)*	.189 (24.281)*
EXPOSE	.062 (.284)	.191 (.995)
CONSTANT	.830 (3.131)*	.824 (3.518)*
F-Statistic	108.146	93.894
R Squared	.535	.499
N	667	667

TABLE 13

THE EFFECT OF CONTACT WITH FAMILY PLANNING PERSONNEL ON FERTILITY

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.342 (-1.509)****	-.297 (-1.485)****
OCCUPW	.038 (.165)	.104 (.514)
EDUH	-.327 (-1.969)**	-.249 (-1.699)***
OCCUPH	.273 (1.632)***	.285 (1.929)**
MRI	.944 (2.497)*	-2.110 (-6.309)*
DM	.217 (24.893)*	.187 (24.385)*
CONTACT	.740 (4.684)*	.659 (4.717)*
CONSTANT	.650 (3.121)*	.769 (4.172)*
F-Statistic	114.857	99.952
R Squared	.550	.515
N	667	667

TABLE 14

THE EFFECT OF EVER USE CONTRACEPTION ON FERTILITY

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.520 (-2.347)*	-.479 (-2.492)*
OCCUPW	.040 (.180)	.095 (.494)
EDUH	-.321 (-1.990)**	-.255 (-1.821)***
OCCUPH	.231 (1.419)****	.243 (1.715)***
MRI	1.299 (3.500)*	-1.737 (-5.393)*
DM	.205 (23.523)*	.174 (23.014)*
EVERUSE	1.236 (7.527)*	1.369 (9.233)*
CONSTANT	.729 (3.668)*	.813 (4.716)*
F-Statistic	125.510	117.901
R Squared	.571	.556
N	667	667

Planning personnel in table 13. Ironically, the regression coefficient for this variable was positive and significant, but in the opposite direction to what was expected. In order to investigate the use of various techniques of contraception, we used two factors of a similar nature. For women who ever used any of the scientific methods, EVERUSE was used in table 14. The regression coefficient for EVERUSE was also positive and statistically significant. The second factor for the use of contraceptives was defined for women who were currently using any of the scientific methods CURUSE in table 15. The regression coefficient is positive. Our empirical research produced results quite the opposite of our expectation. None of the above-mentioned factors had results in the expected direction. In summary, we can conclude that the effectiveness of family planning services in Pakistan is still at a premature level. They do not have enough propaganda, enough supplies of contraceptives or proper planning. However, one can also conclude that only those families make a contact to the family planning clinics which have already high fertility or family planning personnel reach out to women of high fertility.

TABLE 15

THE EFFECT OF CURRENT USE OF CONTRACEPTION ON FERTILITY

EXPLANATORY VARIABLES	DEPENDENT VARIABLE 'CHILDB' (Children ever born)	DEPENDENT VARIABLE 'CHILDN' (Living children)
	(T-values are in parentheses)	
EDUW	-.516 (-2.265)**	-.476 (-2.377)*
OCCUPW	.090 (.397)	.149 (.744)
EDUH	-.303 (-1.832)***	-.236 (-1.625)***
OCCUPH	.239 (1.428)****	.251 (1.706)***
MRI	1.135 (2.992)*	-1.910 (-5.735)*
DM	.210 (23.594)*	.180 (22.961)*
CURUSE	1.026 (4.708)*	1.098 (5.740)*
CONSTANT	.869 (4.290)*	.963 (5.412)*
F-Statistic	114.926	103.000
R Squared	.550	.522
N	667	667

CHAPTER 6

SUMMARY AND POLICY IMPLICATIONS

In chapter 3, a household fertility model and consequently, a household production function were discussed. In the model families as rational economic agents would optimize their utility function by consuming "child services" and "household commodities". Parents extract child services from the number of children as well as the quality of children. Quality of children, from parents' point of view, may include their education, their contribution to the family income, their health, and their sex. Household commodities are produced through some combination of market goods and services, and the time spent at home.

On the basis of this model, we were able to shed some light on some of the socioeconomic factors which are responsible for the changing behavior of fertility.

We did not have a direct measure of family income in our data set. However, the occupation of husband as well as wife, as separate factors, provided a plausible proxy for the standard of living of a typical household. We concluded that a higher standard of living is positively associated with family size. This phenomenon is indicative of social attitudes in the developing countries like Pakistan. People view the number of children as normal goods.

Education of parents was another one of the most important determinants of family size. Education of both husband and wife tended to lower fertility. This appears to stem from the vital role that literacy and education play in freeing women from the drudgery of village and slum life. The role of women needs to be widened beyond childbearing and collecting and preparing of food in the developing countries.

Labor force participation of women plays a decisive role in determining fertility behavior. Our empirical research displayed an interesting aspect of the effect of labor force participation of women on fertility. Mothers, even if working, reduce their fertility only if they are working outside the home environment.

We believe that labor force participation of women does not bring forth a reduction in fertility unless it provides an alternative source of prestige and status to women and releases them from male or kinship domination.

The objective of reducing family size can be accomplished through providing facilities to women outside the home. These include vocational schools for training in the fields like sewing, carpentry, electronics, and handicrafts.

One of the reasons for high fertility and, consequently, high population growth rate in today's developing countries is the high proportion of women entering childbearing age.

More than half of Pakistan's population is under 14 years of age. Couples prefer to marry at an early age. This engenders high fertility as the women are at risk for the entire period of biological fertility.

There is a need to provide the people such an education as will motivate them to marry later and have fewer children in order to enjoy other opportunities in life. A small family size gives mothers time for outside interests that can possibly substitute for the goal of producing large families.

Educational opportunities, modern health facilities, knowledge of and access to family planning services, and economic and social policies of government can also bring an obvious difference in fertility behavior.

The role of government in providing family planning services and other facilities is crucial to curbing of family size and population growth.

The fear of infant/child mortality and old age without a large number of sons should be overcome by providing better medical facilities in general and maternity clinics in the rural areas in particular, and introducing a comprehensive social security system for the elderly.

More and more women should be given the chance to limit their fertility through family planning until all women have the choice to do so. (We have stated earlier that the

grandparents, not mothers, control the decisions regarding fertility).

We believe that simply having an abundant supply of contraceptives may not have an impressive influence on fertility behavior unless we change other social, cultural, and economic values.

APPENDIX A.

HOUSEHOLD PRODUCTION FUNCTION

Household income and time constraints are;

$$I = H + W\,L = P\,X \qquad \text{(A1)}$$

and

$$T = t + L \qquad \text{(A2)}$$

Market purchased goods and services 'X' and time resources used in household production 't' are allocated to the production of child services 'C' and other commodities 'Z' as following;

$$X = X_C + X_Z \qquad \text{(A3)}$$

$$t = t_C + t_Z \qquad \text{(A4)}$$

Substituting (A3) into income constraint (A1), we get;

$$H + W\,L = P(\,X_C + X_Z\,) \qquad \text{(A5)}$$

Substituting (A4) into time constraint (A2), we get;

$$T = (t_C + X_Z)$$

or

$$L = T - (t_C + t_Z) \qquad \text{(A6)}$$

Combining equations (A5) and (A6), and substituting value of 'L' into the income constraint (A5), we get;

$$H + W [T - (t_C + t_Z)] = P X_C + P X_Z$$

or $$H + W T - (W t_C + W t_Z) = P X_C + P X_Z$$

or $$H + W T = P X_C + W t_C + P X_Z + P W t_Z \qquad (A7)$$

PX_C and Wt_C represent the value of market goods and services and the time used in the production of child services 'C'. Similarly, PX_Z and Wt_Z show the value of time and market purchased goods and services devoted to the production of all other household commodities 'Z'.

Equation (A7) can be defined as as family's full wealth or real lifetime consumption, which can alternatively be written as;

$$R = \Pi_C C + \Pi_Z Z = \Pi_C N Q + \Pi_Z Z \qquad (A8)$$

APPENDIX B

LEGEND OF VARIABLES USED IN THE STUDY

VARIABLE	DESCRIPTION
AGEW	Age of wife in completed years.
AGEM	Age of wife at first marriage.
DM	The number of years since first marriage. (the duration of marriage)
CHILDB	The number of children ever born.
CHILDN	The number of living children.
SONL	The number of living son.
SON2+	1 = If the number of living sons were two or greater. 0 = Else.
PSON	The proportion of sons in the family, defined as the number of living sons divided by the total number of children ever born.
MRI	Infant/child Mortality Rate, defined as the number of living children divided by the the total number of children ever born.
CHDEAD	The number of children died.
BRSTC	The number of months breastfed in the last closed birth interval.
EVERUSE	1 = If wife ever used any contraceptive method. 0 = Else.

CURUSE	1 = If wife was currently using any contraceptive method.
	0 = Else.
NOTUSE	1 = If wife was not currently using any contraceptive method.
	0 = Else.
RESIDU	1 = If parents' place of residence was urban.
	0 = Else.
RESIDV	1 = If wife's Childhood place of residence was village.
	0 = Else
EDUW	1 = If wife had at least secondary education.
	0 = Else.
LITW	1 = If wife was literate (read + write).
	0 = Else (illiterate).
OCCUPW	1 = If wife's occupation had a high standard of living.
	0 = Else.
WORKW	1 = If wife was working for compensation.
	0 = Else.
WORKHOME	1 = If wife worked at home.
	0 = Else.
WORKOUT	1 = If wife worked away from home.
	0 = Else.
EDUH	1 = If husband had at least secondary education.
	0 = Else.
LITH	1 = If husband was literate (can read and write)
	0 = Else. (illiterate)

OCCUPH	1 = If husband's occupation had a high standard of living. 0 = Else.
EXPOSE	1 = If family had an exposure to family planning services through mass media. 0 = Else.
CONTACT	1 = If wife had a contact with family planning personnel. 0 = Else.
FAMILY	1= If couple was living in a joint family. 0 = Else.

APPENDIX C

Table C-1

HOW EDUCATION REDUCES FAMILY SIZE IN PAKISTAN

Level of Education	Fertility Rate*	Base Frequency
No Schooling	4.4	4420
Primary	3.4	196
Secondary + Higher	2.9	332
All	4.3	4948

Source: Pakistan Fertility Survey--First Report 1976

* No of children per women aged between 15 and 49 years.

APPENDIX C

Table C-2

FERTILITY RATE* DIFFERENTIALS AMONG
DEVELOPED AND UNDERDEVELOPED COUNTRIES

Country	Fertility Rate
Kenya	8.0
Bangladesh	6.3
India	4.7
Pakistan	4.3
U.S.S.R	2.4
U.S.A.	1.8

Source: Time Vol. 124, No. 6, August 6, 1984 (p.24)

* The average number of children born to a woman.

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