

Determinants of Marital Fertility in Pakistan: An Application of the “Synthesis Framework”

MOHAMMED SABIHUDDIN BUTT and HAROON JAMAL

The fertility phase of the demographic transition has increasingly been viewed as a movement from high to low levels of fertility, and as a shift from natural fertility to deliberately controlled fertility. In an attempt to gain more insight into this process, the present study, in the context of Pakistan, is based on intensive National Population, Labour Force, and Migration Survey data covering 10,000 households. It aims to focus on the determinants of fertility in Pakistan, specifically the determinants of the adoption of deliberate fertility regulations. The role of socio-economic modernisation and cultural factors in the determination of the potential family size and the adoption of deliberate fertility control through a knowledge of fertility regulations have also been explored. The ‘Synthesis Framework’ of fertility determination, applied to Sri Lanka and Colombia by Easterlin and Crimmins (1982), and with its recent modifications by Ahmed (1987), is the main vehicle for the study.

I. INTRODUCTION

Pakistan remained in the “High Growth Potential”¹ stage of fertility transition over the past four decades. Many authors believe that Pakistan is still experiencing “Natural”² fertility and the stage of deliberately controlled fertility has not

Mohammed Sabihuddin Butt and Haroon Jamal are Research Economists at the Applied Economics Research Centre, University of Karachi.

Authors’ Note: We are highly indebted to Professor Don J. DeVoretz of the Department of Economics, Simon Fraser University, Canada, for his encouragement and useful comments on an earlier draft of this paper. We are also grateful to the Pakistan Institute of Development Economics for providing the PLM survey data-set. The responsibility for the results reported here remains ours.

¹There is a general agreement among demographers that the process of demographic transition involves three stages:

- (i) The “High Growth Potential Stage”, characterised by both a high Crude Birth Rate (CBR) and a high Crude Death Rate (CDR): Pre-Industrial societies;
- (ii) the “Transitional Growth Stage”, in which mortality begins to decline but fertility remains relatively high, thereby threatening the risk of “population explosion”: Early stages of economic growth; and
- (iii) the “Incipient Decline Stage”, in which both fertility and mortality rates decline to a low level, thereby completing the process of demographic transition from high to low vital rates: Developed societies.

²Natural fertility is defined by Henry (1961) as fertility in the absence of deliberate fertility control, that is, “bound to the number of children already born and is modified when the number exceeds the maximum which the couple does not wish to exceed”.

yet begun,³ in spite of being the first developing country to initiate an official public family planning programme⁴ along with an extensive analysis of the population phenomenon since 1951.⁵ This suggests that the "whole" story about the determinants of fertility behaviour at the family level has yet to emerge; new insights may arise from further work especially in the directions and magnitudes of the effects of various aspects of socio-economic modernisation,⁶ and on those factors which influence fertility and deliberate 'use' of fertility regulations—a variable which is believed to be the most important factor in the explanation of the variations in fertility behaviour.⁷

It is in this context that an attempt is being made, for the first time for Pakistan, to apply the famous Easterlin and Crimmins (1982) "Synthesis Framework" of fertility determination (hereafter, the EC framework) on cross-sectional data derived from intensive National Population, Labour Force, and Migration Survey. The attempt is intended to extend the empirical understanding of

³Fertility in Pakistan has fallen slightly in more than three decades, and still remains the highest among the other 'Low Income Countries'. On the average, a married woman today gives birth to 6.48 children, during her reproductive career, as compared to 7.1 in 1960–65. Similarly, infant mortality levels remain high; estimated at 140 per 1000 in 1975 and 121 per 1000 in 1985—higher than other LDCs. In contrast, contraceptive prevalence is the lowest as compared to other developing countries [World Bank (1984); WFS (1984); Alam and Dinesen (eds) (1984)].

⁴In 1965, Pakistan was the second country in Asia (after India) to adopt official population planning policies and activities aimed at lowering birth rates. However, the family planning programme, though considered to be a success in its initial years, has had little impact on fertility trends. For a detailed review of the history and performance of Pakistan family planning programme, see Robinson *et al.* (1981).

⁵Since Davis (1951), "The Population of India and Pakistan", where the sociology of fertility in India and Pakistan has been brought out rather clearly, several studies have been undertaken for a proper understanding of the reproductive performance of Pakistani woman. For detailed references, see Alam and Dinesen (eds) (1984). With the availability of Pakistan Fertility Survey (1975) and National Population, Labour Force, and Migration Survey (1979–80) data, which provide much precise and country-wise internationally comparable baseline information, theoretically-based empirical research on various demographic issues expanded enormously during the 1970s and 1980s. For contributions, see Alam and Dinesen (eds) (1984); Sathar (1979, 1987); Sathar and Irfan (1984); Sathar *et al.* (1988); Shah and Palmore (1979) and Soomro and Farooqui (1985). Most of these studies mainly explore levels, trends, and rural-urban differentials pertaining to the sample population by employing theoretical considerations as suggested by economic models with the exception of Sathar (1984), who used the PFS data and analysed the household fertility behaviour employing the 'intervening' variables approach.

⁶The term 'socio-economic modernisation' is used to denote the collective set of the process of economic development and social change operating in any developing country. From the complex nature of changes encompassed by socio-economic development, five could be most critical in bringing about a shift to modern conditions of child-bearing. These are (1) innovations in public health and medical care, (2) innovations in formal schooling, (3) urbanisation, (4) the introduction of new goods, and (5) the establishment of a family planning programme [Easterlin *et al.* (1980) and Easterlin and Crimmins (1985)].

⁷See, in particular, Hermalin (1983); Mauldin and Berelson (1978); Bongaart and Krimeyer (1982). For other contributions, see Bulatao and Lee (eds) (1983) and Easterlin and Crimmins (1985).

the fertility behaviour of married Pakistani couples through assessing socio-biological and economic determinants of marital fertility, in general, and the adoption of fertility regulations, in particular. In addition, this study will systematically search for answers to the recurring questions posed by past demographic research, such as whether Pakistani women are more fecund than others, and why older women use contraceptives after realising their desired family size. This will facilitate formulating a mechanism to achieve the "incipient-decline-stage" for Pakistan as a policy instrument, by providing the relative merits of the family planning programme (lowering costs of fertility regulations),⁸ and/or socio-economic development (motivation to limit family size).⁹

II. THE EC FRAMEWORK

The EC framework¹⁰ views that socio-economic modernisation influences the fertility behaviour of couples through its direct impact on the supply (proximate determinants,¹¹ other than the use of deliberate fertility control) of and the demand for children, and also on costs of fertility regulations. In particular, the EC framework characterises the phase of fertility decline during the demographic transition as a shift from 'natural' fertility to 'deliberately' controlled fertility, as well as changes from the initially high to the eventually low levels of fertility. It also

⁸See, among others, Coale (1973); Frisch (1978); Bongaart and Kirmeyer (1982); Hermlin (1983); Bongaart and Menken (1983).

⁹See, for example, Freedman (1975); Leibenstein (1975); Easterlin (1975, 1978); Cochrane (1979, 1983) and Freedman (1979).

¹⁰The EC framework is an alloy of two generally contradictory approaches to the study of household fertility behaviour—the 'Household Demand' approach developed by Becker (1960); Mincer (1963); Willis (1973); Schultz (1976, 1980) and many others, and the 'Socio-biological' approach propounded by Davis and Blake (1956); Bongaart (1978, 1982); Bongaart and Potter (1983) and Bongaart and Manken (1983). The framework has proved tenable in both less developed and developed countries. The EC framework has served as the conceptual framework for the National Academy of Science study for the fertility determinants in developing countries [Bulatao and Lee (eds) (1983)]. For a detailed and formal exposition of the theory and fuller citation of the EC framework, see Easterlin (1975, 1978); Easterlin and Crimmins (1982, 1985) Easterlin *et al.* (1980); Crimmins *et al.* (1984); Ahmed (1987); Jain-Shing *et al.* (1987) and Boulter and Mankiw (1986). The EC framework as developed by Easterlin and Crimmins (1982) and as modified by Ahmed (1987) has been applied identically in this study.

¹¹In general, it is argued that a complex set of physiological and biological conditions and interaction must exist for a birth to take place, and that various aspects such as age or health status are not, to any significant degree, under the control of an individual. This approach thus suggests that for any discussion on the fertility behaviour, it is useful to begin with the recognition of the set of fertility-inhibiting proximate-determinants (intermediate variables) of fertility that exist in all societies but vary in their impact. These are identified as the extent of exposure to intercourse (duration of age of marriage), fecundability (including coital frequency), duration of postpartum infecundability, spontaneous intra-uterine mortality, sterility, and the use of deliberate fertility controls (contraception and induced abortions) and behavioural factors through which socio-economic, cultural, and environmental variables affect fertility. For details, see Davis and Blake (1956); Freedman (1979); Bongaart (1972, 1982); Bongaart and Potter (1983) and Bongaart and Manken (1983).

conceptualises that factors affecting changes in the fertility behaviour can be best understood by studying those factors which affect fertility regulations. The fertility regulation is viewed as a function of the level of 'motivation' of a couple to control fertility and the perceived and objective costs of fertility regulations.¹² 'Motivation' is considered to be a function of surplus (deficit) children a couple has, that is, excess (shortage) of potential supply of children over a desired demand for children.¹³ Eventually, the trend of deliberate fertility controls and fertility behaviour is determined in the EC framework by the demand for children, their potential supply, and the cost of fertility regulations through an interaction among socio-economic modernisation, plus these three variables.

For empirical purposes, the EC framework is divided into three link modules. Firstly, it explains the variations in completed family size through the proximate-determinants approach. Hence, the first equation relates to the reproductive process expressed as a woman's total births (children-ever-born) over the productive career as a function of the proximate and deliberate fertility control variables. At the second stage, the EC framework considers the deliberate use of fertility control by married couples. It is hypothesised that the deliberate use of fertility control may be explained through the 'motivation' of the couples and the pecuniary and non-pecuniary costs to learn about and use specific techniques of fertility control. Finally, the third module analyses each of the exploratory variables of Stages 1 and 2 by equating these as dependent variables with the set of socio-economic modernisation and cultural variables, which are traditionally thought to be the factors affecting fertility behaviour.

III. DATA SOURCE AND MODEL SPECIFICATION

The study is based on data drawn from National Population, Labour Force, and Migration (PLM) Survey.¹⁴ This was a two-stage stratified random sample

¹²This includes physical/health costs, psychological costs, psychic costs, and economic costs to learn about and use specific techniques of fertility control [For details, see in particular Hermalin (1983)].

¹³For a comprehensive discussion on demand, supply, and regulation costs, including all references to the relevant literature, see in particular Easterlin *et al.* (1980); Lee and Bulatao (1983); Lindert (1983); Bogue (1983); Bongaart and Manken (1983); Hermalin (1983) and Easterlin and Crimmins (1982, 1985).

¹⁴The PLM survey, officially known as "Pak/78/PO4-Studies in Population, Labour Force, and International Migration in Pakistan", was started in 1979. The project was funded by the United Nations Fund for Population Activities (UNFPA) and executed by the International Labour Organisation (ILO). Pakistan Institute of Development Economics was appointed by the Government of Pakistan as the national executing agency. Fieldwork was carried out by the Federal Bureau of Statistics, Statistics Division, Government of Pakistan. The overall objective of the project was to help in creating a necessary information base for in-depth analyses of the household decision-making process concerning fertility, labour force, migration, and income and expenditures. This was deemed necessary for a comprehensive national planning strategy as charted in the Sixth Five-Year Plan (1983-1988). For a detailed description of the project and survey, see, Sathar and Irfan (1984).

survey covering both urban and rural areas of the four provinces of Pakistan. The survey covered about 10,000 households and contained three modules: the Household Income and Expenditure module, Labour Force Activity and Migration module, and Fertility module. The former two modules were offered to each sample household while the latter was applied only to 'eligible' women, that is, ever-married and below 50 years of age in the household.

This study, in line with the EC framework, focuses only on continuously married women who have had at least two children and whose husbands are still alive. The marital restriction is aimed at minimising the conceptual and measurement problems associated with marriage disruption. However, the restriction of at least two children is intended to avoid a bias in the results in favour of the underlying theory which postulates that higher motivation leads to more use of contraception. It reveals that women who had no child, or at the most one child, are most likely to have never regulated their fertility, and that they also lack the motivation to do so. Further, several screens were applied to the data to remove the observations with missing information on the variables used in the analysis. Thus, the study is based on 7077 cases, of which 3720 belong to the rural areas and the rest to urban inhabitants.

A. First Stage-Proximate Determinants Analysis¹⁵

To estimate the socio-biological determinants of cumulative fertility of the continuously married woman (number of children ever born (CEB)), the following linear specification is used. Ordinary Least Squares (OLS) is applied to obtain the estimates of the explanatory variables.

$$CEB = \alpha + \sum \beta_i X_i + \tau U + \varepsilon_i \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

where X_i is a vector of proximate determinants, which include the following seven variables:

- (1) Duration of Marriage in completed years (DURMARY). It is viewed as a proxy for exposure to the risk of intercourse, particularly in those societies where premarital sex is prohibited. Duration of marriage is measured as the algebraic difference between a respondent's current age and her age at marriage. The cumulative fertility of continuously married women is expected to be greater when her duration of marriage

¹⁵The discussion in this section follows the reasoning often emphasised by the 'Socio-biological' approach regarding the conceptual interrelationship between Proximate Determinants and Natural Fertility, as provided by Davis and Blake (1956); Bongaart (1972, 1982); Bongaart and Potter (1983) and Bongaart and Manken (1983).

is larger.

- (2) Length of First Birth Interval in months (FBI). The main component of this variable is the waiting time to conception and period of pregnancy. Since duration of pregnancy is constant in normal circumstances, the waiting time to conception is crucial for explaining the fertility behaviour. Thus, the length of the respondent's first birth interval is a proxy for the level of fecundity in the absence of contraceptives. The negative correlation is hypothesised between FBI and CEB.
- (3) Length of Last Closed Birth Interval in months (LCBI). It is a proxy for non-breast feeding component of postpartum amenorrhea¹⁶ which inhibits ovulation. It is argued that the relationship is inverse between the variable and cumulative fertility.
- (4) Not Secondly Sterility (NSS). It reflects the absence of secondary sterility, that is, the physiological incapacity to produce a live birth. Women found to be fecund were given a value of one while zero was assigned to those women who either reported a fecundity impairment or as currently regulating their fertility, and had no birth in the last five years nor were currently pregnant.
- (5) Duration of Breast Feeding in months (MOBF). Duration of breast-feeding is the principal determinant of the length of postpartum amenorrhea. Increase in the intensity and duration of breast-feeding enhances the duration of postpartum amenorrhea. Therefore, it is a proxy for pregnancy protection conferred on nursing mothers by subsequent prolonged infecundable period.¹⁷ Thus, MOBF is expected to be negatively related with CEB.
- (6) Proportion of Pregnancy Wastage (WASTPREG). It is the ratio of total number of pregnancies wasted, including miscarriages, spontaneous abortions, and still-births; but it excludes embryonic deaths before the first missed menses to the total number of pregnancies. A birth interval which includes a foetal wastage is extended by an additional period of ovulatory exposure, as well as additional months of pregnancy, amenorrhea and, perhaps, an ovulatory cycle. Thus, the total number of children born to a continuously married woman is expected to be higher when foetal wastage rate is lower.
- (7) Proportion of Infant Mortality (IMR). It is viewed that infant and child mortality shortens the non-susceptible period, either due to the end of

¹⁶Temporary absence of menstruation after a birth is often called postpartum amenorrhea. During this period, ovulation cannot take place [Bongaart and Potter (1983)].

¹⁷It has been found though that full breast-feeding associates with lower rates of resumption of menstruation or ovulation than partial (supplemented) breast-feeding [Bongaart and Potter (1983)].

ovulatory interval, if mother had breastfed, or by the resumption of sexual relation. Therefore, both IMR and CEB are believed to be positively related.¹⁸

The Use of Fertility Control (U) also affects fertility and it is expected to be negatively associated with the observed household's fertility. In the standard EC framework, the fertility control or contraceptive use variable was measured by years since its first usage. Unfortunately, such information is not available in the PLM survey. Therefore, the categorical variable (USE) is used instead, in this study. The respondents reporting the use of any methods of contraception were given the value of one, while the rest were assigned the value of zero. Both efficient (Pills, IUD, Diaphragm, Foam, Tablets, Condoms, and Injections) and inefficient (Douche, Withdrawal, and Rhythm) methods are considered. Induced abortion and sterilisation, though not common in Pakistan, are also included as efficient methods. However, to explore any behavioural differences among the users, the variable USE is defined and treated in two different ways. Respondents who reported to have ever practised contraception were given the value of one to the variable USE (MODEL-A), while in MODEL-B the variable USE is constructed by assigning the value of one to those respondents who reported the use of contraceptives during last five years prior to the survey dates. Thus, MODEL-B tries to capture the behaviour of the current users of fertility control methods.

B. Second Stage—Determinants of 'USE' Equation

To determine the factors affecting the probability of use of deliberate fertility control (USE), the following specification (Equation 4), as suggested by the EC Framework and as recently modified by Ahmed (1987), is estimated using the logit estimation technique. It is hypothesised that:

$$USE = \beta_0 + \beta_1 (Cn - Cd) + \beta_2 RC + e \quad \dots \quad \dots \quad \dots \quad (2)$$

where *USE* is the fertility control variable as mentioned above, *Cn* the potential supply of children, *Cd* the demand for children, and *RC* the costs of all types of

¹⁸Total potential supply may decrease as the survival rate of infants increases, in the course of socio-economic modernisation, either due to the behavioural reasons (reduction in infant and child mortality due to an increase in socio-economic status subsequently reduces fertility [Yamada (1985)]) or the physiological reasons (reduction in infant and child mortality might increase the interval between births by providing protection against pregnancy through lengthening the period postpartum infecundity-amenorrhoea—if mothers breastfeed [Bongaart and Potter (1983)]). However, it is hard to distinguish the physiological effect from the behavioural effect [Crimmins *et al.* (1984); Bongaart and Potter (1983); Bongaart and Manken (1983)].

fertility regulations. The difference between C_n and C_d represents the motivation to control fertility. As outlined in Ahmed (1987), C_n is unobservable and its indirect estimation, as described by Easterlin and Crimmins (1982), may produce biases¹⁹ and can be replaced by the following equation:

$$C_n = \alpha + \sum \beta_i X_i + \hat{u}_i \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

where X_i is a vector of all seven proximate determinants of the first stage. Substituting it into Equation (2) yields:

$$USE = \tau + \sum \delta_i X_i - \pi C_d + \emptyset RC + \epsilon_i \quad \dots \quad \dots \quad \dots \quad (4)$$

Theoretically, one would expect the probability of use of deliberate fertility control (USE) by a continuously married woman to be the higher²⁰—due to the following:

- (i) The longer her exposure to the risk of intercourse, measured in terms of duration of marriage ($DURMARY$). The greater the risk to exposure (intercourse) the more it raises the supply of children, which may in turn increase the 'motivation' to adopt fertility controls.
- (ii) The shorter her first birth interval (FBI); implying a faster rate of her early child-bearing.
- (iii) The shorter her birth intervals ($LCBI$) and duration of breast-feeding practice ($MOBF$). These indicators of postpartum amenorrhea reduce postpartum infecundity, which raises in turn, the supply of children and, consequently, increase the probability to adopt deliberate fertility control methods.
- (iv) The higher her fecundity—measured as a secondarily sterility.
- (v) The less are her physiological problems of reproduction as proxied by the rate of foetal wastage ($WASTPREG$). An increase in the rate of foetal wastage decreases the potential supply of births, which decreases in turn, the probability to adopt fertility control.

The direction of the effects of infant and child mortality (IMR) on the probability of the use of deliberate fertility control is less clear; it would be positive if the

¹⁹For a detailed discussion on the main sources of statistical biases, as recognised in the recent empirical work, see Crimmins and Easterlin (1983); Ahmed (1987); Easterlin and Crimmins (1985) and McHenry (1985).

²⁰For a detailed discussion, see Bongaart (1972, 1982); Bongaart and Potter (1983) and Bongaart and Manken (1983).

supply of living children was raised through an earlier ovulation following an infant death; it would be negative if the supply of living children was reduced through successive infant deaths.

To represent demand for children (C_d), desired total family size (DFS) is used in the analysis, defined as the number of existing children plus the number of additional children desired by the respondent. However, its application in many developing countries is beset by the problem of fatalistic (non-numeric) responses, such as "upto God" or "as many as possible", etc. Also, it may fail to reflect the different demographic pressures among those wanting no additional children. Nevertheless, recent empirical work on fertility concludes that the magnitude of such biases is not large enough to invalidate the usefulness of DFS. In fact, DFS has been considered to be a better measure of demand for children than the 'ideal family size'²¹ [Farooq and Simmons (1985)]. For the present analysis, DFS is constructed in the form of four binary variables: DFS1 equals one if DFS is not more than 2 children; DFS2 equals one if DFS is 3 to 4 children; if desired family size is 5 or more, DFS3 equals to one, otherwise zero; and DFS4 equals to one if the respondent gives fatalistic (non-numeric) responses. It is hypothesised that demand for children (C_d) and contraceptive use are inversely correlated.

Costs of fertility regulations (RC) must represent the household's subjective attitudes towards the use of fertility control, their information on the methods of control, and economic costs of obtaining additional knowledge about the use of techniques, and of purchasing the supplies or services needed for the control. Unfortunately, this ideal information is not available in the PLM data set. Therefore, a proxy variable (KNOWN) is used which reflects the number of methods of fertility control (efficient or inefficient) known to a married woman—and she reported these without special prompting.²² The idea is that the significant knowledge reduces time and psychic costs, which, reduces in turn the total costs of fertility regulations. Thus, it is expected that KNOWN tends to increase the probability of use of fertility control.

C. Third Stage—Modernisation and Fertility

In line with the standard EC framework, a set of equations are estimated to

²¹For a detailed discussion of different family size preference measures, refer to Lee and Bulatao (1983) and Farooq and Simmons (eds) (1985). However, it is not clear from the PLM survey data whether the desired family size was stated by wife respondent or the couple. It has been shown that data on fertility preferences can suffer from the fact that those who were interviewed may not be responsible for reproductive decision-making [Khan and Sirageldin (1977)]. Furthermore, sex preferences—disregarded in the present analysis—could also affect fertility preferences [DeTray (1980)].

²²It should be noted that this measure is deficient since it fails to capture the subjective feelings about the specific fertility control methods. Furthermore, it may introduce bias, favouring the hypothesised effect [Ahmed (1987); Easterlin and Crimmins (1985); McHenry (1985)]. However, KNOWN with similar specification is used by Easterlin and Crimmins (1982).

observe the impact of socio-economic modernisation and cultural variables on fertility and the fertility control behaviour. The following linear specifications are used to obtain the coefficient of exogenous socio-economic modernisation and cultural variables. OLS estimation technique is used to estimate the coefficients.

$$X_i = \beta_0 + \sum \beta_i M_i + \hat{u}_i \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

$$DFS = \beta_0 + \sum \beta_i M_i + \hat{u}_i \quad \dots \quad \dots \quad \dots \quad \dots \quad (6)$$

$$KNOWN = \beta_0 + \sum \beta_i M_i + \hat{u}_i \quad \dots \quad \dots \quad \dots \quad \dots \quad (7)$$

where X_i is a vector of seven proximate determinants (other than the use of deliberate fertility control) as described above, DFS is desired family size, and $KNOWN$ is the proxy for the costs of fertility regulations. M_i represents the vector of socio-economic modernisation and cultural variables available in the PML survey data. These include education of husband and wife; rural/urban residence; work status of wife before marriage—farm worker, non-farm worker, and never worked before; husband's occupation—self-employed farmer, agricultural wage worker, unskilled worker, professional, clerical and service worker, and no work. Further, four provincial (Punjabi, Pathan, Balochi, and Sindhi) dummy variables are incorporated to reflect local cultural effects on the fertility behaviour.²³

IV. EMPIRICAL FINDINGS

A. Proximate Determinants Analysis

Regression estimates of the proximate determinants (other than the use of deliberate fertility control)—separate for MODEL-A and MODEL-B—are shown in Table 1. In both cases, the explanatory power of the equations—fairly high adjusted

²³Although, in Pakistan, 98 percent of the total population comprises Muslims, yet each province represents a unique population in terms of ethnicity, social and cultural values, women's status (labour force participation and women's education), family and marital customs, etc. Literacy is the highest in Sindh (35 percent), followed by the Punjab, the NWFP, and Balochistan. Punjab is the most densely populated province, over 100 people per square mile, while only 7 people live in one square mile in Balochistan. Neutral family system—both in the rural and urban areas—is a common feature in the Punjab and the NWFP. In Sindh (excluding Karachi and Hyderabad—where 75 percent of the country's urdu-speaking population lives) and Balochistan, the old tribal system still commands marital union and family structure. Approximately over 70 percent of the female population, both in the Punjab and the NWFP, is directly and indirectly involved in economic activities in the rural areas. Female labour force participation rate is negligible in the rural areas of the remaining two provinces. Female enrolment, both at primary and secondary levels, is the highest in the Punjab, followed by Sindh, the NWFP, and Balochistan. The per capita GNP is the highest in Sindh, followed by the Punjab, the NWFP, and Balochistan. The proportion of total population living in the urban areas is the highest in Sindh (40 percent), followed by the Punjab, Balochistan, and the NWFP.

Table 1

Regression of Children Ever Born on Proximate Determinants
(Equation -1)

| Proximate Determinants | MODEL 'A' ^a | | MODEL 'B' ^b | |
|------------------------|------------------------|----------------|------------------------|----------------|
| | Estimates | Standard Error | Estimates | Standard Error |
| DURMARY | 0.274*** | 0.003 | 0.329*** | 0.003 |
| FBI | -0.025*** | 0.001 | -0.028*** | 0.001 |
| LCBI | -0.027*** | 0.001 | -0.028*** | 0.001 |
| NSS | 1.874*** | 0.056 | -2.667*** | 0.054 |
| MOBF | -0.024*** | 0.003 | -0.021*** | 0.002 |
| WASTPREG | -1.530*** | 0.208 | -1.444*** | 0.204 |
| IMR | 0.733*** | 0.096 | -0.833*** | 0.096 |
| USE | 0.145** | 0.070 | -0.597*** | 0.074 |
| CONSTANT | 1.084 | 0.086 | 0.122 | 0.086 |
| \bar{R}^2 | 0.609 | | 0.699 | |
| F | 1383.416*** | | 1634.093*** | |
| N | 7077 | | 5608 | |

* Significant at 0.10 level.

** Significant at 0.05 level.

*** Significant at 0.01 level.

^a Ever Used any Method.

^b Current Users of any Method.

R-Square and F-statistics—suggests that the equations fit well and the proximate determinants used in the model explain more than 60 percent of the sample household variations in child-bearing. An examination of the regression results also confirms the hypothetical relationships between household fertility and proximate variables. All variables are statistically significant, and are in a right direction, except for the coefficient of USE in MODEL-A.

The mortality variables (WASTPREG and IMR), fecundity (NSS), and duration of marriage (DURMARY) emerge as major proximate determinants of cumulative fertility among the sample households. Postpartum amenorrhic variables (FBI, LCBI, and MOBF) seem to have smaller effects on fertility as against the normal findings in the relevant literature. It may partly be explained by the differences in measurement, and partly by the fact that most fertility studies are usually based on population grouped data rather than individual observations.

The coefficient of USE in MODEL-B bears a correct sign. But it should be noted that current use is not related to the whole reproductive career as is the

dependent variable, cumulative fertility. The observed positive association between ever-used of fertility control seems contrary to the general belief that higher fertility in developing countries is the result of ignorance about fertility regulations. It appears that Pakistani couples engaged in family planning practices only when they have realised their desired family size.²⁴ However, scepticism remains about whether the possible bias arising from the fact that more fecund women tend to use more contraceptives has been controlled for or not. As another possible explanation of this contradiction, one could argue with some plausibility that, *ceteris paribus*, women who successfully space their births by using contraceptive methods must cumulatively have fewer births than those who do not.

In general, the results are similar to those obtained for Sri Lanka and Colombia; but with one exception: fertility regulation in both these two countries was inversely and significantly related to households' fertility [Easterlin and Crimmins (1982)].

B. Determinants of 'USE' Equation

The estimated logit coefficients are reported in Table 2. As expected, the demand for children negatively affects the log odds of contraceptive use. It is interesting to note that, in both models, relatively high probability of the use of contraception is associated with numeric responses. It reveals that those who systematically plan for their desired family size are likely to be contraceptive users. Except the rate for foetal wastage (WASTPREG), all coefficients related with the supply of children variables are significant and depict the presumed association with the probability of adopting fertility control among the sample women. The unexpected positive and significant effect of the foetal wastage rate on the probability of contraceptive use may be either due to 'misreporting' or the fact that those households use contraceptives which have had foetal wastage to avoid future physiological and psychological problems related to still-births, miscarriages, etc.

In both models, the likelihood of adopting fertility control seems to be less among married women who had relatively longer duration of postpartum amenorrhea (longer duration of birth intervals and/or breast-feeding); while relatively more fecund respondents, and those with a relatively longer duration of marriage, are expected to more likely adopt fertility regulations. The variable representing costs of fertility control (KNOWN) shows the expected positive link with the probability of adopting fertility regulations. However, this coefficient is insignificant in MODEL-A. Based on this result, one may argue that women who ever regulated their family size either used fertility control methods without having proper knowl-

²⁴See, for example, Khan and Sirageldin (1977); Soomro and Farooqui (1985); Farooq and Simmons (1985) and Shah and Palmore (1979).

Table 2

Logit Estimates of the Use of Fertility Control on the Demand for Children, Supply of Children, and Costs of Regulation Variables
(Equation - 4)

| | MODEL 'A' ^a | | MODEL 'B' ^b | |
|----------------------------|------------------------|----------------|------------------------|----------------|
| | Estimates | Standard Error | Estimates | Standard Error |
| Intercept | 7.786 | 0.137 | -0.004 | 1.313 |
| Demand for Children | | | | |
| <i>Desired Family Size</i> | | | | |
| 2 Children ¹ | - | - | - | - |
| 3-4 Children | -0.235** | 0.087 | -0.225** | 0.114 |
| 5 or More Children | -0.769*** | 0.095 | -0.848*** | 0.123 |
| Fatalistic Answer | -1.322*** | 0.145 | -1.366*** | 0.184 |
| Supply of Children | | | | |
| DURMARY | 0.033*** | 0.003 | 0.066*** | 0.004 |
| FBI | -0.011*** | 0.001 | -0.015*** | 0.002 |
| LCBI | -0.003** | 0.001 | -0.004** | 0.002 |
| NSS | 0.744*** | 0.091 | 4.210*** | 1.305 |
| MOBF | -0.015*** | 0.003 | -0.017*** | 0.004 |
| WASTPREG | 1.033*** | 0.224 | 1.173*** | 0.298 |
| IMR | -1.301*** | 0.151 | -1.700*** | 0.210 |
| Cost of Regulations | | | | |
| KNOWN | 6.122 | 10.894 | 1.603*** | 0.277 |
| D.F. | 7065 | | 5596 | |

* Significant at 0.10 level.

** Significant at 0.05 level.

*** Significant at 0.01 level.

¹ Reference Category.

^a Ever Used any Method.

^b Current Users of any Method.

edge or irrespective of the costs.

In general, the estimated results of the second stage of the analysis reveal that non-fatalism or systematic planning for the birth of children may motivate the adoption of fertility regulations. Furthermore, we may conclude that 'motivation'—governing the supply of and demand for children—is the major determinant affecting the probability of use of deliberate fertility control among 'eligible' women in Pakistan.

C. Impact of Socio-economic Modernisation on Fertility

The regression results of the potential supply of children (other than use of fertility control), desired family size, and number of methods of fertility control known are presented in Table 3. The socio-economic modernisation and cultural exogenous variables explain about 0.3 to 7 percent of the variation in the dependent variables. The lowest \bar{R}^2 is that of the LCBI, NSS, WASTPREG, and KNOWN.²⁵

Considering all regressions together, both the socio-economic modernisation and cultural variables seem to have effects on the supply, demand, and regulation costs. In socio-economic modernisation, urban residence has the most pervasive impact on fertility. Urban women, despite having a significantly lower family-size desire and a relatively higher knowledge of fertility control (lower costs of regulation), seem to have higher cumulative fertility as compared to their rural counterparts. The reasons may be their relatively higher exposure to the risk of intercourse (longer duration of marriage), and lower incidence of postpartum infecundity (shorter duration of postpartum amenorrheic variables, i.e., MOBF, FBI, LCBI).

On the other hand, lower infant and child mortality among urban respondents indirectly reduces total fertility through its direct effect on postpartum amenorrhea, if they breastfed.²⁶ The same can be true in the case of spouse's education. Though duration of marriage is lower among the more educated, it reduces the possible positive effect of education on cumulative fertility. It should also be noted that, despite much lower mean years of schooling for sample women (less than a year) as compared to men (3.5 years), the effect of wife's education seems to be more significant and consistently dominant than husband's education.

There is no significant difference among women who worked before marriage and those who never worked in terms of their cumulative fertility. Fertility seems to be higher among women whose husbands work in the rural sector or the agricultural sector, (employee or self-employed farmers) as compared to those whose husbands work in other occupations. This may be either due to their longer duration of marriage or a desire for a relatively large family size and relatively

²⁵Low \bar{R}^2 is not an uncommon feature, particularly in cross-sectional data.

²⁶See No. 18.

Table 3

Regressions of Determinants of Potential Family Size, Desired Family Size, and Cost of Regulation on Modernisation and Cultural Variables:

| Variables | Proximate Determinants of Potential Family Size, Cu | | | | | | | | | | Desired Family Size (DFS) | Number of Methods Known (KNOWN) |
|----------------------|-----------------------------------------------------|--------------------------------|----------------------------|-----------------------------------|----------------------------|--------------------------------------------|--------------------------------------|--------------|----------------|-------------|---------------------------|---------------------------------|
| | Duration of Marriage (DURMARY) | Month of Breast-feeding (MOBF) | First Birth Interval (FBI) | Last Closed Birth Interval (LCBI) | Not Secondly Sterile (NSS) | Proportion of Pregnancy Wastage (WASTPREG) | Proportion of Infant Mortality (IMR) | Family Size | Family Size | Family Size | | |
| Wife's Education | -3863(.043) | -3003(.044) | -7063(.148) | -2322(.111) | -0031(.002) | .0004(.0004) | -0073(.001) | -.0823(.007) | .0031(.002) | | | |
| Husband's Education | -1763(.026) | -0702(.026) | -3463(.091) | -062(.067) | -0001(.001) | .00072(.0002) | -0033(.0001) | -.0092(.004) | -.00007(.0001) | | | |
| Urban Residence | 1.9313(.243) | -8403(.247) | -3.1933(.831) | -291(.619) | -0322(.011) | .0113(.002) | -0112(.006) | -.1743(.040) | .0032(.001) | | | |
| Wife's Occupation | | | | | | | | | | | | |
| Farm Worker | -375(.577) | -807(.587) | 3.5371(1.97) | 9.19(1.467) | .015(.026) | .0101(.006) | -016(.015) | .3773(.096) | -.001(.004) | | | |
| Non-farm Worker | -765(.701) | .840(.718) | -778(2.391) | -137(1.784) | .038(.032) | .0172(.008) | -008(.017) | .146(.117) | -.005(.005) | | | |
| Husband's Occupation | | | | | | | | | | | | |
| Farmer | 1.2223(.271) | .201(.275) | 1.272(.925) | 1.3852(.689) | -.0473(.012) | -.001(.003) | .002(.007) | .1833(.045) | -.0031(.002) | | | |
| Agri. Worker | .8093(.453) | -.449(.461) | -2.4751(1.540) | -.393(1.152) | -.0572(.021) | .002(.005) | .004(.011) | .2543(.075) | -.0031(.002) | | | |
| Unskilled | -.0341(.020) | -1.355(2.471) | 19.762(8.290) | -6.364(6.177) | -.044(.109) | -.027(.027) | -.1031(.061) | -.299(.408) | -.004(.016) | | | |
| No Work | .6052(.266) | -.008(.271) | .424(.911) | .674(.677) | .0262(.012) | -.001(.002) | .0182(.006) | .0992(.044) | -.0042(.002) | | | |
| PROVINCE | | | | | | | | | | | | |
| Punjab | .222(.239) | .0001(.243) | -4.1273(.817) | 1.6712(.608) | .0363(.010) | .002(.002) | .0323(.006) | -.4273(.040) | .0022(.001) | | | |
| Pathan | -.388(.348) | .9062(.354) | -5.7813(1.190) | .452(.886) | .0422(0.15) | .0183(.004) | .0131(.009) | -.022(.059) | .0073(.002) | | | |
| Balochi | -1.7493(.477) | -.384(.485) | -1.901(1.631) | 1.753(1.212) | .0612(.021) | -.001(.005) | -.002(.012) | -.3293(.079) | .0051(.003) | | | |

Continued -

Table 3 – (Continued)

| Variables | Proximate Determinants of Potential Family Size, C_u | | | | | | | | |
|-----------|--------------------------------------------------------|--------------------------------|----------------------------|-----------------------------------|----------------------------|--------------------------------------------|--------------------------------------------|---------------------------|---------------------------------|
| | Duration of Marriage (DURMARY) | Month of Breast-feeding (MOBF) | First Birth Interval (FBI) | Last Closed Birth Interval (LCBI) | Not Secondly Sterile (NSS) | Proportion of Pregnancy Wastage (WASTPREG) | Proportion of Infant Child Mortality (IMR) | Desired Family Size (DFS) | Number of Methods Known (KNOWN) |
| CONSTANT | 16.31 | 15.42 | 36.835 | 33.955 | 0.845 | 0.020 | .162 | 5.11 | .0009 |
| R^2 | .040 | 0.22 | .024 | .004 | .005 | .011 | .029 | .074 | .003 |
| F | 25.941 | 14.311 | 16.012 | 3.31 | 4.011 | 7.291 | 18.472 | 48.142 | 2.49 |

Reference Categories: Province: Sindh.

Wife's Occupation: No work before marriage.

Husband's Occupation: White-collar workers, professional, skilled, and service workers.

N = 7077 (All Equations).

¹Significant at 0.10 level.

²Significant at 0.05 level.

³Significant at 0.01 level.

Standard Error in Parentheses.

higher costs of fertility regulations (less knowledge).

Knowledge of fertility regulations is directly related to wife's education and urbanisation, and is the same among those women who ever worked or not at all. It is surprisingly higher among those women whose husbands work in rural sectors. Demand for children is higher among those who work in the agricultural sector, and significantly lower among the more educated and urban respondents.

The table also evinces that there are marginal differences in terms of duration of marriage, infant and child mortality, desire for family size, and knowledge of fertility control among respondents of different provinces. Nevertheless, there seems to be no marked differences in terms of postpartum amenorrheic factors. Therefore, cumulative fertility levels are much likely to be the same among respondents of different cultural settings in the country.

In conclusion, one may state that desire for family size and knowledge of fertility control are more sensitive to modernisation variables. Most of the proximate determinants of the potential family size tend to be sensitive to urbanisation and education, particularly the education of wife. It is relevant to note that the observed negligible impact of women's work status on fertility, and possible positive effects of wife's work status and urbanisation on fertility, seems to be consistent with the available evidence on other LDCs. In a relatively less developed situation, little education, especially wife's, and urbanisation tend to have a positive impact on cumulative fertility via reducing postpartum infecundity of married women by reducing the duration of breast-feeding and other postpartum amenorrheic variables.²⁷

V. CONCLUSIONS

The nationwide cross-section data of the intensive Pakistan PLM survey are applied to replicate the famous Easterlin and Crimmins (1982) 'synthesis' framework of fertility determination with its recent modifications by Ahmed (1987). The following main conclusions are drawn from the preceding discussion and these may be important for policy and planning purposes.

1. The most important determinants of the country's high-level fertility are relatively higher levels of woman fecundity and infant and child mortality.
2. Influence of postpartum amenorrheic variables (other than proportion of children and infant mortality) on cumulative fertility of a married woman is weaker as against the findings of other empirical studies of this type.
3. Factors affecting 'motivation' to adopt fertility control emerge as the

²⁷See, for example, Cochrane (1983); Lindert (1983); UNO (1985); Nag (1983); Oni (1985).

- main determinants of the use of fertility regulations; while knowledge about the methods of fertility regulation (costs of regulation) does not have significant influence on the decision to adopt fertility control.
4. Observed positive relation between ever-used contraceptives (MODEL-A) and fertility may be either due to higher fecundity among the users, as supported by the positive association between probability of ever used of contraception and NSS, or due to the observed higher probability of use among older women (with a longer duration of marriage), or due to a relatively higher probability of use among women who have their desired family size through systematic planning by using contraceptives. Such behaviour of the users may also explain the possible claim for Pakistani married women, that is, the fertility control methods are being used after realising their desired family size—particularly during the later stages of married life.
 5. Systematic planning for children's birth may motivate the adoption of fertility regulations.
 6. Urbanisation and education, especially wife's education, operate on all aspects of cumulative fertility, and may have a positive impact on households' fertility via lowering postpartum infecundity due to a shorter duration of birth-intervals and breast-feeding practice; even though both variables have a depressant effect on the desired family size. A possible positive effect of urbanisation on cumulative fertility is likely to be higher than of education, because urban respondents have longer duration of marriage, lower postpartum practices, and are more fecund than their rural counterparts.
 7. Wife's occupational shift seems to have a negligible effect on the fertility behaviour of married couples.
 8. Husband's occupational structure influences all three aspects of fertility. Cumulative fertility may be lower among those respondents who report non-agriculture occupation of their husbands, either due to shorter duration of marriage or smaller family-size planning and relatively lower costs of fertility regulations.

However, due to the presence of inherent limitations pertaining to an analysis of this type, and possible sources of biases in data and variables specifications, these findings may not be viewed as incontrovertible.²⁸ Any future endeavour to circumvent such limitations may indubitably extend our understanding of the fertility behaviour of married couples in Pakistan.

²⁸See No. 19.

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