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Education and fertility: The case of Nepal

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by

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ABSTRACT

This paper is an attempt to look at differential effects of various levels of educational attainment on fertility level. The argument developed here is that education is not a linear or a continuous function as suggested by many studies. It is not a scale as such. Rather it may very well be a step function. To put it another way, not all levels of educational attainment affect fertility behavior in the same way or with the same magnitude. To demonstrate this relationship, we decompose the education variable into different levels or variables and test whether the different levels of educational attainment have different effects on fertility.

This is a case study of Nepal. Different levels of educational attainment data are stratified according to the educational system of the country. The 1971 National Census of Nepal is used. Data on number of children ever-born to women ages 40-44 are used as dependent variable. Data pertaining to the different levels of educational attainment are used as explanatory variables. The findings show that the relationship between educational attainment and fertility is a step function. Using a multiple regression analysis, an inverse relationship between 6-8 and 9-10 years of school completed and fertility, and a positive relationship between advanced level of education and fertility are found. The relationshipshold for the total as well as male and female population separately. The strength of the relationship, however, is found to be stronger for females than for males. The effect of zero and 1-5 years of schooling is found to be positive on the fertility level. Given the nature of availability of data, the findings of this paper are suggested as tentative. The limitations of data used are pointed out.

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CHAPTER I

INTRODUCTION

The study of the relationship between economic development and population growth has attracted much attention in economic and demographic literature in the late 60's (for example, Robinson 1971, Robinson & Horlacher 1969, Ohlin 1967, Ruprecht & Wahern 1970, Enke 1966, 1971, Schultz 1962, 1971, Kuznets 1967). Most of these studies have successfully documented that fertility rates decline in response to increasing development, whether measured by education, urbanization, non-agricultural labor force participation or income.

Developing countries today are characterized in a demographic sense by high fertility and lowered mortality. The introduction of medical and public health practice into such countries has led to longer life expectancies and lower death rates. This occurred while birth rates prevailed at relatively high levels, resulting in unprecedented rates of population growth. In this sense, most developing countries today are trapped in the second stage of "demographic transition".[1/]

One immediate "interventionist" policy to planning population growth is through the implementation of family planning programs. Accordingly, nation wide family planning programs have been proposed as the most feasible means to restore "demographic equilibrium" (see Berelson 1969). The number of developing countries supporting the provision of family planning programs has increased to sixty-three (Norman and Hofstatter 1976). These countries contain almost three-fourths of the total population of the developing countries (Nortman and Hofstatter 1976).

While family planning programs may be instrumental toward restoring demographic equilibrium, they should not be considered as the "single"

policy available to cope with the population crisis. As Garrett Hardin (1968) in his modern-classic paper, "The Tragedy of Commons" correctly points out there is no technical solution to the population problem. It would be erroneous to assume that the availability of contraceptives would automatically lead to a decline in fertility rates. In populations where contraceptive practice is not yet wide spread or efficient, family planning programs do not offer much as solutions to the problem. In many developing countries contraceptive practice rates have been very low despite governments' massive efforts in increasing acceptance rates.[2/] Secondly, even if we assume that family planning programs are effective, it does not necessarily imply that fertility rates would decline. This aspect of the problem has been well articulated by Kingsley Davis. He (Davis 1967) points out that there is a wide discrepancy between the "desired" family size of an individual or a couple and the family size perceived as "desired" from the societal point of view. "Overlooked" he says, "is the fact that a desire for the availability of contraceptives is compatible with high fertility." So even if perfect contraception prevails among the child-bearing population of a country, it is argued that the country would have enough births to maintain a high population growth.

A careful investigation of other factors that are conducive to reducing population growth is, therefore, warranted. It has been well argued that motivation to lower family size arises out of "social and economic conditions" (Blake and Gupta 1975, Hauser 1967, Dyck 1968). Kingsely Davis (1967) insists that "the social structure and economy

must change before a deliberate reduction in the birth rate can be achieved". In this context, it is not surprising to note that some "family planners" have strongly advocated the need for "beyond family planning" approaches. Bernard Berelson (1969) listed twenty-nine alternative policies including education which governments are urged to consider beyond, or in addition to, family planning. Consequently, there has been more attention paid to the investigation of socio-economic factors that influence the rate of population growth.

Several studies (Adelman 1963, Cho 1970, Janowitz 1976, Fernando 1977, Drakota 1969, 1972, Kamerchen 1971, 1972, Heer and Boynton 1970, Heer and Turner 1965) have shown that educational attainment is one of the key factors that affects fertility rates. (The findings of these studies will be reviewed in the next Chapter). Most of these studies, but not all, have demonstrated an inverse relationship between education and fertility. The central element that runs through all these studies stems from the very "multifunctionality" nature of educational attainment.[3/] There are various ways through which education might influence fertility. Education can transfer values and encourage the formation of more modern attitudes, including more familial attitudes. In addition, education often tends to raise one's aspirations. More highly educated individuals may consider it more important to have highly quality (more costly children) or children themselves may become less desirable relative to competing demands. Education also has an impact on the economic circumstances of a family, which help to determine the feasibility and necessity for having more children. Moreover, education may affect fertility through its influence on health and nutrition, age

at marriage, exposure to mass media. Education affects child spacing and the incidence of infant and child mortality. It may also increase access to information about birth control devices, and thus, better contraceptive knowledge and practice. These issues will be discussed at greater length in Chapter II.

Statement of the Problem

Most studies referred to above dealing with the relationship between education and fertility have analyzed education as a variable in a conventional way: using the percentage of educated population or mean years of education to as an independent variable describing fertility behavior. This is typical of the studies that have utilized Census or aggregate data. By employing education measures such as the percentage of educated population or mean years of education, these studies have demonstrated an inverse relationship between education and fertility.

However, it can be argued that such conventional measures are overly simplistic. The often demonstrated linear relationship between education and fertility assumes that each level of education has an inverse relationship with fertility. To put it another way, implicit in the conventional use of the measurement of education-index is the notion that the "assumption of transitivity" operates between any level of education and that it has no restriction. To illustrate, we presume that education has some sort of influence on fertility, whether through changes in alternative roles for women, adaptation of new social values and norms, or establishment of a better communication network, or efforts to materialize new aspirations and expectations. But do we

really believe that each and every increment in educational years has any such consequences? Unfortunately, every social scientist or researcher who correlates "years of education", whether as an index of fertility or with any other variables is, in fact, testing a theory which presupposes that every increment in educational years inversely influences fertility behavior. We may, for example, argue that five years of education might not be significantly different from, say, two years of education. Conversely, ten years might be significantly different from five years of education. Considering this simple example, it indicates that by employing the mean or average years of education-index we would measure something that does not correspond with our propositions. This clearly indicates the existence of the problem between conceptualization and the actual measurement-index. In other words, problems associated with the conceptualization of an index are inadvertantly ignored or overlooked. The conclusion inferred from studies that have not considered this type of measurement problem "result in frequent testing of hypotheses which one does not really intent to test" (Carter 1971).

Many studies mentioned above that have used conventional education indices have inherited this type of problem. For example, two independent studies (Kamerschen 1971; Drokata 1969) that employed the percentage of educated population found that the effect of education on birth rates are in conflict. Similarly, Heer and Boynton (1970) and Heer and Turner (1965) also found inconsistence relationship between education and fertility. In their subsequent comments and reply, Kamerschen(1972) and Drakota (1972) argue that such contradictory findings are possible

because of the differences in what 'education means in developed versus developing countries'. While their argument may have certain validity, it can also be argued that such conflicting results are the outcome of the lack of proper identification of measurement-index. On the basis of the measurement problem discussed above, it can be argued that had the Kamerschen and Drakota studies looked at the different levels of educational attainment, their findings may have been compatible. That is, it is possible that both studies may have found a negative relationship between education and fertility along certain segment of the curve, and from thereon the direction of the relationship may have been different. In other words, a "threshold" type effect could have been found, which could not be detected by the type of education-index, i.e., total percentage of educated population, being employed by them. Recently, Albert Hermalin, based on a cross-national study, reported a positive correlation between education and fertility for Nepal.[4/] Hermalin used percentage of educated population to the total population in his study. In congruence with most demographic thinking, it would be presumed that fertility would be inversely related to educated or literate population. The argument here is that inconsistencies in findings such as that reported by Kamerschen, Drakota, Heer and Boynton or Hermalin are the result of improper conceptualization of the measurement index as well as failure to test for proper functional form.

Unfortunately, little attention has been given to this aspect of the measurement problem. Many researchers conveniently use indices without any further consideration as to the measurement problems that such indices suppress. Such "indicators are usually chosen because they have

been used before for reasons of face validity" (Carter 1971). In many "model" oriented studies, the education variable is often included in regression equations without any consideration regarding measurement problems. Researchers seem contended with their results by demonstrating that education is inversely related to fertility. "Occasional negations of such propositions should not be surprising. What is surprising is that, by default, many social scientists are, in fact, testing theoretical statements within which such assumptions are buried..." (Carter 1971).

Objective of the Study

This research is an effort toward the investigation of what Lewis Carter (1971) referred to as the "buried assumption" problem. The argument developed here is that education should not be looked at as a linear or logarithmic or continuous function as suggested in many studies. It is not a scale as such. Rather, it may very well be a step function. To put it another way, not all levels of educational attainment affect fertility behavior in the same direction and with the same magnitude. This research attempt will largely focus on clarifying and respecifying the methodology for estimating the complex relationship between fertility and education. We will decompose the education variable into different levels or variables. Then, the different effects of educational attainment on fertility will be empirically tested utilizing the Census data from Nepal.

Economic Implications

The proposed research effort has important implications for econo-

mists and planners. For, this issue may be very instrumental in allocation of resources to alternative uses especially in developing countries where resources are extremely limited.

In recent years, there has been increasing concern among economists over the demographic implications of education (for example, Arnold 1972, O'Donough 1971). The need for a 'multi-disciplinary" approach or at least "multi-disciplinary awareness' has been emphasized when examining the externalities of education. One of the externalities of education is the potential effect of education in reducing fertility. Therefore, it has been argued that resource-allocation decisions regarding education should not be based only on 'manpower requirements' of a nation. Rather, it is pointed out that the demographic implication of the manpower aspect of education should also be considered. There has, however, been scant work done in this area. This potential research-area has been well articulated by Fred Arnold (1972:6):

> While the fertility-development link has been studied by economists and the education-fertility link has been explored by demographers and sociologists, rarely have these links been put together. One searches in vain through the economic literature for a discussion of the effect of education on economic development through fertility. Yet this mechanism may, in fact, be quite powerful...Since reduced fertility is conducive to economic growth and since it may increase welfare in a variety of ways, it is incumbent upon economists and planners to study the demographic implications of various resource allocations. Yet educational policies, for one, are formulated without regard to their potential influence on fertility.

Crucial as the issue pointed out appears, it does not encompass the whole of the problem. In developing countries another aspect has to be looked at also. Since such countries cannot afford to allocate a vast share of

of their resources on education, it is important to decide what level of education should be minimally provided. Also, to what category of people should it be provided, at least from the view point of demographic implications. Perhaps this aspect of the resource allocation problem may not be a severe one in more advanced countries because of relatively large supplies of resources. Also, since the fertility rates have already declined considerably in such countries the demographic implication of educational inputs is of less concern. However, developing countries must make such decisions however 'hard' these decisions appear to be. Addressing a Conference on Population and Development held recently in Nepal, population-economist Stephen Enke (1972) stated this issue succinctly:

> The prospective increases in school age population makes achievement of 100 percent school enrollment a dream of a century (for developing countries).....Hence, hard decisions must be made as to which categories of children should have priority access to education. Should more children be given fewer years of education or fewer children be given more years of schooling? To what extent should boys be preferred over girls (or vice-versa) where teachers and schools are scarce?

In this respect, more research utilizing the methodology proposed in the present study might serve as a criteria for such "hard decisions."

Plan of Study

Chapter II presents a review of literature on fertility and education. More specifically, we will focus on those studies that have attempted to look at each level of educational attainment and the corresponding family size. In Chapter III we will discuss the methodology and operationalization of the concept. In Chapter IV, we will present the empirical results and discuss them. We will conclude

with a summary of our findings. The limitations of the present study will also be pointed out.

CHAPTER II

LITERATURE REVIEW

In this section, we review major findings of past research done in the area of the relationship between education and fertility. First, we briefly summarize the emergence of the concept of economics of education in the developmental theories. Secondly, we review the findings of studies that discuss education and fertility in general perspective. Finally, we focus on the relationship between female educational attainment and fertility.

The Economics of Education

It was not until about 1960 that economists started to recognize the faulty notion apparent in the post-war development theories.[5/] In the post World War II, even the manpower aspects of education were highly ignored by economists. During this period, a whole body of economic theory grew up which treated labor as clearly subordinate to physical capital. Even when labor was considered in the economic models, it was invariably the quantity of labor, rather than its quality, that was emphasized. In his presidential address to the American Economic Association in 1960 Theodore Schultz pointed up the failure of post-war development. Shultz admonished that "counting individuals who can and want to work and treating such a count as a measure of the quantity of an economic factor is no more meaningful than it would be to count the number of all manner of machines to determine their economic importance either as a stock of capital or as a flow of productive services" (Schultz 1971: 27). This address spawned a great deal of interest in human capital and in the economics of education.[6/] However, much of this interest focused typically

on the manpower aspect of education and on the economic return on individual investments in education. Only recently have some authors tried to expand the boundaries of this topic to include some of the less easily measurable products of education (for example, O'Donough 1971, Adams and Bjork 1969).

Gunnar Myrdal (1967: Chap. 30) in his well-known work, Asian Drama, provides an excellent review of the emergence of the concept of human capital. Myrdal sums up post-war theories of development as follows:

> It is remarkable fact, testifying to the damaging compartmentalization of the social science, and in particular the insularity of traditional economics, that economists after the Second World War could build up a theory of development based soley on physical investment--a theory incapable of explaining the process of economic growth that a group of them later "discovered" investment in man--while all the time they were apparently unaware of the thinking and writing of students and practitioners who specialized in this field (and also of the theorizing by earlier members of their own profession).

Indeed, a multi-disciplinary approach is necessary when examining the effects of education. In order to evaluate educational investment properly, it would be necessary to explore both direct and indirect and economic and non-economic effects of education. True, the teaching of knowledge and skill to enhance the ability of a person is a primary objective of education, but in the meantime, the by-products of the education process may be quite significant as well. One such by-product of educational attainment is its contribution to reducing the fertility level.

Education and Fertility

In recent years, several attempts have been made to investigate the

relationship between education and fertility (e.g., Michael 1973, Rindfuss and Westoff 1974, Bumpass 1969, Jaonwitz 1976, Heer and Boynton 1970). One rationale for such increasing interest in this field stems from the fact that educational attainment has been regarded as "perhaps the single most important variable in a study of differential fertility" (Cho 1970: 65).

Education, both of males and females, is believed to reduce desired family size by creating awareness of new goals vis-a-vis additional number of children (Easterlin 1969) and substituting child quality for numbers (Becker 1970:211-215, Fleisher 1977). Educational attainment also decreases incidence of infant and child mortality through influence on health and nutrition (Heer and Turner 1965). Educated couples are found to be more receptive to contraceptive practices and also are reported to use more effective birth control methods (Michael 1973). Thus, education is expected to correlate negatively with fertility. The inverse relationship, however, is not found to be the case for all previous studies.

With respect to fertility differences between nations, Adelman (1963), Heer (1966) found measures relating to educational attainment to be inversely related to fertility. Adelmen (1963) observed that "among all the variables, a one percent change in index of education appears to exert the largest absolute influence upon age-specific birth rates". In studies with sub-national levels as the unit of analysis, similar negative correlations between educational attainment and fertility were found for Taiwan (Collever, Speare, and Liu 1967) and Puerto Rico (Schultz 1967). For ethnic groups within the Soviet Union, Mazur (1967) also showed a

negative partial association between education attainment and fertility.

On the other hand, in their study of sub-national fertility differences in Latin American nations, Heer and Turner (1965) found somewhat a confusing situation. Other inconsistent results were obtained by Leasure (1963) in his study of Spanish provinces. He found slight negative partial association between education and marital fertility for 1950, but substantial positive partial correlation for 1950 and 1910. In a study for Greece, Drakota (1971, 1972) employed percentage of total educated population and found that education exerts the strongest absolute influence on birth rate. Kamerschen (1972), on the other hand, by using 'median years of school completed,' found education to be positively related to fertility.

Education of Women

Female educational attainment is a stable attribute against which reproductive performance may be studied. In contrast to female labor participation, or occupation, which may be interrupted by spells of non-participation or occupational changes, female educational attainment constitutes a characteristic against which reproductive performance could be effectively measured. Gabill, Kizer, and Whelpton (1958), thus, state:

> ...with reference to the number of children ever-born to women of a given educational attainment, one can be fairly sure that in most cases all of the women's children were born while she was of the stated educational class. The characteristics of stability also has advantages in so far as interpretation of reproductive rates by educational attainment is concerned.

Several potential effects of education of women have been pointed out. First, by widening a woman's horizons, education affects her preference for children. Second, by increasing the productivity of her time in the market relative to her time in the home, it creates incentives to spend more time working and less for child-care (Hashimoto 1974). In this connection it should be noted, however, that education may also increase home productivity (Leibowitz 1974, Fleisher 1977). Commenting on this issue, Simon (1974:143) concluded that "at least for single economic reasoning, not all the data on the effect of women's education on fertility are consistent with the notion that the labor force opportunity cost is the dominant mechanism.." Finally, education may affect the effectiveness of fertility control by increasing a woman's knowledge and use of birth control, thereby lessening the divergence between desired and actual family size. For example, Michael (1973) finds that more educated couples select a more effective contraceptive technique and Rindfuss and Westoff (1974) find that the greater the woman's education, the more likely she is to use contraception before the first pregnancy. Educational level also affects age at marriage, which in turn may affect family size. Women marrying later enter marriage with a wider variety of work experience than women who marry young. Also, the former group is more likely to work immediately after marriage than the latter (Bumpass 1969).

Analysing the 1971 Census data for Sri Lanka, Fernando (1977) reported that attainment of 1-4 years of school tends to produce minimal reduction in fertility, where as the reduction would be about 18% in the next higher level. He showed a steady decline in births for married

Sri Lankan women of ages 40-49, who had attended highest level education. It is interesting to point out that this sort of decline was observed without vigorous family planning programs in that country (Fernando 1977). Goldstein (1972) analysed data for Thailand and assertained that "regardless of location, education in Thailand seems to have a very important impact on fertility level, suggesting that secondary and higher education to an increasing proportion of Thai women may significantly reduce fertility levels in the Kingdom as a whole". Abu-Lughod (1965), in a study for urban Egypt based on the 1960 Census of that country, observed female education to be a "significant factor in depressing fertility of urban Egyptian women". He found a clear inverse relationship between the educational attainment of wives and the number of children borne by them. A similar inverse relationship is also reported by Miro and Ruth (1965) for Rio de Janero metropolitan area.

Cho (1970: 65-67), based on an extensive analysis of the 1960 U.S. Census data, reported an "overall" pattern of an inverse relationship between women's educational attainment and fertility. Among the White American women ages 40-44 who had at least five years of college, about 50% less total number of children ever-born were reported than that of women of the same ages who had no education at all. Similarly, he found little over 27% decline in the total number of children ever-born to Black women ages 40-44 who had at least 5 years of college than those who had no education at all. To the contrast, Heer and Boynton (1970), using the same 1960 Census data for the U.S. found "no statistically significant association with fertility". Heer and Boynton's study

employed "median school years" as measurement of education. Thus, the results of the analysis of data for developed countries appear to be conflicting and inconsistent.

Summary

To summarize, a review of the literature regarding the relationship between education and fertility suggests the following:

(1) So far as developing countries are concerned, in most cases there is a fairly well established relationship between education and fertility. Data from developed countries, however, suggest some inconsistency between the two. Cumulative completed fertility is typically measured in terms of children ever-born to women 40-44.

(2) Most findings from the developing countries show that the differential effect of fertility is perhaps much stronger in such countries than in the developed ones. This may, in part, reflect the level of development itself. While in developed countries, developmental activities are more homogeneous, in the developing world the level of development is pronounced only in certain regions within a country. Thus, a particular level of fertility may be found more sensitive to education in a heterogeneous population than for a developed country with a more or less homogeneous pattern of development. It is also important that developing countries which may be experiencing a rapid socio-economic development, education may be one of the most crucial factors in their development processes.

(3) In cases where an inverse relationship is found between education and fertility, the relationship holds for the total as well as for the

female population separately. However, the effect of female educational attainment on fertility may be much stronger or at least as important as male educational attainment. This suggests that for a better understanding of the relationship in question, it may be desirable to look at the effect of male and female educational attainment separately.

It is against these backgrounds that we specify the estimation of equations in the following Chapter.

CHAPTER III

THE DATA AND METHODOLOGY

This section has two purposes: First, we discuss the data base used in the study. Second, the operationalization of the concept, developed in Chapter I, is presented. We discuss the dependent and independent variables employed in the study. A set of equations to be empirically estimated are also presented.

District level data from the 1971 Census of Nepal (Nepal, Central Bureau of Statistics, 1975) are used for this research effort. These data are cross-sectional and thus relate to the same point of time. There are 75 administrative districts in Nepal and the data are available for each. The data base then are aggregates for each Census district. While the relationship between educational attainment and fertility outlined in previous sections is in terms of individual behavior the data available for this research effort are aggregate data for the districts. This discrepancy gives rise to what economists term the "aggregate problem" (Bridge 1971: 348) or sociologists refer to as the "ecological fallacy" (Robinson 1950). One limitation of the grouped data (by districts) is the reduced variability in the variables. The limitation has an advantage, however, in suppressing individual differences in tastes.

In our study, education refers to formal school years completed. This apparently includes that population which has acquired knowledge and education through informal channels such as on-the-job training, religious or military training, in the category of uneducated population. Thus, this may somewhat bias our results which should be borne in mind. It should also be pointed out that we have no information about the quality

of educational information given to the Census enumerator, therefore, this issue is beyond the domain of the present research effort.

Choice of Dependent Variable

As the focus of this research effort is to investigate a step type relationship between fertility and educational attainment, data on children ever-born (CEB) are used as the dependent variable. Besides CEB, there are other indices of fertility measurement such as the Total Fertility Rate (TFR), Gross Reproduction Rate (GRR), the Crude Birth Rate (CBR), and the Child Woman Ratio (CWR). For the present study, however, we propose to use data on the total number of children ever-born (CEB) to women ages 40-44 as measurement of completed family size. Data on the total number of children ever-born has been widely used as a measure of completed family size, since it is argued that this measure of fertility approximates closely completed fertility and is a theoretically appropriate measure of cross-sectional data for a given year (Schultz 1973:244; Tobin 1973:277).

Independent Variables

Educational attainment is broken down into separate levels for explanatory variables. The first equation is estimated for the total population, including both males and females. For the second equation, we use male educational attainment only. In the third equation, female educational attainment data are analysed in the same fashion since it has been claimed (Fernando 1977, Kamerschen 1971, Janowitz 1976) that female education has a greater effect on fertility than does male education. The cut-off points for education levels used here are 5, 8, 10

and over 10 years of school completed. These points represent certain empirically valid levels--Primary, Middle, High, and Advance schools--in the present educational system of Nepal. A more desirable method would be to further break down the advanced level of educational attainment. However, since the percentage of highly educated people in Nepal is very low, less than one percent, we have integrated these levels. In any case, these are 'cutting points' formed by the educational system in Nepal that can be thought of as an 'omnibus personal form'. Putting it another way, there might not be any difference in knowledge between 4 and 5 years of education. However, it is likely that there would be a difference in the social and economic outcomes between 5 and 6 years of education, since years of education represents "entry" into a different reference group--the Middle school. By the same token, there might not be any differences in knowledge represented between 9 and 10 years of education. However, it is likely that the differences in social and economic outcomes would be pronounced between 10 and 11 years of education, because 10 years of education would, under the present educational system in Nepal, represent entry into college. Thus, levels of education can be thought of as what Lewis Carter (1971) referred to as "the points at which major changes of status occur".

Educational Flow and Educational Stock

There are two types of education data available in the 1971 Census of Nepal--(1) years of school completed, and (2) level of school enrollment. In the present study, years of school completed data will be used rather than 'school enrollment'. It is important to spell out the

differences between these two types of data on education. The former category of data--years of school completed--represents the "educational stock" of a nation whereas the latter category denotes "educational flow". (For a discussion on the differences between these two concepts, see McClelland 1979). It has been argued that "educational stock" better reflects modernization and development of a country than does the "educational flow" (McClelland 1969). Furthermore, since the purpose of this study is to investigate the effect of different levels of educational attainment, it is theoretically more appropriate to use the 'years of school completed' data rather than the data on school enrollment. Therefore, we propose to use "educational stock" i.e., years of school completed rather than "educational flow" i.e., school enrollment data.

Literacy Data

In our analysis, no attempt will be made to include the data on literacy rate as the explanatory variable. There are two major problems regarding the use of literacy data. First, the compiling of literacy data is often ambiguous. Even though literacy, by definition refers to basic reading and writing ability plus the knowledge of simple arithmetic, the information given to an enumerator may not meet all the three critieria, yet a person may be willing to be identified as literate. There are hardly any cross checks carried out by an enumerator to make a judgment as to whether a person is literate or semi-literate. Secondly, it has been shown that literacy data are useful in supporting only a "threshold" theory rather than a continuous one (Kamerschen 1968). That is, the

literacy index "seems to work up to a certain level of socio-economic development and after that either works in the opposite direction or becomes indiscriminating" (Kamerschen 1968). Because of these two major problems regarding the use of literacy data, we will not include them in our study.

Specification and Estimation of Equations

Based on the operationalization of variables as discussed in the preceding section, three basic equations, using the two stage least squares technique, will be first estimated:

CEB = A, ONCH, PRI, MID, ADV, E .....(1)

CEB = A, MNCH, MPRI, MMID, MHIG, MADV, E.....(2)

CEB = A, FNCH, FPRI, FMID, FHIG, FADV, E.....(3)

where,

O preceding three letters = Total population

M preceding three letters = Male population

F preceding three letters = Female population

A = Constant or Intercept

CEB = Total number of children ever-born to women 40-44 years of age at the time of the Census

NCH = Proportion of population which has no formal education to the total population of 6 years and over

PRI = Proportion of population which has 1-5 years of school completed to the total population of 6 years and over

MID = Proportion of population which has 6-8 years of school completed to the total population of 6 years and over

HIG = Proportion of population which has 9-10 years of school completed to the total population of 6 years and over

ADV = Proportion of population which has 11 years or more of school completed to the total population of 6 years and over

E = Error term, and

Comma (,) is used to express a complex relationship to be determined empirically.

Equation one (1) is estimated for the total population, including both males and females. Equation two (2) is stratified in the same fashion except that it includes the male population only. The third equation (3) refers to the female population only.

With the identification of dependent and independent variables to be employed in the present research effort, we can now discuss the empirical findings.

CHAPTER IV

THE EMPIRICAL RESULTS AND DISCUSSION

In the last chapter, we discussed how different levels of educational attainment would be stratified in our study. We also identified the usage of the dependent variable. In this section, we present the results and discuss them.

The Problem of Multicollinearity

The results obtained from the least squares multiple regressions are presented in Tables 1, 2, and 3. As these tables show more than three equations were estimated, because of the existence of high multicollinearity or high correlation between any two independent variables. The Zero-order Correlation Matrix, presented in Table 4, shows that the correlations between some of the explanatory variables are as high as over .8. A plausible explanation of such high multicollinearity is that in some educational groupings, a high proportion complete one final year of education merely to go on the the next level. In order to control for the problem of multicollinearity, different sets of equations were estimated, by eliminating the variables wherever the multicollinearity was over .6. The cut-off point of .6 is somewhat arbitrarily chosen. While there is no specific given value at which the problem of multicollinearity should be considered, we decided, given the Zero-order Matrix in Table 4, that .6 would be an appropriate cut-off point regarding exclusion of any particular variable in the aforementioned equation estimates.

Primary, Middle, and High School Attainment and Fertility

The results presented in Table 1, 2, and 3 show that education

possesses a step type function as hypothesized. The Standard Error of Estimates (SEE), given in all the three Tables, are of small magnitude, less than .18. Most variables tested are statistically significant from zero at 2.5% and 5% levels.

As one would expect, zero-education has a positive effect on CEB for the total as well as female population (Table 1 and 2). However, this relationship does not appear to be consistent regarding the equation estimated for the male population only (Table 3). A plausible explanation for such an inconsistent finding might be that in some districts where there are no schools and, therefore, no formal education, some male individuals may have been tutored informally and may reflect the knowledge and attitudes of individuals with formal schooling. This is, however, mere speculation. Additional household data are required for further investigation of this issue.

The cohort of 1-5 years of completed education shows a positive relationship with children ever-born. However, the beta values for this variable are smaller than for zero-schooling. It indicates that 1-5 years of education has relatively less positive influence on fertility than no education at all. The population which has completed 6-8 and 9-10 years of education, i.e., the Middle level and High school level years respectively, have a negative influence on fertility. It confirms the generally held belief that education contributes to depressing fertility level. Looking at the beta values in Tables 2 and 3, we find that the magnitude of the influence of Middle level schooling on fertility is slightly higher than High school level. The inverse relationship holds for the male and female population separately as well.

Table 1

Education-Fertility Regression Estimated for Total Population, Nepal 1971

(N = 75)

Eqs.	Constant	ONCH	PRI	MID	HIG	ADV	EDU	R^2	SEE	F
(1)	4.301	.017 (1.496)						.017	.178	2.24*
(2)	5.965		.065 (2.978)**	-.252 (4.144)**		.073 (1.432)		.178	.162	6.36**
(3)	5.953		.020 (1.021)		-.077 (2.059)**			.036	.176	2.39*
(4)	5.966		.033 (1.673)*				-.069 (3.013)**	.093	.170	4.83**

T values are in parentheses
** Significant at 2.5% level
* Significant at 5% level

Table 2

Education-Fertility Regression for Female Population, Nepal 1971

(N = 75)

Eqs.	Constant	FNCH	FRPI	FMID	FHIG	FADV	FEDU	R^2	SEE	F
(1)	4.760	.0237 (3.188)**	.3018 (1.328)	- 1.417 (3.125)**		.740 (1.996)**		.246	.155	7.045**
(2)	4.862	.0218 (2.876)**	.2979 (1.318)	- 1.637 (3.085)**	-.581 (2.016)**			.246	.155	7.061**
(3)	4.536	.0282 (3.703)**	-1.109 (0.592)				-.1628 (1.216)	.170	.163	6.068**
(4)	5.979		-.0613 (0.306)				0.2410 (1.681)*	.024	.177	2.311*
(5)	4.456	.0296 (3.861)**	-.1929 (1.117)			0.022 (.077)		.153	.165	5.463**

T values are in parentheses
** Significant at 2.5% level
* Significant at 5% level

Table 3

Education-Fertility Regression Estimated for Male Population, Nepal 1971

(N = 75)

Eqs.	Constant	MNSCH	MPRI	MMID	MHIG	MADV	MEDU	R^2	SEE	F
(1)	6.577	-.0123 (2.023)**	.0167 (.581)	-.0929 (1.773)*	-.0795 (1.502)			.119	.168	4.51**
(2)	5.961		.0445 (1.726)*	-.1029 (1.931)*	-.0151 (2.980)**			.081	.172	6.19**
(3)	6.491	-.0114 (1.760)*	.0220 (.734)	-.1214 (2.447)**		-.0388 (.639)		.096	.170	4.97**
(4)	6.588	-.0125 (2.103)**	.0148 (.548)				-.0863 (3.434)**	.131	.167	4.74**

T values are in parentheses
** Significant at 2.5% levels
* Significant at 5% levels

Table 4

Zero-order Correlations Matrix of
Education-Fertility Variables

	CEB	ONCH	PRI	MID	HIG	ADV	EDU
CEB	1.000						
ONCH	.172	1.000					
PRI	.084	-.869	1.000				
MID	-.331	-.768	.487	1.000			
HIG	-.221	-.633	.137	.720	1.000		
ADV	-.116	-.084	.030	.512	.881	1.000	
EDU	-.124	-.990	.727	.852	.764	.649	1.000
FNCH	.416	-.084	.282	-.107	-.058	-.087	.094
FPRI	-.114	-.718	.742	.622	.373	.120	.708
FMID	-.348	-.796	.273	.897	.835	.652	.776
FHIG	-.107	-.642	.006	.568	.911	.923	.639
FADV	-.063	-.529	-.070	.424	.824	.913	.533
FEDU	-.912	-.873	.123	.757	.911	.789	.847
MNCH	-.163	.524	-.536	-.314	-.298	-.229	-.522
MPRI	.045	-.694	.973	.469	.113	.016	.696
MMID	-.245	-.717	.560	.707	.478	.311	.702
MHIG	-.254	-.802	.183	.756	.974	.855	.784
MADV	-.155	-.652	.001	.561	.934	.953	.648
MEDU	-.154	-.966	.762	.806	.678	.545	.957

Table 4 continued

	CEB	ONCH	PRI	MID	HIG	ADV	EDU
CEB							
ONCH							
PRI							
MID							
HIG							
ADV							
EDU							
FNCH	1.000						
FPRI	.012	1.000					
FMID	-.212	.582	1.000				
FHIG	-.076	.178	.708	1.000			
FADV	-.127	.022	.550	.938	1.000		
FEDU	-.109	.369	.989	.951	.842	1.000	
MNCH	-.610	-.361	-.231	-.224	-.074	-.245	
MPRI	.316	.693	.226	-.018	-.082	.087	
MMID	.031	.601	.589	.337	.252	.474	
MHIG	-.052	.424	.868	.881	.787	.945	
MADV	-.101	.153	.703	.968	.948	.928	
MEDU	.148	.718	.695	.544	.453	.791	

Table 4 continued

	MNCH	MPRI	MMID	MHIG	MADV	MEDU
CEB						
ONCH						
PRI						
MID						
HIG						
ADV						
EDU						
FNCH						
FPRI						
FMID						
FHIG						
FADV						
FEDU						
MNCH	1.000					
MPRI	-.527	1.000				
MMID	-.331	.552	1.000			
MHIG	-.296	.160	.526	1.000		
MADV	-.220	-.019	.347	.914	1.000	
MEDU	-.360	.424	.893	.853	.697	1.000

However, it should be pointed out that the negative effect of female education on fertility is higher than that of the male population for the respective level of education. This tends to support the findings of other research (Fernando 1977, Janowitz 1976) that female education possesses a stronger influence on fertility than does male education. Because both Middle and High school levels had negative relationships with CEB, they were merged together, denoted as EDU, MEDU, and FEDU for equation (4) in Table 1, for equations (3) and (4) in Table 2, and for equation (4) in Table 3 respectively. Once again, female education shows a greater influence on fertility and signs are in the expected direction.

Advanced Level of Education and Fertility

The advanced education level, i.e., at least 11 years or more years of school completed, shows a positive effect on fertility for the female (Table 2) and total population (Table 1). The observed relationship for the male population is inconclusive since it is not statistically significant. The positive effect of higher level of education is congruent with some other studies (Miro and Mertens 1968, Janowitz 1976). A few factors might help explain this sort of positive effect. First, the population with advanced education is likely to have better jobs as well as more access to resources, hence better economic security. Given that people with higher education are likely to have better jobs, thus better economic security, the relative costs of having a third child could be expected to be lower in this case. The influence of the negative effect of low costs for having another child may have been pronounced in the observed positive relationship between higher levels of education and fer-

tility.

Another thesis put forward by Strafford (1969) could also be considered to explain the positive effect. Strafford's contention is that expected future income has a substantial effect on the fertility level. A higher level of educational attainment implies an enhancement in the expected future resources or income. Higher expected future resources minimizes the risk of having a third child. This argument suggests that it would be desirable to introduce a variable that closely reflects the resource availability to test such propositions. Such a variable typically used in empirical models is income. However, a-priori it can be said that income as a variable is probably not a good index of measurement here, especially in the case of developing countries. Some past research, such as those by Drakota (1969), have observed this type of problem. Since the economic activities of developing countries like Nepal are not completely monetized, income does not represent the total flow of goods and services that take place in the economy. Income in such countries represents only a small fraction of total economic activities. Moreover, the unavailability of income data for Nepal precludes the use of such as index.

One point of caution should be made here regarding how we defined "advanced education" in the present paper. Because of the very low proportion of the population with 12-14 or 15-16 years of school completed (less than 1% of the total educated population) we have grouped the educational attainment of over 10 years into one level i.e., advanced education. It is quite possible that the negative effect of a very advanced level of education, say 15-16 years of school completed, on

fertility level may be much stronger than the relatively low level of educational attainment, say 12-14 years of school completed. Therefore, the negative effect of advanced level of education on fertility as shown in our estimates may not be expected to hold for different levels of advanced educational attainment variable (ADV).

Time-lag between Education and Fertility

While discussing the effect of educational attainment on fertility, one important aspect should not, however, be overlooked. Even though an inverse relationship between educational attainment and fertility is found, it may not seem to provide much solution towards the effort to depressing the fertility level, particularly high fertility countries. Implicit in the concept of educational attainment is the notion of time-lag anywhere between 8-10 years. Thus, while it may be an effective weapon for the long-run, its effects may not be realized as fast as other fertility reducing agents, for instance effective contraception in the short-run. Apparently, while education is an important factor contributing toward the goal of fertility reduction, it is one of many factors which countries incorporate in their population planning programs. Other factors enlisted by Berelson (1969) should also be considered simultaneously.

The notion of time-lag associated with educational attainment and fertility should not, however, reduce the role of the education-fertility relationship. The planning of developing countries should recognize the importance of education as an agent to reduce fertility. Otherwise, such plans may not yield as much impact as they would have by taking the

the demographic implication of education into account. A case in point is the new education policy of the country in question--Nepal. Given the low educational level of Nepal at the present time, it would probably be a wild fantasy to provide mass education in the sense of formal schooling. The fact is that the extent to which advancement can be made in different levels of education may not be substantial in the foreseeable future of the country. It appears that "less education for more" has been the kind of approach being taken by the Government of Nepal. Recently, under the new plan of education (Nepal, Ministry of Education, 1971), the primary education is being reduced from five to three years; and it is further recommended that only 40% of the primary graduates should be sent up to the secondary level. The demographic implication of such a squeezing-in of education at the base and of lessening further educational opportunities would seem to close off any prospect of the population's educational ability to create awareness to curve the fertility level. Such a plan clearly represents a failure to incorporate the demographic implications of educational attainment in planning. It is in these types of situations that a study such that as attempted here may provide some helpful insights.

The Proportion of Variance Explained

Finally, a few words on the proportion of variance explained (R^2) seems to be in order. In the equations estimated here, the total proportion of variance explained ranges from 3% to as high as 25%. While the upper bound value of the total variance explained (around 25%) are not uncommon in social science research, the small proportion of variance

explained in the lower bound may be attributable to small variations in some explanatory variables. Appendix Table 1 shows that mean values for the different edducational attainment levels of population in question are rather low. However, low R^2's should not be judged as the only criteria for the relative importance or unimportance of the explanatory variables. As discussed earlier, most variables included in the equations as well as F values are statistically significant. Goldberger (1968) warns that "the low R^2's typically found in cross-sectional studies ought not to reduce the attraction of those who are interested in obtaining reliable estimates for population parameters and not merely good fits."

CHAPTER V

CONCLUSIONS AND LIMITATIONS

Summary of Findings

In this paper, we have attempted to test the hypothesis that the influence of educational attainment on fertility level varies in degree as well as in direction resulting from the variation in the level of educational attainment. The conventional educational measures, such as the total percentage of population or mean or median years of education of the population in question, tend to assume a simplistic approach to the rather complex relationship between education and fertility. Our results suggest that different levels of educational attainment affect fertility levels differently. The implication of these findings would appear, therefore, to suggest that education-indexes should not be treated as a simple negative function. The methodology applied here may also serve as an explanation for other studies in cases where the use of an education-index has resulted in conflicting or inconsistent results. The findings indicate that such anomalies may exist because of improper conceptualization of the measurement or index in question. Our results cast doubt on the wisdom of measuring the impact of education on fertility by education in regression equations. Since education's impact on family size depends on where the gains in education are being made, it is important to know more than variation in the mean or median.

Under the educational system in Nepal, the Middle level school, i.e., 6-8 years of completion of school, has the strongest negative influence

on the total number of children ever-born. The second strongest negative inverse relationship is found among the population with 8-10 years of completion of formal education. The effect of 1-5 years of completed school appears to be positive. However, it is interesting to note that the slope of this particular segment of the curve is somewhat steeper than the slope of the curve representing zero i.e., no education at all. It implies, then, that as far as the demographic implication of a lower level of educational attainment is concerned, 1-5 years of education is better than no education at all. Above all, a case has been established that a highly advanced level of education is not a necessary condition for dampening the fertility of the developing country Nepal.

It was also found that the educational attainment of women is an important component in differential fertility. Therefore, in order to reduce the fertility level of the country, educational opportunities for women should not be neglected. Although women enjoy legal equality with men in the sphere of education, they are greatly underrrepresented in high school and college level. Perhaps this is largely a matter of choice or financial constraint, but there is no question that the traditional Nepalese attitude of indifference to or disapproval of educating women still lingers on in present-day Nepal. The old indifference to or disapproval of higher education for women may be difficult to overcome. However, the potential reduction in future fertility implied by educational progress for women provides an additional reason for making the effort.

Limitations of the Study and Future Improvements

Perhaps a major weakness of this research effort is that we considered only the educational attainment of the population in question. It may be pointed out that other socio-economic variables such as employment, ethnicity or race or income would have been desirable to include in the analysis. While the inclusion of some of these socio-economic variables may have been relatively easy in our analysis, we were limited by the availability and or relevance of usage of such data for the country in question. The inclusion of some additional variables would, no doubt, be an improvement in this direction.

The 1971 Census data for Nepal, utilized in this study, does not provide any information on income. According to the data, almost all the population almost 98%, are engaged in the agriculture sector. This severely limited the variance to be expected in different categories of employment data. Therefore, we decided not to include this variable in our equations. A preliminary look at the distribution of data on ethnicity and religion also revealed less attractive distribution. As regard to the data on ethnicity, there are more than forty ethnic groups in the country. Therefore, a breakdown of the data by ethnic groups would result in very small proportions of different ethnic groups such that the percentage of error would outweight benefits to be derived from the inclusion of such a variable.

Factors which might explain the positive effects of advanced education are not studied here. Some variables such as agricultural surplus, status, or the availability of surplus land would have been desirable to include. The inclusion of such factors in the present analy-

sis would be another improvement in this area.

Given data limitations, it would appear that the findings of this paper should, in all fairness, be taken as tentative. With the inclusion of additional variables, the degree to which any particular level of educational attainment affects fertility may be expected to change somewhat--some of the beta coefficients may indicate stronger relationship while some may assume weaker relationship between education and fertility. Nevertheless, the methodology employed here would appear to point out an important issue regarding the measurement of the influence of educational attainment on fertility. Therefore, it is our contention that this sort of approach may warrant more consideration.

A series of other variables such as marriage postponement, labor force participation, effective contraceptive practice, and a higher level of spinsterhood, may affect fertility level. David Heer (1971) points out that despite the inverse relationship usually found between education and fertility "very little is known about the causal mechanism relating educational attainment and fertility". Barbara Janowitz (1976), on the other hand, assertains that "the channels through which education affects family size are not of constant importance, but rather depend on level of education already achieved". It was beyond the scope of this paper to explore this issue. To this end, an effort towards understanding the "mechanism" appears to be an interesting aspect for future research.

Decisions as to which categories of children should have high priority access to education, should more children be given fewer years of education or fewer children be given more years of schooling,

appear to be fundamental issues in the allocation of resources in most developing countries like Nepal. The methodology applied here may provide some insights regarding this. The demographic implications of educational attainment should deserve more attention than they have today. Since education is closely related to fertility, data on educational attainment may be a useful input for fertility projections.

FOOT-NOTES

1/ The concept of "demographic transition" has been a topic of wide debate as to whether it is "the" theory or not. It has been argued that "demographic transition" is actually a "social process", depicting fertility and mortality patterns and not a theory. For example, see Warren C. Robbinson, "The Development of Modern Population Theory", The American Journal of Economics and Sociology, Vol. 23, Oct. 1964: 375-392. In the present context, the notion of "demographic transition" is used to refer simply to the "process" of mortality and fertility patterns.

2/ For instance, in Nepal the recent Nepal Fertility Survey shows that only about 5% of ever-married women have ever used any method of contraception. Furthermore, it is reported that only about 3% of "exposed" women are currently using any form of contraceptive method. (World Fertility Survey-Nepal Project, First Country Report 1976: Table 7.6).

3/ The term "multifunctionality" was applied to the process of education by Charles A. Anderson in The Social Context of Educational Planning (International Institute for Educational Planning, UNESCO, 1967) Cited by Fred Arnold,A Model Relating Education to Fertility in Taiwan, Unpublished Ph.D. dissertation, The University of Michigan 1972.

4/ The findings were reported by Albert Hermalin at a seminar at the East-West Population Institute in summer, 1979.

5/ This section is heavily drawn upon Fred Arnold, A Model Relating Education to Fertility in Taiwan. Chapter II. Unpublished Ph.D. dissertation, The University of Michigan, 1972.

6/ An entire supplement to the Journal of Political Economy (Vol LXX, No. 5, 1962) deals with investment in human resources. For a comprehensive bibliography of works on the economics of education, see Mark Blaug, Economics of Education: A Selected Annotated Bibliography (Oxford, England: Pergamon Press, 1966)

Appendix Table 1

Mean and Standard Deviation for each Variable

Variables	Mean	Standard Deviation
CEB	5.94	.18
ONCH	97.03	1.83
PRI	1.57	1.03
MID	.57	.43
HIG	.55	.55
ADV	.25	.46
EDU	2.93	1.83
FNCH	51.04	2.52
FPRI	.14	.11
FMID	.07	.07
FHIG	.06	.10
FADV	.03	.07
FEDU	.29	.15
MNCH	55.00	3.90
MPRI	1.43	.95
MMID	.55	.53
MHIG	.51	.46
MADV	.21	.38
MEDU	1.06	.87

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