EDUCATION AND FUTURE FERTILITY TRENDS, WITH SPECIAL REFERENCE TO MID-TRANSITIONAL COUNTRIES

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A. INTRODUCTION

Of all the indicators of socio-economic status, schooling has been most widely used by demographers. Education of adults persistently emerges as the single most powerful predictor of their demographic behaviour. Thus, length of schooling is associated with the start of reproductive life (age at marriage and maternity), with childbearing and the use of birth control, and with mortality. Until the late 1970s, the pervasive influence of educational background of individuals and couples on a range of demographic outcomes was thought by many researchers to reflect the close link between extent of formal schooling and material circumstances; schooling was typically taken to be an indicator of socio-economic status, and interest in its association with fertility and mortality was correspondingly diluted. The turning point was the publication of results from a survey in Nigeria that showed the schooling of mothers to be a more powerful predictor of child survival than economic characteristics of the family, such as the father's occupation (Caldwell, 1979) together with an extensive review of the educational-fertility relationships that came to similar conclusions (Cochrane, 1979). Subsequent research has confirmed that the schooling of the mother is generally a more decisive influence on reproduction than characteristics of the father.

Advocacy of better schooling for girls as a means of achieving lower mortality and fertility has become embedded in the ideology of major international organisations such as the World Bank and the United Nations Population Fund. It also emerged as one of the major themes of the 1994 International Conference on Population and Development. Yet empirical support for the view that the enhancement of women's schooling is critical for fertility reduction is neither as strong nor as universal as is often implied, and the links between schooling and fertility are not clearly understood (United Nations, 1987). The relationship between women's schooling and fertility - and particularly the effect of a modest amount of schooling - is highly context-specific, varying by region of the world, level of development and time (Jejeebhoy, 1995). It may also be affected by cultural conditions, particularly by the position women occupy in the traditional kinship structure.

The main purpose of this paper is to identify the implications of past and projected changes in the educational composition of populations for the future course of fertility in countries that have now entered in the mid- and later phases of fertility transition, broadly defined here in terms of total fertility in the range of three to five births per woman. Of critical importance is the speed of future decline and the level at which reproduction will stabilise. The ideal requirements for successful achievement of this purpose are: a theory of fertility transition that specifies the role of schooling as a determinant in the context of other determinants; clear documentation of the statistical associations between schooling at individual and aggregate levels, across space, time and phase of fertility transition; an understanding of the intervening pathways that link schooling to fertility outcomes; and a reasonably accurate forecast of future trends in schooling.

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The mere enumeration of these desiderata, together with the abundance of empirical evidence that has been accumulated in the 50 years, dictate a need for this paper to be highly selective both in terms of issues and evidence. The approach will be to attempt to synthesise features and understanding from studies of the recent past and then to apply them, in a necessarily speculative way, to the future. The issues, or desiderata, will be taken in reverse order.

B. CHANGING EDUCATIONAL COMPOSITION

Two components of educational composition of a population are potentially relevant to fertility: the composition of the school-age population and the composition of the population in the reproductive ages. Considering the first of these, school enrolments may transform intergenerational relationships by raising the direct costs of childbearing, reducing their availability for household production and allowing parents to invest in the quality of offspring at the expense of quantity (Becker, 1991; Caldwell, 1982). The effect of children's schooling on the reproductive aspirations and behaviour of parents has been neglected by researchers. Some of the rather meagre evidence is positive (e.g. Caldwell, Reddy and Caldwell, 1985; Axinn, 1993;) but one cross-national study failed to find any link between primary school enrolment and fertility (Tan and Haines, 1984) and demographic trends in such countries as Bangladesh and Nepal show that high (or even moderate) enrolments are not a necessary precondition for fertility decline.

For the purposes of this paper with its focus on mid- to late transition, consideration of possible effects of primary and secondary school enrolments on the fertility of the parental generation is not a top priority for two reasons. First, mass schooling is already well established in most, though not all, countries that have recorded appreciable fertility decline and it is doubtful that further increases in enrolment would exert any appreciable influence in reproduction. Indeed, fertility transition in sub-Saharan Africa is proceeding in the presence of declining enrolments. Second, most authors have argued that the advent of mass schooling acts primarily as a catalyst for the onset and early phase of fertility transition, a relationship that is largely irrelevant to the countries under consideration here.

Past improvements in literacy and education of the adult population are well documented and will not be discussed here. Future changes in the educational composition of the adult population may well be more relevant to the course of fertility over the next few decades than trends in school enrolment and retention, though, of course, one is merely the longer term consequence of the other. A recent paper by Lutz and Goujon (2001) provides succinct regional projections of educational composition to the year 2030. Two projections are made. The first assumes a continuation of recent enrolment ratios - the constant scenario - together with projections of fertility, mortality and migration trends that follow the IIASA central scenario (Lutz 2001). The second projection assumes that all regions experience linear improvement in their school enrolments that will bring them to the current levels of North America by 2030. Though not explicitly stated by the authors, this 'American' scenario presumably represents the upper bound of possible outcomes while the 'constant' scenario perhaps captures a more realistic future. Certainly a comparison of primary and secondary enrolments in the 1980s and 1990s suggests that no major improvements occurred in most low income regions (United Nations, 1995a). An alternative stance would be to extrapolate past recent rends in enrolments but this exercise is beyond the scope of this paper.

The results of the projections by Lutz and Goujon are summarised in Table 1 for the adult female population for the three regions that contain the majority of mid- and late- transition countries: North Africa, Latin America, West Asia and South Asia. One striking point to emerge is the length of the time lags involved. Even under the optimistic 'American' scenarios, the educational composition of the adult female population does not change radically over the next 30 years. The biggest change concerns the percentage of women with tertiary education, which is projected to rise from about 10 per cent in three of

the four regions to nearer 20 per cent. However large proportions of women in 2030 will still fall into the no schooling or primary schooling categories: over 60 per cent in South Asia, over 40 per cent in North Africa and West Asia and over 30 per cent in Latin America.

Of course, age-specific projections are required to document in detail the possible implications of changes in educational composition for future fertility. If attention were to be restricted to prime childbearing ages - say 20 to 35 years - larger projected improvements in educational composition would be obtained than for the entire adult population aged 15 or more years. But even such age-specific projections, if based on realistic assumptions about future trends in schooling, would probably fall below the 'American' scenario.

In summary, four key points emerge from this brief discussion. First, the multi-state life table methods used by IIASA can be routinely applied to project the educational composition of countries and regions. Second, the assumptions used by IIASA could probably be improved to develop a central or most likely scenario, lying somewhere between the 'constant' and 'American' scenarios (except in sub-Saharan Africa, perhaps). Third, age-specific projections are needed to spell out possible demographic implications. Fourth, the results of such further refinements are unlikely to challenge the impression given by Table 1, namely that adult populations in low income regions indeed will become more educated but the extent of improvement will be relatively modest, at least over a 30 year perspective.

C. EDUCATION AND FERTILITY: PATHWAYS OF INFLUENCE

Most of the research on education-fertility relationships has used cross-sectional surveys, in particular WFS and DHS enquiries. As will be shown in the next section, a cross-sectional perspective can be misleading because it often conveys an impression of immutability, or inevitability, to relationships that evolve over time. Nevertheless, cross-sectional surveys provide valuable information on the linkages between the educational background of individuals and couples and reproductive outcomes, that may be of relevance to considerations of the future. In this section, the behavioural links will be taken first. The relationship between schooling and fertility preferences will then be discussed and finally underlying or distal causal mechanisms will be considered.

1. Behavioural links

No needs exists to repeat in any detail the huge body of evidence concerning the effects of education on the major proximate or behavioural determinants of reproduction: sexual behaviour or its commonly used surrogate, marriage; breastfeeding and related post-partum factors; and fertility regulation. The role of postponement of marriage and maternity in fertility transitions varies greatly by region, accounting for an appreciable proportion of overall decline in many Asian and North African countries but for a much smaller proportion in Latin America. Cross-sectional evidence, most recently summarised by United Nations (1995b) and Jejeebhoy (1995) indicates that age at first marriage and first birth among women are strongly related to schooling in nearly all low and medium income countries, though a small exposure to schooling often has only a negligible impact. Moreover, the multivariate analyses reviewed by Jejeebhoy suggest that the relationship cannot be attributed to employment or the characteristics of the husband.

In the countries that form the focus of this paper, with total fertility below five births but above replacement level, delayed marriage, while impacting on period fertility, may have little influence on ultimate family size or cohort fertility. An issue of critical importance for fertility projections is whether or not rising marriage ages, particularly among more educated strata, will translate over coming decades

into an avoidance of marriage and motherhood altogether, as has happened in many advanced industrialised countries. Thus far, this translation has not occurred. The proportions of all women aged 40 to 49 years who have never married is negligible in nearly all developing countries (Kishor and Neitzel, 1996). When disaggregated by women's education, the dominant impression is that marriage remains the norm. Among women aged 40 to 49 years with ten or more years of schooling, the proportion never married exceeded 10 per cent in only seven out of twenty two DHSs (United Nations, 1995b). It is also true that Western Europe is unusual in having a long tradition of marriage avoidance, in contrast to most Asian and African societies where there is little evidence of any such tradition of non-marriage. Marriage and motherhood still remain almost universal in such low fertility Asian countries as the Republic of Korea and Taiwan, though not in Japan.

The future of marriage, itself strongly influenced by education, in today's medium fertility countries represents the single biggest uncertainty in future fertility forecasting. The topic has been badly neglected by demographers and research in this area might pay high dividends.

Consideration of the post-partum factors (lactational amenorrhoea and sexual abstinence) can be brief because their role in future fertility trends is negligible. Suffice it to say that the fertility-enhancing effects of shorter and less intense lactation and early resumption of sexual relations following childbirth, both associated strongly with schooling, are typically overshadowed by greater use of fertility regulation. For instance in 10 of 14 Asian, North African and Latin American DHSs, the average length of the interval between first and second birth was found to rise monotonically with increasing women's education (Mboup and Saha, 1998). In sub-Saharan Africa, however, the dominant impression was that birth interval lengths varied little by education, presumably a reflection of lower overall levels of fertility regulation.

The dominant behavioural pathway linking education to fertility is, of course, the use of contraceptives. With few exceptions, contraceptive use rises monotonically and steeply across schooling categories. In most countries the link takes the form of increased resort to effective modern methods, though important exceptions exist. In India, China and Bangladesh, better educated couples are less likely to be sterilized than their less educated counterparts.

In today's medium fertility countries contraceptive prevalence is already relatively high and is expected to rise further. Thus contraceptive discontinuation, failure and switching, together with abortion, will become progressively more important determinants of fertility among sexually active women. Surprisingly, women's schooling is not a net predictor of the probability of overall discontinuation while still apparently in need of protection, nor of user- or method- failure (Curtis and Blanc, 1997). This is one of the few instances where schooling fails to lead to benign demographic outcomes. However, schooling is related to one crucially important element of contraceptive behaviour, namely the propensity to switch to another method after abandoning an earlier method. Curtis and Blanc (1997) demonstrate that mother's schooling is a strong net predictor of switching in four of the six DHSs examined. In the remaining two surveys, the net effect of schooling is positive but not significant at the 95 per cent confidence level.

Little is known about schooling-abortion relationships because of lack of reliable data. Ongoing analysis of DHS contraceptive calendar data by Ali and Cleland at the London School of Hygiene & Tropical Medicine supports the expectation that the relationship will be positive. Using pooled data from 18 surveys, they have found that women's schooling is a net predictor of abortion following contraceptive failure. The DHS does not distinguish between induced and spontaneous abortion though it is clear that the majority of abortions following failure are induced. It is also certain that both forms of abortion are severely underreported and thus it remains possible that the educational differential simply reflects reporting error.

2. Links through demand for children

We turn now to fertility preferences. The dominant characterisation of fertility transition is that falling demand for children in response to societal changes, including schooling, is the main driving force of changes (e.g. Pritchett, 1994). Sub-Saharan Africa conforms most closely to this perspective. The very pronatalist attitudes documented by WFS enquiries in the late 1970s and early 1980s have steadily eroded in the past 20 years and falling demand for children has typically preceded widespread uptake of contraception. In other regions, however, family size desires were always much more modest than in Africa and appear to have changed little in the first 10 to 15 years of decline. Thereafter, fertility itself and indicators of desire or demand for children have fallen in parallel. Thus implementation of pre-existing attitudes may have been primarily responsible for initiation of fertility transition in Asia and Latin America. Furthermore one plausible interpretation of the subsequent parallel decline in attitudes and reproductive outcomes is that increased acceptability of, and resort to modern fertility regulation techniques may have acted to destabilise desired family sizes. In other words, the path of causality may not be a straightforward unidirectional one from demand to contraceptive use, but rather circular with strong feed-back effects from behaviour to demand (Robinson and Cleland, 1992).

These considerations serve as a warning that our conceptualisation of fertility desires and implementation of desires may be oversimplified. Nevertheless, in so far as a clear-cut distinction can be made, it is clear that implementation has made a more important contribution to fertility reductions of the past 30 years than changing demand. Feyisetan and Casterline (2000) show that changes in fertility preferences, on average, account for only one-fifth of the observed increases in contraceptive prevalence between the 1970s and the 1990s in low-income countries. Not surprisingly, this fraction is appreciably larger in sub-Saharan Africa.

Broadly the same verdict can be reached with regard to schooling differentials in fertility. While the educational background of couples is negatively associated with desired family size, differences are modest (except in sub-Saharan Africa), once appropriate statistical controls are made for age and number of living children (United Nations, 1995b). Conversely, schooling differentials in implementation (i.e. unmet need) are much wider (e.g. Westoff and Moreno, 1992). As a visual illustration, figure I contrasts actual fertility with two indicators of desired fertility for Peru and Kenya. In Peru, the variation in observed fertility by women's education is vastly greater than the variation in desired fertility. In Kenya, the same tendency is apparent, but in a much less pronounced manner.

The greater ability of more educated couples to achieve their fertility preferences should not be exaggerated. In a multivariate analysis of the probability of bearing children who were unwanted at time of conception, Adetunji (1998) found a variety of maternal education effects in 10 DHSs. In two of the three Latin American countries, the expected result was obtained: the probability of unwanted childbearing declined significantly with increasing schooling. However in two of the four African countries, and in Indonesia and Egypt, the opposite effect was found. The results for the African surveys - Ghana and Kenya, both conducted in 1993 - can be explained by the fact that these two countries were in a relatively early phase of transition, a time when implementation of preferences is tentative and when unwanted fertility may rise. Moreover, as already shown, schooling is more strongly associated with the desire for smaller families in Africa than elsewhere, leaving educated couples more exposed to the risk of unwanted childbearing. The results for Indonesia (1990) and Egypt (1992) are less easy to explain, because these countries had long and well established fertility declines at the time of the surveys analysed by Adetunji. Measurement error is one possible explanation: post-facto rationalisation of the 'wantedness' of recent births may be more common among the less educated.

3. Distal Links

The research literature encompasses a multitude of possible underlying or distal pathways linking the education of individuals and couples to fertility via the proximate factors discussed above. They may be grouped into three broad and overlapping categories: cognitive, socio-psychological and economic.

The most obvious way in which schooling may influence the fertility of couples is by providing them with the means of acquiring and understanding correct information about prevention of pregnancy and childbirth. Literacy, in the narrow sense of ability to read and write, cannot be the only crucially important cognitive skill implicated. Even one to three years of maternal schooling is associated in some countries with an appreciable reduction in childbearing and this modest exposure to primary schooling is rarely sufficient to impart lasting reading and writing skills. However, even a few years at school may improve oral literacy, namely the understanding of decontextualised language (i.e. formal distanced language in which meaning resides in the words and syntax alone rather than in shared contextual understandings). The language of school teachers, health staff and mass media is decontextualised. The work of Levine and associates in Mexico, Nepal and Zambia has demonstrated that unschooled adult women are less capable of understanding radio messages on health in their native language than primary schooled women - a powerful demonstration that oral literacy skills acquired in school persist into later life in ways that might be relevant to health and contraception (Levine et al., 1991). This line of research has the immense appeal of explaining why the effect of schooling is so ubiquitous in low-income countries, despite wide variety in the quality of education and nature of curricula. Exposure to the use of decontextualised language and, at higher grades of primary school, the acquisition of print literacy are universal features of all modern educational systems. Empirical evidence certainly confirms that schooling does lead to better knowledge of contraceptive methods, how they should be used and where they can be obtained. At the same time many studies have demonstrated that lack of knowledge is not a major barrier to adoption and sustained use of contraception. Cognitive factors may be important but are unlikely to be the central pathway.

With regard to socio-psychological, as opposed to cognitive factors that may mediate the relationship between maternal schooling and the proximate or direct determinants of fertility, the main possibilities discussed in the research literature are listed below:

- Shifts in the valuation of children
- Greater autonomy of women in domestic decision making, including reproductive aims and control
- Closer identification with modern institutions (including the health care system) and greater confidence and skill in accessing them.

The work of Caldwell in West Africa and South India suggests that schooling transmits new western values of the child-centred nuclear family which results in a greater commitment to their survival and welfare (Caldwell, 1982; Caldwell, Reddy and Caldwell, 1985). Such a transformation in values leads, inevitably, to smaller family sizes but more investment in each child - a process often termed the quantity-quality trade-off. Though immensely plausible, this thesis founders upon the fact that schooling has only a relatively modest impact on indicators of desired family size, once appropriate statistical controls are introduced.

The possibility that educated mothers enjoy greater domestic decision-making power than uneducated ones has attracted substantial research attention, particularly in the gender-stratified societies of South Asia. As women typically have the responsibility for contraception, enhanced autonomy in this regard might pay high dividends in terms of ability to control the number and spacing of children. Most

ethnographic studies agree that educated mothers are accorded considerable respect and esteem but there is little agreement on the extent to which this enhanced status translates into increased decision-making power (Caldwell, Reddy and Caldwell, 1985; Jeffery and Jeffery, 1996; Zeitlyn and Islam, 1997). The potentially empowering effect of schooling may wither in the face of structural weakness - the lack of control over property or income. Furthermore, some authors have adduced evidence that a modest exposure to schooling may reinforce mainstream values of modesty and deference rather than encourage women to challenge the traditional authority of the husband and older family members.

Another set of socio-psychological mechanisms linking maternal schooling to reproductive behaviour concerns identification with modern institutions and confidence in interacting with them. Once again, the potential relevance of these factors to health care seeking behaviour in general, and uptake of contraceptives in particular, are obvious, because it is well documented that skill and determination is often required to access adequate services in many low-income settings. The main body of evidence comes from large scale surveys and is overwhelmingly positive. Not only are better educated couples more likely to translate the desire to postpone or limit childbearing into contraceptive practice, they are also more likely to use allopathic health services for a range of needs including ante- and natal-care, child immunization and curative care. The evidence from micro-studies is also generally positive. In West Africa, Nepal and rural South India, it has been found that educated mothers make more demands on health care providers and receive a better quality of service.

The final possible distal pathway of influence refers to enhanced opportunity that educated mothers may have to seek paid employment, thus raising the opportunity costs of marriage and motherhood (Becker, 1991). The balance of evidence, both from cross-national and localised studies, is negative. Employment of women does not appear to be a strong predictor of reproductive behaviour in low and medium in some countries, nor can the education-fertility link be attributed to employment opportunities (United Nations, 1987).

4. Conclusions

Agreement can be reached on the proximate mechanisms that account for the negative schooling-fertility association that has been so widely documented in cross-sectional studies. Postponement of marriage and maternity, coupled with an enhanced propensity to translate reproductive preferences into appropriate protective behaviour, are the major pathways. The desire for smaller families represents an additional pathway, but its contribution is relatively minor, except in sub-Saharan Africa.

With regard to the underlying cognitive, socio-psychological or economic factors, agreement may never be reached, because the required research is exceedingly complex and the answers may be context-specific. The available evidence, however, suggests that the crucially important link may be the ability of an exposure to schooling to confer a closer identification with modern institutions, including the health system, and greater confidence in interacting with these institutions. This interpretative emphasis, if correct, carries important implications. It implies, for instance, that reproductive differences between better and less well-educated couples have a relatively shallow and mutable origin. As the social modernisation of societies proceeds and as modern contraception and associated services evolve from something perceived as alien, unnatural and rather frightening into a normal humdrum part of everyday life, the initial 'advantage' conferred by schooling will dissipate. To explore further this process, the changing relationship over time needs to be examined.

D. EDUCATION-FERTILITY RELATIONSHIPS OVER THE COURSE OF FERTILITY TRANSITION

The relationship between schooling and fertility over the course of the fertility transition is depicted in figure II. Prior to the onset of decline, schooling enrolments and the educational composition typically improve. However, there is no threshold. In some countries - Bangladesh and Nepal for instance - fertility started to decline when most of the adult population were illiterate. In others - Philippines and Jordan, for example - the reverse was true: the majority of the population had received schooling prior to the onset of decline. As fertility transition progresses over a period of some 50 years, the educational attainment of population typically improves though again no inviolate rule applies. Fertility in some countries of East and Southern Africa continues to fall in a context of declining enrolments.

In pre-transitional societies, the link between education and fertility is weak and varied. Usually the bulk of the population has received no formal schooling, a moderate proportion has had primary schooling and a tiny elite higher levels of schooling. This latter group may record lower fertility but the fertility of the primary schooled group is often no different or even higher than that of unschooled couples. This scenario was typical of most sub-Saharan countries and the less developed states of South Asia in the 1970s and early 1980s.

As reproductive decline likes root, fertility differentials by schooling initially tend to widen, because of the staggered process of change. Childbearing declines first among the best educated and last amongst the least well educated. In the later phase of fertility transition, these differential begin to narrow until convergence is reached at the end of transition. Thus the pronounced links between schooling and fertility are a transient phenomenon, arising and then disappearing over the course of a few decades.

Abundant evidence supports this temporal model. Consider figure III, which shows differentials by women's schooling for selected regions, running from early and mid-transitional ones on the left to post-transitional ones on the right. The link between schooling and fertility has entirely disappeared in the two lowest fertility regions - the advanced industrialised countries of Western Europe, North America and Japan and the former Soviet block countries. Conversely, differentials are still wide in the highest fertility regions of sub-Saharan Africa, West Asia and North Africa. Latin America is the only region that departs appreciably from the overall impression that divergences in fertility between educational strata attenuate in the later phase of transition. However, this region is not a true exception. Rodriguez (1996) demonstrated that, in the 1980s, reconvergence had already started: in this decade, marital fertility decline was smallest among couples where the wife had received secondary schooling, and largest in the group with incomplete primary schooling. Documentation of fertility trends by education in Chile between 1950 and 1980 offers convincing further support for the analysis by Rodriguez (Chackiel and Schkolnik, 1996). Latin America is unusual among regions in exhibiting exceptionally large educational differentials in fertility in the early phases of transition but these are now narrowing in accordance with the model in figure II.

Figure II suggests that improvements in the schooling of the adult population may be a relatively modest force behind fertility decline, particularly in the later phase of transition when downward trends in fertility may be more pronounced in the lower than in the higher educational strata. Table 2 shows the contribution of changing educational composition to overall decline between the 1970s and 1990s for a selection of countries. The table shows the observed total fertility rates for the 1970s, as estimated by WFS enquiries, the observed rates in the 1990s, as recorded by the DHS, and the DHS rates, standardised by the educational composition of women in the WFS. Remarkable variation in the per cent contribution to decline of changing composition is apparent. In Peru and Philippines, 60 per cent of decline is attributable to composition, suggesting that reproductive levels within educational strata have changed

rather little in those two countries. More typically, however, composition accounts for only about 20 per cent of fertility decline, clearly indicating that within-strata declines have been the dominant force of change. These results are consistent with those obtained in an earlier study which found large effects of composition in five Latin American countries but much smaller effects in two African countries (United Nations, 1995b).

E. Conclusion

The temporal perspective outlined in the preceding section offers for greater insights into the possible role of schooling in future fertility declines than the more common cross-sectional perspective. The reproductive behaviour of the best-educated elite probably does provide a sound guide for the future behaviour of the rest of the population. As so often stated, well-schooled couples represent the vanguard of change. Others will inevitably follow. Historical evidence strongly suggests that convergence between educational strata will come about as the era of fertility transition ends. There is probably no better guide to fertility forecasting at the national level than to assume that less privileged strata will follow the path of the most privileged. However, the speed with which they will follow will vary greatly between countries.

The second lesson from the temporal perspective is that detailed consideration of probably future trends in school enrolments and educational composition of the adult population and their possible impact on fertility may be a poor investment of time and resources.

References

Adetuni, J. A. (1998). *Unintended Childbearing in Developing Countries: Levels, Trends and Determinants*. Demographic and Health Survey Analytical Reports No. 8. Calverton, Maryland, Macro International Incorporated.

Axinn, W. G. (1993). Children's schooling and fertility. *Population Studies*, vol. 47, No. 3, pp. 481-493.

Becker, G. S. (1991). *A Treatise on the Family*. Enlarged Edition. Cambridge: Harvard University Press.

Caldwell, J. C., P. H. Reddy and P. Caldwell (1985). Educational transition in rural South India. *Population and Development Review*, vol. 11, No.1, pp.29-51.

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

Chackiel, J., and S. Schkolnik (1996). Overview of the fertility transition. In. *the Fertility Transition in Latin America,* Guzman, J.M., Singh, S., Rodriguez, G., and Pantelides, E.A. (eds). Oxford: Clarendon Press, pp. 3-26.

Cochrane, S. H. (1979). *Fertility and Education. What do we really know?* Baltimore, Maryland: Johns Hopkins University Press.

Curtis, S. L., and A. K. Blanc (1997). *Determinants of Contraceptive Failure, Switching, and Discontinuation: An Analysis of DHS Contraceptive Histories*. Calverton, Maryland, USA, Macro International Incorporated. Demographic and Health Surveys analytical Reports, No.6.

Feyisetan, B., and J. B. Casterline (2000). Fertility preferences and contraceptive changes in developing countries. *International Family Planning Perspectives*, vol. 26, No. 3, pp. 100-109.

Jeffery, R., and A. M. Basu (1996a). Schooling as contraception? In *Girls' Schooling, Women's Autonomy and Fertility Change in South Asia*, Jeffery, R. and Basu, A.M. eds. New Delhi, Sage, pp.15-47.

Jeffery, R., and A. M. Basu (1996b). (eds.) *Girls' Schooling, Women's Autonomy and Fertility Change in South Asia.* New Delhi: Sage.

Jejeebhoy, S. J. (1995). *Women's Education, Autonomy and Reproductive Behaviour: Experiences from Developing Countries*. Oxford, United Kingdom: Clarendon Press.

Kishor, S., and K. Neitzel (1996). *The Status of Women: Indicators for Twenty-Five Countries.* Demographic and health Surveys Comparative Studies No. 21. Calverton, Maryland: Macro International Inc.

Levine, R. A., S. E. Levine, A. Richman, F. M. T. Uribe, C. L. Correa and P. E. Miller (1991). Women's schooling and child care in the demographic transition: a Mexican case study. *Population and Development Review*, vol. 17, No. 3, pp 459-496.

Lutz, W., and A. Goujon (2001). The world's changing human capital stock: multi-state population projections by educational attainment. *Population and Development Review*, vol. 27, No. 2, pp 323-339.

Lutz, W. (ed.) (in press). *Population balance: Population Distributions, Human Capital and Sustainable Development in the 21st Century*. Draft report. Laxenberg, Austria, International Institute for Applied Systems Analysis.

Mboup, G., and T. Shah (1998). *Fertility Levels, Trends and Differentials*. Demographic and Health Surveys Comparative Studies No. 28, Calverton, Maryland, USA. Macro International Inc.

Pritchett, L. H. (1994) Desired fertility and the impact of population notices. *Population and Development Review*, vol. 20, No. 1: pp. 1-43.

Rodriguez, G. (1996). The spacing and limiting components of the fertility transition in Latin America. In. *the Fertility Transition in Latin America.* Guzman, J.M., Singh, S., Rodriguez, G., and Pantelides, E.A. (eds). Oxford, Clarendon Press, pp. 27-47.

Robinson, W., and J. Cleland (1992). The influence of contraceptive costs on the demand for children. In *Family Planning Programmes and Fertility,* J.F. Phillips and J.A. Ross, eds. Oxford: Clarendon Press, pp. 106-122.

Tan, J. P., and M. Haines (1984). Schooling and demand for children; historical perspectives, Washington D.C. *World Bank Staff Working Paper* No. 697.

United Nations (1987). *Fertility Behaviour in the Context of Development: Evidence from the World Fertility Survey.* Population Studies No. 100 ST/ESA/SER.A/100. Sales No. E.86.XII.5.

United Nations (1995a). The world's women 1995: Trends and statistics. New York, United Nations. Social Statistics and Indicators Series K, No.12.

United Nations (1995b). Women's education and fertility behaviour: recent evidence from the demographic and health surveys. ST/ESA/SER.R/137.

Westoff, C. F., and L. Moreno (1992). The demand for family planning: estimates for developing countries. In *Family Planning Programmes and Fertility,* J.F. Phillips and J.A. Ross, eds. Oxford: Clarendon Press, pp. 141-158.

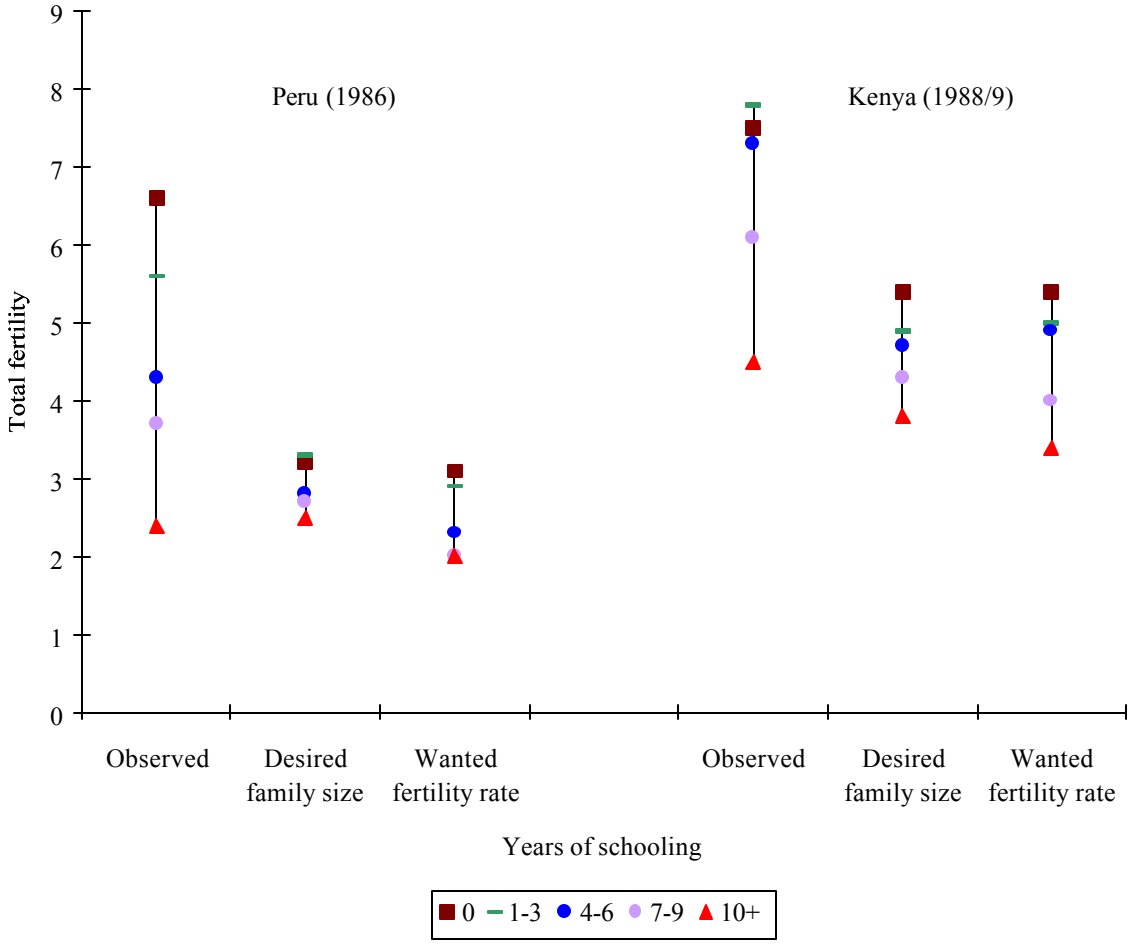
Zeitlyn, S., and F. Islam (1997). Mother's education, autonomy and innovation. In *Maternal Education and Child Survival,* L. Visaria, J. Simons and P. Berman, eds. New Delhi, Vikas: Publishing House Pvt. Ltd., pp. 204-222.

TABLE 1. EDUCATION COMPOSITION (%) OF THE ADULT FEMALE POPULATION (AGED 15+ YEARS) FOR SELECTED REGIONS, 2000 AND 2030 (PROJECTED)

		Schooling			
		None	*Primary*	*Secondary*	*Tertiary*
North Africa:	2000	55	17	20	8
	2030 (constant)	34	21	35	9
	2030('American')	30	17	36	17
Latin America:	2000	15	39	37	9
	2030 (constant)	4	35	50	11
	2030('American')	4	29	48	19
West Asia:	2000	34	33	23	10
	2030 (constant)	25	29	37	9
	2030('American')	22	24	38	17
South Asia:	2000	66	17	15	2
	2030 (constant)	37	44	15	4
	2030('American')	34	32	25	10

Source: Lutz and Goujon (2001) The world's changing human capital stock: multi-state population projections by educational attainment. *Population and Development Review*, vol. 27, No. 2, pp 323-339.

Figure 1. Observed fertility and desired fertility: Peru and Kenya

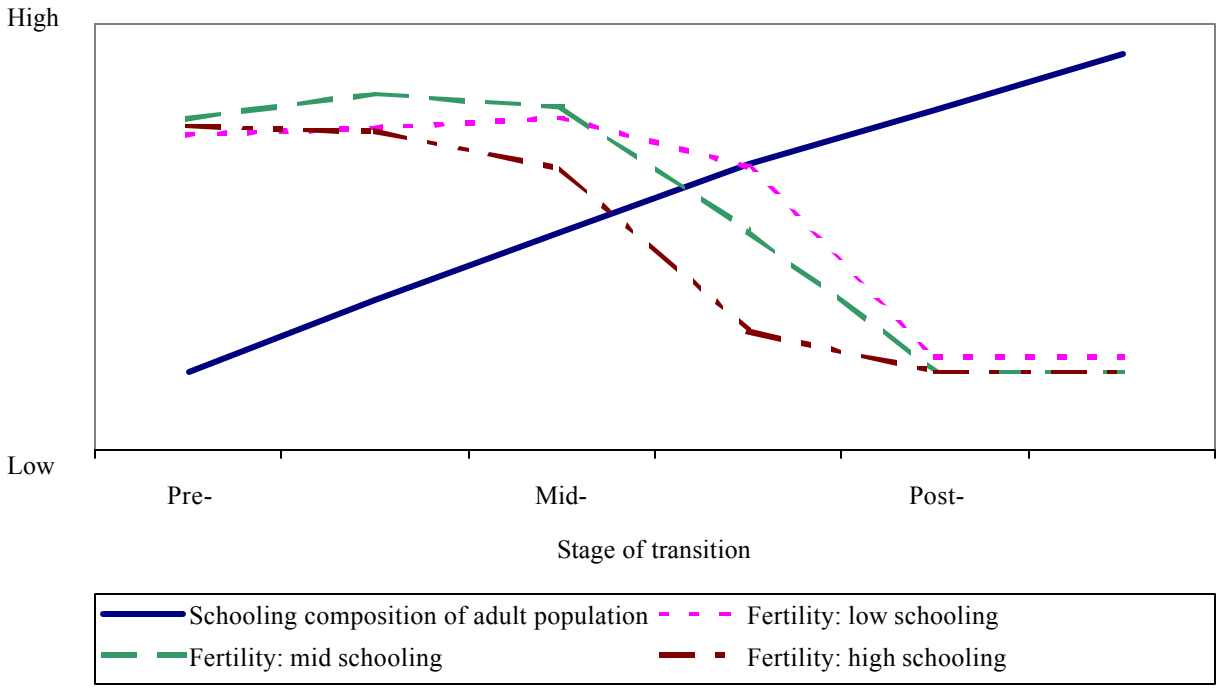


Source of Data: United Nations 1995(b) Women's education and fertility behaviour: recent evidence from the demographic and health surveys. ST/ESA/SER.R/137.

TABLE 2. TOTAL FERTILITY TRENDS BETWEEN THE 1970S AND 1990S: OBSERVED AND STANDARDISED BY EDUCATIONAL COMPOSITION OF WOMEN

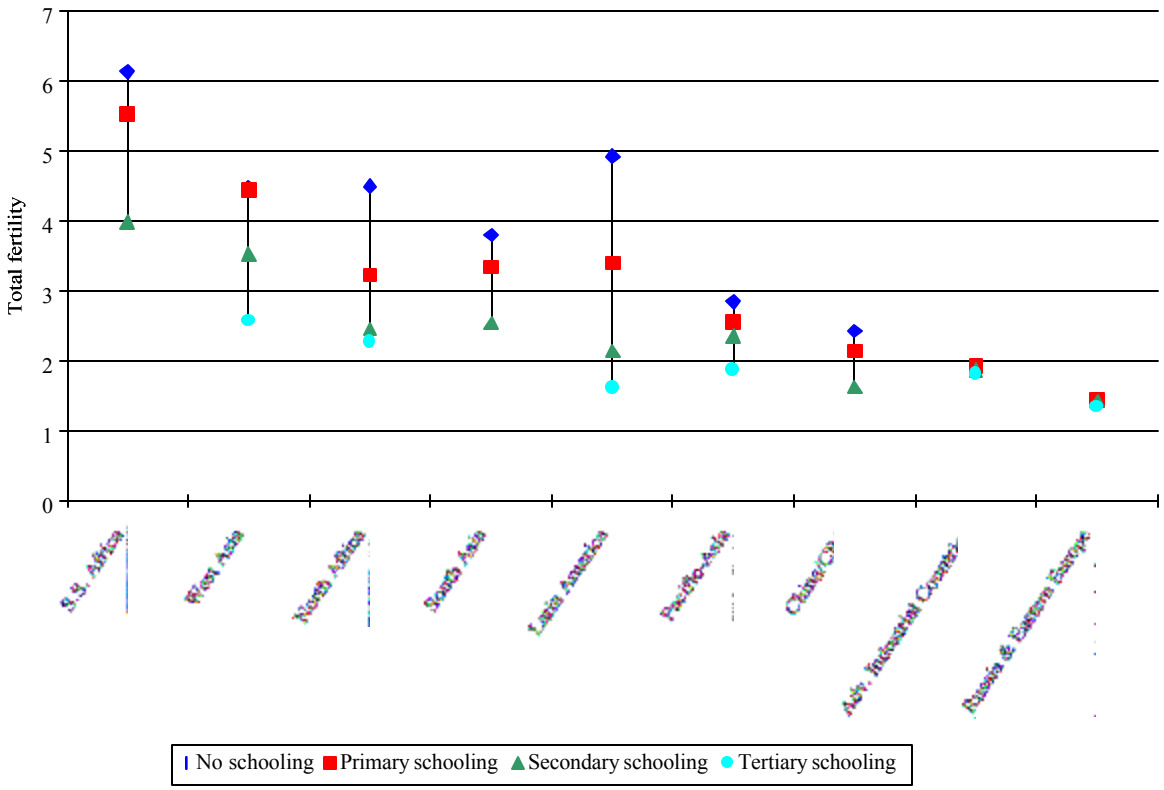
	WFS		*DHS*			*Per cent decline attributable to composition*
	Date	*Observed TFR*	*Date*	*Observed TFR*	*Standardised TFR*	
Kenya	1975	8.25	1997	4.70	5.00	8
Jordan	1974	7.64	1989	5.57	6.01	21
Morocco	1978	5.90	1991	4.04	4.37	18
Turkey	1976	4.50	1992	2.51	3.02	26
Bangladesh	1973	6.08	1998	3.31	3.86	20
Philippines	1976	5.24	1992	4.09	4.78	60
Colombia	1974	4.69	1994	2.96	3.63	39
Peru	1975	5.57	1995	3.48	4.73	60

Figure 2. An illustration of the role of schooling in fertility transition



Source: Adapted from Jeffery and Basu (1996b) (eds.) *Girls' Schooling, Women's Autonomy and Fertility Change in South Asia*, New Delhi, Sage.

Figure 3. Differentials in total fertility by women's education, circa 2000, for selected regions



Notes: Estimates are not shown for educational strata that comprise less than five per cent of adult female population.
Source: Adapted from Lutz and Goujon 2001 The world's changing human capital stock: multi-state population projections by educational attainment. *Population and Development Review*, vol. 27, No. 2, pp 323-339.