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DEMOGRAPHIC PATHWAYS OF INTERGENERATIONAL EFFECTS: FERTILITY, MORTALITY, MARRIAGE AND WOMEN'S SCHOOLING IN INDONESIA

INTRODUCTION

Increases in educational attainment benefit individuals and society. Individuals with more schooling have, on average, higher earnings, more wealth and better health. Those with more schooling also have children who obtain more schooling, a mechanism that transmits and multiplies the advantages of increased educational attainment across generations. As such, educational attainment is a fundamental engine of social change, and educational expansion a boon at both the individual and the population level.

But how do we measure the total intergenerational effect that increasing educational attainment might have? Evaluating the effect of an increase in schooling at the individual level is complicated by possible confounding with unobservable traits such as “ability” or family background. One might address these issues with a careful study design and advanced statistical techniques. Measuring the effect of an increase in schooling across generations is harder still. Policies aimed at increasing schooling are generally implemented at early ages, early enough in life that the intervention precedes marriage and fertility decisions. A substantial amount of research shows that in most contexts the timing and level of marriage and fertility and the choice of mate are quite sensitive to levels of schooling (Bledsoe et al. 1999; Rindfuss, Morgan and Swicegood 1988). Yet nearly all of the research that focuses on the benefits of increasing the schooling of parents for the schooling of their children misses this key dimension. If marriage, fertility and the population renewal process are endogenous to changes in schooling, then measuring the total effect of an increase in schooling must include the potential changes that accrue via these demographic routes as well as along other dimensions.

Conventional studies of intergenerational educational mobility generally examine the association between parents’ and children’s statuses using survey data on existing pairs of parents and children (see for example Jencks et al. 1972; Featherman and Hauser 1978). But if changes to educational attainment in the parents’ generation alter the choice of mate and number and timing of children, then data on existing pairs of parents and children represent an incomplete set of the relationships that may emerge across generations given an expansion in schooling in the older generation. The approach described in this paper goes beyond conventional studies to examine intergenerational effects that are not conditional on observed family configurations.

We use data from Indonesia and a demographic modeling strategy to estimate the total effect of increasing women's schooling for the schooling of the next generation. This approach differs from standard approaches in that we include an estimate of how changes in women's schooling affect children's schooling not only directly (the transmission process) but also through women's choice of mate, marriage timing, fertility timing, fertility levels and the mortality of women and children. Each of these demographic factors can affect the relative number of children who will achieve different levels of schooling in the subsequent generation as a result of increasing women's schooling in the previous generation. This approach improves our understanding of the effect of increases to women's schooling both in developing countries and more developed ones.

This work builds on our earlier work that formalized these demographic mechanisms and proposed models that capture both the direct and demographic effects of changes to women's schooling (Mare and Maralani 2005). In that work, we applied similar models to data from Indonesia and showed how traditional estimates of the effects of mother's educational attainment change when one accounts for how her education affects her marriage market chances and her fertility. Using simulations, we examined the consequences of increasing the educational attainment of women in different parts of the education distribution and emphasized how such an intervention may have complex implications if it affected the kinds of husbands (in terms of education) that women marry and their levels of fertility.

In this paper we advance this previous work in several important ways. First, we extend these models to include changes in both the levels and the *timing* of fertility and marriage. Second, we include differential mortality (both adult and infant mortality) in the model. This provides a more realistic demographic context for developing societies and incorporates a control for differential attrition in the model. Third, we allow for the substantial socioeconomic and demographic differences that exist in Indonesia by cohort to enter the model. This captures how the effects of women's educational attainment on offspring's schooling may vary with economic and demographic development.

This effort to embed intergenerational mobility in the population renewal process builds on prior research that showed that intergenerational social mobility rates cannot be used to project distributions of various socioeconomic statuses unless they are combined with rates of differential fertility (Mukerjee 1954; Duncan 1966; Preston 1974, Lam 1986, Preston and Campbell 1993, Mare 1997, Mare 2000, Musick and Mare 2004). Our earlier work (Mare and Maralani 2005) extended this literature by using a model of socioeconomic and demographic reproduction to develop new methods of estimating the effects of family socioeconomic background on educational attainment. We build on this effort by extending these models to include differences by age and timing, controlling for differences in mortality, and considering these dynamics across cohorts.

DEMOGRAPHIC MECHANISMS AND INTERGENERATIONAL EFFECTS

Although the models described by Mare and Maralani (2005) can be applied to the intergenerational transmission of all aspects of family background, we focus here on the effects of increasing women's educational attainment. In developing countries, mother's schooling is often viewed as a key determinant of the welfare of her children (e.g., Caldwell 1986; King and Hill 1993; Schultz 2001). As summarized by Summers: "…once its benefits are recognized, investment in girls' education may well be the highest return investment available in the developing world" (1994, p.1). Improving women's schooling does more than improve their life circumstances. It also changes their patterns of family formation and well-being including their own mortality and the mortality of their children. But it is not always the case that women with more schooling have fewer children. Although that pattern holds true in many societies, some societies show a non-monotonic relationship between education and fertility (Jeejeebhoy 1994). Fertility in Indonesia has historically been highest for women with an intermediate level of education. In this context, efforts to raise the education of women with no or very little schooling will have a two fold effect for the next generation. First, the better educated women will bear *more* children. Second, these children will be, on average, more educated than the children of women with less schooling. Standard analyses of the effects of increasing women's schooling miss this key dynamic.

Each of the demographic mechanisms that we consider (marriage, fertility, mortality) can have direct or indirect effects on children's schooling. For example, we consider two components of marriage: marital status and assortative mating. Marital status, meaning whether a women is married or not, is correlated with levels of fertility and household structure. In many societies, nonmarital fertility is lower than marital fertility. In Indonesia, there is essentially no nonmarital fertility. Marital status, therefore, may indirectly affect children's schooling through levels and timing of fertility. Or, marital status may affect children's schooling directly if household structure such as living with a single mother affects children's educational attainment. Another component of marriage, assortative mating, also has both direct and indirect effects on children's schooling. Women with more schooling typically marry men who also have more schooling. Like women, men with more schooling can transmit this advantage to their children. In addition, men's and women's schooling both influence a couple's level of fertility, a mechanism that is correlated with children's schooling directly through the effects of sibship size.

We also consider the effects of both the level and timing fertility. Fertility levels determine the number of siblings a child has while growing up. Fertility timing determines when in a women's life children are born. Children born to young parents may suffer disadvantages if the parents have lower levels of income and wealth or are less experienced in caring for children (Mare and Tzeng 1989). Children born to somewhat older parents, however, may suffer hardships if their parents are in poor health or die before the children reach maturity. The form and interpretation of the relationship between parental age and children's achievement depend on what other factors are controlled. A strong correlate of fertility at later ages of parents is the overall *level* of fertility, because women with the highest completed family size are most likely to be still bearing children at later ages. Absent a control for sibship size, therefore, the relationship between parents' age and sibship size may be curvilinear, with a maximum advantage to children born in the middle of the childbearing years. Only when sibship size is controlled does the monotonic positive relationship emerge.

It is also important to control for the birth cohort of the child or the mother in analyses of parental age effects. *Ceteris paribus*, children born to older parents tend to be born in later birth cohorts. If schooling opportunities expand rapidly over a span of five to fifteen years, then children born later (or, when parents are older) will benefit from these expansions. It is necessary to control for birth cohort to isolate the effect of parental age.[1] Finally, if women who get more schooling delay their fertility until later in life, then this change in timing may result in a compression of their births, which itself may have consequences for children.[2]

Mortality affects the number of women who survive through their childbearing years as well as the number of children who survive to adulthood. Because women with less schooling experience higher mortality and higher infant mortality, the effects of changes to women's schooling on the schooling of the next generation can accrue via this mechanism as well. Increasing women's schooling can decrease both their own mortality and the mortality of their children. This means that increasing the schooling of the most educationally disadvantaged women can result in an increase in overall fertility and an increase in the number of children who survive to adulthood and complete their own schooling.

Indonesia is a particularly useful context in which to consider these questions. Indonesia has the world's fourth largest population and has experienced dramatic demographic changes in recent decades. Fertility and mortality rates have fallen substantially, life expectancy has increased by nearly 20 years, the gender gap in education has narrowed, literacy has increased greatly, and participation in agriculture has declined while industry has grown. A key component of Indonesia's development plan has been to make educational expansion, especially the expansion of women's schooling, a national priority. We examine the consequences of increasing the educational attainment of women who would otherwise have little or no schooling. We emphasize how such an intervention could have complex implications for the education of women's children if, in addition to the transmission process, this intervention affected whether women marry, the husbands they choose, their levels and timing of fertility, and differences in mortality by women's education for both women and their children.

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[1] As discussed further below, controls for parent's birth cohort or offspring's birth cohort are mathematically equivalent alternative specifications in the analysis of parent's age effects because of the linear dependence among these three variables. When parent's birth cohort is controlled, the estimated effects of parent's age reflect both life cycle variation in family environments and cohort trends for children. When offspring's birth cohort is controlled, the estimated effects of parent's age reflect both life cycle variation in family environments and cohort trends for parents.

[2] Differences in fertility timing also have important implications for differences in growth rates of various groups across generations. Because we only consider changes across one generation, this feature of fertility timing is not investigated in our analysis.

RESEARCH DESIGN

All of our analyses use individual level data and control for age and cohort. We begin with a model of the direct effect of parents' schooling on children's schooling. This replicates the standard transmission model often used to assess the effect of a hypothetical "increase" in mother's education. Covariates include mother's and father's schooling and aspects of family structure including number of siblings, mother's age at child's birth, and mother's birth cohort. We call this the transmission function. We estimate five additional equations, one for each of the following demographic processes:

(i) conditional on her education, the likelihood that a woman will be married at each five year age interval from 15 to 45;
(ii) conditional on her education, the education of her husband if she marries;
(iii) conditional of the education of a woman and her husband and her age (measured in five year age intervals), the number of children born within each age interval;
(iv) conditional on her education, her likelihood of survival through her childbearing years; and
(v) conditional on her education and the sex of her child, the likelihood that the child will survive to adulthood.

Each of these processes – transmission, marriage, assortative mating, fertility, and women's and children's mortality – contributes to the total effect of changes in women's schooling. These constitute the full set of mechanisms that relate the education of women in one generation to the education of the next generation.

We use the parameter estimates generated by these models to calculate expected rates and probabilities of marriage, fertility, mortality and transmission. We use these estimates in a series of simulations that compare the combined or total effect of changes to women's schooling in the parent generation on the schooling of their children. The simulations isolate the effects of various parts of the population renewal process (such as marital or fertility timing) and reveal how these processes amplify or dampen the effects of improvements to women's schooling for the next generation. The simulations also highlight how, in a context of rapid socioeconomic and demographic change, these processes can differ by birth cohort.

Formal Model of Educational Reproduction

These ideas can be formalized as follows. To begin, assume that schooling is completed before marriage and that whatever kind of man (at least with respect to his education) that a woman or her family wants, she can get. Let C_j be the number of persons in the offspring generation with education level j, W_i be the number of women in the parent generation with education level i, and $r_{jka|i}$ be the number of children who attain education level j, with a father with education level k, born in mother's age interval a per woman who has attained education level i. The $r_{jka|i}$, therefore, are the rates at which a woman at a given level of educational attainment produces children who attain given levels of education. Let $i = 1, \ldots, 5$; $j = 1, \ldots, 5$, $k = 0, \ldots, 5$, where $k = 0$ denotes that a woman is unmarried and $a = 1, \ldots, A$. Thus, education has five discrete, but ordered levels. Then,

(1) $$C_j = \sum_{i=1}^{5} \sum_{k=0}^{5} \sum_{a=1}^{A} r_{jka|i} W_i \ .$$

Given the $r_{jka|i}$ one can compute the expected number of children of education level j born to a mother with education level i. For Indonesia, where marriage is universal and nonmarital fertility essentially nonexistent, we assume that all women marry, albeit at varying ages. Thus, there is no nonmarital fertility and the $r_{j0a|i} = 0$. If one knows the educational distribution of women at a given point in time, then this equation can project the educational distribution of children in the next generation. One can also simulate what would happen to C_j if the distribution of W_i were modified or if the distribution of W_i differed by cohort.

Marriage, fertility, mortality, and intergenerational transmission affect the $r_{jka|i}$ as follows. Let $s = 1$ if the mother or child survives and $s = 0$ if the mother or child dies. Then,

(2) $$r_{jka|i} = p^{M}_{k|ai} p^{F}_{s|ai} r_{ka|i} p^{D}_{s|i} p^{T}_{j|kai} \ ,$$

where the components denote the following:

- $p^{M}_{k|ai}$ is the probability that a woman in the i^{th} education category has a husband in the k^{th} education category when she is in age group a. $p^{M}_{0|ai}$ is the probability that she is not married, that is, $k = 0$. In practice, we estimate this component in two parts. We compute the probability that a women is married in each five-year age interval from 15-45, which we call $\hat{p}^{N}_{a|i}$. Then, conditional on marriage, we compute the probability that a woman with a given level of education has a husband in each of the five education categories, which we call $\hat{p}^{H}_{k|ia}$ (with k ranging only from 1 to 5. Thus $p^{M}_{k|ai} = \hat{p}^{N}_{a|i} * \hat{p}^{H}_{k|ia}$.
- $p^{F}_{s|ai}$ is the probability that a woman in the i^{th} education category survives to age group a ($s = 1$), given that she survives to the beginning of her childbearing years;
- $r_{ka|i}$ is the expected number of children born to a woman in education category i with a husband in education category k while she is in age group a.
- $p^{D}_{s|i}$ is the probability that a child of a woman in education category i survives to adulthood ($s = 1$).
- $p^{T}_{j|kai}$ is the probability that a child born to a woman in the a^{th} age group and the i^{th} education category with a man in the k^{th} education category achieves the j^{th} level of schooling.

We estimate each of the components of equation (2) using a separate regression with its respective covariates. The probability that a woman is married in each age category is analyzed as a binary logit model. The probability that she has a husband in a particular education category is analyzed as an ordered logit model. The number of children born to a woman of a given age and educational attainment group is analyzed as a log linear poisson model. The survival probabilities are estimated as binary logits and child's schooling as an ordered logit. We use predicted rates and probabilities from these regressions to get an estimate of $r_{jka|i}$. We then conduct a series of simulations to highlight how the estimated effect of changes to women's schooling vary based on whether one considers the changes that accrue via different demographic mechanisms, where in the educational distribution the expansion in schooling occurs, and the cohort that experiences the hypothetical educational upgrading.

As specified here, the model is recursive in that woman's schooling precedes marriage, husband's schooling, and fertility. Woman's schooling also precedes mother's survival to a given childbearing age, which precedes fertility. The relationship between woman's survival and her marital status is not analyzed in the model. In this model only women's educational attainment is exogenous. The joint distribution of marital status, husband's schooling, fertility, women's and offspring's survival, and offspring's schooling is dependent on women's schooling.[3]

Interpreting the Probability of Marriage. The model assumes that women's and husband's schooling, women's marital status, and offspring's schooling are *statuses*, whereas age-specific fertility is an *event*. Thus the model does not focus on specific marital transitions (into marriage, divorce, widowhood, etc.) or school continuation decisions. Marital status, however, is age-dependent and allows for women to vary in the ages at which they are currently married. This allows for variation in ages at which women are at risk to marital fertility. In principle, it also allows one to distinguish between ages at which at children's parents are married and those in which the mother is unmarried, as a result of divorce or widowhood. In the present analysis, however, we do not consider the effects of parents' marital status on offspring's educational attainment.

Interpreting Mother's Cohort and Mother's Age Effects. A key feature of the equation for the educational attainment of offspring is that it contains the effects of mother's birth cohort and mother's age at the birth of the child. This specification allows us to examine the effects of changes in women's educational attainment for different cohorts of women who, because of rapid social change in Indonesia, experienced different demographic norms and socioeconomic conditions. It also enables us to assess the effects of the timing of parenthood on the attainment of offspring (Mare and Tzeng 1989). Conventional analyses of educational attainment also include the effects of the birth cohort of *offspring*, reflecting secular changes in attainment. Given mother's birth cohort and mother's age at offspring's birth, however, offspring's cohort is exactly determined. Offspring cohort effects, therefore, cannot be separately estimated, but can

[3] In its current form, the model assumes that individuals and families are homogeneous within the categories of the independent variables included in the models and that the demographic processes are independent; that is, that no common unmeasured variables affect marriage, fertility, mortality, and intergenerational transmission. Although most studies of stratification processes make these same assumptions, the assumption of uncorrelated errors is often violated. We expect to ease these assumptions in future work.

be easily computed from estimated mother's cohort and mother's age at offspring's birth effects. In our specification, the effects of mother's age at offspring's birth result from two underlying processes. One is that children born to parents of varying ages experience different family conditions, which reflect age variation in family wealth and parenting practices. The other is that, conditional on mother's birth cohort, children born at later ages of mother are part of later birth cohorts and thus experience the improved educational opportunities available in recent periods. Both of these mechanisms are consequences of the age patterns of women's fertility, another outcome that depends on variation in women's educational attainment.[4]

Alternative Marriage Markets. The effect of a change in the distribution of women's schooling depends on changes in women's preferences and opportunities for marriage. How a change in women's attainment affects the next generation may depend on how the attainments of *men* respond to changes for women because men's aggregate responses determine the possible combinations of men and women who marry, and bear and raise children. In the simulations reported here, we assume a simple marriage market in which men's attainments are entirely endogenous to those of women. That is, men respond to changes in women's educational attainments so as to maintain the prior conditional distributions of husband's educational attainment given wife's attainment. In this case, women's increased educational attainments do not constrain their marital opportunities; that is, after an aggregate shift in women's attainments, women at each level of educational attainment have the same expected distribution of husband's educational attainment that their counterparts would have faced before the aggregate change. This extreme case is only realistic if men are given the same rewards and inducements to increase their schooling as women. Elsewhere, we consider alternative marriage market assumptions, including the possibility that men's education distributions remain fixed when the women's education distribution is changed, and show that our conclusions about intergenerational effects are robust to variations in these assumptions (Mare and Maralani 2005).

[4] One can obtain a "purer" assessment of the effects of mother's age on offspring's schooling in a specification that includes offspring's cohort instead of mother's cohort. In that specification, the estimated mother's schooling effect for a given cohort of offspring includes both the effects of growing up with parents of varying ages and of variation in mother's birth cohort. Net of offspring's cohort, however, the latter effect is likely to be small, implying that the maternal age effect is dominated by life cycle rather than intercohort variation.

Data and Methods

Our analyses of marriage, fertility, and offspring's educational attainment are based on the Indonesian Family Life Survey (IFLS), a longitudinal household sample first interviewed in 1993 and followed up in 1997, 1998, and 2000. We supplement these data with published tabulations on differential mortality from the 1987 National Indonesia Contraceptive Prevalence Survey, the first Demographic Health Survey (DHS) for Indonesia. We describe our use of the mortality data in the Appendix. The IFLS is a comprehensive socioeconomic and health survey with detailed information on family structure and composition, marriage, fertility, and school enrollment and completion. Almost everyone in the household was interviewed directly so the data are both comprehensive and largely self-reported. When necessary, the survey also collected information by proxy. The survey represents an area that includes 83 percent of Indonesia's population. We use the public domain data from the 1993 and 1997 waves. The surveys achieved very high response and follow up rates, and the combination of the 1993 and 1997 data provides a near complete enumeration of 1993 household members. For detailed IFLS documentation, see Frankenberg and Karoly (1995) and Frankenberg and Thomas (2000).

Our analytic samples include female respondents ages 15 to 64 in 1997 and their adult children. For 1993 respondents not interviewed in 1997 (either because they died between the two waves or because the 1993 household was not located in 1997), we use information from 1993 whenever possible to retain these cases in our sample. For each woman, we assemble a full marital history and a count of all live births in each five year age interval starting at age 15; the schooling level of each living child age 20 and older; and the schooling of her husband (either current or previous) if she is married. For the approximately 30 percent of ever-married female respondents who married more than once, we use the schooling of the husband to whom she was married for the longest period between her ages 15 and 40.[5] We include only observations with complete data on woman's, husband's, and children's schooling and woman's age, marital status and fertility. We restrict the sample of children analyzed in the transmission equation to children age 20 and older whose mothers are 41 and older in 1997 to capture completed schooling and completed fertility. Overall, the data are quite complete and of high quality.

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[5] That a number of IFLS female respondents have multiple husbands introduces a small amount of measurement error into our estimates of father's educational attainments. The correlation between the educational attainments of women's first and second husbands is about 0.74.

We control for women's birth cohort in all models. Women's birth cohort is measured in three categories (1933-1947, 1948-1962, and 1963-1982). Women in the youngest birth cohort are likely to be censored before their marital and fertility history is completed. They contribute to the age-specific rates only for the intervals in which they are observed. We present model and simulation results only for women in the two older birth cohorts. Women born 1933-1947 have substantially lower levels of schooling. About 54 percent have completed no schooling while only five percent have completed grade 12 or higher. In contrast, women in the second oldest cohort (born 1948 to 1962, or ages 35-49 in 1997) have a more advantageous distribution of schooling. About 24 percent of these women have completed no schooling while 11 percent have completed grade 12 or higher. Appendix Table A1 describes each cohort's education distribution in more detail. Note that in the transmission equation, we use a more detailed version of birth cohort (parameterized as five year intervals based on woman's age in 1997) in order to control child's cohort effects and mother's age at birth effects more precisely.

Our analyses use several interdependent samples of IFLS women and their offspring, described below:

Marriage/Husband's Education/Fertility Sample. We begin with a sample of 9,358 female respondents ages 15 to 64. We use this sample to analyze the probability of being married in each five year age interval from 15 to 45, and for those who marry, the educational attainment of husbands and estimates of age-specific fertility (N=6,954).

Intergenerational Transmission Sample. This sample includes 8,910 offspring ages 20 and older of ever-married female respondents. Some but not all off these offspring were themselves IFLS respondents. The offspring have a median age of 30 years, with an interquartile range from 25 to 36 years. The mothers of these sampled children are a subsample of the women included in the marriage and fertility sample described above, namely those who had at least one surviving child ages 20 or older with valid information on the necessary variables. Women with more than one eligible child contribute multiple observations to this offspring sample.

For each respondent the IFLS asks the highest level of school attended (no school, some primary, primary completion, some secondary, secondary school completion or higher) and the highest grade or number of years completed at that level.[6] Taking account of sample size

[6] This education classification differs from the one used by Mare and Maralani (2004) for the same data. In that paper, we distinguished between persons who attend at least some post secondary school and those who graduate

constraints, we collapse this information into a five-category measure of the highest level of school completed. For women and their husbands, our schooling categories correspond to having completed zero years of schooling, one to five years, six to eight years, nine to 11 years, or 12 or more years. For the sample of children, our schooling categories correspond to having completed zero to five years, six to eight years, nine to 11 years, 12 years, or 13 or more years. Given the rapid expansion in schooling in Indonesia in recent decades, the distinction between no schooling and some primary schooling is less salient for the children's sample while the distinction between completing senior secondary and entering college emerges as an important transition to capture. For this reason, our education classification for women and husbands is different from the one we use for children.

Table 1 summarizes the education distributions of women, husbands, and children for each of the relevant samples. These distributions show the sizable education differences by gender and a substantial intergenerational increase in educational attainment between parents and their adult children. In the sample used to estimate age-specific probabilities of being married, more than one in five women had completed no schooling at all. This proportion is higher in the assortative mating and fertility subsamples because these women are all married, and therefore a bit older, on average. Here about one in four women has completed no formal schooling. In contrast, only about 18 percent of the women's husbands had completed no formal schooling. The children of these parents achieved much higher levels of educational attainment: only six percent of adult male children and nine percent of adult female children failed to complete any school while 35 and 30 percent, respectively, completed at least one year of post-secondary schooling. Although the gender gap in schooling is still present in the sample of adult children, differences in schooling by sex have diminished from one generation to the next.

Table 2 summarizes the distributions of the six outcome variables by women's educational attainment estimated from the relevant samples used in our analyses. Marriage timing varies substantially in Indonesia, with women with more schooling marrying later than women with less schooling. About 85 percent of women with no schooling were married at ages 20 to 24 compared to about half (51%) of women who had completed grade 12 or higher. The distribution of husband's educational attainment shows strong positive assortative mating on

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from high school and go no further, and collapse the some primary and completed primary categories. In view of the relatively low average level of educational attainment in Indonesia, especially for the mother's generation, the classification used in the present paper more fully reflects the true educational variation in the population.

formal schooling in Indonesia, with a pronounced tendency for a woman to marry a man who is at the same or next level of schooling higher than she is. The fertility distribution reflects the well-known curvilinear pattern of fertility by mother's educational attainment. The distribution of offspring's education shows a strong positive association between mother's and offspring's schooling but also substantial upward intergenerational educational mobility. Differential mortality reflects a negative monotonic relationship with schooling. Both maternal and child mortality diminish as women's educational attainment increases.

Estimation and Simulation

We estimate the components of the intergenerational process (these are terms shown in equation (2)) separately, each by maximum likelihood.[7] We use predicted probabilities of marriage, of marrying a man at each level of educational attainment, of survival to childbearing age intervals, and of children achieving each level of educational attainment and predicted age-specific numbers of children born that are implied by parameter estimates and actual or hypothetical values of observed characteristics of women and their husbands to compute an estimate of $r_{jka|i}$. That is,

$$(3) \qquad \hat{r}_{jka|i} = \hat{p}^{N}_{a|i}\hat{p}^{H}_{ka|i}\hat{p}^{F}_{s|ai}\hat{r}_{ka|i}\hat{p}^{D}_{s|i}\hat{p}^{T}_{j|kai},$$

where ^ denotes predicted values and all other notation is as defined above. Given the $\hat{r}_{jka|i}$ for each woman in the initial generation, the expected number of persons in the offspring generation who attain the *j*th education level is the sum over all women's and husbands' education categories and women's ages, or $\hat{n}^{C}_{j} = \sum_{a}\sum_{i}\sum_{k}\hat{r}_{jka|i}$. As discussed in further detail below, the $\hat{r}_{jka|i}$ are computed under a variety of scenarios that vary with (a) the hypothetical change in the education distribution of the mothers' generation; and (b) the presence or absence of variation in the six components of $\hat{r}_{jka|i}$ that are included in equation (3) (that is, which of the women's education effects on marriage, mortality, fertility, and child's schooling are taken into account in a simulation).

[7] Recall that we estimate the first term in equation (2) in two parts. Thus, we have six equations.

Table 3 presents a summary of the statistical models we use to compute the components of equation (3). For each equation, we use specifications that capture important interactions or nonlinearities present in the observed data. We estimate the transmission equation separately for boys and girls to capture interactions between parents' schooling and child's sex and mother's birth cohort and child's sex. These statistical models provide rich detail about the relationship between women's schooling and various demographic mechanisms in Indonesia. Although we review this detail briefly below, our main focus is on the interplay of these demographic mechanisms and the intergenerational effects of increases in women's schooling. Therefore, we provide a limited discussion of these parameter estimates, highlighting only the main relationships and patterns.

EMPIRICAL RESULTS

Parameter Estimates

Appendix Tables A2 to A6 report the parameter estimates for the four main parts of our model: marital status, assortative mating, fertility and transmission (estimated separately for boys and girls). Figures 1-5 summarize the results of these models. Women's, husbands', and children's schooling are measured in the five categories discussed above. We report ratios of coefficients to robust standard errors for all models and correct for the clustering of multiple observations for the same woman (same women observed at each age interval and or mother of multiple children in transmission equation).[8]

Figure 1 shows that women with 12 or more years of schooling are much less likely to be married at ages 15 to 19 and 20 to 24 than women with less schooling, but that they catch up later in life. At the youngest ages fewer that 10 percent of highly educated women are married compared to nearly half the women in the lowest schooling category. By age 30 to 34, about 90

[8] We have included number of siblings as a regressor in the equation for children's educational attainment for theoretical reasons. The variable's effects on educational attainment in Indonesia are extremely small and range over cohorts from slightly positive to slightly negative (Maralani 2005). In the Indonesian context, therefore, the family level effect of sibship size does not contribute much to the overall effect of changes in women's education on the next generation. In other societies, number of siblings may have a substantially different effect.

percent of women in all education groups are married (and an even larger proportion have been married at some point prior to that age).[9]

Indonesian couples show extremely strong evidence of positive assortative mating. Figure 2 shows the relationship between women's and husbands' schooling, as predicted by our model (estimated for women born between 1948 and 1962). Women in the lowest education category have a probability of about 0.75 of getting a husband with five or fewer years of schooling and a negligible chance of getting a husband with 12 or more years of schooling. In contrast, women in the highest schooling category have a probability of more than 0.8 of having a husband with 12 or more years of schooling and a near-zero probability of having a husband with 5 or fewer years of schooling

Figure 3 shows differences in age-specific patterns of marital fertility by women's schooling and birth cohort. Although women in both cohorts have similar patterns of fertility, fertility levels are higher for the older women (those born 1933 to 1947). Estimates of the effects of parents' schooling on number of children ever born, shown in Figure 4, follow the curvilinear pattern of differential fertility found in other research on Indonesia. Holding husband's education constant at six to eight years of schooling, women's expected number of children is approximately five for women born between 1948 and 1962, and about six for women born between 1933 and 1947.

Figure 5 shows that the probability that a daughter has completed 13 or more years of schooling increases monotonically as mother's age at birth and schooling increase. This reflects both the substantial expansions in schooling opportunities experienced in Indonesia in recent years as well as the strong positive relationship between mother's and daughter's schooling levels. For example, for women who give birth between ages 15 and 19, those with no schooling have about a 0.1 probability of having a daughter who completes grade 13 or higher compared to a probability of about 0.75 for women who themselves complete this schooling level. For women who give birth between ages 40 and 44, those with no schooling are more than three times as likely to have a daughter who completes grade 13 or higher (probability of about .35). Women

[9] For example, in 1980, 78 percent of 20-24 year olds, 94 percent of 25-29 year olds and 97 percent of 30-34 year olds women were married (Hirschman and Guest 1990). Recall that these data capture marital status at each age. Thus, divorce and widowhood decrement the proportion currently married at each age. Overall, Indonesia is a society with near universal marriage.

with 12 or more years of schooling in this interval have a probability of about 0.93 of having a daughter in the highest schooling category.

These results provide a partial picture of the effect of mothers' educational attainment on their offspring's attainment. In most standard analyses, researchers use the parameters of a transmission equation (predicting children's schooling from parents' schooling) to evaluate the effect of a hypothetical change in mother's schooling on the schooling of her children. To assess the overall effect of an increase in women's educational attainment, however, it is necessary to take account of the joint aggregate effects of marriage, fertility, and mortality as well.

Simulations

We assess the effects of women's education on the educational attainment of the next generation through a series of simulations. Each simulation has two parts: (1) a hypothetical change in women's schooling and (2) a given set of demographic mechanisms that we specify as endogenous to changes in women's schooling. Each simulation is carried out separately for the two older birth cohorts (1933-1947 and 1948-1962). For each simulation, we draw a random subsample of five percent of the women in the marriage sample and impose a hypothetical change in the women's education distribution.[10] For example, to estimate the effect of moving five percent of the sample women in the 1933-1947 cohort from no schooling to some primary schooling, we move 83 women from this cohort (or 137 women for simulations using women from the 1948-1962 birth cohort) from the no schooling category and to some primary. The other 95 percent of the women retain their original values. We use the parameters estimated from our models and the remaining assumptions that we want to examine (specifically, whether fertility, marriage, and mortality are taken into account) to predict husbands' and offspring's education distributions and the number of children born in each educational category in the subsequent generation. We then form a ratio of the simulated offspring educational distribution to the baseline distribution predicted by our sample women's observed schooling to see whether a given simulation increases or decreases the proportion of children in each schooling level

[10] Focusing on the effect of redistributing five percent of the population is arbitrary, although, for most of the simulations that we discuss, using a different fraction of the population would simply rescale the estimated effects up or down in proportion to the change in the fraction. Five percent is a number large enough to reveal a discernable pattern of effects yet small enough that it can be applied to each of the first four categories of women's schooling.

(relative to making no changes in women's schooling). We describe each component of the simulations in more detail below.

Changes in Women's Education Distribution. We simulate the "effect" of increases in women's schooling by computing the expected offspring education distribution for each of six actual or hypothetical distributions of women's educational attainment:

A1. The education distribution of the sample women, as observed;

A2. Five percent of sample women are moved from the no schooling category to some primary schooling category;

A3. Five percent of sample women are moved from the some primary schooling category to six to eight years of schooling;

A4. Five percent of sample women are moved from six to eight years of schooling to the nine to 11 years category;

A5. Five percent of sample women are moved from nine to 11 years of schooling to 12 plus years of schooling;

A6. Five percent of sample women are moved from the no schooling category to 12 plus years of schooling.

In A2 to A5, we move five percent of the sample women one education level beyond their observed level. In A6, we move five percent of the sample from the lowest to the highest education category. We compare the expected distribution of children's schooling predicted by each perturbed women's education distribution (A2-A6) to the expected distribution of children's schooling predicted by the observed women's education distribution (A1).

Combinations of Effects. Each of the simulations above is carried out for combinations of each the components of equation (2). We present results for the following nine combinations, which we call scenarios:

B1. intergenerational transmission, fertility, marriage, child and maternal mortality;

B2. intergenerational transmission, fertility, marriage, child mortality;

B3. transmission, fertility, marriage;

B4. transmission, fertility, assortative mating only;

B5. transmission, fertility, marital status only;

B6. transmission, fertility levels only, marriage;

B7. transmission, marriage;

B8. transmission, fertility;

B9. transmission only.

These scenarios correspond to the different components of the population renewal process that are endogenous to changes in women's schooling. Each scenario includes some combination of mechanisms through which a change in women's schooling can affect the numbers and types of children produced in the next generation. The effects estimated from scenario B9 correspond to conventional estimates of the effect of mothers' schooling on offspring's schooling based on the conditional joint distribution of parents' and offspring's schooling. These estimates do not allow changes in women's schooling to alter their marriage, fertility or mortality experiences. Here, changes in women's schooling only affect children's schooling through the transmission process.

The effects estimated in scenarios B1 through B8 modify conventional estimates by taking account of different components of fertility, marriage, mortality, or all three demographic processes. For example in B1, we allow increases in women's schooling to change their levels and timing of fertility, the ages at which they are likely to be married, the schooling of their husband, and both maternal and child mortality rates. In contrast, in B8, increases in women's schooling cannot change either their marital status or the schooling of their husbands. These rates and probabilities remain fixed at the levels predicted by women's observed level of schooling. Only fertility levels, fertility timing and the direct transmission of educational status are allowed to change to the levels and rates predicted by the perturbed women's new level of schooling. [11]

Results. We include the full set of simulation results for the nine scenarios we discuss here in Appendix Table A7 and A8. The appendix tables include results for both boys and girls. Although changes to women's schooling produce different results for boys and girls, the patterns are similar for both groups. In the following discussion, we focus only on the results for girls. Table 4 highlights our main findings. We show results for two cohorts of women: those born 1933-47 and 1948-62. We show only two perturbations to women's schooling: one that moves

[11] These nine scenarios represent a subset of the 17 scenarios that we have estimated. We include only nine for the sake of brevity. The full set of simulations is available from the authors upon request.

five percent of the women from no schooling to completing some primary (A2) and one that moves five percent of the women from no schooling to completing senior secondary or higher (A6). For each simulation and each cohort, we show the estimated effect for the lowest and highest categories of daughters' education (zero to five years and 13 or more years).

Columns one through four show the results for the oldest cohort of women. Recall that this cohort has a much more disadvantageous baseline education distribution than the 1948-62 cohort (see Appendix Table A1). More than half of these women have no schooling compared to only about one quarter of women born from 1948-62. These differences in starting distributions have important implications for the effects of changes to women's schooling. For example, a simulation that moves five percent of women in the oldest cohort from no schooling to some primary has very small effects for the bottom of the girls' educational distribution and nearly no effect at the top (columns 1 and 2). A simulation that includes all our demographic mechanisms (row 1) generates a four percent reduction in number of girls in the lowest education category relative to the baseline. Ignoring both child and maternal mortality changes this estimate to a three percent reduction in the lowest education category (row 3). Ignoring the benefits that can accrue to children through assortative mating produces a two percent reduction in the number of girls in the lowest education category (row 5).

This particular perturbation of women's schooling produces very small changes to the top of the children's education distribution, no matter which combination of demographic mechanisms is considered. This is because this hypothetical expansion in women's schooling represents only a modest improvement in the distribution. Women with some primary schooling are still unlikely to have children who complete high levels of schooling. Thus, all scenarios produce only a one or two percent increase of daughters in the highest education category.

Columns three and four show results for the simulation that moves women from the lowest to the highest education category. This perturbation has somewhat larger effects at the bottom of the girls' education distribution than the simulation that increases the educational attainment of these women to some primary (compare column 3 and column 1). Instead, this simulation moves a random sample of women from the very bottom to the very top of the educational distribution, where women are very unlikely to have daughters who complete fewer than six years of schooling. The various scenarios all produce about the same level of change in the girls' education distribution. The results in column three show that all models project a six to seven percent reduction in the number of girls in the lowest education category.

The effects at the top of the daughters' education distribution are substantially larger for this simulation. Moving five percent of the women in the oldest cohort into the highest education category results in a 30 percent increase in daughters in the highest education category when we consider the scenario that includes all mechanisms (row 1). Fewer children are in the highest education category when we disregard the benefits that accrue via changes in mortality. Increasing women's education decreases rates of maternal mortality for the more educated women, which produces more children for these women. Increasing women's education also lowers infant mortality for these women. Ignoring these mechanisms means that we predict lower net fertility for these more educated women, which decreases the number of girls in the highest education category (rows 2 and 3). Ignoring the benefits that accrue via assortative mating (rows 5, 8 and 9) reduces substantially the number of girls in the next generation who are predicted to obtain the highest level of schooling. In this and all the other simulations, improvements to women's schooling have a double effect when marriage is included in the scenario. Women can advantage their daughters both through improvement to their own schooling and by getting better educated husbands.

In a simulation that moves women from the lowest to the highest education category, the combined effect of the demographic mechanisms and transmission is much higher than the effect of intergenerational transmission alone (compare, for example, column 4, row 1 vs. row 9). The various demographic mechanisms, however, do not all, by themselves, amplify the positive effects on children of an increase in women's educational attainment. Because women's schooling has a negative effect on marital fertility in the upper part of the women's education distribution, the intergenerational benefit of improving women's schooling is slightly dampened when fertility is taken into account (compare row 3 vs. row 7 in column 4). That is, women have higher levels of schooling, which benefits their children, but they have fewer children who enjoy this benefit.

The effects of marriage are also mixed. An increase in a woman's educational attainment improves the quality of husband that she marries but it also causes her to marry later, on average. This delay in marriage reduces her total exposure to the risk of childbearing. This mechanism also results in an offsetting fertility effect because better educated women and their better educated husbands offer greater benefits to their children but, again, bear fewer children who enjoy these benefits. (Compare column 4, row 4, which includes the assortative mating but not the age-specific marital status component with row 5, which includes only age-specific marital status, and row 3, which includes both these marriage effects.)

Columns five through eight show the results for the 1948-1962 birth cohort. This birth cohort has a more advantageous starting distribution than the older cohort. For this cohort, moving five percent of sample women from no schooling to some schooling has modest effects for girls at the bottom of the education distribution and nearly no effect for girls at the top of the distribution (columns 5 and 6). Here the effects are larger than those we predicted for the older cohort because fewer children are predicted to be in the lowest education category for this younger cohort of women. Thus, the improvement to girls' schooling at the bottom of the distribution represents a larger proportional change. Still, the change in women's schooling does not occur at a place in the women's educational distribution that produces substantially more girls in the highest education category (column 6).

Columns seven and eight in Table 4 show the effects of a simulation that moves five percent of the women from no schooling into the highest education category. Here, the benefits to children are more pronounced both at the bottom and the top of the children's education distribution. Overall, this simulation generates about a ten percent reduction in the bottom of the daughters' education distribution. At the top of the daughter's distribution, this simulation produces a range of results depending on the mechanisms that we make endogenous to women's schooling. A scenario that considers all the mechanisms produces a 15 percent increase in the proportion of daughters in the highest education category. Ignoring maternal and child mortality decreases this effect by two percentage points because we do not account for the fact that better educated women are more likely to survive through their childbearing years to produce children who go on to obtain more schooling. Ignoring assortative mating (row five) greatly underestimates the benefits of increases to women's schooling. This scenario produces only a seven percent increase in children with the highest level of schooling. Including transmission and marriage but ignoring differential fertility (row 7) overestimates the benefits that accrue to children because it does not account for the fact that women with the highest level of schooling have lower fertility than women with no schooling. This scenario generates a 16 percent increase in the proportion of daughters at the highest education level relative to the baseline.

Transmission only (row 9) underestimates the benefits to daughters. This scenario, which represents the conventional estimate of intergenerational effects, predicts only a seven percent increase in the proportion of daughters in the highest education category.

CONCLUSION

Expansions in women's schooling benefit those in the next generation both through family level processes, and also through changes in family size and family structure that have compositional effects at the population level. Demographic mechanisms such as marriage, fertility and mortality, which are sensitive to changes in women's schooling, alter the numbers and types of families and children across generations. Measuring the total intergenerational effect of improvements to women's schooling requires accounting for both family level effects and the effects that accrue through the population renewal process. Static analyses of intergenerational transmission that rely on existing pairs of parents and children miss this important dimension.

Our results show that these demographic mechanisms can have important effects on the educational distribution of the next generation. Some mechanisms, such as assortative mating, have very strong positive effects. Women with more schooling marry men with more schooling, which further advantages their children. The benefits of positive assortative mating, however, are offset by that fact that women with the highest levels of schooling bear fewer children overall. Increases in schooling also delay first marriage, which may dampen fertility even more. Differential mortality has a positive effect. Women with more schooling are more likely to survive through their childbearing years and to have children who survive to adulthood. This mechanism improves the education distribution of the next generation by increasing the number of surviving children who are most likely to obtain higher levels of schooling.

Our results demonstrate that the effects of expansions in women's schooling depend on both the starting distribution of women's schooling and where in the distribution women's schooling increases. For example, Indonesian women born between 1933 and 1947 obtained very low levels of schooling. For this cohort of women, moving women from no schooling to some primary has only modest effects for the schooling of those in the next generation. Despite the increase in women's schooling, a large proportion of women remain at the bottom of the educational distribution where women are unlikely to have children who obtain very high levels of schooling. On the other hand, moving five percent of the women from the bottom to the very top of the distribution has large effects on children's schooling because this nearly doubles the number of women in the highest education category. This latter change would substantially improve this older cohort's education distribution and greatly improve the education distribution of these women's children. In contrast, the cohort of women born between 1948 and 1962 had already benefited from expansions in schooling in Indonesia and shows a more advantaged starting distribution than the older cohort. In the 1948-62 cohort, increases in women's education at the bottom of the educational distribution have larger effects and increases at the top of the distribution have smaller effects than in the older cohort.

The effects of increases in women's schooling also depend on how men's schooling changes in response. If increases in women's schooling are not matched by increases in men's educational attainment, then the benefits that accrue through assortative mating will be dampened. In general, it seems likely that most expansions in women's schooling are accompanied by some expansion in men's schooling as well, albeit perhaps at different parts of the educational distribution and at different rates of change if there is a closing gender gap in schooling. The exact effect on the next generation, however, depends on how much men's schooling increases when women's schooling increases and how the marriage market changes in response to this educational upgrading. In other work, we find that even under the extreme assumption that the men's schooling distribution remains fixed at observed levels, the pattern of results is similar to those presented here (Mare and Maralani 2005).

Our analyses assume that, given the variables included in the models, the demographic and intergenerational transmission processes are independent. If, however, women vary systematically on unmeasured factors that jointly affect marriage, fertility, mortality and childrearing, then the estimated effects of parents' educational attainments on their offspring's schooling may be biased. Although we typically regard "family background" as exogenous to socioeconomic success, in this case it may be necessary to treat family background as jointly determined with the outcomes of family effects such as offspring's educational attainment. In future research we plan to refine our approach by developing models that relax this assumption of independence.

Our approach provides a more complete assessment of the intergenerational effects of expansions in women's schooling. It captures the numerous ways that educational changes in one generation shape the educational distribution of the next generation. It also highlights the role of different social institutions and demographic mechanisms such as marriage and fertility in the process of intergenerational transmission. Societies with different norms, social structures, and demographic regimes will produce different combinations of intergenerational effects. Similarly, if the relationship between education and these different mechanisms changes, for example through development, modernization, globalization, or acculturation, then the pattern of intergenerational effects may also change. Unlike most conventional models of intergenerational transmission, our approach identifies and analyzes these dynamics.

APPENDIX: ESTIMATING SURVIVAL RATES

The mortality information used in this paper was derived from the 1987 "National Indonesia Contraceptive Prevalence Survey" (NICPS), which is the Indonesia Demographic and Health Survey (DHS) for that year. We use the infant mortality rate information contained in Badan Pusat Statistik, Republik Indonesia (1989: Tables 8.2 and 8.3). The infant death data contained in that report are based on birth histories for the 10 years prior to the survey. Thus, the data provide estimates for average mortality conditions over the 1977-87 period.

Our strategy is to use the infant death probabilities ($_1q_0$) by sex of child and educational attainment of mother to infer sex-education-specific model life tables and to use the latter tables to compute the mortality functions required by our model. Unfortunately, the report tabulates infant mortality by education of mother and by sex of child but not by these two variables jointly. Thus, we assume that the sex difference in infant mortality does not vary by education of mother. For a given level of mother's schooling, we let the infant death probability for both sexes combined be q_t and the infant death probabilities for males and females be q_m and q_f respectively. If $q_f/q_m = k$ and we assume that the sex ratio at birth is 1.00, then $q_t = .5(q_f + q_m) = .5(1+k)q_m$, $q_m = .5q_t/(1 + k)$, and $q_f = .5kq_t/(1 + k)$. Our estimate of k is the ratio of sex-specific infant death probabilities reported in Table 8.3 of the report and our estimates of q_t are the education-specific infant death probabilities reported in Table 8.2.

The NICPS obtained education data using a six-category classification of highest level of school completed: none, some primary, completed primary, junior high, senior high, and academy/university. In the infant death tabulations however, only four levels are distinguished: none, some primary, primary completed, and secondary or more. We assume that these four levels correspond to 0, 1-5, 6-8, and 9+ years of schooling. Thus, we assume that mortality levels are the same for the 9-11 and 12+ categories used throughout the rest of our analysis.

We use the $_1q_0$ estimates to infer a model life table for each sex–education category. We use the Coale-Demeny "West" family of life tables (Coale, Demeny, and Vaughn 1983), and infer a mortality level for each sex and education level by linear interpolation of the $_1q_0$. For example, if a given $_1q_0$ is 60 percent of the way between the $_1q_0$ for levels 15 and 16 of the Model West tables then we assume that all life table functions for that sex-education group are 60 percent of the way between their corresponding values in the level 15 and 16 Model West tables.

We require two sets of survival probabilities, the survival of children to adulthood and the survival of women to selected age intervals of childbearing.

Survival of Children to Adulthood. Our transmission equation estimates the effects of women's schooling on offspring's schooling, given that the offspring have survived to the young adult population. By adding an equation that predicts the probability of survival to the young adult population, we can assess the effects of women's schooling on the educational attainment of their offspring taking differential mortality into account.

The offspring in our transmission model range in age from their 20s through their 50s, but most of them are aged 20-39. From an individual perspective, the relevant survival probability is to some exact age in early adulthood, say 20 (l_{20}/l_0). But from a population perspective, the relevant survival probability is to an age interval of the adult population, ${}_xL_{20}/Xl_o$. Although there is some arbitrariness in choosing this age interval, we use the 20-39 interval and thus, for each sex and education of mother category, we estimate ${}_{20}L_{20}/20l_0 = s^D$. We estimate ten of these quantities, one for each of five mother's education groups for each sex.

Survival of Women During Childbearing Years. Our fertility equation estimates the effects of women's schooling on her fertility given that she survives throughout her childbearing years. By adding an equation that predicts the probability of survival to the ages of childbearing, we can estimate the effects of women's schooling on fertility taking mortality into account. We want to allow for differential survival of women with varying amounts of education to each of the age intervals used in our fertility analysis given that they have survived childhood. Thus we estimate $s^M = {}_5L_x/5l_{15}$ (x = 15, 20, 25, 30, 35, 40, 45). We estimate 35 of these quantities, one of each combination of the 5 women's schooling and 7 women's age categories.

In future work we will obtain estimates for other periods as well. Comparable DHS data are available for later periods, up to 1992-2002. These data may be more suitable for forecasts but are less relevant to the cohorts represented in the IFLS. We can also use the estimates of Cho *et al.* (1976) from the 1971 Census (for the period from 1966-71). Additionally, we will use microdata from the DHS surveys, which will let us refine education categories and take account of father's educational attainment, mother's age, and the interaction of these effects with sex of child.

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Table 1. Educational Attainment Distributions for Selected IFLS Samples (Percent)[ab]

	Marriage Selection	Assortative Mating/ Fertility		Transmission	
Educational Attainment - Parents	Woman	Woman	Husband	Woman	Husband
None	22.3	26.2	18.3	41.6	26.0
Complete Some Primary (1-5)	23.0	27.3	25.8	28.5	29.3
Complete Primary (6-8)	26.5	26.6	28.2	19.7	25.6
Complete Jr Sec (9-11)	13.6	8.7	10.2	5.2	8.7
Complete Sr Sec (12+)	14.6	11.2	17.5	5.0	10.4
Total	100.0	100.0	100.0	100.0	100.0
# Observations	9358	6954	6954	2988	2988
Educational Attainment - Children				Sons	Daughters
Complete none or some primary (0-5)				5.9	8.7
Complete Primary (6-8)				13.4	15.9
Complete Jr Sec (9-11)				30.2	32.7
Complete Sr Sec (12)				15.2	13.1
Complete some college (13+)				35.3	29.6
Total				100.0	100.0
# Observations				4415	4495

[a] Data are weighted to adjust for oversampling and attrition

[b] Totals do not sum to 100 due to rounding.

Table 2. Distribution of Outcomes by Women's Educational Attainment[a]

	Married at age 20-24[b]	Husband's Education (%)[b]					Maternal Survival[c]	Children Ever Born[d]	Offspring's Education (%)[b]					Survival[b]	
		None	1-5	6-8	9-11	12+			0-5	6-8	9-11	12	13+	Sons	Daughters
Woman's Education:															
None	0.85	44.9	31.6	18.2	3.1	2.2	0.837	4.6	15.1	23.9	38.7	10.3	12.0	0.760	0.798
Completed 1-5 yrs	0.90	15.4	42.7	30.5	7.3	4.2	0.862	4.9	2.3	13.5	39.0	19.7	25.5	0.800	0.834
Completed 6-8 yrs	0.88	6.8	18.9	46.6	14.2	13.3	0.897	4.9	0.7	3.5	20.8	17.4	57.6	0.860	0.884
Completed 9-11 yrs	0.78	2.5	8.4	24.8	26.2	38.0	0.939	4.7	0.4	0.6	3.5	15.7	79.7	0.920	0.941
Completed 12+ yrs	0.51	1.2	1.1	6.9	11.4	79.3	0.939	3.8	0.3	0.4	0.7	3.3	95.3	0.920	0.941
Total	0.81	18.2	25.9	28.4	10.1	17.4	NA	4.7	7.3	14.7	31.5	14.2	32.4	NA	

[a]Data are weighted to adjust for oversampling and attrition

[b]Estimate based on subsample of women over age 40 (N=7701)

[c]Probability of survival to age 40-44 given survival to age 15 (5L40 / 5l15), calculated based on model life tables and summary data form the Indonesia Demographic and Health Survey (DHS)

[d]Infant mortality caculated based on model life tables and summary data from the Indonesia (DHS).

Table 3. Summary of Statistical Models Used in Analysis

Equation	Model	Dependent Variable	Specification
Marital Status	Binary Logit	Married (yes/no)	Woman's Educ * Age; Women's Educ * Age^2 ; Women's Educ * Age^3; Birth Cohort * Age
Assortative Mating	Ordered Logit	Husband's education in 5 categories	Woman's Educ; Birth Cohort
Maternal Mortality	Binary Logit	Survival to Given Age	Woman's Educ; Age; Birth Cohort
Fertility	Poisson	Number of children born in each age interval	Woman's Educ * Age; Age^2; Husband's Educ; Birth Cohort
Child Mortality	Binary Logit	Survival to Age 20-40	Mother's Educ; Sex of Child
Transmission	Ordered Logit	Child's education in 5 categories. Model estimated separately for boys and girls	Woman's Educ; Husband's Educ; Mother's Age at Child's birth; Mother's Cohort * Number of Siblings; Mother's Cohort

Table 4. Ratio of Simulated to Baseline Daughters' Education Distribution for Selected Scenarios, Perturbations of Women's Schooling, and Daughters' Schooling Categories.

	Women's Birth Cohort: 1933-1947				Women's Birth Cohort: 1948-1962			
	Simulation: None to 1-5 yrs		Simulation: None to 12+ yrs		Simulation: None to 1-5 yrs		Simulation: None to 12+ yrs	
Scenarios	Daughters in Lowest Education Category (0-5 yrs)	Daughters in Highest Education Category (13+ yrs)	Daughters in Lowest Education Category (0-5 yrs)	Daughters in Highest Education Category (13+ yrs)	Daughters in Lowest Education Category (0-5 yrs)	Daughters in Highest Education Category (13+ yrs)	Daughters in Lowest Education Category (0-5 yrs)	Daughters in Highest Education Category (13+ yrs)
1. Transmission, Fertility, Marriage, Child and Maternal Mortality	0.96	1.01	0.94	1.30	0.94	1.01	0.90	1.15
2. Transmission, Fertility, Marriage, Child Mortality	0.97	1.01	0.94	1.29	0.94	1.01	0.90	1.15
3. Transmission, Fertility, Marriage	0.97	1.01	0.94	1.26	0.94	1.01	0.90	1.13
4. Transmission, Fertility, Marriage (Assortative Mating only)	0.97	1.02	0.93	1.33	0.94	1.01	0.90	1.16
5. Transmission, Fertility, Marriage (Marital Status only)	0.98	1.01	0.95	1.09	0.96	1.01	0.91	1.07
6. Transmission, Fertility (levels only), Marriage	0.96	1.02	0.94	1.25	0.94	1.01	0.90	1.13
7. Transmission, Marriage	0.96	1.02	0.93	1.35	0.94	1.01	0.89	1.16
8. Transmission, Fertility	0.98	1.01	0.94	1.10	0.96	1.01	0.90	1.07
9. Transmission only	0.97	1.01	0.93	1.11	0.95	1.01	0.90	1.07

Figure 1. Probability of Being Married by Women's Age and Education for Women Born 1948-1962 (Cohort 2), IFLS 1997

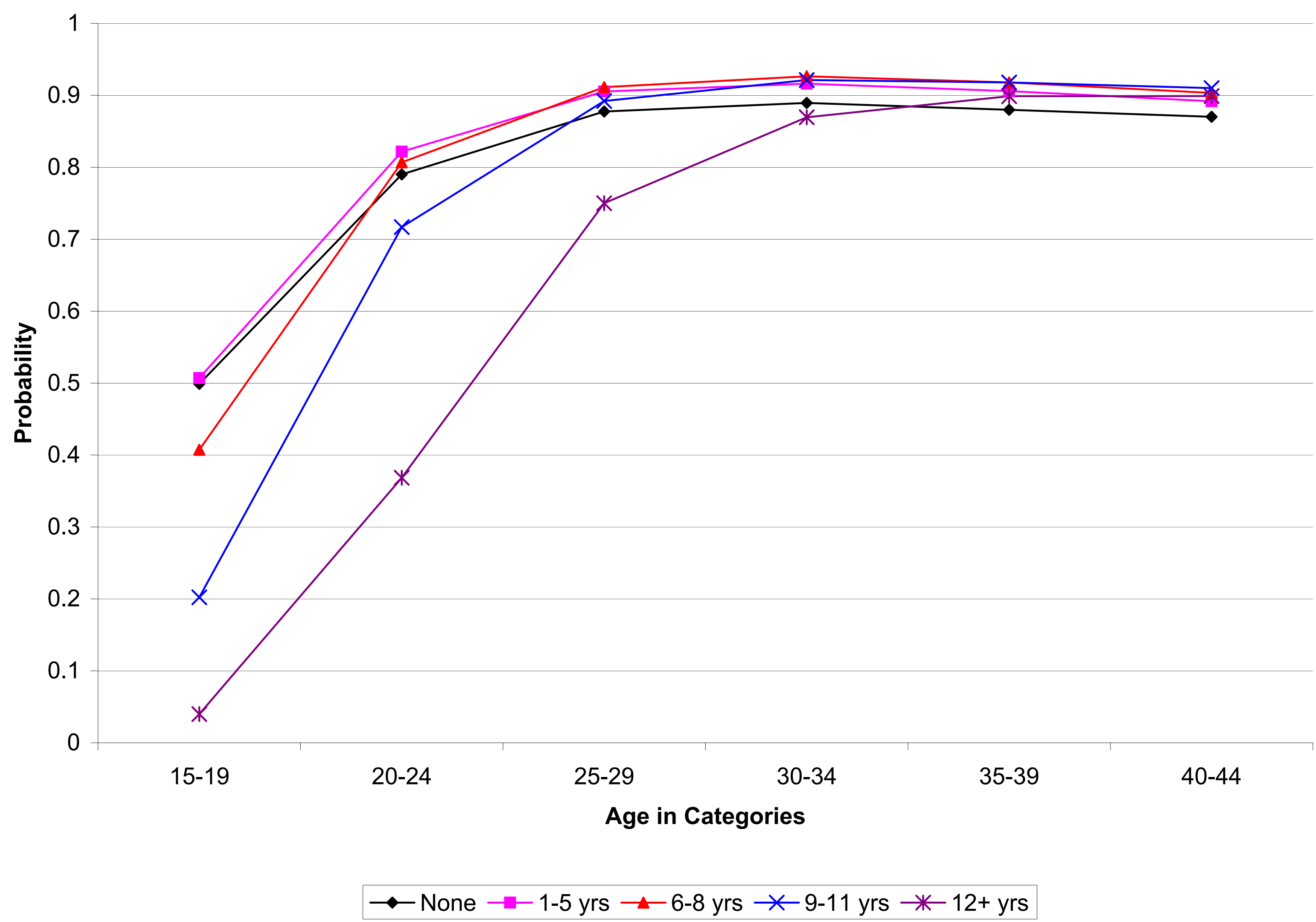


Figure 2. Husband's Education Given Wife's Education, for Women Born 1948-1962 (Cohort 2)

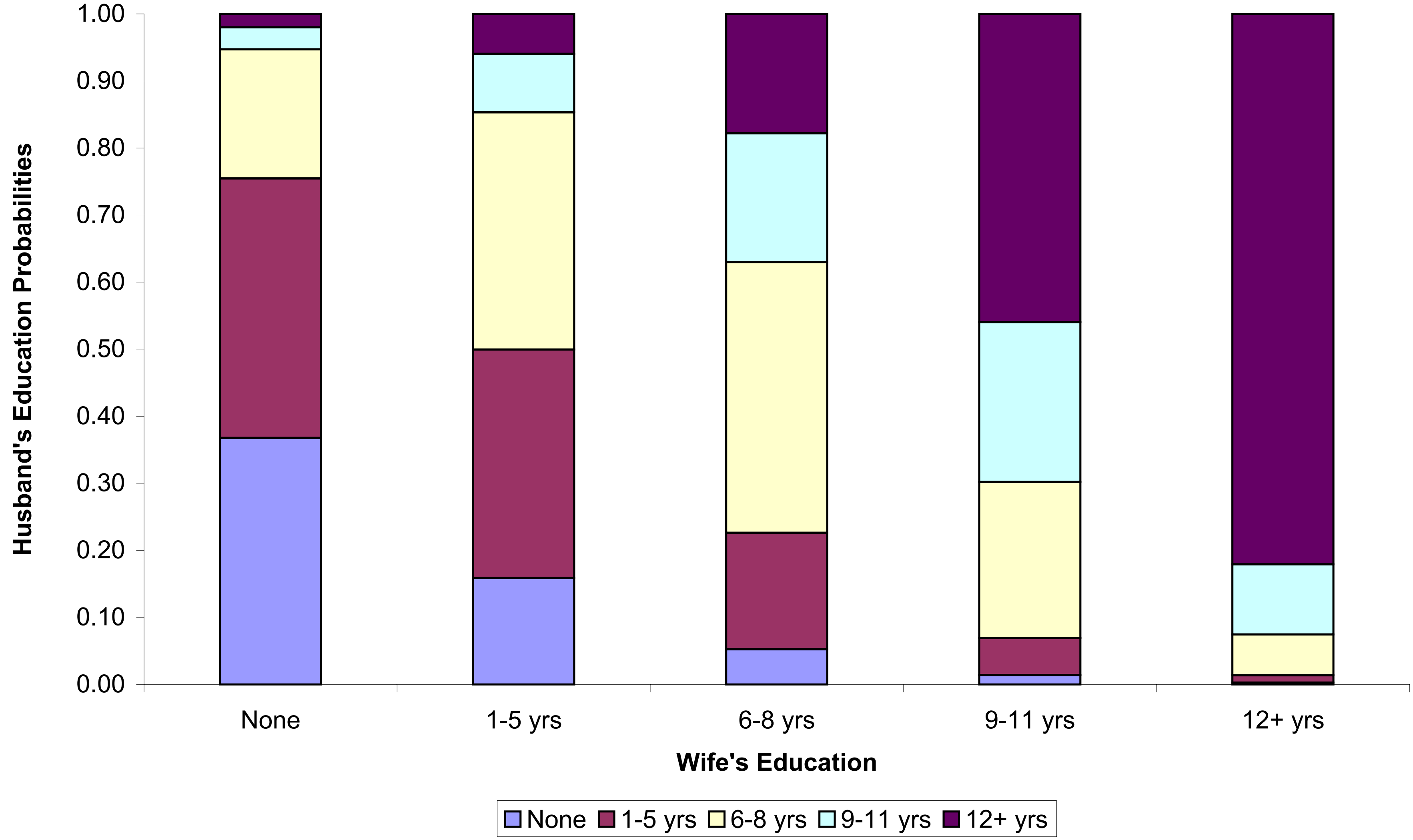


Figure 3. Age-Specific Marital Fertility by Woman's Education and Cohort (Husband's Education Held at 6-8 yrs.), IFLS 1997

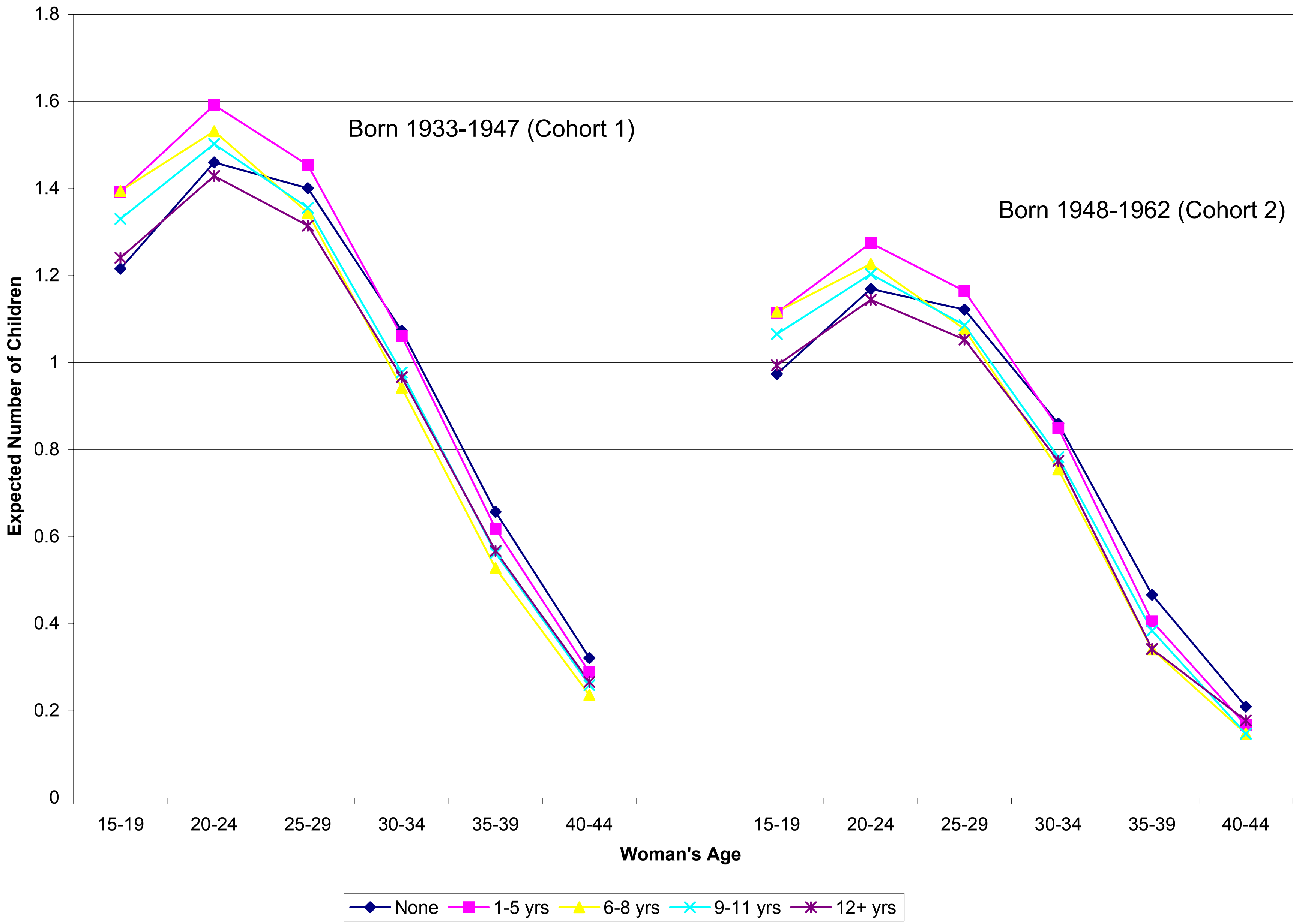


Figure 4. Expected Number of Children by Woman's Education and Cohort (Husband's Education Held at 6-8 yrs), IFLS 1997

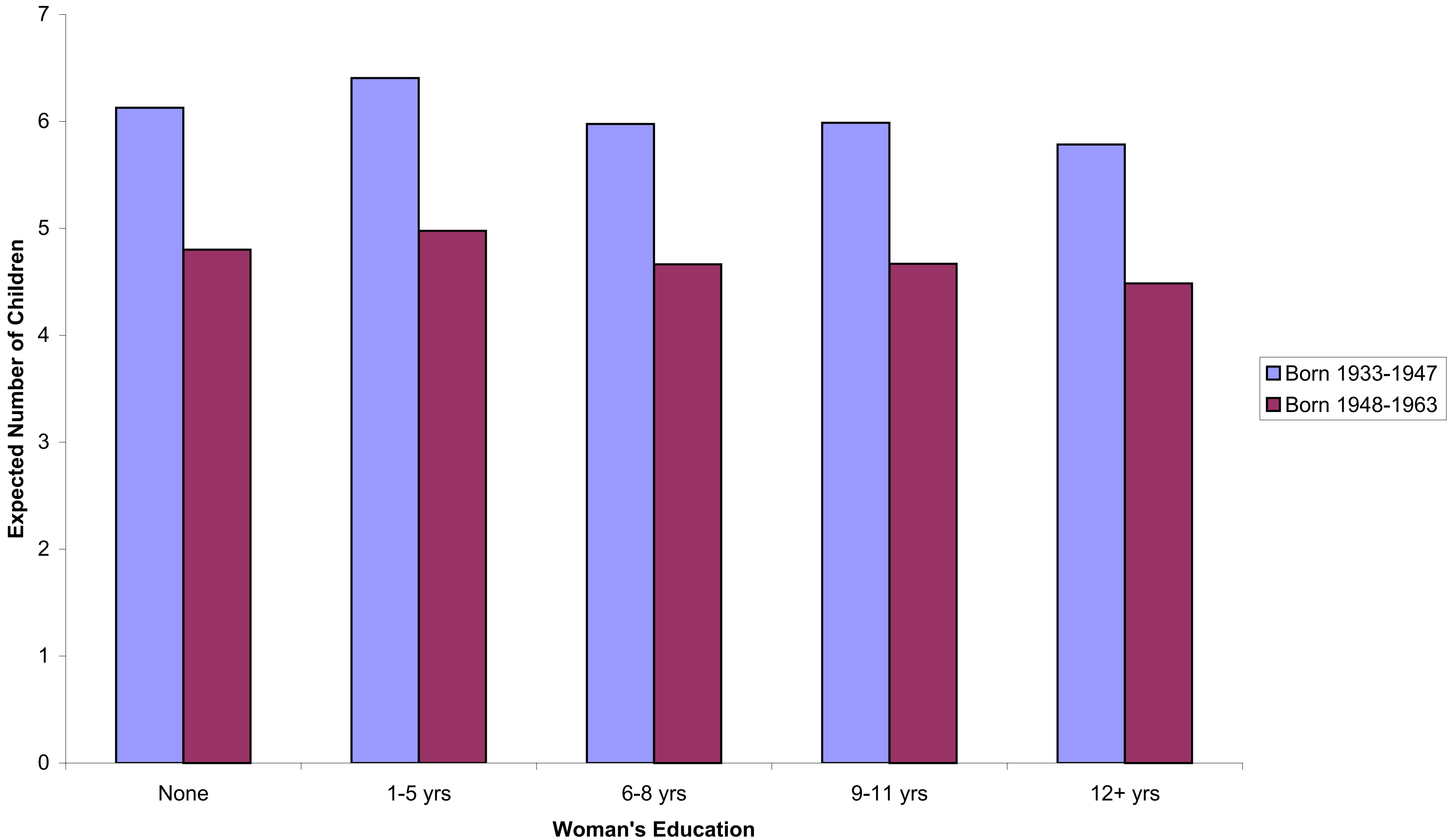
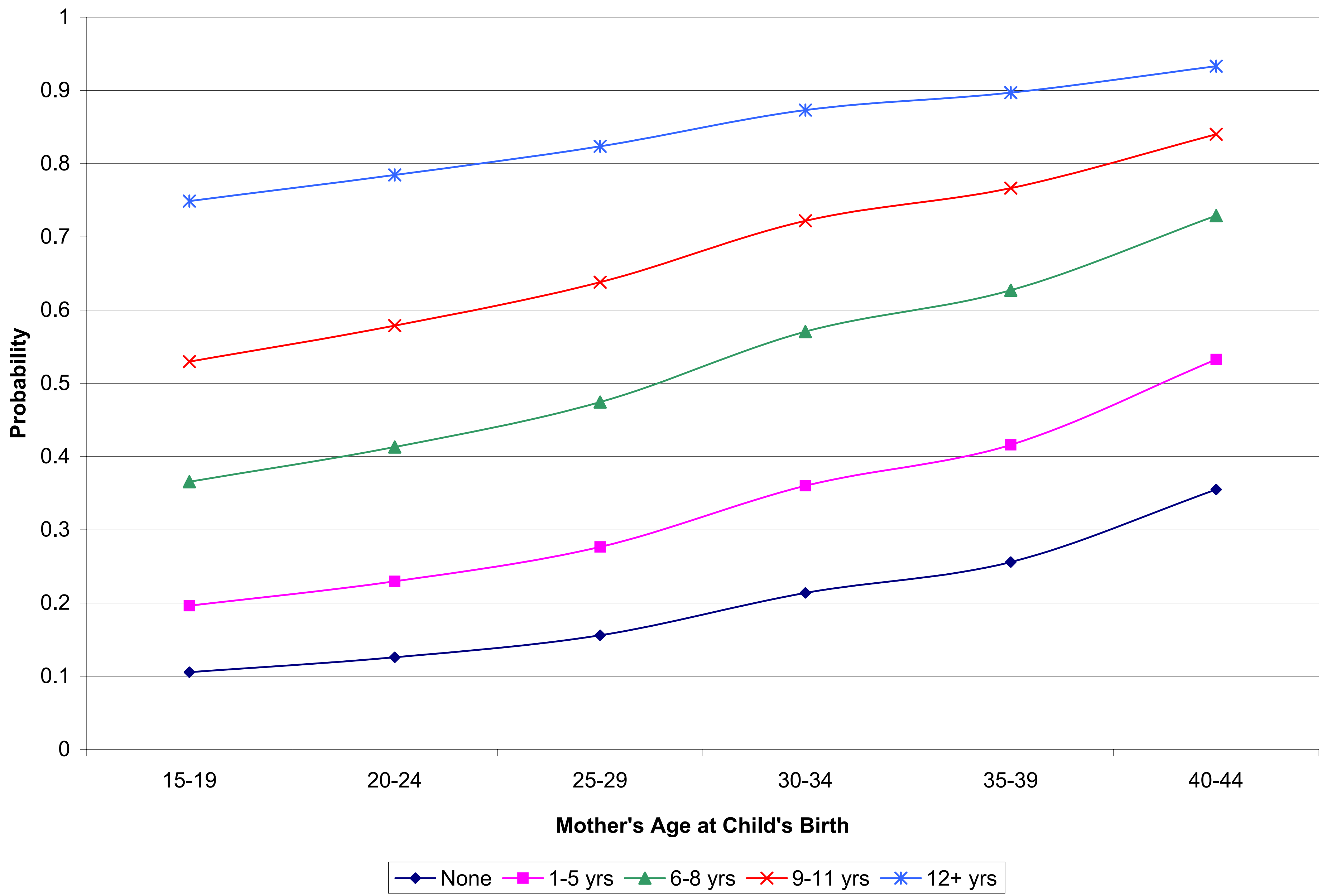


Figure 5. Probability Daughter has Completed At Least 13 Years of Schooling by Mother's Education and Age at Birth (husband's education=6-8 yrs, siblings=3, mother's age cohort=1943-1947), IFLS 1997



Appendix Table A1. Cohort Summaries, IFLS 1997[a]

	Cohort 1	Cohort 2	Cohort 3
Birth Year	1933-1947	1948-1962	1963-1982
Age in 1997	50-64	35-49	15-34
Education			
None	.54	.24	.10
1-5 yrs	.23	.32	.18
6-8 yrs	.13	.26	.32
9-11 yrs	.05	.07	.21
12+ yrs	.05	.11	.20
# Women in Marriage Sample	1669	2748	4941

[a]Data are weighted to adjust for oversampling and attrition

Appendix Table A2. Parameter Estimates for Model of Marriage Selection (binary logit)[a,b]

Dependent variable: Married (0/1)

	β	β/[S.E.(β)]
Woman's Education		
0. None (omittec		
1. Complete Some Primary (1-5)	-0.240	1.319
2. Complete Primary (6-8)	-1.116	5.958
3. Complete Jr Sec (9-11)	-2.894	11.701
4. Complete Sr Sec (12+)	-4.819	15.611
Age Interval		
1. 15-19 (reference)		
2. 20-24	1.377	27.090
3. 25-29	2.068	26.042
4. 30-34	2.230	20.296
5. 35-39	2.183	15.235
6. 40-44	2.141	12.144
Age Interval * Women's Ed.		
AI * Woman's Ed 0 (reference)		
AI * Woman's Ed	0.330	1.387
AI * Woman's Ed 2	0.899	3.637
AI * Woman's Ed 3	1.845	5.603
AI * Woman's Ed 4	1.809	5.636
Age Interval^2 * Women's Ed.		
AI^2 * Woman's Ed 0 (reference)		
AI^2 * Woman's Ed 1	-0.060	0.740
AI^2 * Woman's Ed	-0.162	1.858
AI^2 * Woman's Ed 3	-0.339	2.786
AI^2 * Woman's Ed 4	-0.169	1.617
Age Interval^3 * Women's Ed.		
AI^3 * Woman's Ed 0 (reference)		
AI^3 * Woman's Ed 1	0.003	0.366
AI^3 * Woman's Ed 2	0.009	1.003
AI^3 * Woman's Ed 3	0.021	1.638
AI^3 * Woman's Ed 4	0.002	0.155
Cohort		
1. Born 1963-1982 (reference)		
2. Born 1948-1962	0.267	3.905
3. Born 1933-1947	0.387	4.776
Age Interval * Cohort		
AI * Cohort 1 (reference)		
AI * Cohort 2	-0.047	1.366
AI * Cohort 3	-0.125	3.458
Constant	-0.225	4.256
# Observations	170061	
Log Likelihood	-75940	

[a]Observations are person-year

[b]Standard Errors are adjusted for clustering.

Appendix Table A3. Parameter Estimates for Model of Assortative Mating (ordered logit) [ab]

Dependent variable: Husband's Education (5 categories)

	β	β /[S.E.(β)]
Woman's Education		
0. None (omitted)		
1. Complete Some Primary (1-5)	1.112	16.670
2. Complete Primary (6-8)	2.323	31.175
3. Complete Jr Sec (9-11)	3.672	35.206
4. Complete Sr Sec (12+)	5.335	46.561
Cohort		
1. Born 1963-1982 (reference)		
2. Born 1948-1962	0.213	4.032
3. Born 1933-1947	-0.079	1.223
Cut Points		
Cut 1	-0.361	
Cut 2	1.318	
Cut 3	3.072	
Cut 4	4.056	
# Observations	32514	
Log Likelihood	-41236	

[a]Observations are person-age intervals.

[b]Standard Errors are adjusted for clustering.

Appendix Table A4. Parameter Estimates for Model of Fertility (Poisson)[ab]

Dependent variable: Number of children born in each age interval

	β	β/[S.E.(β)]
Woman's Education		
0. None (reference)		
1. Complete Some Primary (1-5)	0.184	4.433
2. Complete Primary (6-8)	0.226	5.464
3. Complete Jr Sec (9-11)	0.151	2.839
4. Complete Sr Sec (12+)	0.062	1.117
Age Interval	0.520	23.864
Age Interval^2	-0.112	35.498
Age Interval * Women's Ed.		
AI * Woman's Ed 0 (reference)		
AI * Woman's Ed 1	-0.049	3.337
AI * Woman's Ed 2	-0.089	6.018
AI * Woman's Ed 3	-0.061	3.029
AI * Woman's Ed 4	-0.042	2.281
Husband's Education		
0. None (reference)		
1. Complete Some Primary (1-5)	0.098	4.403
2. Complete Primary (6-8)	0.044	1.897
3. Complete Jr Sec (9-11)	0.058	2.069
4. Complete Sr Sec (12+)	0.058	2.203
Cohort		
1. Born 1963-1982 (reference)		
2. Born 1948-1962	0.183	12.960
3. Born 1933-1947	0.405	23.115
Constant	-2.271	53.120
# Observations	28083	
Log Likelihood	-31282	

[a]Observations are person-age intervals.

[b]Standard Errors are adjusted for clustering.

Appendix Table A5. Parameter Estimates for Model of Transmission for Girls (ordered logit)

Dependent variable: Girl's Education (5 categories)

	β	β/[S.E.(β)]
Woman's Education		
0. None (reference)		
1. Complete Some Primary (1-5)	0.706	7.10
2. Complete Primary (6-8)	1.558	12.50
3. Complete Jr Sec (9-11)	1.993	11.93
4. Complete Sr Sec (12+)	2.915	13.96
Husband's Education		
0. None (reference)		
1. Complete Some Primary (1-5)	0.612	5.52
2. Complete Primary (6-8)	1.354	10.89
3. Complete Jr Sec (9-11)	1.896	11.69
4. Complete Sr Sec (12+)	2.671	15.41
Cohort of Mother		
1. Age 35-39 in 1997	0.941	2.87
2. Age 40-44 in 1997	1.153	4.18
3. Age 45-49 in 1997	1.170	4.14
4. Age 50-54 in 1997	0.565	2.06
5. Age 55-59 in 1997	0.203	0.72
6. Age 60-64 in 1997 (reference)		
Mother's Age at Child's Birth		
1. 15-19 (reference)		
2. 20-24	0.229	2.84
3. 25-29	0.387	3.96
4. 30-34	0.769	6.70
5. 35-39	0.900	5.90
6. 40-44	1.481	4.47
Number of Siblings	0.007	0.20
Mother's Cohort * Siblings		
Cohort 1 * Siblings	-0.081	1.26
Cohort 2 * Siblings	-0.125	2.49
Cohort 3 * Siblings	-0.128	2.69
Cohort 4 * Siblings	-0.090	1.98
Cohort 5 * Siblings	-0.008	0.17
Cohort 6 * Siblings (reference)		
Cut Points		
Cut 1	0.636	
Cut 2	2.420	
Cut 3	3.307	
Cut 4	5.640	
# Observations	4495	
Log Likelihood	-5694	

[a]Observations are children.

[b]Standard Errors are adjusted for clustering.

Appendix Table A6. Parameter Estimates for Model of Transmission for Boys (ordered logit)

Dependent variable: Boy's Education (5 categories)

	β	β/[S.E.(β)]
Woman's Education		
0. None (reference)		
1. Complete Some Primary (1-5)	0.532	5.30
2. Complete Primary (6-8)	1.411	11.47
3. Complete Jr Sec (9-11)	1.871	9.92
4. Complete Sr Sec (12+)	2.383	11.43
Husband's Education		
0. None (reference)		
1. Complete Some Primary (1-5)	0.580	5.10
2. Complete Primary (6-8)	1.183	9.69
3. Complete Jr Sec (9-11)	1.562	9.54
4. Complete Sr Sec (12+)	2.289	13.04
Cohort of Mother		
1. Age 35-39 in 1997	0.791	2.44
2. Age 40-44 in 1997	0.854	2.90
3. Age 45-49 in 1997	0.909	3.14
4. Age 50-54 in 1997	0.793	2.88
5. Age 55-59 in 1997	0.368	1.33
6. Age 60-64 in 1997 (reference)		
Mother's Age at Child's Birth		
1. 15-19 (reference)		
2. 20-24	0.120	1.42
3. 25-29	0.112	1.19
4. 30-34	0.357	3.19
5. 35-39	0.786	5.47
6. 40-44	0.584	2.19
Number of Siblings	0.044	1.23
Mother's Cohort * Siblings		
Cohort 1 * Siblings	-0.156	2.44
Cohort 2 * Siblings	-0.161	3.09
Cohort 3 * Siblings	-0.140	2.76
Cohort 4 * Siblings	-0.135	3.07
Cohort 5 * Siblings	-0.078	1.74
Cohort 6 * Siblings (reference)		
Cut Points		
Cut 1	0.011	
Cut 2	1.599	
Cut 3	2.447	
Cut 4	4.666	
# Observations	4415	
Log Likelihood	-5888	

[a]Observations are children.

[b]Standard Errors are adjusted for clustering.

Appendix Table A7. Ratios of Simulated to Observed Offspring's Education Distributions for a Given Change in Women's Schooling,

	Sons					Daughters				
	0-5 yrs	6-8 yrs	9-11 yrs	12 yrs	13+ yrs	0-5 yrs	6-8 yrs	9-11 yrs	12 yrs	13+ yrs
Simulation	Transmission, Fertility, Marriage, Child and Maternal Mortality									
None to 1-5 yrs	0.968	0.990	1.010	1.021	1.014	0.964	0.997	1.021	1.027	1.013
1-5 yrs to 6-8 yrs	0.971	0.971	0.986	1.031	1.069	0.972	0.973	0.998	1.048	1.067
6-8 yrs to 9-11 yrs	0.992	0.986	0.980	0.999	1.081	0.992	0.983	0.979	1.014	1.092
9-11 yrs to 12+ yrs	1.009	1.004	0.993	0.971	1.056	1.009	1.001	0.981	0.953	1.130
None to 12+ yrs	0.939	0.952	0.970	1.022	1.218	0.938	0.956	0.978	1.040	1.302
	Transmission, Fertility, Marriage, Child Mortality									
None to 1-5 yrs	0.968	0.991	1.011	1.021	1.014	0.965	0.998	1.021	1.027	1.013
1-5 yrs to 6-8 yrs	0.971	0.971	0.987	1.032	1.069	0.973	0.974	1.000	1.048	1.066
6-8 yrs to 9-11 yrs	0.992	0.986	0.981	1.000	1.080	0.993	0.983	0.979	1.015	1.090
9-11 yrs to 12+ yrs	1.009	1.004	0.993	0.970	1.060	1.009	1.000	0.980	0.952	1.135
None to 12+ yrs	0.939	0.954	0.973	1.026	1.211	0.938	0.958	0.982	1.043	1.292
	Transmission, Fertility, Marriage									
None to 1-5 yrs	0.968	0.991	1.011	1.021	1.014	0.965	0.998	1.021	1.027	1.014
1-5 yrs to 6-8 yrs	0.973	0.973	0.987	1.031	1.065	0.975	0.975	0.999	1.046	1.063
6-8 yrs to 9-11 yrs	0.995	0.989	0.982	0.999	1.070	0.995	0.985	0.980	1.011	1.081
9-11 yrs to 12+ yrs	1.009	1.004	0.993	0.971	1.059	1.009	1.000	0.980	0.952	1.134
None to 12+ yrs	0.946	0.959	0.977	1.024	1.183	0.944	0.963	0.985	1.040	1.256
	Transmission, Fertility, Marriage (Assortative Mating Only)									
None to 1-5 yrs	0.968	0.991	1.010	1.021	1.015	0.965	0.997	1.021	1.027	1.015
1-5 yrs to 6-8 yrs	0.972	0.972	0.988	1.031	1.065	0.974	0.975	1.000	1.046	1.063
6-8 yrs to 9-11 yrs	0.991	0.985	0.981	1.003	1.079	0.991	0.983	0.980	1.018	1.087
9-11 yrs to 12+ yrs	0.997	0.993	0.984	0.975	1.111	0.997	0.990	0.972	0.961	1.203
None to 12+ yrs	0.933	0.947	0.968	1.030	1.237	0.930	0.951	0.977	1.053	1.327
	Transmission, Fertility, Marriage (Marital Status Only)									
None to 1-5 yrs	0.978	0.996	1.009	1.012	1.007	0.975	1.002	1.016	1.015	1.006
1-5 yrs to 6-8 yrs	0.979	0.981	0.995	1.023	1.037	0.982	0.986	1.005	1.029	1.032
6-8 yrs to 9-11 yrs	0.998	0.994	0.990	1.001	1.033	0.998	0.993	0.991	1.007	1.033
9-11 yrs to 12+ yrs	1.010	1.006	0.998	0.981	1.014	1.010	1.003	0.987	0.968	1.068
None to 12+ yrs	0.950	0.969	0.996	1.041	1.077	0.947	0.974	1.010	1.063	1.094

Appendix Table A7 Continued. Ratios of Simulated to Observed Offspring's Education Distributions for a Given Change in Women's, Schooling 1933-1947 Birth Cohort

	Sons					Daughters				
	0-5 yrs	6-8 yrs	9-11 yrs	12 yrs	13+ yrs	0-5 yrs	6-8 yrs	9-11 yrs	12 yrs	13+ yrs
Simulation	Transmission, Fertility (Level only), Marriage									
None to 1-5 yrs	0.968	0.991	1.010	1.021	1.015	0.964	0.997	1.021	1.028	1.015
1-5 yrs to 6-8 yrs	0.973	0.973	0.987	1.030	1.066	0.975	0.975	0.999	1.045	1.064
6-8 yrs to 9-11 yrs	0.995	0.989	0.982	0.999	1.067	0.995	0.986	0.981	1.012	1.075
9-11 yrs to 12+ yrs	1.009	1.004	0.993	0.972	1.055	1.009	1.001	0.981	0.955	1.124
None to 12+ yrs	0.946	0.960	0.978	1.024	1.179	0.944	0.963	0.986	1.042	1.245
	Transmission, Marriage									
None to 1-5 yrs	0.968	0.990	1.010	1.021	1.016	0.964	0.997	1.021	1.028	1.017
1-5 yrs to 6-8 yrs	0.969	0.970	0.987	1.034	1.070	0.971	0.973	1.001	1.051	1.067
6-8 yrs to 9-11 yrs	0.991	0.986	0.981	1.002	1.078	0.991	0.983	0.981	1.017	1.086
9-11 yrs to 12+ yrs	0.997	0.992	0.983	0.975	1.115	0.996	0.989	0.972	0.962	1.209
None to 12+ yrs	0.931	0.946	0.966	1.029	1.250	0.929	0.949	0.975	1.052	1.347
	Transmission, Fertility									
None to 1-5 yrs	0.978	0.996	1.008	1.012	1.007	0.975	1.002	1.015	1.016	1.007
1-5 yrs to 6-8 yrs	0.978	0.981	0.995	1.024	1.037	0.981	0.985	1.005	1.030	1.032
6-8 yrs to 9-11 yrs	0.994	0.991	0.990	1.005	1.038	0.995	0.991	0.993	1.011	1.035
9-11 yrs to 12+ yrs	0.999	0.997	0.992	0.989	1.051	0.999	0.993	0.982	0.982	1.115
None to 12+ yrs	0.940	0.962	0.995	1.051	1.087	0.937	0.968	1.014	1.079	1.103
	Transmission									
None to 1-5 yrs	0.977	0.995	1.008	1.013	1.009	0.974	1.001	1.015	1.017	1.009
1-5 yrs to 6-8 yrs	0.976	0.980	0.996	1.026	1.039	0.979	0.985	1.007	1.033	1.032
6-8 yrs to 9-11 yrs	0.995	0.991	0.990	1.004	1.037	0.995	0.992	0.993	1.011	1.033
9-11 yrs to 12+ yrs	0.998	0.996	0.991	0.990	1.055	0.997	0.992	0.981	0.983	1.120
None to 12+ yrs	0.938	0.961	0.996	1.053	1.091	0.934	0.966	1.014	1.082	1.109

Appendix Table A8. Ratios of Simulated to Observed Offspring's Education Distributions for a Given Change in Women's Schooling, 1948-1962 Birth Cohort

	Sons					Daughters				
	0-5 yrs	6-8 yrs	9-11 yrs	12 yrs	13+ yrs	0-5 yrs	6-8 yrs	9-11 yrs	12 yrs	13+ yrs
Simulation	Transmission, Fertility, Marriage, Child and Maternal Mortality									
None to 1-5 yrs	0.953	0.982	1.005	1.016	1.007	0.940	0.980	1.009	1.020	1.008
1-5 yrs to 6-8 yrs	0.959	0.963	0.978	1.016	1.040	0.962	0.964	0.980	1.018	1.039
6-8 yrs to 9-11 yrs	0.990	0.985	0.979	0.990	1.050	0.991	0.985	0.978	0.990	1.052
9-11 yrs to 12+ yrs	1.008	1.004	0.997	0.982	1.025	1.008	1.004	0.995	0.972	1.042
None to 12+ yrs	0.905	0.931	0.958	1.005	1.127	0.895	0.928	0.959	1.004	1.146
	Transmission, Fertility, Marriage, Child Mortality									
None to 1-5 yrs	0.954	0.983	1.006	1.016	1.007	0.941	0.982	1.010	1.020	1.008
1-5 yrs to 6-8 yrs	0.960	0.964	0.979	1.017	1.041	0.962	0.965	0.981	1.019	1.039
6-8 yrs to 9-11 yrs	0.990	0.985	0.979	0.991	1.050	0.992	0.985	0.978	0.991	1.053
9-11 yrs to 12+ yrs	1.008	1.004	0.997	0.981	1.027	1.008	1.004	0.994	0.971	1.045
None to 12+ yrs	0.907	0.933	0.961	1.008	1.126	0.897	0.931	0.963	1.006	1.145
	Transmission, Fertility, Marriage									
None to 1-5 yrs	0.953	0.982	1.005	1.016	1.009	0.941	0.981	1.010	1.020	1.010
1-5 yrs to 6-8 yrs	0.961	0.965	0.979	1.016	1.040	0.964	0.966	0.981	1.018	1.039
6-8 yrs to 9-11 yrs	0.994	0.988	0.981	0.990	1.046	0.994	0.987	0.979	0.990	1.049
9-11 yrs to 12+ yrs	1.008	1.004	0.997	0.981	1.027	1.008	1.004	0.994	0.971	1.045
None to 12+ yrs	0.913	0.939	0.966	1.009	1.112	0.903	0.936	0.967	1.008	1.130
	Transmission, Fertility, Marriage (Assortative Mating Only)									
None to 1-5 yrs	0.952	0.982	1.005	1.016	1.010	0.940	0.980	1.009	1.021	1.011
1-5 yrs to 6-8 yrs	0.961	0.965	0.980	1.017	1.039	0.964	0.966	0.982	1.019	1.038
6-8 yrs to 9-11 yrs	0.990	0.985	0.980	0.992	1.049	0.990	0.984	0.978	0.993	1.051
9-11 yrs to 12+ yrs	0.997	0.994	0.988	0.981	1.049	0.997	0.993	0.984	0.970	1.071
None to 12+ yrs	0.901	0.928	0.957	1.010	1.134	0.891	0.925	0.957	1.007	1.157
	Transmission, Fertility, Marriage (Marital Status Only)									
None to 1-5 yrs	0.969	0.992	1.006	1.009	1.003	0.957	0.991	1.010	1.012	1.004
1-5 yrs to 6-8 yrs	0.967	0.973	0.987	1.015	1.027	0.970	0.975	0.990	1.016	1.024
6-8 yrs to 9-11 yrs	0.997	0.993	0.989	0.996	1.023	0.998	0.993	0.989	0.997	1.022
9-11 yrs to 12+ yrs	1.009	1.006	1.000	0.987	1.011	1.009	1.005	0.997	0.979	1.028
None to 12+ yrs	0.918	0.948	0.981	1.027	1.058	0.907	0.944	0.982	1.033	1.068

Appendix Table A8 Continued. Ratios of Simulated to Observed Offspring's Education Distributions for a Given Change in Women's Schooling, 1948-1962 Birth Cohort

	Sons					Daughters				
	0-5 yrs	6-8 yrs	9-11 yrs	12 yrs	13+ yrs	0-5 yrs	6-8 yrs	9-11 yrs	12 yrs	13+ yrs
Simulation	Transmission, Fertility (Level only), Marriage									
None to 1-5 yrs	0.952	0.982	1.005	1.016	1.009	0.940	0.980	1.010	1.021	1.010
1-5 yrs to 6-8 yrs	0.961	0.965	0.980	1.016	1.040	0.964	0.966	0.981	1.018	1.039
6-8 yrs to 9-11 yrs	0.994	0.988	0.982	0.990	1.044	0.995	0.988	0.980	0.991	1.046
9-11 yrs to 12+ yrs	1.008	1.004	0.997	0.982	1.025	1.008	1.004	0.994	0.973	1.042
None to 12+ yrs	0.913	0.939	0.966	1.010	1.110	0.903	0.936	0.968	1.010	1.126
	Transmission, Marriage									
None to 1-5 yrs	0.950	0.980	1.004	1.017	1.012	0.937	0.978	1.009	1.022	1.013
1-5 yrs to 6-8 yrs	0.959	0.964	0.980	1.018	1.039	0.961	0.965	0.982	1.020	1.038
6-8 yrs to 9-11 yrs	0.990	0.985	0.980	0.992	1.048	0.991	0.985	0.979	0.993	1.049
9-11 yrs to 12+ yrs	0.996	0.993	0.987	0.981	1.051	0.996	0.992	0.984	0.970	1.073
None to 12+ yrs	0.899	0.926	0.955	1.009	1.139	0.889	0.922	0.955	1.007	1.164
	Transmission, Fertility									
None to 1-5 yrs	0.967	0.991	1.006	1.010	1.004	0.956	0.990	1.010	1.013	1.005
1-5 yrs to 6-8 yrs	0.967	0.973	0.988	1.015	1.026	0.971	0.975	0.990	1.016	1.023
6-8 yrs to 9-11 yrs	0.993	0.991	0.989	0.998	1.024	0.994	0.991	0.990	0.999	1.021
9-11 yrs to 12+ yrs	0.998	0.996	0.993	0.989	1.028	0.998	0.995	0.989	0.980	1.049
None to 12+ yrs	0.910	0.943	0.981	1.033	1.058	0.898	0.938	0.982	1.039	1.067
	Transmission									
None to 1-5 yrs	0.965	0.989	1.005	1.011	1.006	0.953	0.988	1.009	1.014	1.007
1-5 yrs to 6-8 yrs	0.966	0.973	0.988	1.016	1.025	0.969	0.975	0.991	1.017	1.022
6-8 yrs to 9-11 yrs	0.994	0.991	0.989	0.998	1.023	0.995	0.992	0.990	0.999	1.020
9-11 yrs to 12+ yrs	0.997	0.995	0.992	0.989	1.030	0.997	0.994	0.988	0.980	1.051
None to 12+ yrs	0.909	0.942	0.980	1.033	1.058	0.896	0.936	0.981	1.041	1.069