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**Family Size and Educational Attainment in Indonesia:
A Cohort Perspective**

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Family Size and Educational Attainment in Indonesia: A Cohort Perspective

Introduction

Numerous studies of educational attainment in the United States have shown that schooling is negatively correlated with sibship size. That is, children with fewer brothers and sisters obtain more schooling than those with more siblings. Moreover, this negative relationship exists even after family socioeconomic characteristics are controlled (Featherman and Hauser 1978; Hauser and Sewell 1985; Mare and Chen 1986; Blake 1989). This finding is often explained using an argument of finite resources: parents have limited time, money, and patience to devote to the education of their children, and those with fewer children can invest more per child.

The evidence from the developing world, however, is mixed. In Thailand and Brazil, for example, there is a negative relationship between family size and educational attainment while in Vietnam the relationship is negative only for families with six or more children and effects are modest once other family characteristics are controlled (Psacharopoulos and Arriagada 1989; Knodel, Havanon and Sittitrai 1990; Anh et al. 1998). In Botswana and Kenya, on the other hand, the reverse is true: educational attainment has a positive relationship with family size (Gomes 1984; Chernichovsky 1985). These differences are explained, among other things, by differences in urbanization and infrastructure, family production and wealth flows, and the relative strength of the nuclear family versus larger kinship networks in each context. The case of Israel fits well with these general patterns and explanations. Among Israeli Jews, family size has a negative relationship with educational attainment while among Israeli Muslims, who are less advantaged socioeconomically, live in less urban settings and have much higher fertility rates,

family size and educational attainment are not negatively related (Shavit and Pierce 1991). The socioeconomic characteristics of the family are also more strongly related to educational attainment among Jews than among Muslims. The authors suggest that, unlike Jewish families, Muslim families draw on a large kinship network beyond the nuclear family, which mitigates the financial, emotional and time constraints associated with additional children.

Three ideas emerge from this array of evidence. First, the effect of family size on educational attainment is related to societies' level of development, modes of production, and access to schooling, which in turn shape the relative influence of the family on the schooling of children (Lloyd 1994, King 1987). In certain contexts or at certain stages of development, having more siblings to share household and labor market work may provide the whole sibship with more time and resources for schooling. In these contexts, it may not follow that the desire to have better educated children will automatically lead parents to choose smaller families (Mueller 1984).

Second, context-specific factors such as family organization and cultural roles determine wealth flows between parents and children, whether the burden of child rearing is limited to the nuclear family or extended across broader kin networks, whether and how much school-aged children work inside and outside the home, and whether these factors change as societies become more developed or as overall levels of educational attainment or educational opportunities increase (Caldwell, Reddy, and Caldwell 1985). In societies in which parents bear most of the cost of schooling and where the costs are high, we might expect a negative relationship between family size and educational attainment while in societies with extended kinship networks and lower costs of schooling, the relationship may be neutral or positive. Also, it seems likely that

these contextual factors will change over time as development brings changes in income, consumption, urbanization, educational costs and opportunities, and gender roles.

Third, the evidence highlights the interdependence of family size, family structure and educational attainment. Family size and organization and educational attainment are likely to be jointly determined, at least to some degree, with families choosing the level of fertility that is likely to produce children with the preferred level of education for a given family, context, or society. The relationship between family size and children's educational attainment can have demographic feedbacks as well. Small families may raise educational attainment, which in turn may lower fertility in the next generation. Moreover, if the effect of family size grows more negative or more positive over time, then these aggregate demographic relationships may intensify or accelerate as a result.¹

In this context, Indonesia is an interesting case study. Indonesia has the world's fourth largest population and is the largest predominantly Muslim nation. Indonesia has experienced dramatic demographic change in recent decades. Infant mortality has fallen from 145 per 1000 live births in early 1970s to 46 per 1000 in late 1990s. Over this same period, the total fertility rate per woman declined from 5.6 children to 2.6 children and life expectancy increased from 48 years in 1970 to 65 years in 1998 (UNICEF 2000; Indonesia Central Bureau of Statistics 2003). At the same time, literacy has increased dramatically, the gender gap in education has narrowed, participation in agriculture has declined and industry has grown. This setting provides a unique opportunity to examine the relationship between family size and educational attainment in a society undergoing rapid development and to observe how this relationship changes over time as a society develops. The existing evidence allows us to compare across countries at different

¹ See Preston (1976) for a precise demonstration of the relationship between the average number of children ever born for a cohort of women and the average sibship size of the offspring of those women.

levels of development and different social to draw conclusions about the relationship between family size and children's education. The case of Indonesia, however, provides an opportunity to observe change over time within the same context, and examine whether the relationship between family size and educational attainment changes in the ways predicted by existing theories.

This paper examines the relationship between family size and composition and educational attainment in Indonesia using a cohort perspective. The results show that the relationship between family size and children's schooling was positive or neutral for earlier cohorts in Indonesia while, for more recent cohorts, family size and schooling are negatively correlated. Moreover, these relationships differ by urban/rural status. Very large families were associated with better educational outcomes for rural cohorts ages 40 to 49 but are associated with poorer educational outcomes in recent urban cohorts. The next section reviews the data and methods used. The remaining two sections present the analyses and results, and the discussion and summary.

Data and Methods

The analysis is based on the 1993 and 1997 waves of the Indonesian Family Life Survey (IFLS), a comprehensive longitudinal socioeconomic and health survey. The survey represents an area that includes 13 of Indonesia's 26 provinces and 83 percent of its population.² The IFLS contains, among other measures, detailed information on family structure and composition, marriage, fertility, school enrollment and completion, parents' and children's employment, within household decision-making, and wealth flows between parents and children and among siblings. The IFLS has numerous strengths. Nearly everyone in the household was interviewed

² See Frankenberg and Karoly (1995) and Frankenberg and Thomas (2000) for detailed documentation on the IFLS.

directly so the data are both comprehensive and largely self-reported. The survey also achieved very high reinterview rates at the second wave: more than 90 percent of individuals interviewed in 1993 were reinterviewed in 1997. Children (or other panel respondents) who were interviewed in 1993 but moved to a new household by 1997 were tracked to their new households. The 1997 wave added these households to the original sample and includes information on any new spouses or children in these split-off households. Used together, the 1993 and 1997 waves allow for a complete record of nearly everyone present in households sampled in 1993. The IFLS collects fertility and marriage histories and extensive education histories. For ever-married women, there is a count of all live births and information on the schooling of all living coresident and noncoresident children (and those who have died within one year of the survey date).

The analytic sample used in the current study includes approximately 5,100 families with 21,500 living children. All variables are measured as of 1997, except for those respondents who died between 1993 and 1997 or households not found in 1997 (about five percent of the sample). For these cases I use the information provided in 1993, except for the schooling of respondents ages 19 or younger, which I leave missing because it is likely to be censored and systematically underreported if compared to the 1997 data. Overall, the data are quite complete and the variables used in the analyses do not include much missing data. For both parents and children, educational attainment is measured as the number of years of schooling completed in 1997.

I build the analytic sample as follows. For each ever-married female respondent in the 1997 survey (Indonesia is a society with nearly universal marriage and essentially no nonmarital fertility) I assemble a full roster of all children, alive or dead, coresident or living elsewhere. I use the full count of all live births as the sibship size. I also identify the schooling of the woman's husband, whether current or former. For those with multiple marriages (about 20

percent of the data), I use the husband to whom the woman was married for the greatest number of years between ages 15 and 40 (to maximize the likelihood that I select the actual father of her children). The child is the unit of analysis, the woman and her husband are the parents and all of the woman's live births comprise the child's sibship.³ I do not include children who have died within the last year (a very small proportion of the sample) in the analysis of children's educational attainment. This sample is approximately representative of the offspring of ever-married women in the target sample areas of the IFLS in 1993, although it is contaminated by the new respondents added in 1997 (about 4 percent of the children). The location of the mother's household determines the child's urban/rural status and the province of residence. This assumes that noncoresident children grew up in the same region as the current residence of their mothers. Using the mothers' urban rural status helps address, although it does not eliminate, the problem that adult children in 1997 may not be living in the area in which they grew up and attended school because of migration after childhood.⁴

I assemble four cohorts spanning in age from 6 to 49. The oldest three cohorts are restricted to families with mothers who are at least age 41 (to capture completed fertility) and children ages 20 and older to capture completed education. Although the children used in these cohorts were at least age 20 in 1997, the measure of family size includes the full sibship count, including younger siblings and any siblings that may have died. This sample of children, born between 1948 and 1977 provides information on three cohorts: those ages 20 to 29, 30 to 39, and 40 to 49 in 1997. I use this sample to examine changes in the relationship between family size

³ I use the terms sibship size and family size interchangeably in the remainder of the paper. By sibship or family size I mean all of a child's brothers and sisters plus the child himself/herself. When I count a child's siblings I use the sibship size minus one.

⁴The IFLS collects extensive migration histories as well so it is possible to identify childhood residence even more precisely than done in the present analysis. Although migration histories are not available for noncoresident children (if they were never a member of an IFLS household) it may be possible to use the information collected on siblings who did complete migration histories to derive this information. I plan to conduct this sensitivity check in future analyses.

and completed education by cohort and urban/rural status using OLS regression with completed education as the dependent variable and family size and household characteristics as independent variables.⁵

To these three cohorts I add a fourth cohort of very young children, those ages 6 to 19 in 1997. Here, there are no restrictions on the mother's age and fertility is not completed in many cases. Because many members of this youngest cohort have not completed their schooling, I use enrollment status and continuation beyond primary school as the measure of educational attainment for this sample. This cohort captures the experience of the most recent cohort available in the 1997 IFLS, those born between 1978 and 1991. Because the analytic samples include multiple children from the same mothers, I report robust standard errors in all models to adjust for the within family correlation across children (Greene 2000: 462-463). Whenever possible, I use self-reported schooling for children and their parents.

There is evidence that educational attainment is correlated with household wealth, especially in developing countries (Filmer and Pritchett 1999). The analyses presented here do not control for household wealth because the IFLS does not include an appropriate measure of family wealth for the children used in this study, namely a measure of family wealth when the respondents were school aged. The IFLS does collect extensive information about household consumption and it is possible to construct a measure of per capita household consumption in 1997 with these data. Because many of the sample children coreside with their families, however, it seems likely that the measure of consumption is endogenous to children's education. Children who coreside with their parents contribute financially to the family once they complete

⁵ About seven percent of those ages 20 to 29 were still enrolled in school in 1997 (concentrated primarily at ages 20 to 23). For these cases, education is censored at the highest grade completed in 1997. More than 90 percent of those enrolled in school at these ages had completed grade 12 or higher, with a median and mode of 15 years of completed schooling. Thus, although education is censored for these cases in 1997, these respondents have already achieved very high levels of education and are at the top of the distribution even with their censored level in 1997.

school and those who reside and work elsewhere may send money back to their families. For this reason, I present results from models that do not include this measure. I did conduct some sensitivity tests on models restricted to children ages 15 and younger under the assumption that these children were quite likely to be enrolled in school and not yet working (models not shown in paper). Including log per capita household consumption in those models did not change the pattern of results presented here.⁶

This analysis does not address the concern that family size and child's education may be jointly determined and cannot provide causal evidence of the effect of family size on children's education. It can, however, use differences across cohorts to show how the relationship between family size and child's education, however determined, has changed over time within the context of a rapidly developing country.

Results

Table 1 presents sample means and proportions, both for all sample families, and for each child cohort. The general trends are as expected. Average family size has decreased steadily over the past forty years while average levels of schooling have increased over the same period. At the same time, differences in educational attainment by sex have gone from a 1.7 year advantage for boys in the oldest cohort to a small advantage for girls in the youngest cohort.⁷ Family size, measured as number of children, ranges from one to fifteen; the number of siblings ranges from zero to fourteen.

⁶ I am grateful to Duncan Thomas for letting me borrow his coding of the IFLS consumption data.

⁷ Because schooling is censored for this young cohort, however, it is impossible to know whether the gender gap in educational attainment will in fact remain closed once this cohort completes its schooling. That is, if boys have higher continuation probabilities into the higher levels of schooling, which the data suggest is still true for this young IFLS cohort, then a small gender gap favoring boys is likely to emerge by the time the cohort completes its schooling. Nonetheless, the overwhelming trend in Indonesia is a closing of the gender gap in schooling in a matter of about 40 years.

There are two key features to the distribution of family size. First, one and two child families are quite uncommon in Indonesia (having zero or only one sibling). Only in the youngest cohort does the proportion of families with only one or two children exceed ten percent but this is also the only cohort in which more than half of the mothers are still in their peak childbearing years (recall that the older cohorts are restricted to children of mothers over age 40). Second, it is difficult to identify a family size “norm” for Indonesia over the past forty years. In the 30 to 39 and 40 to 49 cohorts, families with five to nine children are each equally common, that is having from four to eight siblings. In both these cohorts having nine siblings is also relatively common (not shown in table). For the cohort ages 20 to 29, families with four to eight children are equally common. Despite an undisputable trend towards smaller families over time, the range of the number of children preferred by Indonesian parents is quite wide and fairly high for the years covered by these data.

Given this distribution of family size, it is perhaps not surprising that the most notable feature of the gross relationship between number of siblings and completed education in Indonesia is the apparent lack of such a relationship. Figure 1 shows completed education by family size for those ages 20 to 49 in the study sample. Respondents with zero or one sibling, a rare sibship size in this sample, have about 0.75 years less schooling than those with two to six siblings. Those with seven or more siblings also have an average of about 0.75 years less schooling relative to this middle group. Remarkably, children’s educational attainment in the cross-section displays no relationship with family size from two to six siblings, a substantial range by most demographic standards.

This gross relationship, however, hides substantial variation by cohort and urban/rural residence. Figure 2 shows the same sample shown in Figure 1 divided by cohort and urban/rural

residence. The top panel provides a detailed specification of number of siblings. The bottom panel collapses adjacent categories to provide a more tractable grouping for analysis. The comparison of the two graphs shows that the more parsimonious grouping stays true to the trends apparent in the more detailed representation. This figure also highlights the dramatic increase in schooling in Indonesia over time and the large difference in average educational attainment by urban/rural residence.

For the urban cohort ages 20 to 29, schooling has a negative relationship with family size. Each larger category of siblings is associated with lower levels of average schooling, with a difference of about 2.5 years between the smallest and largest sibship categories. The relationship is quite different in the two older urban cohorts. For urban cohorts ages 30 to 39 and 40 to 49, those with four or fewer siblings have less schooling than those with five to six siblings. In the 40 to 49 cohort, for example, having five or six siblings corresponds to more than an extra year of schooling relative to having fewer siblings. Although those with seven or more siblings have less schooling in these cohorts as well, this association appears considerably more negative among those ages 20 to 29.

The young rural cohort exhibits a small benefit of having very few siblings relative to the other categories, but the general relationship between family size and educational attainment is rather flat for this group. For the rural cohort ages 30 to 39 there is a positive relationship between family size and schooling. As family size increases, average educational attainment appears to increase as well. The rural cohort ages 40 to 49 also displays this relationship except for a dip in schooling levels for those with three to four siblings relative to those with very few or very many siblings. The trend, nonetheless, suggests a positive relationship between family size and educational attainment.

Table 2 and Table 3 show results from multivariate models that examine the relationship between family size and completed education while controlling for other family characteristics. The first two columns in Table 2 replicate the general result shown in Figure 1. The gross effect of family size entered as a linear term on completed education is very small (Model 2.1) and the estimate is reduced to zero once parent's education is controlled (Model 2.2). Columns three and four show models that estimate the relationship using a discrete version of family size to capture any nonlinearities (Model 2.3) and control for other characteristics such as age, sex and sibship composition. The omitted category, having three or four siblings, represents the modal family size in the sample. About 28 percent of the sample families fall in this category.⁸

The results show that mother's and father's schooling have a strong, positive relationship with completed education while age and sex are negatively correlated with completed education. Holding family size constant, girls are predicted to have about 0.7 years less schooling than boys. Being the oldest child in a family is also negatively associated with educational attainment, with oldest girls showing more of a disadvantage than oldest boys. Holding sibship composition, age and parents' schooling constant, those zero to two siblings are predicted to have about a third of a year more schooling, on average, than those with three or four siblings. There is not, however, a disadvantage of having five or more siblings relative to three or four. The other contrasts are not associated with any differences in educational attainment.

Table 3 presents separate estimates by cohort and urban/rural residence.⁹ Model 3.1, shown in column one, gives estimates for the urban cohort ages 20 to 29. For this cohort, having

⁸ I also estimated all models shown in Table 2 and Table 3 using more detailed categorizations of siblings (8 and 10 category versions). Those results were not substantively different than the more parsimonious models presented here. There are also no meaningful nonlinearities or interactions among key regressors beyond those shown in the tables.

⁹ The three-way interaction of rural residence, cohort and family size is jointly statistically significant. The two-way interactions of family size and rural residence, cohort and rural residence, and the 40 to 49 cohort and family size are

two or fewer siblings is associated with higher levels of completed schooling relative to having three or four siblings. Having seven or more siblings is associated with lower levels of completed schooling (relative to having three or four siblings). Thus, having very few siblings has a positive relationship with educational attainment while having many siblings is negatively correlated with educational attainment. While there is no gender gap in completed schooling in this cohort, oldest girls obtain about half a year less schooling, holding other family characteristics constant.

Models 3.2 and 3.3 show results for the two older urban cohorts. Among those ages 30 to 39, having very few siblings is associated with an increase in educational attainment relative to having three or four siblings but there is no significant association of having more siblings, including no association of having seven or more siblings relative to three or four. Among those ages 40 to 49, there are no statistically significant differences among various sibship sizes, and the parameter estimates for the contrast of very big families relative to the medium sized one are both about zero. In both cohorts, girls are disadvantaged relative to boys both in average educational attainment and when they are the oldest girls in the family.

Models 3.4 to 3.6, shown in columns four through six, give estimates for the three rural cohorts. In contrast to the young urban cohort, the rural cohort ages 20 to 29 exhibits neither the positive relationship between very small families and educational attainment nor the negative relationship for very large families. The rural cohort ages 30 to 39 also does not reveal any statistically significant relationship between family size and schooling. The benefit of very small families relative to those with four or five children is not apparent in this rural 30 to 39 cohort as it was in its urban counterpart.

also significant. The two-way interaction of the 30 to 39 cohort and family size is not significant (model and estimates not shown).

The results for the oldest rural cohort (Model 3.6 shown in column 6) are a bit puzzling. As we might expect from the trends observed so far, there is a substantial, statically significant positive relationship between having seven or more siblings (relative to three or four) and completed years of schooling. This finding follows directly from the bar graphs shown in Figure 2, the pattern of results review thus far, and the theory that in rural areas of less developed countries larger families may be more beneficial (Mueller 1984). What is surprising, however, is that this model also shows a positive correlation of coming from a very small family relative to one of average size, a finding that is statistically significant holding other family characteristics constant. Estimating the model shown in column six with a more detailed categorization of number of siblings (0, 1, 2, 3 (omitted), 4, 5, 6, 7+, results not shown) suggests that this estimate is driven largely by those who have only one sibling (n=36 in this sample of 859 respondents). I am reluctant to draw any substantive conclusions based on a result driven by so few cases.¹⁰

Overall, the findings reproduce the trends shown in Figure 2 in a multivariate framework. Historically in Indonesia, children from large families obtained more schooling than those from smaller families, holding other family characteristics constant. In recent rural cohorts, the benefit of very large families has disappeared but no evidence has emerged yet for the benefit of a small family or a detriment of a very large family. In urban areas, there was no association between family size and educational attainment for the oldest cohort (either positive or negative) but a

¹⁰ I conducted several sensitivity tests for this model. First, as described in the text, I reestimated the model using a more detailed categorization for number of siblings. In that model, the contrast between having only one sibling (n=36) versus three (n=73), holding all else constant, is statistically significant and large in magnitude. The contrast between zero versus three siblings is not statistically significant and the contrast between two versus three siblings is marginally significant. Second, I reestimated the model shown in Table 3 using quantile regression. Quantile regression produces a coefficient similar in magnitude to the one shown in Table 3 with a p value of 0.097. Third, I estimated the model using weighted least squares to check for possible outliers. That regression produces an attenuated parameter estimate (0.765) with a p value of 0.073. Fourth, I calculated studentized residuals and hat values and reestimated the model excluding cases with the most extreme values. That regression produces a coefficient of 0.79 with a p value 0.043 (n=838 versus original sample of 859). Fifth, I inspected the distributions and correlations of the relevant variables but found no obvious anomalies. In summary, the relevant samples are too small in the present analysis to produce any conclusive evidence on this finding.

benefit of a small family emerges for those ages 30 to 39 (but no detriment for having a very large family). For those ages 20 to 29, however, there is evidence of both a benefit to a small family and a detriment to a very large one.

The evidence so far suggests that by the 1970s and 1980s Indonesia had entered a stage of development, at least in urban areas, which favored smaller families. The models presented in Table 4 extend the analysis to the most recent cohort of children available in the 1997 IFLS, those ages 6 to 19 in 1997. Because many members of this cohort have not completed their education, these analyses rely on enrollment status and continuation beyond primary school rather than completed education. About two-thirds of IFLS children ages 6 to 19 were enrolled in school in 1997. Most boys and girls entered school at age six or seven. In both rural and urban areas, nearly 95 percent of children ages 8 to 12 were enrolled in school. For those age 13 and older, enrollment by age drops faster in rural areas than in urban areas, with about two-thirds of urban children still enrolled at age 17 compared to less than half of rural children age 17. Only about four percent of children worked while enrolled in school with the proportions slightly higher in rural than urban areas (5.5 versus 2.5 percent). Figure 3 shows enrollment proportions by age and family size for this cohort. Differences in enrollment by family size are most apparent for the very young and for teenagers. Those with five or more siblings have lower proportions enrolled at age six and after age 11. Those with four or fewer sibling have consistently higher proportions enrolled at nearly every age, but especially at these ages. This graph also highlights that while Indonesia has achieved nearly universal primary school enrollment, enrollment proportions drop rapidly at ages associated with junior secondary and senior secondary enrollment.

A note of caution is in order when studying enrollment, especially in the context of society like Indonesia where many children fail and repeat grades (in this sample about 20 percent of the children had failed at least one grade). Although in general we believe that school enrollment is a good thing, there is a sense in which enrollment is not always a better outcome than being not enrolled. If, for example, a child is enrolled in school but progressing slowly because of grade repeats that child will be enrolled but far behind grade for age. When compared to a child of the same age who progressed through school without delay the first child will be enrolled but the second child will have completed more schooling. If the effect of family size differs between enrollment on time and enrollment behind grade for age, then this presents a problem. In the IFLS, this does not appear to be the case. A multinomial model comparing the odds of being enrolled on time or enrolled behind grade both relative to being not enrolled shows that the relationship between family size and educational attainment are similar for both contrasts (model not shown, results available from author).

Table 4 shows results from six binary logit models. The first two models predict the odds of school enrollment for all children ages 6 to 19. The remaining four models are restricted only to children ages 16 to 19 and predict the odds of completing junior secondary schooling (completing grade nine) and entering senior secondary (measured here as completing at least grade 10) by urban/rural residence. I estimate these latter four models separately for urban and rural areas because several regressors have significantly different effects by region. The models shown in Table 4 also include a measure for having a child under age 6 present in the household. Because the children in this sample are quite young, more than 90 percent live in the same household as their mothers. This measure is intended to capture whether having a young child present in the household decreases the odds of school enrollment for older siblings. All models

control for the province in which the mother resides and child's age entered in single years dummies (coefficients not shown in table; both sets are jointly significant).

The results in Table 4 column 1 show that having five or more siblings (versus three or four siblings) reduces the odds of school enrollment by about 25 to 30 percent (odds ratio of 0.75 and 0.70 respectively) holding other family characteristics constant. Mother's and father's schooling show a positive relationship with children's school enrollment. Increases in these variables are associated with increases in the predicted odds of school enrollment. Child sex and birth order have no statistically significant relationship with school enrollment for this young cohort. Having a child under age six present in the household, however, is associated with an 18 percent decrease in the odds of enrollment. Living in a rural area reduces the odds of enrollment by nearly thirty five percent, holding other factors constant. The relationship between family size and school enrollment does not vary by rural residence for children ages 6 to 19 (the interaction of the sibling categories and rural residence is not significant, estimates not shown).¹¹

Model 4.2 examines whether the relationship between family size and children's schooling differs by age. Figure three suggests that children from larger families are particularly disadvantaged at school entry and in the late teenage years. The results in column two show that, in general, once other family characteristics are controlled this is not the case. Only the interaction between the late teenage years and having a very small sibship is statistically significant. The other interaction terms are not significantly different from zero. Figure 4 shows the results predicted by this model graphically. The four solid lines show adjusted enrollment probabilities predicted by Model 4.2 for children ages six to 19 (with the other covariates held at

¹¹ As noted above, I examined whether including a measure of household wealth changed the results presented in Table 4 (models not shown). In general, controlling for log per capita household consumption does not change the pattern of results presented here. Unfortunately, this is the only set of models for which this test is feasible with this analytic sample.

the sample mean). For comparison, the graph also shows the observed (unadjusted) sample proportions enrolled for those with five or more siblings. Controlling for family characteristics improves predicted enrollment probabilities at age 6 although a moderate gap remains between those with four or fewer siblings and those with five or more siblings (predicted probabilities of about 0.7 versus 0.6). The adjusted probabilities begin to diverge again after age 13 with the adjusted probabilities for those from larger families consistently below those from smaller families. There is little relative advantage, though, to having only one or two siblings relative to three or four. What advantage exists in the early teenage years disappears after age 15. The adjusted probabilities of enrollment are about equal for these two types of families from age 16 to age 19.

Models 4.3 and 4.4 predict the odds of completing junior secondary schooling, that is completing at least 9th grade.¹² For urban children ages 16 to 19, having five or six siblings versus three or four is associated with about a 35 percent reduction in the odds of completing ninth grade, holding other characteristics constant. Having seven or more siblings lowers the odds of completing ninth grade by more than 70 percent (versus having three or four siblings). Being a girl more than doubles the odds of completing ninth grade. In contrast, there is no significant relationship between completing ninth grade and family size for rural children ages 16 to 19. Moreover, the relative advantage of girls in urban areas is reversed in rural areas. In the rural model, being female reduces the odds of completing junior secondary by 28 percent, all else being equal.

The models in columns five and six (Model 4.5 and 4.6) predict the odds of entering senior secondary school. For urban children, having five or six siblings versus three or four

¹²The dependent variable here (completed 9th grade) is unconditional, meaning it is not conditioned on completing at least 8th grade. The same is true for the measure of completing grade ten, used below. That variable is not conditioned on completing at least grade nine.

lowers the odds of entering senior secondary schooling by about 27 percent, an estimate that is only marginally significant. Having seven or more siblings versus three or four reduces the odds of entering senior secondary by about 73 percent, holding other factors constant. Urban girls again show a strong advantage in the odds of obtaining secondary schooling relative to boys (odds of 1.7) but there is also weak evidence that eldest boys have increased odds of obtaining senior secondary schooling in urban areas. For rural children, having five or six siblings (versus three or four) lowers the odds of obtaining senior secondary schooling by about 35 percent. The estimate for having seven or more siblings is about the same size in magnitude, although it is only marginally significant. In this model, there is no significant association between child's sex and senior secondary school enrollment.

Figure 5 shows adjusted probabilities of junior secondary completion and entry into senior secondary schooling based on models 4.3 to 4.6 (with covariates held at the sample mean). For children living in urban areas, adjusted probabilities of obtaining schooling beyond the primary level drop steadily as family size increases. This pattern is present both when measuring junior secondary completion and entry into senior secondary schooling. For children living in rural areas, the adjusted probabilities of completing junior secondary are not negatively correlated with family size. Although the overall likelihood of completing this level is lower in rural areas than urban areas, this likelihood does not appear to differ much by family size. Obtaining senior secondary schooling is still much less common in rural areas than in urban areas. At this very selective level, having more siblings is associated with lower adjusted probabilities of completing at least tenth grade.

Discussion and Summary

The analyses described above provide ample evidence for a correlation between family size and children's schooling. In Indonesia, this relationship is not uniformly positive or negative. Rather, there are important differences by cohort and urban/rural residence (controlling for province of residence). For the rural cohort ages 40 to 49, larger families are associated with more schooling. Although this positive relationship diminishes over time, a negative relationship does not appear in rural areas until the very recent cohort (children ages 6 to 19 in 1997) and only at the still selective senior secondary level. In urban areas, on the other hand, the relationship between family size and schooling is neutral for the oldest cohort but a positive association between smaller family size and more schooling emerges for the 30 to 39 cohort. In the 20 to 29 cohort we see both a positive relationship between very small families and educational attainment and a negative relationship between very large families and educational attainment (both relative to medium sized families). In the youngest urban cohort the relationship between family size and schooling becomes monotonically negative. Each successively larger family size is associated with lower levels of enrollment and or schooling. This monotonically negative relationship has yet to emerge in Indonesia's rural areas, at least in those areas covered by the IFLS sample.

The evidence for the correlations is clear but what are the mechanisms that explain these relationships and the changes over time? In order to understand how the relationship between family size and child's education functions, one needs to answer the question of how this relationship is determined. If family size and child's education are in fact determined jointly, then one cannot begin to examine the mechanisms that explain the relationship before specifying

the nature of the how this joint determination operates. That task is beyond the scope of the current paper.

Rapid development in Indonesia, however, has changed numerous aspects of both family structure and educational attainment so one could assemble a long list of candidate explanations that might explain changes over time in the relationship between family size and schooling. In the realm of the family, fertility has declined, child mortality has declined, age at first marriage has increased, educational differentials between husbands and wives have decreased, and women's labor market returns have increased. In the realm of schooling, primary school has become nearly universal and the gender gap in schooling has nearly closed (especially at the bottom of the educational distribution). Given this infusion of schooling at least at the primary level it seems likely that families' educational aspirations have grown. But the expansion in educational infrastructure has not yet reduced the cost of junior secondary and senior secondary schooling to a level that most families, and especially rural families, can afford. In Indonesia, the per-student cost of secondary schooling is about three times that of primary schooling while the per-student cost of tertiary schooling is about 13 times as high (UNESCO 1999). Even before the economic crisis of 1997 (an experience captured by subsequent waves of the IFLS but not the samples used here) Indonesia could not finance the expansion in post primary schooling the nation hoped to achieve (World Bank 1998). As long as families have to shoulder a substantial share of the cost of post-primary schooling, the relationship between family size and children's schooling will be closely tied.

The issue of the cost of schooling brings forth the issue of the role of household wealth in mitigating the relationship between sibship size and schooling in Indonesia. The analyses presented here do not include a measure of household wealth because the best such measure in

the IFLS, log per capita household consumption, is likely to be endogenous to the sample children's educational attainment. Unfortunately, the IFLS does not include a measure of household wealth when children were school-aged, at least not for those older than school age in 1997. For the current cohort of school-aged children in the IFLS, controlling for household wealth does not change the results presented here in a meaningful way. It is impossible to know whether the results of the other models are also robust to this control.

How do the results presented here contribute to our understanding of the relationship between family size and children's schooling? First, the evidence for Indonesia provides the opportunity to examine how the relationship between family size and children's schooling changes over time, perhaps as the contextual factors that influence the underlying mechanisms of this relationship change. Second, differences by urban rural residence provide evidence for the hypothesis that children in rural areas of less developed countries may benefit from large families of origin but those in more urban or developed contexts may not. These results highlight the complexity of the relationship between family size and schooling, at least in the context of Indonesia. Any model that aims to explain the causal mechanisms between the family and children's schooling in Indonesia must account for great variation over time and place.

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Table 1. Sample Means and Proportions (standard deviations shown in parentheses), IFLS 1997

	Age 6-19	Age 20-29	Age 30-39	Age 40-49	All Sample Children
Family Size Distribution (# of siblings):					
0	0.04	0.01	0.02	0.03	0.03
1	0.13	0.03	0.04	0.04	0.08
2	0.19	0.09	0.06	0.05	0.13
3	0.17	0.13	0.09	0.08	0.14
4	0.14	0.14	0.12	0.10	0.13
5	0.10	0.15	0.14	0.12	0.13
6	0.08	0.12	0.12	0.11	0.10
7	0.05	0.11	0.13	0.13	0.09
8	0.04	0.09	0.11	0.12	0.07
9 plus	0.05	0.12	0.17	0.22	0.11
Number of Siblings	3.8 (2.5)	5.3 (2.6)	5.9 (2.8)	6.1 (3.0)	4.8 (2.8)
Mother's Education in years	4.7 (4.1)	3.8 (3.9)	2.6 (3.6)	1.8 (3.1)	3.8 (4.0)
Father's Education in years	6.1 (4.4)	5.4 (4.4)	4.4 (4.2)	3.7 (3.8)	5.4 (4.4)
Child's Education in years	5.1 (3.6)	9.2 (4.2)	7.8 (4.8)	7.0 (4.6)	6.9 (4.5)
Difference in Education by Sex (male-female)	-0.17	0.68	1.18	1.70	0.41
Child's Educ Distribution					
None	0.14	0.04	0.10	0.12	0.10
Elementary	0.54	0.33	0.43	0.48	0.46
Jr. Secondary	0.20	0.17	0.13	0.13	0.17
Sr. Secondary	0.12	0.32	0.24	0.18	0.20
College	0.01	0.13	0.11	0.08	0.07
Age of Mother	39.4 (7.7)	52.4 (7.5)	60.6 (7.8)	67.4 (7.4)	49.1 (12.5)
Age of Child	12.7 (4.0)	24.5 (2.8)	33.9 (2.8)	43.4 (2.8)	22.3 (10.8)
Female	0.49	0.51	0.50	0.49	0.50
Rural	0.54	0.53	0.55	0.51	0.54
Oldest Boy	0.24	0.20	0.24	0.30	0.24
Oldest Girl	0.24	0.21	0.25	0.31	0.24
Child under age 6 in sibship in 1997	0.35	0.04	0.00	0.00	0.18
Currently Enrolled	0.75	0.07	0.00	0.00	0.37
Number of Obs	9652	5654	3854	1685	20845

Table 2. OLS Regression Predicting Child's Completed Education by Family Size and Controls, Ages 20-49, IFLS 1997, (N=11,193, robust standard errors in parentheses)^a

Model	2.1	2.2	2.3	2.4
Number of Siblings:				
Linear (0-14)	-0.094* (0.016)	-0.010 (0.013)		
Categories:				
0-2			0.251* (0.116)	0.369* (0.115)
3-4 (omitted)				
5-6			0.066 (0.095)	0.069 (0.093)
7 plus			0.089 (0.092)	0.064 (0.092)
Mother's Education		0.382* (0.012)	0.383* (0.012)	0.335* (0.013)
Father's Education		0.358* (0.011)	0.358* (0.011)	0.336* (0.011)
Female				-0.717* (0.092)
Child's Age in years				-0.046* (.005)
Oldest Boy in Family (1=yes)				-0.197* (0.100)
Oldest Girl in Family (1=yes)				-0.601* (0.094)
Rural (1=yes)				-1.105* (0.077)
Intercept	8.711	5.057	4.916	7.665
R ²	0.067	0.386	0.386	0.415

^a Models control for province in which household is located (coefficients not shown).

*p < .05

Table 3. OLS Regression Predicting Child's Completed Education by Family Size, Cohort, Region and Controls, Ages 20-49, IFLS 1997, (Total N=11,193, robust standard errors in parentheses)^a

Model	3.1	3.2	3.3	3.4	3.5	3.6
	Urban 20-29	Urban 30-39	Urban 40-49	Rural 20-29	Rural 30-39	Rural 40-49
Number of Siblings:						
0-2	0.439* (0.191)	0.789* (0.359)	0.282 (0.500)	0.321 (0.202)	0.240 (0.279)	1.038* (0.419)
3-4 (omitted)						
5-6	-0.125 (0.171)	0.316 (0.258)	-0.090 (0.466)	-0.152 (0.160)	-0.299 (0.233)	0.560 (0.337)
7 plus	-0.637* (0.182)	-0.006 (0.246)	0.081 (0.382)	-0.156 (0.173)	0.037 (0.226)	1.097* (0.315)
Mother's Education in years	0.343* (0.021)	0.365* (0.029)	0.349* (0.046)	0.321* (0.025)	0.371* (0.042)	0.337* (0.081)
Father's Education in years	0.231* (0.018)	0.343* (0.027)	0.318* (0.039)	0.333* (0.020)	0.420* (0.028)	0.443* (0.051)
Female (1=yes)	-0.201 (0.159)	-0.923* (0.250)	-1.234* (0.428)	-0.515* (0.162)	-1.157* (0.230)	-1.754* (0.390)
Child's Age	0.078* (0.022)	-0.041 (0.032)	0.083 (0.052)	-0.028 (0.021)	-0.081* (0.028)	-0.014 (0.041)
Oldest Boy in Family (1=yes)	-0.342 (0.187)	-0.651* (0.264)	-0.169 (0.392)	-0.106 (0.181)	-0.290 (0.245)	0.278 (0.351)
Oldest Girl in Family (1=yes)	-0.513* (0.183)	-0.844* (0.249)	-0.848* (0.397)	-0.664* (0.167)	-0.359 (0.219)	0.329 (0.352)
Intercept	5.601	7.959	2.983	6.153	6.793	3.671
R ²	0.371	0.385	0.312	.337	.333	.350
Number of Observations	2650	1748	826	3004	2106	859

^a All models control for province in which household is located (coefficients not shown).

*p < .05

Table 4. Logistic Models Predicting Odds of School Enrollment and Continuation Beyond Primary School For Children Ages 6 to 19, IFLS 1997^{ab}

Model	4.1	4.2	4.3	4.4	4.5	4.6
	Enrolled in School	Enrolled in School (w/age interactions)	Completed Jr Sec Urban	Completed Jr Sec Rural	Entered Sr Sec Urban	Entered Sr Sec Rural
	Age 6-19	Age 6-19	Age 16-19	Age 16-19	Age 16-19	Age 16-19
# of Siblings:						
0-2	1.106 (.100/.084)	1.330* (.285/.124)	1.280 (.247/.230)	0.971 (-.029/.176)	1.289 (.254/.189)	0.752 (-.285/.205)
3-4 (omitted)						
5-6	0.749* (-.289/.087)	0.748* (-.291/.087)	0.665* (-.407/.204)	0.791 (-.235/.166)	0.725 ^c (-.322/.183)	0.643* (-.442/.190)
7 plus	0.700* (-.356/.103)	0.702* (-.354/.145)	0.289* (-1.241/.239)	0.913 (-.091/.189)	0.268* (-1.318/.218)	0.660 ^c (-.415/.218)
Mother's Educ	1.151* (.141/.011)	1.151* (.140/.012)	1.230* (.207/.028)	1.229* (.206/.025)	1.162* (.150/.024)	1.222* (.201/.027)
Father's Educ	1.142* (.133/.010)	1.142* (.133/.010)	1.184* (.169/.024)	1.203* (.185/.020)	1.164* (.152/.021)	1.239* (.215/.024)
Mother's Age	1.008 (.008/.006)	1.008 (.008/.006)	1.057* (.056/.016)	1.002 (.002/.010)	1.054* (.052/.013)	1.014 (.014/.012)
Female	0.944 (-.057/.083)	0.947 (-.055/.082)	2.159* (.769/.206)	0.724* (-.324/.162)	1.699* (.530/.187)	0.873 (-.136/.188)
Oldest Boy in Family (1=yes)	0.985 (-.015/.096)	0.985 (-.015/.096)	1.470 (.386/.238)	0.963 (-.038/.193)	1.461 ^c (.379/.207)	0.864 (-.146/.215)
Oldest Girl in Family (1=yes)	1.020 (.020/.096)	1.017 (.016/.096)	0.752 (-.285/.242)	1.033 (.033/.185)	0.758 (-.277/.210)	0.860 (-.152/.210)
Child under 6 in Hshld (1=yes)	0.820* (-.199/.078)	0.824* (-.193/.078)	1.380 (.321/.221)	0.763 (-.270/.167)	1.105 (.099/.197)	0.927 (.076/.191)
Rural	0.666* (-.407/.070)	0.666* (-.406/.070)				
Child's Age (in single years)	Yes*	Yes*	Yes*	Yes*	Yes*	Yes*
Child Age 16-19 * 0-2 sibs		0.700* (-.357/.160)				
Child Age 16-19 * 7p sibs		0.980 (-.021/.177)				
Child Age 6-7 * 0-2 sibs		0.855 (-.157/.204)				
Child Age 6-7 * 7p sibs		1.011 (.010/.308)				
Log Likelihood	-3447.5	-3444.9	-564.8	-848.9	-688.0	-657.4
# Observations	9652	9652	1386	1519	1386	1519

^a Coefficients shown are odds ratios. Logits/robust standard errors are shown in parentheses. Estimates significant at $p < 0.05$ are shown with a star.

^b Models control for province of residence (coefficients not shown).

^c $p < 0.08$

Figure 1. Educational Attainment by Family Size in Indonesia, 1997
Adults Ages 20-49, IFLS (N=11,193)

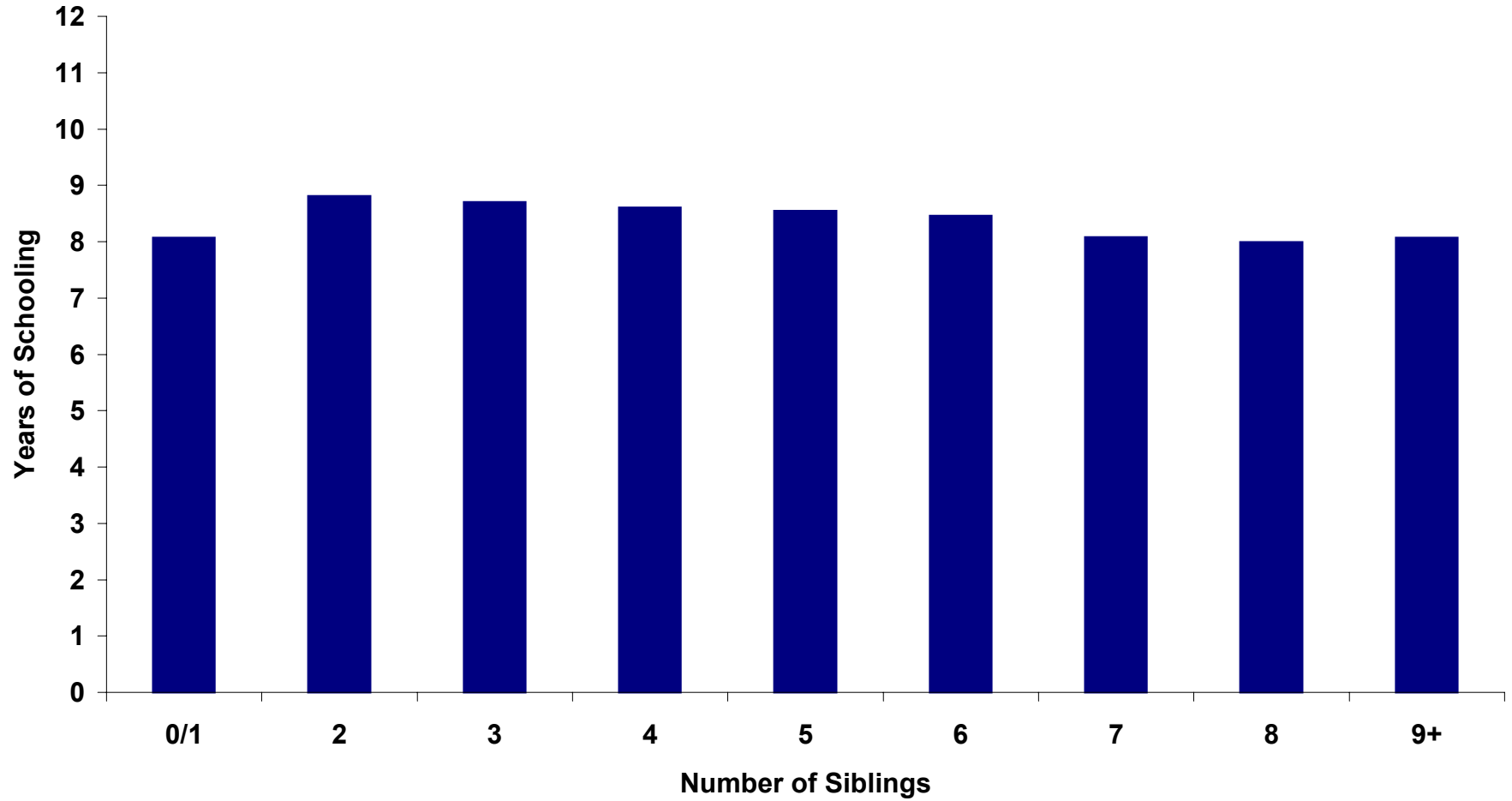
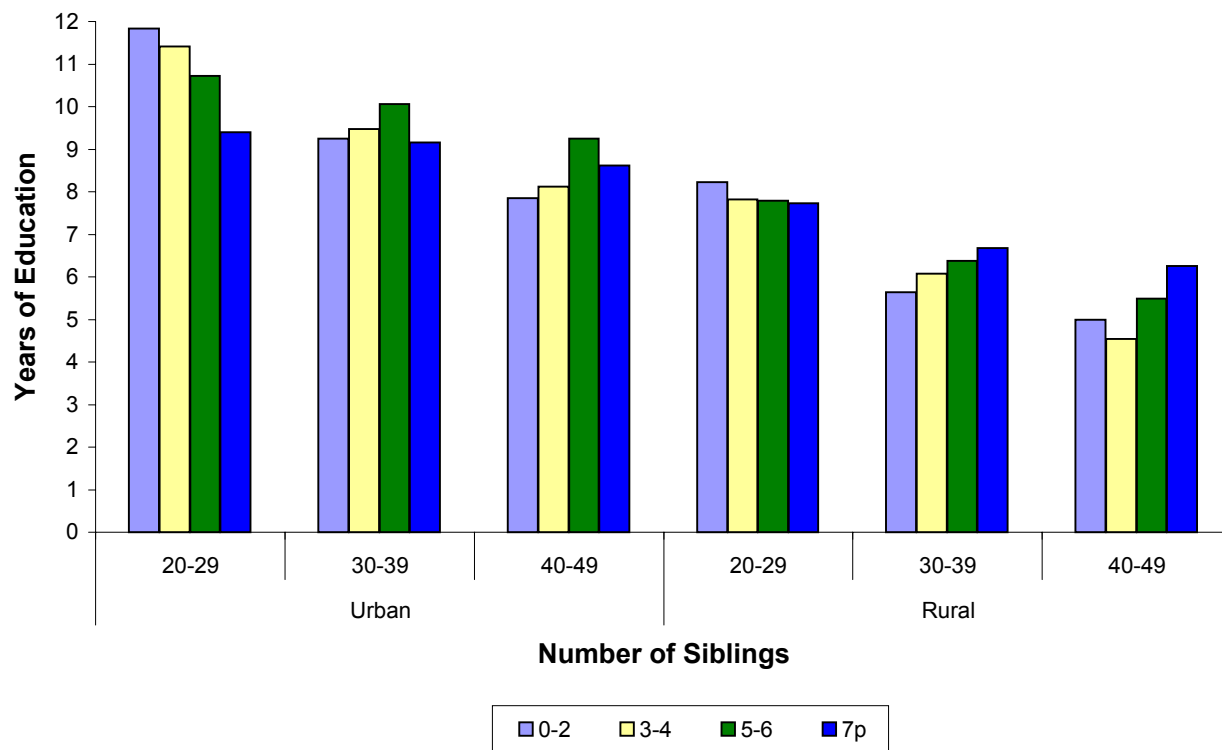
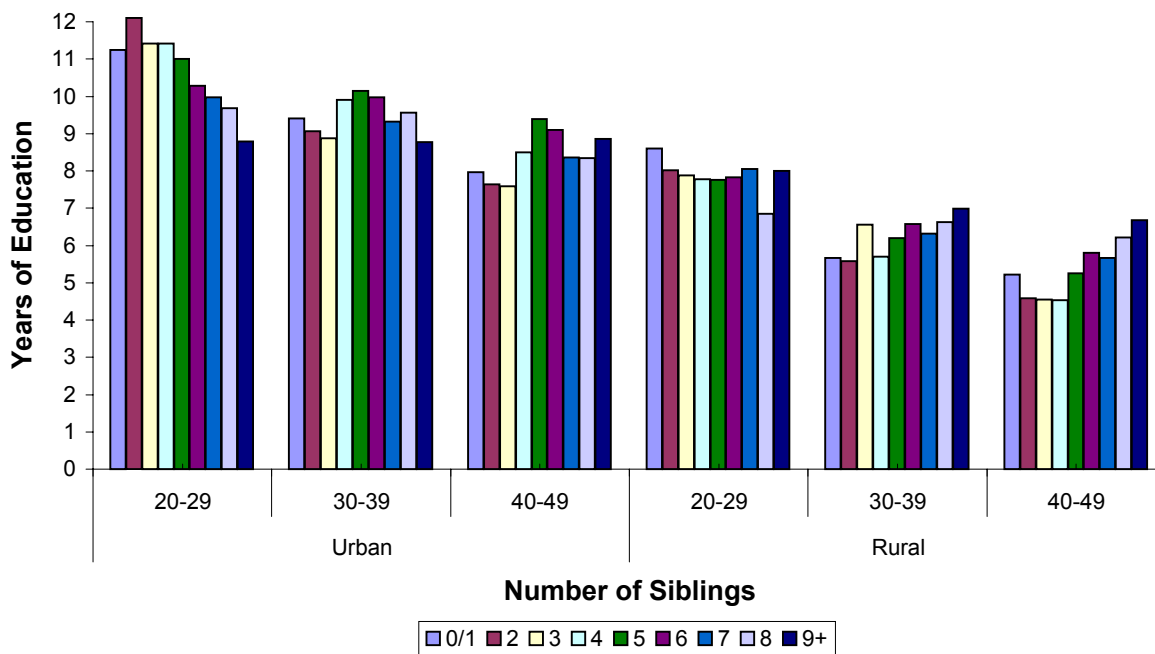


Figure 2. Educational Attainment by Family Size and Cohort in 1997, IFLS, (N=11,193)



**Figure 3. Enrollment by Age and Family Size
For Children Ages 6 to 19 in 1997, IFLS (N=9,652)**

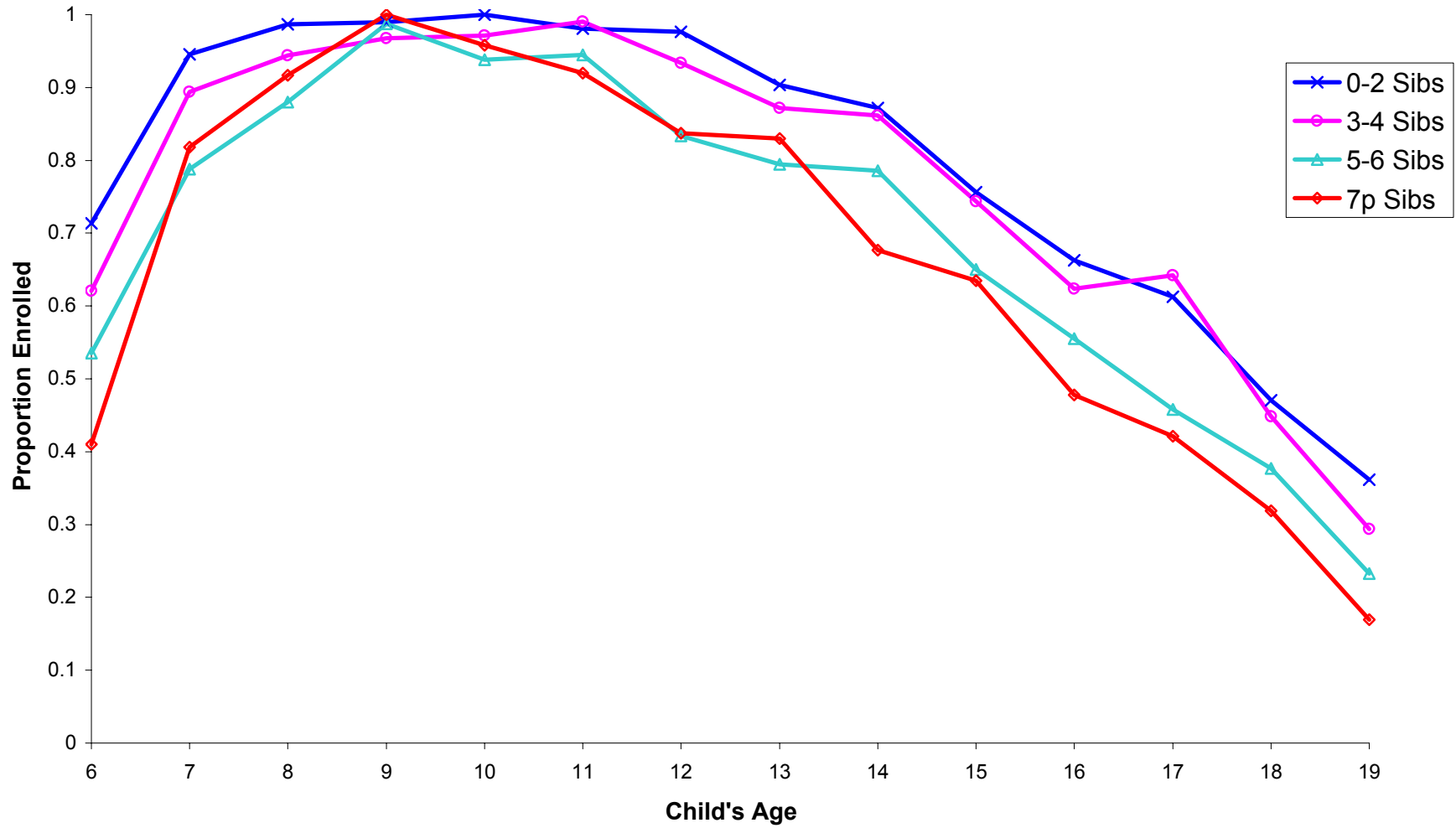
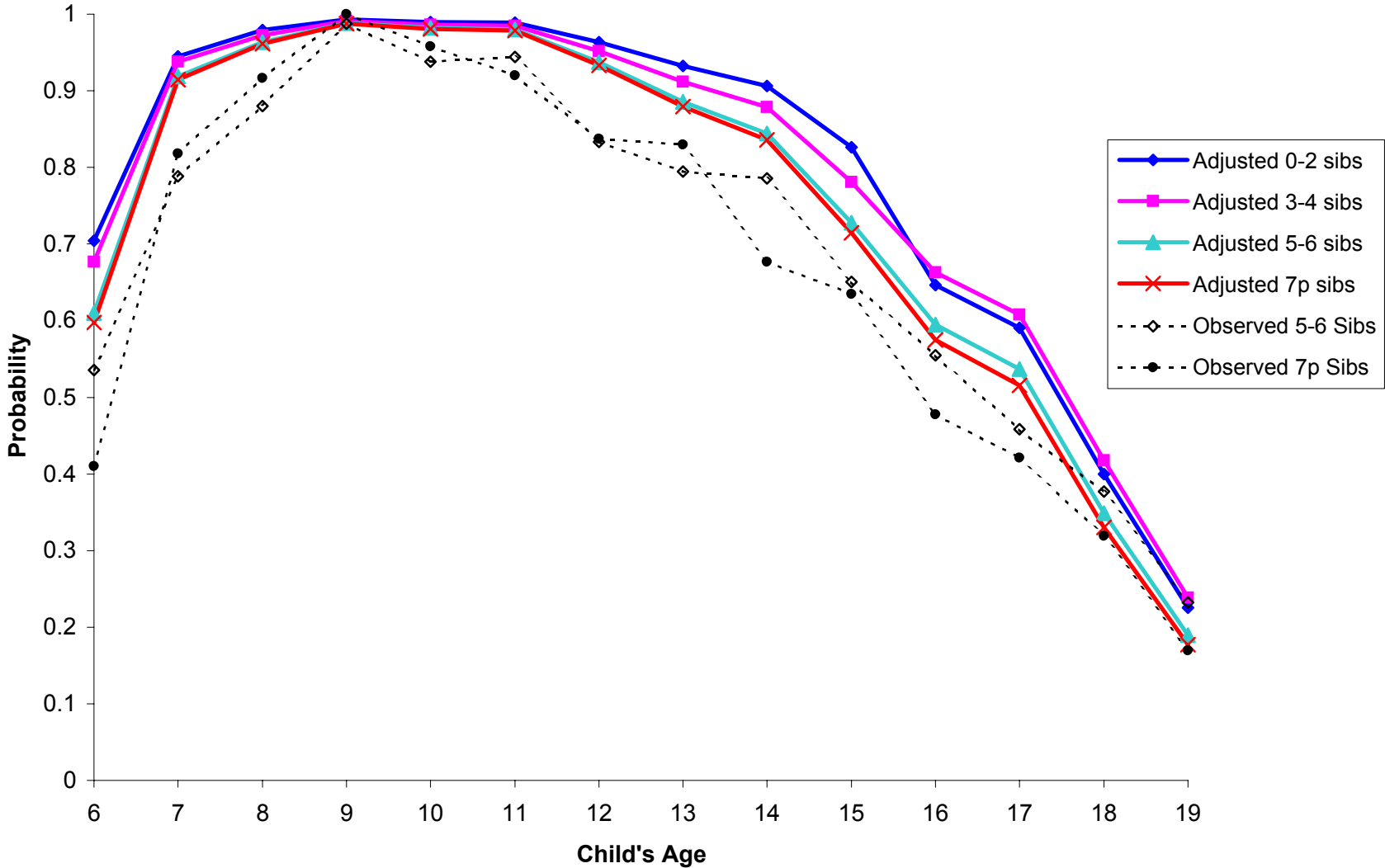


Figure 4. Adjusted Enrollment Probabilities Based on Model 4.2, Ages 6-19 in 1997, IFLS (N=9,652)



**Figure 5. Adjusted Probabilities of Jr Secondary Completion and Sr Secondary Enrollment
Models 4.2 - 4.6, Ages 16-19 in 1997, IFLS (N=2905 combined)**

