The Effects of Female Education and Health and Family Planning Programs on Child Mortality and Fertility in Indonesia

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The principle aim of this study is to measure the relative impacts of female education and Indonesia's health and family planning programs on child mortality and fertility. Earlier work by Angeles, Guilkey and Mroz (2003) examined the relevance of increases in female education as a driving force for lower fertility in that country. That work suggested that the empirical evidence in support of this proposition was flawed. It appeared that many women who achieved higher levels of education were those who would have low fertility even if they had not achieved their higher educational attainments. This means that the commonly observed simple correlation of higher education levels with low fertility levels is not entirely causal. Instead it likely reflects the fact that education is an endogenous determinant of fertility. One implication of that research is that it is quite possible that previous estimates of the importance of female education for reducing child mortality could suffer from similar endogeneity bias.

One of our main hypothesis is that naive estimates of the relationship between women's education and child mortality rates imply larger education effects than estimates that more closely resemble causal estimates of the education effect. The estimators we use recognize and model explicitly the potential for common unobserved factors to be determinants of both a women's educational attainment and child mortality. Higher ability women, for example, might be more likely to continue on in school, and even in the absence of additional schooling, they would be better able to provide a safe and sanitary environment for their children which in turn will reduce the probability of their children dying. Since accurate and reliable measures of ability or intelligence are rarely available, naive models would tend to attribute to educational attainment much of the impact of ability for lowering mortality rates. Policies that target increased female education as an important tool for lowering child mortality rates could find such education programs could be much less effective than estimates from simple models might suggest. We plan to use data from the 1993 Indonesia Family Life Survey (1993 IFLS) to examine this hypothesis and its implications

There is an additional deficiency in the research relating educational attainment to child mortality and fertility that could give rise to invalid inferences about the causal impacts of education. Many public programs, including health and family planning programs, may influence a woman's decisions about education. Foster and Roy (1997) in a study of the Matlab experiment in Bangladesh, for example, show that women in the treatment area had fewer children and the children that they did have obtained more education than the control group. Angeles, Guilkey, and Mroz (1998, 2001) in studies in Tanzania and Peru show that access to family planning programs at the beginning of a woman's child bearing years have lasting effects on her fertility in addition to the effects of current access to family planning. Using data from the 1993 IFLS, Angeles, Guilkey, and Mroz (2003) demonstrate that the expansion of Indonesia's family planning programs from 1970 to 1993 resulted in significantly higher educational attainments than did the improvements in resources devoted directly towards schools during the same time period. Simple models that control for education but ignore such potential pathways may seriously understate health and family planning program effects on fertility and mortality and may lead to incorrect allocations of scarce resources. The indirect effects of these government health and family planning programs could be quite substantial.

Using detailed information available in the 1993 IFLS, we propose to estimate a statistical model that will allow us to examine the direct effect of family planning programs on fertility and child mortality plus indirect programs effects through education. Our experiences with this analysis, in conjunction with our earlier analyses in Indonesia, Tanzania and Peru, will help us to assess the type of information that one needs to undertake an accurate evaluation of a wide range of FP and education policies. Our methods will control for the endogeneity of program placement, education, and selective migration in the fertility and mortality equations.

Foster and Roy's (1997) study in Bangladesh did find important program effects on education associated with the Matlab experiment, but because of the design of the Matlab program, their study had the advantage of being able to treat program inputs exogenously. This typically is not the case. Gertler and Molyneaux (1994) and Pitt, Rosenzweig, and Gibbons (1993), for example, note the very targeted nature of the Indonesian family planning program and estimate fixed effects models to measure the impact of family planning programs on fertility. Gertler and Molyneaux's major conclusion is that, after controlling for program endogeneity, program effects on fertility are not significant even though simple methods indicate a significant negative impact on fertility for health centers. Pitt, Rosenzweig, and Gibbons, on the other hand, find that simple methods yield a significantly *positive* impact for family planning programs on fertility. The effect becomes negative but insignificant when the endogeneity of program placement is controlled. In their study of the effects of family planning program is Indonesia, Angeles, Guilkey, and Mroz (2003) found somewhat different implications about the importance of controlling for the endogeneity of the targeted placement of family planning programs. While they did find considerable evidence about the importance of recognizing the endogeneity of program placement, they found that provincial level controls, by urban/rural status, were sufficient to eliminate the most serious sources of biases. This implies that they can still use some of the actual variation in program placement within provincial regions as exogenous determinants of education, mortality, and fertility, and this provides the opportunity to uncover more accurate estimates of the programs' impacts.

Following Angeles, Guilkey, and Mroz (2003), we examine information from Indonesia from near the beginning of the expansion of services in Indonesia until 1993. Our methodology allows us to examine annual decisions made by women as a function of the current and past program environment. This permits a better match to the timing of the introduction of services to fertility and mortality outcomes. Our previous studies indicate that this is a robust estimation approach.

The complete mortality histories available in the 1993 IFLS allow us to consider the relative importance of individual level variables and program variables on infant and child mortality. The inclusion of mortality is a natural extension to our earlier work, and we can effectively control for selectivity by jointly estimating the mortality hazard for each child together with the fertility equation. This means that we can control for such factors as the endogenous age of the woman at the birth of each child and birth order on

mortality. In addition, joint estimation with the education equation allows us to obtain consistent estimates of the effects of education and public health programs on infant and child mortality. Unfortunately, including mortality as an outcome adds tremendously to our computational difficulties since health programs and family planning programs are not necessarily introduced simultaneously. This means that we will need to examine and model the endogenous placement of health programs in addition to family planning programs.

The expected outcome from our study is a better understanding of the role that health programs and female education have played for reducing infant and child mortality in that country. The study will also provide a better understanding of the role of family planning programs for reducing fertility in Indonesia. Since our estimation method is complex and the results somewhat difficult to interpret, we will use simulation methods to quantify both direct program effects and indirect program effects through education.

References

Angeles, G., D. Guilkey, T. Mroz. (2003). "The Effects of Education and Family Planning Programs on Fertility in Indonesia." MEASURE Evaluation Working Papers No. wp-03-73-en. Carolina Population Center

Angeles, G., D. Guilkey, and T. Mroz (1998). "Purposive Program Placement and the Estimation of Family Planning Program Effects in Tanzania," Journal of the American Statistical Association, Vol. 93, No. 433.

Angeles, G., D. Guilkey, and T. Mroz (2001). "The Determinants of Fertility in Rural Peru: Program Effects in the Early Years of the National Family Planning Program," MEASURE Evaluation Working Paper No. 46. Carolina Population Center.

Foster, A. and N. Roy (1997). "The Dynamics of Education and Fertility: Evidence from a Family Planning Experiment," University of Pennsylvania mimeo.

Gertler, P. and J. Molyneaux (1994). "How Economic Development and Family Planning Combined to Reduce Fertility in Indonesia," Demography 31:33-64.

Pitt, M., M. Rosenzweig, and D. Gibbons (1993). "The Determinants and Consequences of the Placement of Government Programs in Indonesia," The World Bank Economic Review 7:319-348.