The Decline of Fertility in Thailand, Malaysia, Indonesia, and the Philippines: 1968-70 to 1988-90.

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ABSTRACT

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“Own children” estimates of fertility based on micro-level census data show significant declines in Thailand, Malaysia, Indonesia, and the Philippines during the 1970s and 1980s. The most rapid decline occurred in Thailand. Smaller declines occurred in Indonesia and the Philippines, but the pace of decline accelerated in the 1980s relative to the 1970s. Fertility declines in Malaysia were intermediate. Regression standardization is used to estimate how much of the observed changes in fertility over the two intervals for each country were a function of macro-level changes (estimated as characteristics of provinces) in the status of women, the economic roles of children, and infant mortality relative to micro-level changes in female education, husband’s education, and lifetime interprovincial migration. Overall, the set of macro-level variables accounted for more of the observed fertility decline than did the individual-level variables. These results support core hypotheses from demographic transition theory, but with the caveat that the relative weight of the determinants of fertility decline can vary widely across time and location.

There are continuing theoretical debates on how best to explain the historical record of fertility declines in developed countries as well as the ongoing fertility transitions in the developing world (Hirschman 1994, Kirk 1996, Mason 1997). Demographic transition theory has been the beacon in guiding empirical research over the past forty years, but there has not always been consistent empirical evidence affirming every proposition from the theory. These anomalies have sparked a number of revisionist and "new" theories and approaches to the study of fertility, e.g., intergenerational wealth flows (Caldwell 1982), demand and supply models (Bulatao and Lee 1983), ideational theory (Lesthaeghe 1983), and diffusion and interaction interpretations (Rosero-Boxby and Casterline 1993, Bongaarts and Watkins 1996) which have been introduced (or reintroduced) to explain fertility change.

These new theoretical formulations, however, have not yet replaced demographic transition theory as the dominant perspective in the field. In several cases, the new ideas represent only partial theoretical frameworks and do not really offer a comprehensive account of how social change affects demographic processes. In other cases, the new theories are promising, but the core hypotheses have not been empirically confirmed and perhaps may not be testable with available data. A major limitation of most empirical research on fertility from all theoretical perspectives has been a reliance on cross-sectional data from a single country. In this article, we test several core hypotheses from demographic transition theory with a longitudinal and comparative research design that is appropriate to the theory.

This research is a continuation report from a comparative study of fertility decline in four Southeast Asian countries based on multilevel models with microlevel census data from 1970, 1980 and 1990. In earlier work, we described patterns of fertility decline and tested cross-sectional and lagged multilevel models of fertility determination (Hirschman and Guest 1990a, 1990b) and tested a preliminary model of fertility change for one country (Hirschman, et al. 1998). Here, we broaden the empirical analyses of this framework to test several key hypotheses from classical demographic transition theory on the causes of fertility change with data from three rounds of censuses for four countries.

Southeast Asian Societies in Transition

Southeast Asia is the region of the world nestled between South Asia and East Asia. On the mainland, it includes Burma, Thailand, Vietnam, Cambodia, and Laos. Insular Southeast Asia includes the huge Indonesian and Philippine archipelagos. Malaysia is comprised of Peninsular Malaysia on the mainland and two states on the island of Borneo. Singapore, a city-state on the tip of Peninsular Malaysia, and Brunei, a microstate on the island of Borneo, are the other countries in the region. With a combined population of over 500 million (about 9 percent of the world's total), Southeast Asia encompasses tremendous diversity in terms of religion, language, colonial history, and current political and economic structures. In spite of this diversity, there are some common cultural threads—specifically, bilateral kinship and a relatively positive status for women—that unite the region or, at a minimum, distinguish the region from the more patriarchal societies of South and East Asia (Reid 1988, Hirschman 1992).

For the present analysis, we focus on Indonesia, Malaysia, the Philippines, and Thailand. For three of these countries, the microdata census files are samples of their entire national populations; the exception is Malaysia, for which the microdata census sample file is limited to Peninsular Malaysia (excluding the states of Sabah and Sarawak on the island of Borneo). Indonesia is by far the largest of the countries with an estimated population of 212 million in the year 2000. The Philippines and Thailand are also populous by world standards with estimated populations of 76 and 61 million, respectively, in 2000. Malaysia is somewhat smaller with a 2000-estimated population of about 22 million (United Nations 1999).

Until slowed by the economic crisis of the late 1990s, Southeast Asia has been a region of relatively successful socioeconomic development. In economic terms, Malaysia had a per capita GNP of over $3,480 (U.S.) in 1994 that put the nation into what the World Bank calls "upper middle income" economies (World Bank 1996: Table 1). The other three countries are ranked in the "lower middle income" category of the World Bank's classification (World Bank 1996: Table 1). Economic growth in these countries has also been impressive, with average annual growth rates of 4 percent or higher in per capita GNP from 1965 to 1986 in Malaysia, Indonesia, and Thailand. The Philippines has not been quite so successful, but still has attained a respectable 1.9 percent average annual growth rate over the two decades (World Bank 1988: Table 1). During the decade of the last half of the 1980s and the first half the 1990s (largely beyond the empirical focus of this study), the rapid economic growth characterized as the “East Asian Economic Miracle” was thought to be spreading from East to Southeast Asia (World Bank 1993). Other socioeconomic measures including school enrollment, occupational patterns, and infant mortality show comparable gains for these years.[1]

Theories and Models of Fertility Decline

The central thesis of demographic transition theory is that economic and social modernization leads to an initial decline in mortality, which reduces incentives for large families and eventually leads to low levels of fertility (Notestein 1953, Davis 1963). One of the primary criticisms of demographic transition theory has been the fairly weak relationship between measures of modernization and fertility (Knodel and van de Walle 1979, Cleland 1985, Cleland and Wilson 1987). Indeed, cases can be cited where fertility began to decline in rural rather than in urban areas and in other cases where fertility change has preceded socioeconomic development or followed after a long lag period (Watkins 1987).

Although anomalies tend to generate more interest than replications, there is a significant body of research that supports many of the central propositions from classical demographic transition theory (Friedlander, Schellekens, and Ben-Moshe 1991; Lee, Galloway, and Hammel 1994). Over the long-term, socioeconomic modernization and declines in mortality and fertility move together, but short run trends often reveal a variety of anomalous patterns (Mason 1997).

To resolve the current debate over demographic transition theory, it is important to develop a cumulative research tradition based on an explicit conceptualization of how the many (and varied) dimensions of socioeconomic development are linked to each other and to lowered fertility. Based on observations from a number of developing countries, Freedman (1979) posits that different subsets of the conventional predictors may be sufficient to lead to lower fertility, while none of the variables seem to be a <u>necessary</u> condition for a fertility decline. Perhaps some of the debate over the determinants of fertility change arises from the cacophony of empirical research that assumes all indicators of socioeconomic status are interchangeable and that multivariate research should include all available variables (Hirschman 1994).

In this study (and in prior work), we are guided by general theoretical model of fertility behavior presented schematically in Figure 1 (Hirschman and Guest 1990b, Hirschman et al.

1998). This model draws upon the central hypotheses of demographic transition theory, but with the significant distinction between macro- and micro-level determinants of fertility. Classical demographic transition theory specified that changes in social institutions and social structure were the fundamental causal forces that shaped human fertility (Smith 1989). These institutional factors—labeled here as structural characteristics or contextual variables—are only indirectly reflected in the individual-level survey data that are typically used in cross-sectional analyses of fertility. The assumption guiding this study is that fertility behavior, as with all individual behavior, is influenced by the social, economic, and cultural context as well as by individual circumstances. Changes in social structure—opportunities, constraints, and normative context—are not simply exogenous variables to be held constant so that individual-level relationships can be examined. Our premise is that temporal change in fertility behavior is a product of large-scale changes in the organization of societies that is filtered thorough changes in individual characteristics and the opportunities that individuals face.

[Figure 1 About Here]

Based on demographic transition theory and past research, the specific structural characteristics selected for this study as the most likely institutional factors to influence fertility are (1) the status of women, (2) the economic roles of children, (3) infant and child mortality, and (4) marriage patterns. While these factors are correlated with other aspects of social structure that may influence fertility, these variables capture several of the central hypotheses of demographic transition theory.

Social structure may influence the fertility of individuals directly through economic incentives and normative pressures or indirectly by modifying the characteristics of individuals.

To cast the net as broadly as possible, the model in Figure 1 includes several individual-level characteristics, including a woman's educational attainment, her migration status, and her husband's occupation. These individual-level characteristics serve as intervening variables between socioeconomic context and fertility outcomes and also as important causal variables in their own right because there is considerable individual heterogeneity in all institutions, places, and social contexts. Age and parity are included as “control variables” since fertility is also dependent on stage in the reproductive life cycle.

Although this theoretical framework is quite general, the choice of particular variables to represent key concepts reflects the availability of data. This analysis is based upon data files that combine (or pool) microdata samples from three successive censuses (1970, 1980 and 1990). With individual women (aged 15 to 44) as the units of analysis, the dependent variable is a measure of current fertility for the periods 1968-70, 1978-80 and 1988-90 (based upon the presence of children, aged 0 to 2, who can be linked with a mother in the same household).

The contextual variables are created from census data assembled for the province or district of residence for each woman respondent in the sample. The major limitation of census data is the lack of the full range of individual-level variables that are usually considered in fertility research. Moreover, some of the most important determinants of fertility change, such as family planning programs, the availability of contraception, and informal social networks that may diffuse fertility norms cannot be measured with census data. In spite of these limitations, our focus on social structural determinants of fertility change within a multilevel analytical framework, measured across two time intervals and four countries represents a more comprehensive approach to the study of modern fertility transitions than is typical in the research literature.

The major determinants of fertility change identified in this model are fairly similar to those that might be presented in an economic theory of fertility. The concepts of the status of women, the economic roles of children, and infant mortality could be repackaged to be consistent with a supply-demand framework for children (Easterlin and Crimmins 1985). From an economics perspective, the status of women might well be conceptualized as the value of a woman's time, and the concept of the economic roles of children is fairly close to the "price" of children. The major omission in our formulation of the demographic transition framework is income. Income is a central element in economic theory, but the causal impact of income on fertility in demographic theory is secondary to the institutional structure of society and the family. Moreover, a microeconomic framework would posit individual-level variables as the primary causal factors, with the aggregate characteristics of social contexts considered only as environments that shape preferences or condition individual-level relationships.

The basic difference between our social demographic model of hypotheses (based on the demographic transition literature) and the economics of fertility model is the primacy of the community or the individual. Our assumption is that individuals are socialized as members of specific communities, where they learn norms of appropriate behavior and face the collective constraints and opportunities in specific geographical settings shaped by social institutions and the level of technological development. Therefore, our theoretical perspective specifies that contextual variables should be considered as the prime explanatory variables, and then individual-level variables are introduced as mediators of the community-level influences and as potentially independent determinants in their own right. Economic theory would posit that individual-level variables should be considered as the fundamental causal variables to explain fertility and fertility change; then and only then should contextual variables be considered for their marginal explanatory power. Given that the validity of these differing assumptions cannot be empirically determined, but only evaluated with data, our analysis compares models with alternative sequences of contextual and individual-level variables.

Another way to frame these alternative explanatory frameworks is to examine the relative variance in fertility among individuals between communities and within communities. Although sociological theory typically assigns primacy to social structural influences at the community level, there is always considerable individual-level variation within communities. Indeed, our own prior research has shown that less than five percent of the total variation in individual fertility lies between the geographical areas that are used to measure contextual influences (Hirschman and Guest 1990b: 380).

Measuring Fertility Change and Testing Hypotheses

With pooled census data from the 1970 and 1980 censuses, the baseline model is the regression of current fertility on a dummy variable representing the census year (1980 = 1, 1970 =0). The regression coefficient of year can be interpreted as the absolute decline in period fertility over the decade. In subsequent models, this baseline equation is elaborated with the introduction of additional independent variables. The change in the year coefficient from the baseline to the more complex models is a measure of our ability to "explain" fertility change in a multilevel model of socioeconomic change. We conduct this analysis for the first intercensal decade (1970 to 1980) and then repeat the same analysis for the second interval from 1980 to 1990 (based upon pooled data from the 1980 and 1990 censuses).

Following the order of the variables in Figure 1, we first add the set of structural variables (provincial-level contextual variables) in the second model (equation). The third model includes only the individual-level characteristics as independent variables. The fourth model includes both the macro- and micro-determinants of fertility. One of our objectives is to compare the explanatory power of the contextual variables and the individual variables. Both sets of variables, macro and micro, represent a "demand" model of fertility. Census data do not contain social-biological measures of supply, nor are there appropriate indicators of available family planning services for the geographical areas and time periods considered here. The emphasis here is on the potential explanatory power of macro- or structural characteristics of geographical areas, coded as contextual variables in multilevel models of fertility change.

The individual-level variables may be mediators of the structural or contextual variables and may also have independent explanatory power. An important question is whether the influences of the contextual variables on fertility are mediated by individual characteristics. In other words, is the impact of modernized areas just the weighted sum of the impact of "modernized" persons in these areas? Caldwell (1980) argues that the community level of educational attainment can have a stronger influence on individual fertility behavior than individual characteristics. The primary substantive hypotheses to be examined are whether the three primary contextual variables of (1) status of women, (2) the economic roles of children, and (3) infant mortality can explain the observed fertility declines in these four countries over the

1970s and the 1980s. These factors may affect fertility by postponing marriage or may affect marital fertility directly.

The theme of women's status and roles encompasses an array of issues from women's participation in economic life to their relative power in household decision making (Mason, 1987). Our focus here is on the relative balance of women's involvement in traditional (family and household) versus modern (non-household) roles. To the extent that significant proportions of women in the community are active in the modern sector, there should be some legitimation and freedom to break with traditional roles, including high fertility. We suggest that much of the impact of socioeconomic development on fertility is mediated by the structure of women's roles inside and outside of the family. From the census files, we have constructed a contextual indicator of women's status at the provincial level: the proportion of women, aged 15-34, who have secondary (post-primary) schooling and above (based on measures of educational attainment). The age boundaries, 15-34, identify women in the peak childbearing years whose behavior might serve as a model for the normative context of appropriate fertility behavior.

In a similar fashion, social and economic structure may influence fertility by modifying the roles of children, especially their economic contribution to the family. The typical illustration of demographic transition theory describes how the shift from an agricultural economy to an urban industrial economy transforms children from economic assets to economic liabilities. From this hypothesis has come a considerable body of research that attempts to measure the actual and perceived value of children to the household economy (Mueller 1976, Nag, White and Peet 1978, Darroch, Meyer, and Singarimbun 1981, Caldwell 1983). The variable identified here is the labor force activity of children, aged 10-14 (for the Philippines, the youngest age possible is 15-18).

Infant and child mortality, in addition to being an important index of socioeconomic development, also has a well-developed theoretical link to the motivation for childbearing. With a lack of institutional-based pensions, parents see their adult children as providers of old-age assistance. Under conditions of high infant and child mortality, parents are likely to "insure" themselves with extra births. On the other hand, when mortality begins to decline, families may begin to see large families as an impediment to social mobility or status maintenance (Davis 1963).

The impact of the contextual variables on fertility might be direct on marital fertility, or indirect via the postponement of marriage. The status of women variable is most likely to influence the incidence of very early marriage. We therefore include an indicator of the level of marital postponement (percent of women, aged 15-24, who are never married) in the province as an additional contextual variable.

At the individual level, a large body of research has shown that a woman's education is the most powerful individual-level predictor of fertility (Cochrane 1979). It seems that higher levels of education lead to lower fertility, not only because of improved employment prospects but also because educated women have different ideas about family life and childbearing (Cleland 1985:239). Migration status is generally thought to have a negative influence on fertility. The basic assumption is that the act of migration is an innovative behavior that is correlated with other innovative behavior such as lower fertility. However, migration is not always an independent activity of the individual. Measured here as lifetime migration (measured by a comparison of the place of birth and the current place of residence) across administrative boundaries, the migration decision may have been made by parents or spouse. Husband's occupation (for married women with a spouse present) is a crude measure of social class. The standard expectation is that the wives of agriculturalists will have the highest fertility, while women married to men in higher status, white collar occupations, will have the lowest fertility. In every model, the age of the woman is entered as a covariate to serve as a partial control for exposure.

Data and Measurement

The present study is based upon microdata samples from twelve population censuses from the four countries of Indonesia, Malaysia, the Philippines, and Thailand for 1970 (1971 for Indonesia), 1980 and 1990 (1991 for Peninsular Malaysia). The microdata samples were constructed by the national statistical office in each country to be representative of the national population. The one exception is Malaysia, where the microdata sample covers only Peninsular Malaysia (excluding the states of Sabah and Sarawak on the island of Borneo—about 20 percent of the total population of Malaysia). In this paper, Malaysia refers to Peninsular Malaysia only.

The sampling fractions and sample designs varied across the twelve data files. In some instances, the sample was a straightforward systematic random sample of the master census file. In other instances, the microdata sample was drawn from the "long-form" (detailed census questionnaire) sample. Disproportionate sample designs based upon geographical areas were frequently used and therefore weights are necessary to adjust the sample to the total census enumerated population. For each population (country censuses), we estimate models using the sample weights (in order to have a representative sample of the population), but weights are "deflated" so that the weighted sample size is equal to the original unweighted sample.

Although the weighted microdata samples are representative of the complete census-enumerated populations, they are not, with the exception of Peninsular Malaysia, simple random samples of all households in the country. In some cases, the census offices administered the "long form" questionnaire to all persons within a random sample of geographic areas. These procedures mean that the standard errors estimated by statistical packages (which assume simple random samples) may be in error. This bias is partially compensated by the enormous sample sizes of the census microdata files and our very conservative criterion for reporting statistical significance results at the .001 level. For the subsamples of women aged 15-44, the sample sizes range from 35,000 observations for the 1970 Malaysian sample to over 1.5 million cases for the 1980 Indonesian sample. For the largest of the sample files, we took random subsamples to make computation more manageable (e.g., sampling fractions are .67 for 1970 Philippines, .50 for 1980 Philippines, and .18 for 1980 Indonesia). Further details on each microdata census sample are presented in an appendix table.

The dependent variable is an index of current fertility—the number of surviving children, aged 0 to 2, of each woman. Based upon the own-children methodology (Cho, Retherford, and Choe 1986), each child is matched with his or her mother in the household. In earlier work, we based the index of current fertility on surviving children, age 1 to 4, in order to minimize the effect of the underenumeration of infants (Cho, et al. 1980:31). This bias seems to be limited to the 1971 Indonesian census, and here, we rely on the more conventional measure of own-children below age 3. The index is weighted to represent the number of children a woman would eventually have if current fertility continued for her entire reproductive career (akin to a total fertility rate) and is adjusted for the proportion of unmatched children in the sample. The current fertility indexes are presented (and analyzed separately) for women in two age groups: 15-29 and 30-44. Our assumption is that "early" fertility behavior is shaped by somewhat different determinants than fertility at older ages (Hirschman 1985:35-36). At younger ages, variation in fertility is heavily influenced by the timing of marriage and the postponement of the first birth (and the intervals between early births). Our analysis of early fertility is based on the sample of all women (married and unmarried) aged 15-29. For older women, fertility decisions center on the completion of childbearing or "stopping" behavior. The sample is restricted to ever-married women for the age range from 30 to 44 (which includes almost all women in these age ranges for these years).

The own-children method is subject to a number of measurement problems, but it has the virtue of being an indicator of recent behavior. While cumulative fertility is probably more accurately measured, it may refer to behavior in the distant past. Additional analyses, not reported here, with children-ever-born as the dependent variable, yielded results generally consistent with those reported here (for more discussion of the concept and measurement of current fertility, see Hirschman and Guest 1990a). Own-children fertility estimates for areas are usually adjusted for variations in areal levels of infant and child mortality. For studies using own-children techniques to estimate fertility at the individual level (including this one), there is not a reliable method of adjustment for infant mortality (Rindfuss and Sweet 1977, Swicegood, et al. 1988). The lack of adjustment for infant mortality means that current fertility is underestimated, but more importantly, that it is underestimated most for women in areas with higher infant mortality (as in Indonesia). The provincial level of infant mortality is one of the central independent variables in our analysis. Moreover, other aggregate and individual-level variables are probably correlated with infant mortality. The consequence is a bias in the estimated relationships between these independent variables and our index of current fertility that is opposite to the theoretical expectations. This may be one of the reasons for some of the negative findings in the study. We have measured contextual variables for the smallest geographical units for which the necessary data are available (adjusted for consistency across censuses and some combining to insure a minimum number of cases in each area). In Indonesia, the units are regencies (kabupaten/kotamadya, N=246); in Malaysia, districts are the standard geographical units (N=70); in the Philippines and Thailand, the units are provinces (N=67 and 71 respectively). Although our choice of geographical units is greatly influenced by the constraints of available data, the units seem to offer a reasonable balance between small communities and very large heterogeneous states or regions.

The contextual variables have been estimated from the original microdata samples from each census. The great advantage of census files is their large size, which makes it possible to reliably estimate the characteristics of subnational areas, including the provinces and districts for this project. Most of the contextual variables were estimated in a relatively straightforward fashion. The one exception was infant mortality. Only for Peninsular Malaysia were published and reliable vital statistics available for each areal unit (district). For the other countries, we had to estimate provincial levels of infant mortality (q_x values) using Brass type methods based on children ever born and children surviving. If independent estimates for regional values of infant mortality were available, we attempted to follow precedents in methods of estimation. We do not yet have measures of infant mortality for the late 1980s, so our analysis of the impact of infant mortality on fertility declines is limited to the first intercensal interval. Additional information on the estimation of infant mortality levels is available from the authors.

In the multivariate analysis that follows, the age of the woman is included as a covariate in all models. In all models containing micro-level variables, current parity (measured by children-ever-born minus current fertility) is included as an additional covariate. Our objective is to measure the total effects of contextual variables, and their direct effects, after including intervening individual-level variables in the models.

Descriptive Analysis

In Table 1 we present summary measures of fertility and fertility change for the four countries. Age-specific fertility rates (ASFR) are computed by dividing the number of average annual births for the 3 years prior the census (based on surviving children age 0 to 2) of women of age (x) by the number of women age (x). The Total Fertility Rates (TFR) are simply the sum of the ASFRs (computed on a per woman basis). The fertility indexes in Table 1 are lower than those reported in other sources for the same countries and times, primarily because the own children estimates have not been adjusted for infant and child mortality. The rates are also somewhat lower than those reported in our own prior publications with these data (Hirschman and Guest 1990a); the lower rates are due to the different reference period and, in the case of Indonesia, the underenumeration of infants in the 1971 census. The very low figure for the 1990 Thai TFR is biased downward by the lack of correction for infant mortality and perhaps by other factors (Hirschman et al. 1994a, Knodel et al. 1996). We do not claim that these figures are the best estimates of fertility for these dates, but rather that they are fairly reasonable indicators based on a common measurement strategy across countries and time periods.

[Table 1 About Here]

Table 1 reveals that fertility declined in every country during the 1970s and 1980s. In Thailand, the rapidity of the decline is almost unbelievable—a decline of more than 2.6 births per woman in the 1970s and an additional 1.1 births in the 1980s. Even with a generous allowance for an underestimate of fertility in the 1990 census, fertility in Thailand had probably reached the replacement level by the late 1980s. The pace of fertility decline in Peninsular Malaysia had decelerated in the 1980s relative to the 1970s with a drop of 0.4 births per woman for the second decade compared to a decline of 1.2 births in the first interval. Almost all of the decline in the in the 1980s in Malaysia was among younger woman, perhaps reflecting a continuing desire for moderate size families among married women in their thirties.

In contrast to Malaysia, the pace of fertility decline accelerated in Indonesia and the Philippines in the 1980s. After only slight declines in both countries during the 1970s, the total fertility rate dropped by almost one birth per woman in the following decade in both Indonesia and the Philippines. These changes in fertility are the phenomena to be explained in this study.

The primary explanatory variables—changes in contextual variables at the provincial level—are displayed in Table 2. The figures in Table 2 are summary statistics (means and percentages) of the contextual variables for the two samples of women (all women, age 15-29, and married women, age 30-44) for each country in 1970, 1980, and 1990. Individuals are the units of analysis for both sets of independent variables and the contextual variables can be interpreted as the average context for the population of respondents, as defined above. In other words, these figures do not represent the average context (where each context is be counted once) but the context of the average respondent with each context included as many times as there are respondents (in the sample) living there.

[Table 2 About Here]

The contextual measure of women's status—the proportion of women, age 15-34, in the province with secondary schooling—rose dramatically in every country for both intercensal intervals. In Indonesia, the figure doubled from 7 percent in 1970 to approximately 13/14 percent in 1980 and then doubled again to 30/31 percent in 1990. In Malaysia, the index of women's status rose from 24/25 percent to 50 percent in 1980, and then rose to 75 percent in 1990. And in the Philippines, the proportion of women with secondary schooling rose from 37/38 percent in 1970 to 52/53 percent in 1980, and to 66 percent in1990. In Thailand, the comparable figures for the status of women increased from 10/11 percent in 1970 to 27/29 percent in 1980 and then rose to 58/59 percent in 1990.

The change in our indicator of children's economic roles—the percent of children, age 10-14 in the labor force—did not show a consistent pattern across countries. The average level dropped significantly in both Thailand and Indonesia from 1970 to 1980, but somewhat less so in Malaysia, where few children were reported in the labor force. The reported change in child labor in the Philippines probably reflects a shift in the measurement of labor force activity in the two censuses rather than a real change in behavior. There were only modest changes in this index from 1980 to 1990 in the three countries for which data are available. With less than 10 percent of children, aged 10-14, working in Malaysia and Indonesia in 1980, there was almost no room for further change in the most recent decade. For Thailand, the proportion of children working seems to have leveled off at about 40% during the 1980s.

Infant mortality (only measured for the 1970 to 1980 interval) fell substantially, with absolute declines of between 13 to 41 points (deaths before age 1 per 1000 births) and relative declines from 26 to 33 percent. The average contextual level of infant mortality remained highest in Indonesia and lowest in Peninsular Malaysia. As noted earlier, data on infant and child mortality for 1990 are not currently available.

For the final contextual variable—the average percentage of young (15-24), single (never-married) women—a ceiling effect was beginning to emerge in Thailand, Malaysia, and the Philippines where upwards of 70 percent of young adults were not yet married. Only modest change was reported in these counties in either period. In Indonesia, where age at marriage was considerably younger, there was an acceleration of marital postponement for the most recent period (1980 to 1990).

Multilevel Models of Fertility Change

The multilevel analysis of fertility change is organized in terms of four basic equations (or models), suggested by the order of variables in Figure 1. Model 1 includes only "year" as an independent variable with the year coefficient representing the observed change in fertility over the intercensal decade.[2] Model 2 adds the contextual variables as covariates. Model 3 includes only the individual-level variables, and Model 4 includes both the contextual and individual-level independent variables. Because of the volume of results from these equations for two intervals for two populations (all women, age 15-29, and married women, age 30-44) for each country, only selected coefficients for each equation are shown in Tables 3 (for the 1970-80 interval) and 4 (for the 1980-90 interval). The complete tables of results from every equation are reported in appendix tables.

[Tables 3 and 4 About Here]

Tables 3 presents the results of the multilevel models of fertility decline from 1968/70 to 1978/80 for Thailand, Indonesia, Malaysia, and the Philippines based on the pooled data from the 1970 and 1980 censuses. Only the coefficients for the year and contextual variables are shown for each model. The results for younger women (all women aged 15-29) are shown in the left-hand panel and for the sample of older women (married, aged 30-44) in the right-hand panel. Above each set of equations are summary measures of the dependent variable—current fertility, for the two samples.

The 1970s

The mean fertility for all Thai women, age 15-29, in 1968-70 was 2.65 births.[3] Subtracting the comparable figure for 1978-80, 1.64 births, yields the measured decline in fertility, 1.01 births, over the decade of the 1970s for women age 15 to 29. The comparable exercise for the sample of married Thai women, age 30-44, shows a decline of almost 1.7 births for the same time period. Explaining these observed changes is the objective of this analysis. Below the headings with the observed changes in fertility are the grand means of current fertility for the combined samples for the two census years. The pooled sample of all women, age 15-29, from the 1970 and 1980 Thai censuses (for the three year periods prior to each census) had a overall mean of 1.94 births (N = 145,240 women), and the comparable pooled sample for older women had a mean fertility of 2.37 births.

The first equation, model 1, contains only the dummy variable for the year (1980 = 1, 1970 = 0) and age as independent variables. The year coefficient in this equation is the decline in current fertility over the decade. This coefficient should be the same as the gross change computed by subtracting the 1980 mean fertility from the 1970 mean. The Thai coefficient is, however, slightly different (-1.05 compared to -1.01) because age composition is held constant in the regression equation. Since the current fertility measure is weighted to approximate the total fertility rate, these coefficients can be interpreted as declines in the average level of childbearing over the decade (for the age range included in the model).

In model 2, the four contextual variables are added as predictors of fertility. All four structural variables have significant effects on fertility, but our primary interest is observing the change in the year coefficient from model 1 to model 2. The direct effect is reduced from -1.05 to -.53 births. This means that changes in the four contextual variables can explain about half of the observed change in fertility among younger Thai women from 1968-70 to 1978-80.

The contextual variables for women's status, the economic roles of children, and marital structure are coded so that a unit change in the unstandardized regression coefficients represents an effect of 10 percentage points in provincial characteristic. The effect of infant mortality is coded so that a unit change is 10 points in the infant mortality rate (rate of infant deaths per 1000 births). All of these variables have the expected net effects on fertility with the exception of infant mortality. Except for changes in proportions married, the contextual variable of the economic roles of children has the largest absolute effect on fertility, and change in this variable has the largest effect on the reduction in Thai fertility over the decade.

Introducing individual-level variables (coefficients not shown) in model 3 also mediates the overall trend by reducing year coefficient by about 20% (compared to 50% in model 2). It seems that changes in context have been more important than changes in the composition of the individual variables (as measured here) in explaining fertility decline during the 1970s. Note, however, that there are important direct effects of individual variables as indicated by the increment to variance explained (R-Squared) from 10.5 to 13.6 percent from Model 1 to Model 3. The contextual variables and the individual variables are, of course, correlated. Model 4 shows the effect of introducing both the contextual and the individual variables in the model. The joint effect of both sets of variables on the year coefficient is about the same as with the contextual variables alone. The effect of the contextual variable for women's status is entirely mediated by the educational distribution of individual women. The effect of the economic roles of children is, however, unaffected by the introduction of individual-level covariates.

The patterns for the sample of married Thai women, age 30-44, are roughly comparable for the sample of younger women. About one-third of the observed fertility decline of 1.6 births over the decade can be explained by changes in the contextual variables, primarily the economic roles of children. Changes in the composition of individual characteristics (at least those measured here) play almost no role in explaining the decline over the 1970s in marital fertility of women above age 30. The combined model (model 4) of both contextual and individual variables explains only slightly more of the variance in fertility change than model 2, which includes only the contextual variables. The importance of changes in the economic roles of children for the Thai fertility decline corroborates a similar explanation reported in qualitative research (Knodel, et al. 1987).

A comparable analysis of Indonesian fertility change for the first intercensal interval is presented in the next panel of Table 3. The modest reduction in Indonesian fertility during the 1970s is confounded with problems of measurement in our analysis, and provides very little demographic change to be explained.[4] Taking the results at face value, there was a decline of .12 of a birth for women age 15-24 and .21 of a birth for married women above age 30 over the decade from the late 1960s to the late 1970s. Adding the contextual variables in model 2 reduces the year coefficient among younger women to zero (technically, it is not significantly different from zero), but there is little reduction in the effect of year on fertility decline in the equations for older women. From additional analyses (not shown here) where each contextual variable is tested individually, it appears that the most significant contextual factor is the decline in infant mortality. Interestingly, changes in the individual-level variables did not account for any reduction in the year coefficient. The increase in the year coefficient for older women when the individual-level variables are added (see Model 3) may be due to some particular compositional shifts into categories with a positive relationship to fertility.

For Peninsular Malaysia, the basic patterns are very similar to that of Thailand. There was a substantial reduction in measured fertility during the 1970s in Malaysia of about 2/3 of a birth per woman for both the younger (15-29) and older (age 30-44) populations. These fertility declines can be “explained” entirely by changes in the contextual variables—the status of women, in particular. Changes in composition of the individual variables work in the same direction, but they do not account for the changes in fertility as completely as do the contextual variables. These results suggest a “suppressed” trend toward higher fertility in the 1970s, net of the changes in context and composition for younger women.

Fertility in the Philippines declined by a small amount during the 1970s, but the year coefficients in model 1 (for both the samples of younger women and older married women) are not significant—effectively equal to zero. But an interesting pattern emerges when the contextual variables are entered as covariates in model 2. The year coefficient becomes significant, but in a positive direction. This equation is a "statistical experiment" which represents the counterfactual where the passage of time witnesses changes in statistical relationships, but context (as measured here) is held constant (no change during the decade). According to this model, fertility would have risen over the decade if there had been no change in the contextual variables.

The potential increase in fertility (as implied by the year coefficients in model 2) is relatively modest: a third of a birth among younger women (age 15-29) and a quarter of a birth among older married women (age 30-44). What is important is that the provincial variables (the status of women is the key variable in the Philippines) play a similar role in societies where fertility is declining rapidly (Thailand) and in societies where fertility is stagnant (the Philippines). In Thailand, change in the contextual variables was a key mechanism that mediated a substantial share of trend in rapidly declining fertility. In the Philippines, the underlying trend was one of rising fertility (by about a 1/2 of a birth over the decade), but changes in social structure, as indexed by the contextual variables, held the observed fertility change to almost zero.

The change in the composition of the measured individual variables did not have consistent effects on fertility change. Among younger women, change in female education and other micro variables worked in the same fashion as the macro variables, though to a lesser extent. Among the sample of older married women, the opposite pattern prevails. The changes in composition actually favored increased fertility; had there been no changes in the individual-level variables, fertility would have decreased over the decade.

<u>The 1980s</u>

The fertility transition continued at an impressive pace in Thailand during the 1980s. And the relative importance of changes in contextual variables remained broadly similar. Changes in the structural variables accounted for about one-half of the observed decline in fertility from the late 1970s to the late 1980s for both younger and older women (compare the year coefficients in models 1 and 2 in both the left hand and right hand panels in Table 4). Individual-level characteristics are important as predictors of fertility, but changes in the composition of individuals over time does not explain fertility decline as much as change in structural characteristics. The fertility decline in Thailand has largely been completed in little more than two decades, and one of the major reasons for this striking social change appears to have been changes in the economic roles of children, as measured by the contextual variable.

The second panel in Table 4 shows a comparable analysis of the accelerating pace of the Indonesian fertility transition during the 1980s—about two-thirds of a birth among younger women and about one-third of a birth among women above age 30. The structural variables in model 2, as measured here, provide a slightly better explanation for the Indonesian fertility decline in the 1980s than for the 1970s, but at a fairly modest level. The structural variables mediate only about one-third of the observed fertility decline for younger women during this period. Nonetheless, in comparison to the lack of explanatory power (in terms of mediating the year coefficient) of the individual-level variables, there is some basis for claiming that changes in social structure explain a significant fraction of the Indonesian fertility decline. The addition of infant mortality to the model (when measures for the 1980s become available) may strengthen this interpretation.

The analysis of the slowdown of the Malaysian fertility decline in the 1980s in Table 4 reveals some new twists to our previous account for the 1970s. The entire decline of about .4 of a birth occurred among younger women in the 1980s—perhaps part of the process of a continuing rise in marital postponement. This change can be entirely accounted for by the changes in the structural variables (the year coefficient is insignificant in model 2). For older women, the observed levels of fertility showed no change during the decade, but this stability changes in both structural forces and individual composition that were “pushing” fertility down by more than one birth per woman. Were it not for the “social change,” as indexed by these measures, fertility among women above thirty would have increased by one child per women (an increase of more than 60%).

As noted earlier, the Philippine fertility transition accelerated in the 1980s with a decline of about one-half of a birth among younger (age 15-29) and older married women (age 30-44). Almost all of the decline among younger women and about half of the decline among older married women can be “explained” by changes in the structural variables, and by changes in the status of women in particular. In comparison, changes in the composition of individual characteristics did not mediate the observed fertility decline among younger Filipino women (see model 3). When the macro- and micro-variables are both included as independent variables (see model 4), there is less mediation of the observed fertility decline coefficient than when the macro-variables are included alone (model 2). Note, however, the micro-variables do have strong direct effects on fertility, as indicated by the increase in variance explained when the individual-level variables are added as independent variables (see model 3). Among married women, age 30-44, changes in the contextual variables or changes in the individual-level variables mediate roughly the same proportion of the observed fertility decline, but the contextual variables alone (model 2) provides the most parsimonious explanation.

Conclusions

For many decades, demographic transition theory was the standard theoretical template for studies of fertility around the world. In many ways, demographic transition theory was an ideal framework with a plausible core hypothesis about the modernization of societies and the resulting decline of fertility, but the theory remained loose enough to incorporate novel ideas. Prior to the 1970s, the evidence for demographic transition theory consisted of parallel societal trends in fertility and socioeconomic development in Western societies. Although there were some notable exceptions (e.g., France) to the standard account, transition theory seemed to be a reasonable framework to explain the historical trend from high to low fertility in Europe and North America. Prior to the 1970s, there were so few cases of fertility decline in the Third world that fertility research was largely limited to the examination of cross-sectional fertility differentials.

In the 1970s, demographic transition theory was challenged, first by empirical evidence and then by rival theoretical interpretations. Research findings from the Princeton European Fertility Project raised fundamental questions about the applicability of transition theory to fertility declines in Europe (Coale 1973, Knodel and van de Walle 1979, Coale and Watkins 1986). At about the same time, there was a significant expansion of data from World Fertility

Surveys in developing countries. Although there was clear evidence of declining fertility in many Asian and Latin American countries, the correlations between socioeconomic variables and fertility were often very modest. Without a real theoretical alternative, transition theory remained the standard, although increasingly critiqued, perspective in the field.

By the 1980s, several new ideas (some are reworkings of older ideas) began to vie with transition theory as alternatives to explain the decline of fertility. Perhaps most influential has been ideational theory which posits that cultural values are the most important determinant of cross-national variation in fertility levels and fertility declines (Lesthaeghe 1983, Lesthaeghe and Surkyn 1988, Cleland and Wilson 1987). The evidence for ideational theory is primarily the association between regional and cultural areas and fertility decline. This is clearly a significant contribution, and there appears to have been rapid diffusion of innovative fertility behavior within culturally homogeneous areas. But there has not yet been a convincing theoretical argument that would explain the origins and spread of cultural values that shape fertility behavior.

A considerable degree of support for the ideational theory and other new theories of fertility is based on the empirical weaknesses of socioeconomic hypotheses (demand theory) of fertility. The lack of empirical support for demographic transition theory, in our judgement, is due in large part to the lack of formal specification of key hypotheses and clear operationalization of important concepts. By treating every socioeconomic variable as equally important and often testing hypotheses with bivariate relationships, there is not a strong body of empirical generalizations and theoretical cumulation in the research literature (Hirschman 1994).

In this study, we have tested propositions from demographic transition theory in a different way than is generally the case. Most importantly, we specified a multilevel model that attempts to incorporate the key hypotheses from demographic transition theory as structural or conextual variables that influence the fertility behavior of individuals. Although the record of multilevel or contextual models of fertility has not always been encouraging (Casterline 1985), we believe that analyses with fertility change as the dependent variable (and not just variations in cross-sectional fertility) will be more promising.

The findings from this analysis provide rather striking evidence in support of hypotheses drawn from demographic transition theory, although the patterns vary substantially across time and space. We measured changes in current fertility, based on “own children” reported in the 1970, 1980, and 1990 censuses of Thailand, Indonesia, Malaysia, and the Philippines. Fertility declines were reported in both intercensal decades in every country, although the declines were modest in Indonesia and the Philippines during the 1970s. Simple regression standardization models show that a significant share—up to 50% or more—of the fertility declines in these countries can be “explained” (or mediated) by temporal shifts in women's status, the economic roles of children, and infant mortality. These results can be interpreted as "statistical experiments" using the method of regression standardization. The question is how much of the measured decline in fertility would have occurred if other factors were held constant. It seems that the changes in the structural environment have been a critical factor in accounting for the decline of fertility. Our results show that if there had been no changes in women's status, children's roles, and infant mortality, then much of the observed declines in fertility in these countries would not have happened.

These findings are the more striking because we compared the relative explanatory power of models with (1) only changes in contextual variables, (2) only changes in individual variables (composition), and (3) both changes in the contextual and individual variables. In almost every case, the model with changes in the contextual variables alone proved to be a more powerful explanation of the observed fertility decline than changes on the individual variables, or even models with both contextual and individual variables. The individual-level variables have strong associations with fertility levels, but the changes in the macro variables worked much better in explaining fertility declines over time.

The method of regression standardization (used here) holds the values of the covariates constant at a weighted average of the different populations in the sample. In these equations, the weighted values are intermediate between the 1970 and 1980 populations (for the first period and between the 1980 and 1990 populations for the second period). If there are interactions between the covariates, year, and fertility, then the estimates of fertility decline (the year coefficient) in these models could be unstable-depending on the values of the covariates. To investigate this possibility, we tried other forms of regression standardization. We substituted 1980 values of the contextual variables in the 1970 regression equation. We also did the reverse by substituting 1970 values of the contextual variables in the 1980 regression equations. The results, not presented here, confirm the essential findings of our regression analysis.

As with any study, there are many important qualifications to the results reported here. First, the geographical areas used for the construction of the contextual variables were generally very large provinces and may not closely fit with the local social spheres and institutions that shape reproductive norms and behavior. And the variables available for our study are limited to those collected in the censuses. The set of individual variables in this analysis does not include many of the important determinants of fertility, the most important of which is family planning programs. For these reasons, the results reported here are suggestive, not definitive.

. In spite of these limitations, the findings reported here provide encouragement for new directions of research and the development of a comprehensive theoretical framework to study fertility transitions. We have identified several key structural variables that appear to have been important in explaining the decline in fertility in several Southeast Asian societies during the 1970s and 1980s. There may well be systematic variations in the pathways of fertility decline across societies and over time with different forces appearing more important in some contexts than others. These findings do not necessarily invalidate the ideas from “alternative theories” of fertility decline. In most cases, arguments about the causes of fertility decline are not mutually exclusive. The other lesson from this study is the importance of testing hypotheses with comparative research designs that follow demographic transitions from their onset to their completion.

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Endnotes

[1] These same countries have experienced major setbacks from the Asian economic crisis that began in 1997. Our empirical analysis, based on census data from 1970, 1980, and 1990, is focused on the period preceding the recent economic downturn.

[2] Age group, measured as a series of dummy variables for each five-year age group, is also included as an independent variable in Model 1 and in every other equation. Since change in fertility may be due to changes in age composition, the inclusion of the age covariate will allow us to focus on explaining the change in “age standardized” measures of fertility.

[3] This measure of current fertility is coded with the logic a total fertility rate. The mean number of births (own children, age 0-2) for this sample of women, age 15-29, is divided by 3 to give an annual measure and then multiplied by 15 to represent the 15 years of exposure from age 15 to 30.

[4] Infants, children less than age 1, were disproportionately underenumerated in the 1971 Indonesian census. Moreover, the lack of adjustment in the own-children estimates of fertility for infant and child mortality is a more serious problem in Indonesia because of the higher mortality levels in the country (and especially in 1971). And if the underestimation problem is greater for the 1971 census than the 1980, then we have underestimated the 1971 to 1980 fertility decline.