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

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There are few topics in the social sciences as intensively studied as the process of fertility decline. Yet, as Cleland (1985:225) noted, remarkably little progress has been made toward the goal of producing a convincing theory of fertility change. The lack of progress is not due to a lack of effort or ingenuity. For several decades, demographers and other social scientists have produced enough empirical research on the trends and patterns of fertility in historical and contemporary populations to fill several bookshelves. Innovative research programs have unearthed historical records and devised new methods to investigate population trends prior to and during fertility transitions. Over the past three decades there have been dozens of original surveys of fertility behavior in developed and developing countries in the midst of fertility declines. The most notable of these, the World Fertility Survey program was probably the largest comparative social science project ever undertaken. These efforts have produced an impressive body of empirical evidence on levels and patterns of fertility in various times and places. The problem has been to move from these facts to a systematic theory of how and why fertility changes (Hirschman 1994a, Mason 1997).

There is a mixed record of progress in the development and testing of theory to explain fertility transitions. Demographic transition theory, the standard framework in the field, has been very important in guiding empirical research over the past forty years. There has not been, however, consistent evidence in support of the hypotheses and propositions from this theory. These anomalies have sparked the formulation of revisionist and "new" theories of fertility, e.g., intergenerational wealth flows, demand and supply, proximate determinants, diffusion processes, and ideational influences which have been introduced (or reintroduced) to interpret fertility change.

These new theoretical formulations, however, have not replaced demographic transition theory as the dominant perspective in the field. In some cases, these new perspectives are partial theoretical frameworks and do not really offer alternative ideas on the links between social and demographic change. In other cases, the new theories suggest hypotheses that cannot be tested with available data. In spite of the wealth of demographic data from censuses and surveys, the need for both macro- and microdata for long historical periods, including information on individual attitudes, sociobiological characteristics, and behavior, precludes straightforward tests of competing hypotheses. The challenge is to specify theoretically informed hypotheses that can be tested with extant data. We believe that there are many possibilities for such work that can lead toward more cumulative theoretical formulations.

In this paper, we offer a continuation report from a comparative study of fertility decline in four Southeast Asian countries based on microlevel census data from 1970, 1980 and 1990. In earlier work, we described patterns of fertility decline and tested cross-sectional and lagged models of fertility determination (Hirschman and Guest 1990a, 1990b) and tested a preliminary model of fertility change for one country (Hirschman, et al. 1994b). Here, we test hypotheses about the causes of fertility change from the late 1960s to the late 1980s. While the primary objective is to provide a rigorous test of hypotheses from classical demographic transition theory, we also attempt to include ideas from revisionist theories.

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, and the Indochinese states of 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 400 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).

For the present analysis, we focus on Indonesia, Malaysia, the Philippines, and Thailand. For three 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, both in terms of area and population, with a 1994 population of 190 million. The Philippines and Thailand are also populous by world standards with 1994 populations of 67 and 58 million, respectively. Malaysia is somewhat smaller with a 1994 population of about 20 million.

Southeast Asia, and particularly these four countries, has been a region of relatively successful socioeconomic development. In economic terms, Malaysia had a per capita GNP of over $3480 (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. Economic growth 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). The more recent period from the mid 1980s to the mid 1990s (beyond our period of study of fertility) have witnessed an even more impressive economic growth in Indonesia and Malaysia, and especially in Thailand (World Bank 1996 Table 1). Other socioeconomic measures of school enrollment, occupational patterns, and infant mortality show comparable gains.

Theories and Models of Fertility Decline

The central thesis of demographic transition theory is that economic and social change leads to an initial decline in mortality that eventually leads to lowered fertility. Although there is not an explicit conceptualization of a monolithic process of socioeconomic development, most proponents and critics of demographic transition theory have treated transition theory as a list of independent variables. Urbanization, higher education, nonagricultural employment, and almost any other attribute of modern society are considered to be potential causes of lowered fertility.

Although all of these modernization variables are positively related to one another, the correlations are far from perfect. Moreover, the sequence and timing of change vary across societies. The same patterns, or variations in patterns, hold for the relationship between fertility decline and these variables. The net result is that hypotheses that specify bivariate relationships based upon demographic transition theory often encounter negative evidence, e.g., fertility decline sometimes begins in rural areas, fertility change may precede sustained economic development or follow after a long lag period. Since there are many other instances where the expected relationships hold, there is not total rejection of demographic transition theory but there is, however, considerable dissatisfaction with the prevailing paradigm.

There are many innovative ideas that offer substantial additions or modifications to demographic transition theory. For example, Freedman (1979) notes that there are unexamined possibilities for substitution among the list of variables suggested by this theory. Based on observations from a number of developing countries, he 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 necessary condition for a fertility decline. The increasing pace of many fertility transitions suggests that diffusion processes, aided by a favorable cultural environment or an active family planning program, may be the key to the spatial spread and acceleration of fertility declines.

What has been lacking, however, is an integrated or multivariate analytical framework to tie together the many ideas from the standard and revisionist perspectives. Although there are many examples of multivariate analyses of fertility, relatively few are guided by more than the availability of data. When independent variables are correlated with each other, it is important to specify the selection of variables and the causal links among them. Without presuming to offer more than an interim statement, we posit the model outlined in Figure 1 as a tentative formulation of the hypotheses to be tested in our comparative analysis of fertility declines in

Southeast Asia. The basic model is an extension of our prior analysis of cross-sectional fertility determination (Hirschman and Guest 1990b).

This analysis is based upon data files which 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 own children aged 0 to 2, living with the mother). Although many women may have been enumerated in both censuses, it is not possible to match individual records across censuses. The first model to be estimated 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 fertility over the decade. In the successive 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 (1968-70 to 1978-80) and then repeat the same analysis for the second interval from 1978-80 to 1988-90.

Following the order of the variables in Figure 1, we first add the set of marcrovariables (provincial contexts) in the second model (equation), and a fourth model includes both the macro- and microdeterminants of fertility. The intervening third model includes only the microvariables as independent variables. 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 period 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 microvariables are considered as mediators of the macrovariables and as explanatory variables in their own right.

The specific structural attributes were selected as the most likely factors to influence fertility, based on demographic theory and past research. These structural characteristics 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, we believe that this list captures the central hypotheses of demographic transition theory.

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 in 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 postprimary (secondary and above) educational attainment. The age boundaries 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-based one transforms children from economic assets to 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 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). 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 in limited to the first intercensal interval.

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 variables seem 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.

This study measures 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 choice (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.

A major objective of the present study is to test the impact of ecological attributes on fertility before and after the inclusion of individual level determinants of fertility. The question is whether the proximate contextual influences 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. To analyze this question, our multivariate models include the contextual variables and the following individual level variables: the woman's educational attainment, her migration status, her husband's occupation, and her age. These characteristics can serve as intervening variables and also as important causal variables in their own right.

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 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. In every model, the age of the woman is entered as a covariate as a partial control for exposure.

In the multivariate analysis that follows, the age of the woman is included as a covariate in all models. In models with microlevel variables, current parity (measured by children-ever-born minus the value of 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.

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. Details of these data files are reported in Appendix Table A1. 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 eight 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. We have adjusted sample weights so that the weighted sample size is deflated to the original unweighted sample. Further details on each microdata sample are available from the authors.

The sample sizes of the microdata files are enormous by the usual standards of social science statistical analysis. 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 .25 for the 1990 Philippines, and .18 for 1980 Indonesia).

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. For the age range from 30 to 44, the sample is restricted to married women.

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 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 for adjustment (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 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 serious 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.

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 there published and reliable vital statistics 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. Additional information on the estimation of infant mortality levels is available from the authors.

Descriptive Analysis

In Table 1 we present summary measures of fertility and fertility change for the four countries by age, female education, and region. 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 below age 3) 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). These figures are not reported as the best estimates of fertility for these dates, but rather as fairly reasonable indicators that reflect a common measurement strategy across years and time periods.

Table 1 reveals that fertility declined very rapidly in Thailand (more than 2.6 and 1.1 births over the two intervals) reaching replacement level fertility (or close to it) by the late 1980s. The fertility decline in Malaysia decelerated (but continued downward) in Malaysia for the two intercensal intervals, but accelerated in Indonesia across the two periods. Fertility decline was nominal in the Philippines for the first intercensal interval (fertility data from the 1990 Philippine census were not available for this paper, but will be very soon). Although the general order of magnitude of these figures is probably correct, the biases caused by the omission of infant deaths and selective underenumeration of infants in Indonesia have led to an underestimate of fertility levels, particularly in Indonesia.

There is a general pattern of fertility decline beginning among women with secondary schooling or higher. As the fertility transition deepens and spreads throughout society, women with less education also experience lower fertility levels. For the two countries where the fertility decline was most rapid--Thailand and Malaysia--the largest absolute declines occurred among women with primary schooling and less during the 1970s. Among women with secondary schooling, fertility was already at fairly moderate levels by the late 1960s, and there was less room for further dramatic declines during the 1970s. The trends by geographic areas do not reveal clear patterns except for the case of Thailand, which experienced a narrowing of the absolute differntials between Bangkok and other regions. Overall, the declines were fairly ubiquitous in both Thailand and Malaysia during the 1970s. The slowdown of the fertility decline in Malaysia during the 1980s affect almost all states, especially in the high fertility region in the Northeast (Kelantan and Trengganu).

In the two countries with a slower initial fertility decline--Indonesia and the Philippines--the larger absolute declines were registered among women with some secondary schooling and above. Fertility was still relatively high among higher status women in the late 1960s in Indonesia and the Philippines (closer to a TFR of 4 than the 3 prevalent among comparable women in Thailand and Malaysia), providing room for significant movement towards lowered fertility. There were significant regional differentials in Indonesia and Philippines, but there was little evidence of convergence during the 1970s. and in Indonesia for the 1980s

Tables 2a, 2b, 2c, and 2d shows summary statistics--means and percentage distributions--for the contextual variables and the individual level 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. The structural variables can be interpreted as the average context for the population of individuals. In other words, each context is represented as many times as there are respondents (in the sample) living there.

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 in 1970 to 13/14 percent in 1980 to 30/31 percent in 1990. In Malaysia, the index of women’s status rose from 24/25 to 50 percent to 75 percent, in the Philippines from 37/38 to 52/53 percent (data are only available for the first interval, and in Thailand from 10/11 percent in 1970, to 27/29 percent in 1980 and 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 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 from 1970 to 1980) fell substantially, with declines of between 13 to 41 points (deaths before age 1 per 1000 births) or between 26 and 33 percent. The average contextual level of infant mortality remained highest in Indonesia and lowest in Peninsular Malaysia.

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 and Malaysia where upwards of 70 or 80 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).

The individual level variables (also summarized in Table 2a, b, c, and d) are not measured in exactly the same way across the four countries. The measure of lifetime migration is based on different administrative units in the different countries. The educational classification listed in the stub of Table 2 is correct for the Philippines and almost so for Indonesia. For Malaysia, however, the top three categories represent divisions of secondary school (or above) based on a certificate received after passing a national education examination. For Thailand, there are only five educational categories with the highest one being secondary school and above. The distribution of the husband's status variable (our measure of social class) is presented only for the sample of married women, age 30-44.

Most of the changes in the distributions of background variables from 1970 to 1980 are due to cohort replacement with women exposed to more modern (recent) experiences replacing those socialized in an earlier era. Change is most evident in the declining percentages of women with no schooling and only incomplete primary schooling. The percentages of women with secondary schooling and above increased everywhere. In general there was a shift in the distributions of the husband's occupations, away from agriculture and towards urban occupations, but the changes were relatively modest and confounded with the varying proportions of men in the non-matched and unknown categories. The migration status variable shows slight shifts, but it is unclear if these represent a consistent trend.

Multilevel Models of Fertility Change

The multilevel analysis of fertility change is organized in terms of four basic equations, suggested by the order of variables in Figure 1. The basic equations are estimated for the two populations (all women, age 15-29, and married women, age 30-44) for each country.

Tables 3a and 3b presents the results of the multilevel models of fertility decline in Thailand based on the pooled data from the 1970 and 1980 censuses (Table 3a) and the 1980 and 1990 censuses (Table 3b) . 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 mean fertility for all Thai women, age 15-29, in 1968-70 was 2.65 births.[1] Subtracting the comparable birth rate for 1978-80, 1.64 births, yields the measured decline in fertility, 1.01 births, over the decade for the first half of the reproductive cycle. 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 gross changes is the objective of this analysis. Below the figures reporting the observed changes in fertility are the means of current fertility for the two pooled samples. The pooled sample of all women, age 15-29, from the 1970 and 1980 Thai censuses 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 contrast between 1970 and 1980. 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 4 contextual variables explain about half of the measured 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

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[1]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

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. The measure of the economic roles of children has the largest absolute effect on fertility, and changes in this variable have the largest effect on the reduction in Thai fertility over the decade.

Introducing individual level variables in model 3 also mediates the overall trend by reducing year coefficient by about 1/5 (compared to 1/2 in model 2). It seems that changes in context have been more important than changes in the composition of the individual variables measured here in explaining fertility decline during the 1970s. 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 women, age 30-44, are roughly comparable for the sample of younger women. Overall fertility declined by about 1.7 births over the decade. A bit more than one-third can be explained by changes in the contextual variables, primarily the economic roles of children. Changes in the composition of individual variables 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 less of the

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represent the 15 years of exposure from age 15 to 30.

overall fertility change than model 2 which includes only the contextual variables. The finding of the importance of changes in the economic roles of children for the Thai fertility decline corroborates the explanation offered by a recent qualitative investigation (Knodel, et al. 1987).

After this extensive discussion of the logic and methods behind our analysis of the factors behind the Thai fertility decline in the 1970s (Table 3a), we can to be more succinct in discussing the comparable analysis for the 1980s (Table 3b). Change in the structural variables account for about ½ of the observed decline in fertility from the late 1970s to the late 1980s for both younger and older women (compare the year coefficient in models 1 and 2 for both the left hand and right hand panels in Table 3b). Individual level characteristics are important as predictors of fertility, but changes in the composition of individuals over time does not explain fertility change as much as change in structural characteristics. In the sense the continuing fertility decline from the 1970s to the 1980s follows a very similar pattern in terms of explanation.

A comparable analysis of Indonesian fertility change is presented in Tables 4a and 4b. The modest reduction in Indonesian fertility during the 1970s is confounded with problems of measurement in our analysis. The underenumation of infants in the 1971 census and the lack of adjustment for infant mortality mean that our own-children estimates of current fertility are probably 10-20 percent below independent estimates for the same time period. Since the underestimate is greater for 1971 than 1980, we underestimate the 1971 to 1980 fertility decline.

The first column in Table 4a, model 1, shows that there was a decline of .12 of a birth for women age 15-24 and .21 of a birth for 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 microvariables are added may be due to some particular compositional shifts into categories with a positive relationship to fertility. The expected negative relationship between female education and fertility did not hold for Indonesia among older women.

Table 4b shows a comparable analysis of the more significant Indonesian fertility decline during the 1980s--about two-thirds of a child among younger women and about one-third of a child among women above age 30. The structural variables in model 2 provide a slightly better explanation for the Indonesian fertility decline in the 1980s than for the 1970s, but not a wholly convincing one. The role of structural variables is modest in an absolute sense, but in comparison to the lack of any 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 part of the decline in fertility. The addition of infant mortality to the model (when measures become available) may strengthen the case.

For Peninsular Malaysia (see Tables 5a and 5b), 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. If there had been no changes in either context or composition, fertility would have increased in the 1970s for younger women.

The analysis of the slow down of the Malaysian fertility decline in the 1980s in Table 5b reveals some new twists to our previous account. The entire decline of about 4/10 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 concealed both structural forces and individual composition that pushed fertility down by more than one birth per woman. Were it not for “social change” in these measures, fertility among women above thirty would have increased by one child per women (an increase of more than 60% in the fertility level).

Table 6a shows the results for the Philippines from 1968-70 to 1978-80. 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 means that if context (as measured here) were held constant (there had been no change during the decade), fertility would have risen from 1968-70 to 1978-80.

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 the contextual variables held the observed fertility change to close to 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.

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. 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.

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. 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.

Conclusions

Demographic transition theory was a convincing interpretative framework for fertility research until there was a sufficient body of empirical data to test its propositions. Prior to the 1970s, the evidence from the Western world largely consisted of parallel societal trends in fertility and socioeconomic development. 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, the evidence from the Princeton European Fertility Project raised fundamental questions about the applicability of transition theory to fertility declines in Europe. At about the same time, there was a significant expansion of data from World Fertility Surveys in developing countries and evidence of declining fertility in many Asian and Latin American countries. The results were anything but clear. In 1979, Freedman summarized the data from several developing countries and suggested that there were multiple paths to modern demographic transitions. Without a real theoretical alternative, transition theory remained the standard, although increasingly critiqued, perspective in the field.

By the 1980s, several new ideas (some were reworkings of older ideas) began to vie with transition theory as alternatives to explain the decline of fertility. Perhaps most influential has been the ideational theory which posits that cultural values are the most determinant of variations in national levels of and declines in fertility (Cleland and Wilson 1987). Much of the evidence in support of ideational theory is the weakness of any socioeconomic hypotheses (demand theory) and the correlation of regional/cultural areas and fertility decline. This is clearly a significant contribution, and there appears to be solid evidence in support of rapid diffusion of innovative fertility behavior within culturally homogeneous areas. But there are few ideas on the origins and spread of cultural values. It seems necessary to integrate the potential impact of socioeconomic conditions (from transition theory) with cultural change to develop a satisfactory theory of fertility decline.

Our belief is that transition theory has suffered from a lack of formal specification of key hypotheses and clear operationalization of important concepts. By treating every socioeconomic variable as equally important and testing hypotheses with bivariate relationships, cumulative theory and empirical generalizations have not developed. Although the record of multilevel or contextual models of fertility has not been encouraging (Casterline 1985), we believe that structural theory requires an evaluation of both macro- and microlevel determinants of fertility and fertility change.

The results of this analysis provide solid evidence for a particular form of a demand theory (or structural hypotheses) as an explanation (or partial explanation) for the decline of fertility from the late 1960s to the late 1980s in these four Southeast Asian countries. Simple regression models show that a significant share of the fertility declines in these countries can be explained by temporal shifts in women's status, the economic roles of children, and infant mortality. These results are tentative in that we have yet to explore all alternative specifications of these models. But we can assert that the obituary for demographic transition theory is premature.

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