Demography, Vol. 28, No. 3, August 1991

Fertility Decline in Taiwan: A Study Using Parity Progression Ratios*

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Taiwan's decline in fertility is studied by using period parity progression ratios. Levels of marriage and motherhood are found to have been high and essentially constant though the late 1980s, suggesting that the decline has been due almost entirely to declines in second and higher order-births. Families with three or more children play an important role in maintaining the current level of fertility. The level of fertility would be even lower without these families. They contributed more than one-half child per woman to the total fertility rate during most of the 1980s. Total fertility rates computed from the period parity progression ratios indicate a substantially higher level of fertility than the conventional total fertility rate; they remained above or at replacement level through 1988. A formal demographic analysis suggests that the conventional total fertility rate has been depressed by shifts in age at childbearing.

Parity progression ratios were invented independently by Norman B. Ryder ([1951]1980) and by Louis Henry ([1953]1980) in the early 1950s. The general idea, now familiar, is to ask what proportions of women proceed from one event in the childbearing sequence to the next. Of all women born, what proportion ever become mothers? Of those who have a first child, what proportion goes on to have a second? Of those who have a second child, what proportion progresses to a third, and so on?

Parity progression ratios, like other fertility measures, may be calculated either on a cohort or on a period basis. Cohort calculations typically use census or survey data on number of children ever born, classified by age or by duration of marriage. Period calculations are made by using birth probabilities specific for parity and for one other characteristic or more.[1]

The liabilities of period measures for the analysis of fertility trends were recognized clearly by Hajnal (1947, pp. 150–53) and were modeled formally by Ryder (1964, 1980, 1982, 1983). The liability of cohort measures, on the other hand, is that they may be computed only after the experience of the cohort in question is completed. Because this experience typically spans one decade or more, cohort statistics are incapable of describing the recent past.

This paper uses period parity progression ratios to study the nature and the possible

* I am grateful to Ronald Freedman, Norman B. Ryder, Chi-hsien Tuan, and three anonymous *Demography* reviewers for comments on earlier drafts; to Helen Yang Hai-Cheng Feeney for comments and translation of Lee (1990); and to Ronald Lesthaeghe for providing a copy of Willems, Wijewickrema, and Lesthaeghe (1981) with English annotations.

future of Taiwan's fertility decline. The history of Taiwan's demographic transition is well documented. Information on the pretransition situation is detailed in Barclay (1954). The decline of the total fertility rate from about 6 1/2 children per woman in the mid-1950s to fewer than two children per woman in the mid-1980s is documented in the remarkable series of *Taiwan Demographic Factbooks*.[2] A recent survey of what is known about Taiwan's fertility decline is provided by Chang, Freedman, and Sun (1987). Freedman (1986a, 1986b) reviews the current demographic situation for policy options.

Period Parity Progression Ratios

Period parity progression ratios may be calculated from birth probabilities specific either for parity and age (Whelpton [1954]1973) or for parity and time elapsed since marriage or last birth (Henry [1953]1980). Henry's approach, used here, may be illustrated by considering progression from first to second birth. We define birth probabilities $r_1(x)$, $x>0$, for second births to Parity 1 women with x years elapsed since first birth. These probabilities determine the parity progression ratio for progression from first to second birth in the same way as the force of mortality function determines the survivorship function in the life table. Thus

$$\exp\{-\int_0^x r_1(a)da\} \qquad (1)$$

gives the proportion of women who have not progressed to a second birth within x years after their first birth. Various discrete approximations are employed in calculation; for a detailed discussion of the approach used here see Feeney (1985b, pp. 127–29).

The empirical literature on period parity progression ratios is sparse but increasing. Whelpton ([1954]1973) gave birth probabilities specific for parity and age, painstakingly constructed from long time series of single-year age-order-specific birth rates. The series are updated in Heuser (1976) and in the annual U.S. vital statistics reports. Similar calculations probably could be carried out for many developed countries, but seemingly have not been made. Japan is the only other country in which I know that such calculations have been carried out, and those results apparently are unpublished (Kono and Ishikawa 1986, pp. 31–32). The census and vital registration data required to compute birth probabilities specific for parity and time elapsed since marriage or first birth are available for Belgium (Willems, Wijewickrema, and Lesthaeghe 1981) but for few (if any) other countries. Direct calculations of Henry's probabilities have been made, however, from a 1% sample of the 1971 census of England and Wales (Ní Bhrolcháin 1987), and from China's 1982 one-per-thousand fertility survey (Feeney and Yu 1987). Direct calculation from World Fertility Survey-type surveys is possible but generally unsatisfactory on account of small sample sizes, but Lutz (1989) has given indirect estimates for 55 WFS countries.

Estimation Procedure

Several procedures have been developed for indirect estimation of period parity progression ratios. Henry ([1953] 1980) proposed two procedures to derive estimates from annual numbers of marriages and births distributed by order. Feeney (1985b, pp. 131–33) proposes a third procedure using the same data. Chiang and van den Berg (1982) proposed yet another procedure based on Whelpton's age-parity-specific birth probabilities. Whereas the Chiang-van den Berg procedure can yield seriously biased results (Feeney and Lutz 1990, Note 15), improvements have been made by Feichtinger and Lutz (1983; see also Lutz 1989, pp. 102–16 and Lutz and Feichtinger 1989).

The estimation procedure described in Feeney (1985b, pp. 131–33) is used here. Given an annual series of numbers of first and second births, I use a standard schedule of probabilities for progression from first to second birth to estimate the distribution of parity 1 women by completed years since first birth at the beginning of the first year of the given annual series. Then I use the standard schedule to project this initial open birth interval distribution forward one year, thus obtaining an implied number of second births for the year. Dividing this implied number of second births into the observed number of second births yields a certain constant, which would equal 1 if the standard probabilities of a second birth were identical to the probabilities actually experienced by the population. Multiplying the standard probabilities by this constant produces the estimated probabilities of a second birth for the first year. I use these estimated probabilities to calculate a period parity progression ratio for the year, and also to project the initial open birth interval distribution forward to the beginning of the next year. The process then is repeated for each succeeding year of the available data series. I use the same procedure to estimate the progression ratios for progression to higher-order births.

Results of a series of robustness tests of this method are given in Feeney (1986, pp. 19–24). Sensitivity to the initial open birth interval distribution is considerable for the first few years but vanishes rapidly; errors decrease from roughly 10% in the first year to 5% in the fifth year and to 1% or 2% in the tenth year. Sensitivity to the standard birth probabilities is more persistent, but is small, rarely over 1% or 2%.

In the present application, the standard probabilities for progression from first marriage to first birth are taken to be the Japanese values given in Feeney (1986, p. 16). The standard probabilities for progression from i^{th} to $(i+1)$st birth are derived from a simple model that assumes a constant birth interval distribution for women of any given parity who go on to have another birth.[3] The robustness analysis noted above suggests that more elaborate specifications would have little effect on the results.

Estimates for Taiwan: 1979–1988

Table 1 shows estimated period parity progression ratios for Taiwan for the years 1979 to 1988. Progression to first birth is broken down into two components: progression from birth of woman to first marriage (B→M) and progression from first marriage to first birth (M→1). I have calculated the former from probabilities of first marriage derived from 1980 census data and from marriage registration data. I estimated the latter from annual numbers of first marriages and first births, using the same procedure as I used to estimate higher-order progression ratios.

Subsequent columns in Table 1 show period proportions of women progressing from first to second birth (1→2), second to third birth (2→3), and so on, estimated by the procedure described in the previous section. Because the Taiwan data series is very short, only the first four years of the series, 1975 to 1978, have been dropped. Therefore the estimates for the earlier years should be regarded as less accurate than those for the more recent years.

The 1988 increase in the higher order parity progression ratios evidently reflects the fact that 1988 is a Dragon Year. The increase of the conventional total fertility rate in 1988 was identical to the increase in 1976, the previous Dragon Year; that increase was reversed

Table 1. Period Parity Progression Ratios for Taiwan, 1979–1988 (per 1,000)

Year	Period Progression Ratio									TFR
	B→M	M→1	1→2	2→3	3→4	4→5	5→6	6→7	7→8	
1988	1000	968	849	497	250	193	199	191	200	2.33
1987	996	961	805	432	210	167	172	174	192	2.14
1986	992	959	782	428	212	170	185	198	216	2.10
1985	989	965	833	504	249	187	187	192	193	2.27
1984	987	968	852	555	285	209	223	205	205	2.38
1983	990	967	855	604	324	235	226	219	223	2.48
1982	989	970	866	647	373	260	240	235	244	2.60
1981	988	972	881	686	407	277	256	254	239	2.71
1980	986	973	883	710	437	298	282	272	279	2.78
1979	980	974	887	730	458	325	297	291	299	2.83

Sources: Progression to first marriage (B→M) computed from first marriage probabilities derived from 1980 census data and marriage registration data. Progression from first marriage to first birth (M→1) estimated from annual numbers of first marriages and first births. First marriages from *Demographic Factbooks*, Table 28 for 1975 and Table 21 for 1976–1988. Higher-order progressions (1→2, 2→3, . . .), estimated from annual numbers of births classified by birth order, are given in the annual *Demographic Factbooks* in Table 37 for 1975, Table 29 for 1976–1986, and Table 30 for 1987–1988. All tables give numbers of live births based on date of occurrence. For 1975 there is a discrepancy in the total number of births recorded in Table 37 (357, 653) and in Table 75 (367, 647). This difference may be explained if the latter are numbers by date of registration, though this point is not stated explicitly. The discrepancy does not occur in any subsequent year, however, and may represent an error in the first year of the new series. Such an error would have very little effect on the above estimates. (See text for estimation procedure.)

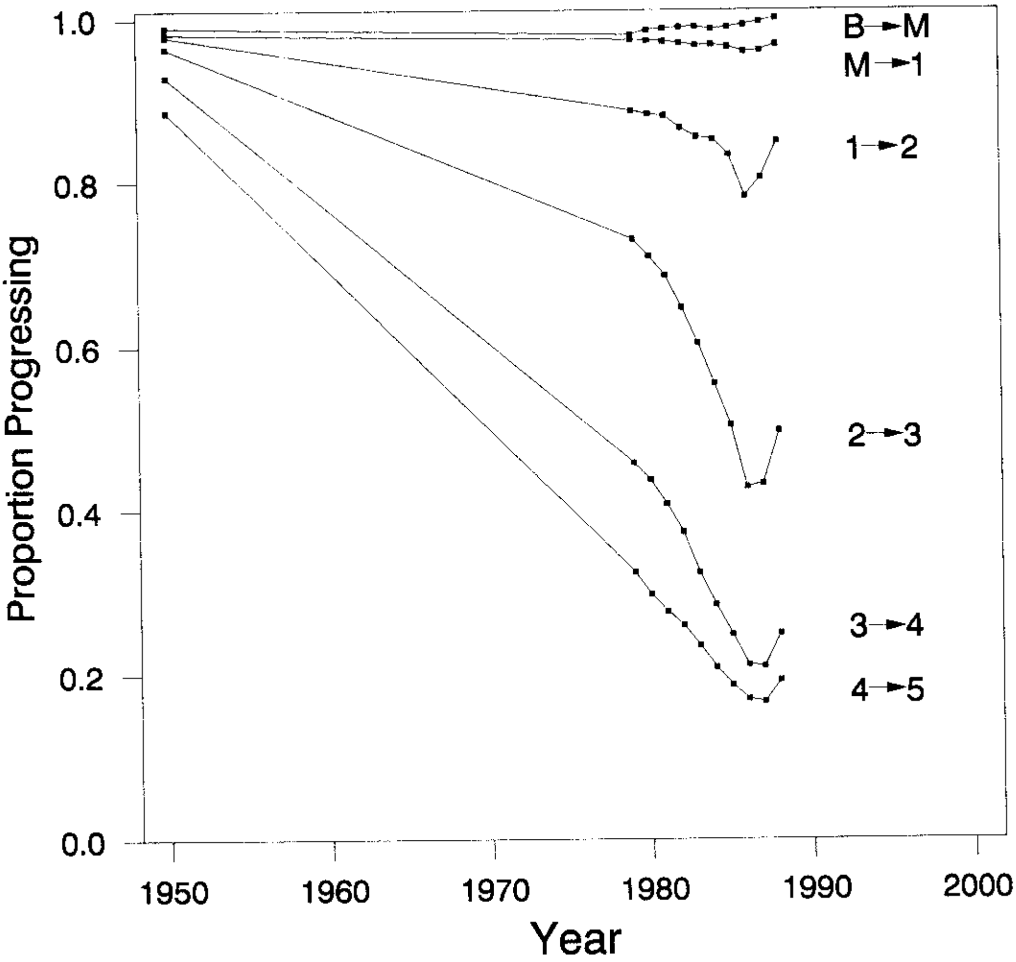
in 1977. This pattern is not observed in the two preceding Dragon Years, 1964 and 1952, perhaps because of the relatively low incidence of controlled fertility during these earlier years.

The parity progression measures given in Table 1 show only the last third of Taiwan's long term fertility decline. Year-by-year detail for earlier years is not available, but we can guess roughly what the parity progression ratios in 1950 and earlier years would have been by taking values from another population with a similar level of fertility. Values for China in 1965 (Feeney and Yu 1987, p. 81) are suitable for this purpose. They are broadly similar to values from a local area survey taken in 1953 (Tuan 1958, p. 46).

Figure 1 plots the parity progression measures in Table 1, together with the point for 1950. The result is a stylized but not unreasonable depiction of Taiwan's fertility decline in terms of parity progression. The series for progression from fifth to sixth birth and above are very close to the series for progression from fourth to fifth birth and therefore are not plotted.

Discussion

The most striking feature of the Taiwan progression ratios in Table 1 and Figure 1 is the high and unchanging level of marriage and motherhood. Roughly 99% of all women marry, and though this proportion is exceptionally high, it is broadly consistent with census data on marital status for Taiwan as well as for many other Asian countries (Smith 1980; updated in Xenos 1990). The real surprise is the absence of any decline in proportions ever



Source: Tables 1 and 2.

Figure 1. Period Parity Progression Ratios: Taiwan, 1979–1988

marrying, despite the rapid increase in age at marriage. Though there is no logically necessary connection between these two variables, the empirical correlation between them is well established (see for example Dixon 1971), and our discrepant finding requires explanation.

Errors in the data, of course, are one possibility. Underregistration of marriages would give values of proportions ever marrying that are too low, but several factors could bias the result in the opposite direction, including underenumeration of young women, single women reporting nonsingle marital status, and the reporting of second and higher-order marriages as first marriages. If the statistic of interest were the proportion of women who never marry, it would be prudent to allow for a substantial error. Our interest, however, is in proportions ever marrying, and even a gross understatement of proportions never marrying would not change the picture of high, and nearly constant entry into marriage.

How then can we reconcile the continued high proportions ever marrying, as indicated by the probabilities of first marriage, with the rapid increase in age at marriage? The answer lies in the very high levels of the probabilities of first marriage. In 1986, for example, the five highest first marriage probabilities occur at ages 27 to 31 and range from 0.27 to 0.45. These levels are so high that in a hypothetical cohort of single women covering only these five years of age, 89% would marry. When first marriage probabilities are so high, large numbers of single women may be married off in a very short time; thus even a very late age at marriage does not preclude a high proportion from ever marrying.

The proportions ever marrying shown in Table 1 do not merely remain high, however; they actually increase. The increase is not great—it cannot be great, in view of the high level at the beginning of the series— but why should it increase at all? The answer lies again in the empirical pattern of the probabilities of first marriage, which increase at older ages at the same time as they decrease at younger ages. The probability that a single women at age 30 will marry in the following year, for example, increased from 0.18 in 1979 to 0.43 in 1987. The increases at the older ages are more than enough to outweigh the decreases at younger ages.

The high incidence of motherhood places the population of Taiwan as a whole roughly on a par with the high-fertility Hutterites (Eaton and Mayer 1954, p. 20), among whom some 97% of all ever married women have at least one child and only 3% remain childless. The comparison with Hutterites suggests that the estimates err on the high side, but other evidence for China consistently suggests very high levels of motherhood. Data reported by Tuan (1958, p. 46) for a rural *hsien* in Taiwan in 1953 show that 96% of all women aged 45 to 64 are mothers. Data for China noted below indicate similar levels, a formidable consistency.

We expect errors of 1% or 2% on account of the indirect estimation procedure, and these may be compounded by the reporting of some higher-order births as first births. Here again, the significance of the error depends on the perspective. If we are concerned with the incidence of childless women in marriage, the 3% figure may well be low, despite the consistent empirical evidence, because adopted children are reported as natural. Even if the true proportion of childless women were double this figure, however, the corresponding proportion of women progressing to a first birth would be 94%, only 3% below the estimated values.

Comparative data for China show similarly high levels of marriage and motherhood. Annual period proportions of women ever marrying over the past three decades may be computed both from the 1982 one-per-thousand survey (Feeney and Yu 1987, p. 81) and from the 1987 one-per-hundred survey (Luther, Feeney, and Zhang 1990, p. 344). Both sources show a median level of more than 99%. Annual period parity progression ratios for progression from marriage to first birth over the same period show a median level of 98.4% from both the 1982 and the 1987 surveys. This value is almost certainly too high, despite the consistency between the two sources, and probably reflects the reporting of adopted children as natural. It is possible that the proportions ever marrying are overstated as well, though this point is less clear. In any case, even if the proportions never marrying or remaining childless are doubled or tripled, the progression ratios would remain very high.

Japan provides an interesting contrast; values are substantially lower but still high by Western standards. Marital status data from the Japanese censuses of 1920 through 1980 show proportions of women ever marrying as essentially constant at about 99% for cohorts reaching marriageable age from the late nineteenth century through about 1930. Proportions ever marrying then begin to decline, reaching 95% for cohorts reaching marriageable age during the 1950s. Indirect estimates of annual period proportions ever marrying from the early 1950s to the early 1980s show levels varying between 92% and 97% (Feeney and Saito 1985, p. 28). Proportions of women progressing from marriage to first birth actually rise over the course of the demographic transition, from a level of about 90% for women marrying early in this century to about 94% in the 1960s (Feeney 1990, p. 41).

Alternative Methods

There are two practical alternatives to the period parity progression ratios used here, one based on Whelpton's age-parity-specific birth probabilities and the other based on age-order-specific birth rates. For a succinct exposition of the Whelpton approach, see Feeney et al. (1989, p. 307–10), where it is applied to 1987 data for China. If fertility is high, Whelpton's approach is preferable because it controls for changes in parity progression ratios induced by changing age at childbearing. The effects of changing age at childbearing, however, are primarily on higher-order parity progression ratios, and when fertility is low these have almost no effect on the overall level of fertility because so few women reach high parities. In such a case, Henry's ([1953] 1980) approach is probably preferable on the grounds of its simplicity and relative ease of calculation.

Both approaches are clearly superior to the use of age-order-specific birth rates. As pointed out by Whelpton ([1954]1973, pp. 9–10), age-order-specific birth rates mismatch events to the exposure to risk because only parity i-1 women can have an i^{th} birth. Matching events to the exposure to risk is always a matter of degree, to be sure, and a deeper understanding of the difference between the two kinds of rates requires further analysis. Consider the case of progression to first birth. The age-specific first birth rate at age x may be expressed as the product of the corresponding probability and the proportion of women at age x who are zero parity,

$$b(x,1) = q(x,1)w(x,0), \qquad (2)$$

where $b(x,1)$ denotes the first birth rate at age x, $q(x,1)$ the probability of first birth for zero parity women aged x, and $w(x,0)$ the proportion of zero parity women at age x. Equation (2) is a tautology because $w(x,0)$ is the ratio of the denominators of $b(x,1)$ and $q(x,1)$. It shows that the age-order-specific birth rate $b(x,1)$ varies both with the risk of second birth, which describes the current fertility behavior of zero parity women, and with the proportion of zero-parity women, which reflects their past fertility behavior. In this sense, the rates of first birth $b(x,1)$ have both a period and a cohort aspect.

Changes in $b(x,1)$ accordingly may represent changes in population composition, represented by $w(x,0)$, as well as changes in current fertility behavior, represented by the probability $q(x,1)$. The relative importance of these two factors may be suggested by a simple scenario for increasing age at first birth. Suppose probabilities of first birth have been constant for the past several decades, so that the proportions of zero parity women at each age represent the operation of these probabilities; that the probabilities decline in some year, in correspondence to a shift toward later ages of childbearing; and that the new probabilities remain constant for several decades into the future.

The proportions $w(x,0)$ of zero-parity women immediately after the change reflect the operation of the old, higher probabilities and therefore are lower than the proportions that will result from the continuation of the new, lower probabilities. As the time passes, the proportions $w(x,0)$ will rise slowly as the proportions of zero-parity women at each age come into equilibrium with the new probabilities of first birth. Because the risks $q(x,1)$ are constant after the initial change, the rates $b(x,1)$ will rise as this new equilibrium is established. The age-specific rates of first birth therefore exaggerate the decline in risks of first birth for many years into the future.

The simulations reported in Feeney and Yu (1987, pp. 94–97, esp. Figure 8) suggest that the magnitude of the initial effect is several hundred percent and that about a decade is required for return to equilibrium. A decline in probabilities sufficient to reduce the proportion of women ever having a first birth from 95% to 90%, for example, reduces the total first birth rate (the sum of age-specific rates of first birth over all ages) from 95% to 75% in the first year, with recovery to 88% occurring only after ten years.

The situation in Taiwan during the 1980s suggests that these simulation results are broadly applicable. The first column of the first panel of Table 2 shows period proportions of women ever having a first birth calculated from the period parity progression ratios in Table 1 (as the product of progression from birth to first marriage and progression from first marriage to first birth). We see that some 96% of all women become mothers, with essentially no change over the decade.

The first column of the lower panel of Table 2 shows total first birth rates, defined as the sum over all ages of age-specific first birth rates. These statistics also may be interpreted as the proportion of women who ever become mothers, and although the interpretation is unexceptionable for first birth rates in a birth cohort, a change in age at childbearing may seriously distort values calculated from period first birth rates. Thus the parity progression ratios in Table 2 show progression to motherhood constant at about 96% during the 1980s, whereas the total first birth rates range from a low of 71% in 1987 to a high of 87% in 1981.

Table 2. Total Fertility Rates and Birth Order Components (per 1,000) Calculated from Parity Progression Ratios (PPR) and Age-Specific Birth Rates (ASBR): Taiwan, 1979–1988

		Birth Order				
Item	Year	1	2	3+	4+	TFR
PPR	1988	968	822	536	127	2326
	1987	957	770	417	84	2143
	1986	951	744	400	82	2095
	1985	954	795	524	123	2272
	1984	955	814	615	163	2384
	1983	958	819	703	208	2480
	1982	959	831	808	270	2597
	1981	961	846	903	323	2711
	1980	959	847	971	370	2777
	1979	954	846	1031	413	2831
ASBR	1988	736	674	435	112	1845
	1987	708	608	383	107	1698
	1986	709	566	394	120	1669
	1985	740	655	489	155	1884
	1984	782	700	568	192	2050
	1983	798	705	655	235	2158
	1982	853	724	746	286	2323
	1981	868	758	825	325	2451
	1980	852	762	898	376	2512
	1979	910	776	975	424	2661

Sources: Parity progression ratio (PPR) components calculated from Table 1. Age-specific birth rate (ASBR) components computed from age-order-specific birth rates given in the *Demographic Factbooks*, as follows: 1979–1985, 1985, Table 38, p. 720; 1986-1988, 1988, Table 39, p. 722. (See text for explanation.)

The Continuing Importance of Large Families

If some women have no children or only one child, the maintenance of replacement-level fertility requires that other women have three or more children. Feeney and Lutz (1990, Table 6) provide data for Japan and six low-fertility Western countries showing that third and higher-order births contribute between one-quarter and one-half child per woman to total fertility.

The numbered columns of Table 2 show the contribution of first, second, third and higher order and fourth and higher-order births to Taiwan's total fertility rate during the 1980s. The upper panel shows the contribution based on period parity progression ratios, the lower panel the same contribution figured from age-order-specific birth rates. We see that third and higher-order births contributed between 0.4 and 1.0 children per woman to the total fertility rate during 1979–1988. Interestingly, there is little difference between the parity progression ratio and age-specific birth rate calculations with respect to third and higher-order births.

To understand the importance of these relatively large families, consider that the conventional total fertility rate reached a low of 1.67 children per woman in 1986. If it were not for third and higher-order births, the rate would have been lower by 0.39 children per woman, or 1.28 children per woman, which would have made Taiwan's fertility rate one of the lowest in the world.

Is Fertility in Taiwan Below Replacement-Level?

The parity progression ratio results raise some doubt as to whether fertility in Taiwan has indeed fallen below replacement level. The birth order decomposition of the conventional total fertility rate in Table 2 (lower panel) shows that the below-replacement values in the 1980s are due largely to the low contributions of first and second births. The analysis given above suggests that these first and second birth rates are low because of increasing age at childbearing, however, rather than because of any behavioral shift toward childlessness or only children. The total fertility rates based on period parity progression ratios, shown in the upper panel, are for the most part at or above replacement level.

Lee (1990) reaches a similar conclusion about below-replacement fertility by different methods. Ryder showed how changing age at childbearing within birth cohorts affects period total fertility rates (1964, 1980, 1982, 1983; see also Foster 1990). Lee applies Ryder's demographic translation formula to Taiwan and concludes that changing age at childbearing during the 1980s pushed the conventional period total fertility rate 10% to 30% below what the author calls the "true" level of fertility (1990, p. 162).

Lee's result, together with the analysis of exposure to risk given above and the numerical comparison made in Table 2, suggests that basing period total fertility rates on birth probabilities rather than on age-specific rates may sharply attenuate the distorting effect of changes in age at childbearing. If this conclusion is borne out in further studies, it will have important implications for the analysis of recent fertility trends in many low-fertility countries.

Conclusion

Perhaps the most striking finding of this parity progression ratio study is the continuing high level of marriage and motherhood in Taiwan. Our results show that virtually all women marry and that there has been no change in this respect during the 1980s. Changing nuptiality, according to this analysis, has contributed essentially nothing to Taiwan's fertility decline. The decomposition analysis given in Chang et al. (1987, pp. 321-22), on the other hand, shows that 35% of the decline in the crude birth rate between 1961 and 1984 was due to changing nuptiality.

There is no contradiction here from a purely technical point of view. The conclusion that nuptiality plays a large role derives from declines in proportions ever married at younger ages. This change is important, and it strongly affects age-specific birth rates, but it does not imply a decline in proportions ultimately marrying. Female's probabilities of first marriage thus far have given no indication of such a decline.

Despite this formal consistency, the divergence between the two analyses is striking. Much attention has been devoted, for example, to the question of whether fertility decline in Taiwan will be accompanied by a transition to Western family forms (Freedman, Chang, and Sun 1982; Weinstein et al. 1990). The parity progression results show that in at least two important respects — the near universality of marriage and of childbearing — Taiwan remains sharply differentiated from Western experience, where nonmarriage and voluntary childlessness are much higher (Bloom and Pebley 1982).

Families of three or more children played an important role in maintaining Taiwan's fertility around replacement level during the 1980s. Because steady below-replacement fertility is likely to raise the same concerns in Taiwan as elsewhere (Davis, Bernstam, and Ricardo-Cambell 1986), it may be appropriate to direct a modicum of research and policy attention to these relatively large families. Although positive encouragement may not be in order, it would be prudent to be aware of, and perhaps to work to ameliorate, policies and conditions that militate against them. This argument, of course, will gain strength if fertility declines further.

A third conclusion is that fertility in Taiwan may not be below replacement level after all. Both the parity progression ratios and Lee's (1990) translation formula analysis suggest that the below-replacement levels of the conventional total fertility rate are due to shifts in the timing of childbearing rather than to a change in completed family size. In light of the long-term implications of below-replacement fertility, including the likelihood of pronatalist policies to counter it, a misjudgment on this point could have significant negative consequences.

A fourth conclusion concerns future fertility levels in Taiwan. The trend of the total fertility rates over the past four decades provides little evidence of leveling off in recent years. Even an optimistic linear extrapolation of the long-term trend brings fertility down to zero early in the next century. No one has suggested that this is a likely outcome, to be sure, but Westoff (1990) has criticized the view that the demographic transition ends when fertility falls to replacement level.

The parity progression ratios shown in Figure 1 provide useful perspective on this issue. In view of the constancy of progression to first birth, the progressions to higher-order births are evidently the key to short term fertility levels. They decline rapidly through 1986, level off in 1987, and rise sharply in 1988. The 1988 increase evidently is associated with the Dragon Year and likely will be temporary (1989 data are not yet available at this writing), but even if this element is taken into account, the last two years of the series, viewed together, clearly show a break in the decline. Granted, the two-year period is too short to provide any but the most tenuous indication that fertility in Taiwan may stabilize near recent levels. Even this modest evidence may be useful, however, if it forestalls undue concern about plummeting fertility rates.

In concluding, we consider the prospects for securing the data required for direct calculation of birth probabilities, period parity progression ratios, and other refined measures of marriage and fertility behavior. The situation in Taiwan in this respect does not differ materially from that in most developed countries. Vital registration data can make a useful contribution if birth certificates indicate date of first marriage and, for second and higher-order births, date of last birth. These data will provide information only for the future, however, and only when and if the necessary innovations are made in the vital registration system.

A more promising avenue for immediate results, and one that would provide valuable historical perspective, is the birth history reconstruction technique of Luther and Cho (1988; see also Luther et al. 1990), a recently developed extension of the own-children method (Cho, Retherford, and Choe 1986). This technique might be applied to a sample of the 1990 round census, and would yield retrospective birth histories that could shed much light both on Taiwan's historical fertility decline and on the structure of current and prospective fertility.

Notes

[1] The word "probability" has long been used to refer to life table $_nq_x$ values to distinguish them from age-specific death rates. By extension, "birth probability" has been used at least since Whelpton ([1954]1973) to refer to quotients that take a number of parity i women at age or duration x as their denominator and take the number of (i + 1)st births to these women over some subsequent age or duration interval as their numerator.

[2] For the total fertility rate series see Table 10, pp. 20–21 of the 1970 *Factbook* (1949–68), Table 77, pp. 934–35 of the 1978 *Factbook* (1969–78), and Table 79, pp. 1006–07 of the 1988 *Factbook* (1979–88).

[3] The standard birth probabilities for each progression are defined as follows. A base parity progression ratio p for progression from i^{th} to (i + 1)st birth is computed by dividing all (i + 1)st births during 1975–1988 by all i^{th} births during the same period. The standard probabilities for progression to (i + 1)st birth then are determined as those which would apply in a parity cohort in which p women go on to have an (i + 1)st birth, and in which the birth interval distribution for these women is defined by birth probabilities 0.005, 0.170, 0.335, 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, and 0.250, for completed years duration in parity 0, 1, . . . , 9, respectively. Initial open birth interval distributions are calculated as the stationary distribution of women defined by the standard birth probabilities and by the number of marriages or births in the first year of the observed series.

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