Stagnation in the Decline of the World Population Growth Rate During the 1980s

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The world human population growth rate after World War II passed through three phases: the rise in the 1950s and 1960s, the fall (though still at a positive level) in the 1970s, and the plateau in the 1980s. The rise was produced by the global decline in death rates, the fall was mainly due to the reduction of fertility in a number of developing countries, and the stagnation of growth rate decline was attributable to three major factors. First, substantial fertility declines started around 1970 and stalled around 1980 in both China and India. Second, the age structure of population changed in favor of higher birth rates. Third, although fertility started to decline significantly around 1970 mainly in East Asia, Southeast Asia, and Latin America, few countries have begun fertility declines since then. Many countries in sub-Saharan Africa and South Asia have not started substantial fertility reductions, deepening the gap between developing countries that are moving to lower fertility levels and those that are left behind.

The world's population has more than doubled in the last four decades, from 2.5 billion in 1950 to 5.3 billion in 1990, according to the latest United Nations estimates (*1*). The population growth during the 40 years, however, was not constant. The estimated annual rate of growth increased from 1.79% in 1950 to 1955 to 2.06% in 1965 to 1970, decreased to 1.73% in 1975 to 1980, and then remained almost unchanged at that level throughout the 1980s (Fig. 1). Therefore, three phases of world population growth during the postwar period can be identified: (i) the rising growth rate in the 1950s and 1960s, (ii) the falling (though still positive) growth rate in the 1970s, and (iii) the leveling off of the growth rate in the 1980s (*1*).

The growth rate decline in the 1970s suggests that global efforts directed toward promoting fertility control were producing results. The total number of births per year in the world is estimated to have decreased slightly from 122.4 million in 1970 to 1975 to 120.7 million in 1975 to 1980 (*1*). The news provided some relief to the fear of overpopulating the earth. The decline, nevertheless, stalled around 1980, and no strong indication of its resumption has so far been seen. Whether the growth rate continues to fall or remains constant makes a considerable difference in the long run: the world population would have reached zero growth at 6.7 billion in 2030 if the growth rate decline in the 1970s had not stalled in the 1980s and continued linearly; the world population, however, will increase to 10.7 billion in 2030 if the growth rate stays on the current plateau.

Why has the decline of the world population growth rate unexpectedly stagnated in the 1980s? I will investigate this global growth rate trend in terms of demographic changes in different groups of countries. The primary source of data is the 1990 Revision of Global Demographic Estimates and Projections by the United Nations Population Division (*1*, *2*). The data set contains demographic estimates of all countries in the world for the same periods since 1950. Population by sex and age is given for midyears of multiples of five (1950, 1955, and so forth), and growth rates, birth rates, and death rates are given for 5-year periods between those midyears (1950 to 1955, 1955 to 1960, and so forth) (*3*).

The study period covers 1950 to 1985 and the 1985 to 1990 period is excluded from the analysis. Available demographic data for the late 1980s are still seriously limited, particularly in a number of developing countries where vital registration is incomplete and demographic surveys are infrequent. United Nations (U.N.) estimates for 1985 to 1990 should be interpreted as a mixture of estimates and projections. The latest data for China used in the U.N. 1990 Revision, for example, are the 1988 Fertility and Family Planning Survey, and those for India are the 1987 Sample Registration System records.

Differential Growth Rate Trends

In order to compare the growth rate trends of different countries, the U.N. has grouped them according to timing of fertility declines (*4*). It classifies countries into three categories: (i) pre-transition countries, which have not started or are at early stages of fertility declines, (ii) late-transition countries, which began significant fertility declines after 1950; and (iii) early-transition countries, which started significant fertility declines before 1950. These three groups comprise 67, 46, and 37 countries, respectively.

The pre-transition group includes most countries in sub-Saharan Africa and a number of countries in South Asia (excluding India); late-transition countries, which include China and India, lie predominantly in East and Southeast Asia and Latin America; and early-transition countries consist mostly of developed countries in Europe and North America. West Asia (the Middle East) and North Africa are highly mixed regions of pre-transition and late-transition countries. The three groups constituted 17, 60, and 23%, respectively, of the world population in 1990.

The three groups have followed very different courses of population growth (Fig. 1). The growth rate was highest in pre-transition countries and kept rising from 2.10% in 1950 to 1955 to 3.08% in 1980 to 1985. In contrast, the growth rate was lowest in early-transition countries and continued to fall from 1.30% in 1950 to 1955 to 0.68% in 1980 to 1985. Located between the two are late-transition countries, for which the growth rate rose from 2.02% in 1950 to 1955 to 2.52% in 1965 to 1970, fell steeply to 1.88% in 1975 to 1980, and then declined only slightly to 1.83% in 1980 to 1985. The shape of the growth rate trajectory of the world is similar to that of

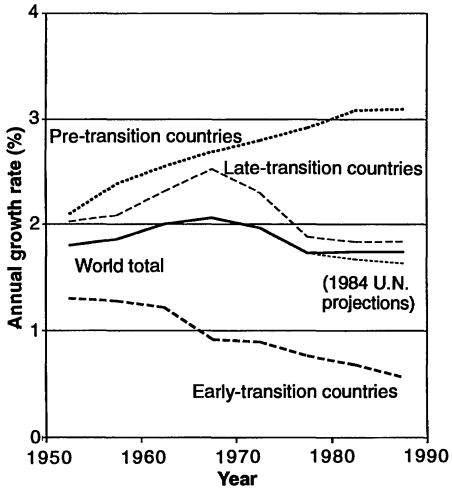

Fig. 1. Global trends in the annual rate of population growth, 1950 to 1990. For the world total, latest estimates from the U.N. 1990 Revision (solid line) and earlier projections from the U.N. 1984 Revision (dotted line branching out of the solid line) are presented.

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late-transition countries, though the global curve is flatter and lower.

Trends in Birth and Death Rates

The growth rate of the world population is the difference between the crude birth rate (CBR) and the crude death rate (CDR). The CBR and CDR are the annual numbers of births and deaths, respectively, per 1000 people. Although the CBR and CDR for the world total have been decreasing, their decrements have changed in different ways (Fig. 2). The CBR declined slowly from 37.5 per 1000 in 1950 to 1955 to 33.9 in 1965 to 1970. The decline then accelerated to 31.5 in 1970 to 1975 and 28.3 in 1975 to 1980 but decelerated to 27.6 in 1980 to 1985. The CDR fell from 19.7 in 1950 to 1955 to 10.4 in 1980 to 1985, and unlike the CBR trend the CDR decline continuously decelerated. There seem to be three major reasons for the deceleration of the CDR reduction: (i) each age-specific death rate is not likely to keep falling linearly because it is bounded by zero, (ii) developing countries with relatively high mortality levels tend to have high growth rates and increasing shares of the world population, and (iii) the proportion of older people in the world population has been rising.

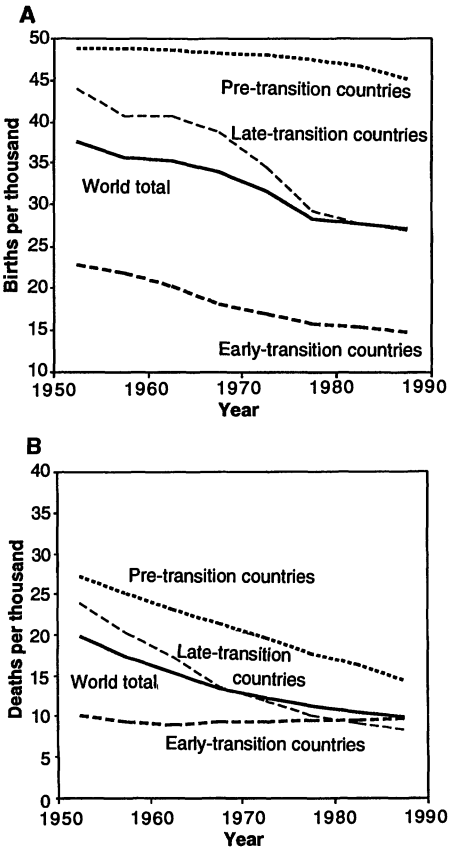

Fig. 2. Global trends in (**A**) the crude birth rate and (**B**) the crude death rate, 1950 to 1990.

The different timing of acceleration and deceleration of the CBR and CDR declines resulted in three distinct phases of the world population growth. The 1950s and 1960s are marked by the combination of a slow decline in CBR and a rapid decline in CDR, which kept the growth rate rising. Then the accelerated CBR decline and decelerated CDR decline made the growth rate fall in the 1970s. This trend was followed by the slow decline of both the CBR and the CDR in the 1980s and the leveling off of the growth rate.

The different courses of population growth in the three groups of countries resulted from different trends in CBR and CDR (Fig. 2). The slow CBR decline and the fast CDR decline in pre-transition countries kept the growth rate rising. In contrast, the CBR decreased substantially but the CDR changed little in early-transition countries, leading to a falling growth rate. In late-transition countries the decline in CBR accelerated around 1970 and decelerated around 1980, and the decline in CDR continued to decelerate, resulting in a growth rate trajectory comparable to that of the world total (5). All of these CBR and CDR trends seem consistent with a typical demographic transition: when a population shifts from high to low levels of mortality and fertility, the start of a significant decline of mortality usually precedes that of fertility. The typical pattern, however, does not explain the sudden decelerated decline of the CBR around 1980 in late-transition countries.

Decomposing Growth Rate Changes

In order to identify factors behind the stagnated growth rate decline, the rate change in each of the three phases is decomposed in two steps using Kitagawa's method (*6*, *7*). First, a change in the world population growth rate is the difference between the CBR change and CDR change. The CBR and CDR reflect levels of fertility and mortality, but they are also affected by the age structure of population. The most popular measure of fertility independent of the age structure is the total fertility rate (TFR), the expected number of births by a woman surviving to the end of the childbearing period. Thus, the change in the CBR is divided further into fertility change and age structure change by expressing the CBR as the product of the TFR and the ratio of CBR to TFR and then applying the Kitagawa equation to them. The CBR/TFR ratio has been proven to indicate age structure effects on the CBR (8). The change in CDR, on the other hand, is not decomposed into mortality change and age structure change in this analysis because decomposition of the CDR change is more complicated than that of the CBR change (9) and because there seems to be no strong reason to expect a substantial impact of age structure through the CDR on the stagnated decline of the growth rate.

The second step is decomposition of global changes in the TFR, CBR/TFR ratio, and CDR into the corresponding changes in pre-transition, late-transition, and early-transition countries. China and India, the world's two most populous countries, are further distinguished among the late-transition countries because of their strong impacts on the world population. Because the global change in each of the three demographic variables is a weighted sum of the corresponding changes in the five country groups (pre-transition countries, China, India, other late-transition countries, and early-transition countries), changes in the distribution of the weighting factor must be included as a special component of the global change.

Growth rate changes are analyzed for three periods in Table 1 (*10*): between 1950 to 1955 and 1965 to 1970, 1965 to 1970 and 1975 to 1980, and 1975 to 1980 and 1980 to 1985, or phases 1, 2, and 3, respectively. The length of the three study periods varies. To make growth rate changes in those three phases comparable, the average annual change of annual growth rate is calculated for each phase. Since this tends to be a small figure, the growth rate is expressed hereafter as the annual increment of population per 10,000 instead of the conventional percentage.

The rise of the world population growth rate in phase 1 was produced by the CDR decline, and the sharp drop of the growth rate in phase 2 was due to the TFR reduction. The average annual change of the growth rate was 1.79 in phase 1, with a CDR effect of 4.25. In phase 2, the global growth rate decreased by 3.26 annually, influenced by the downward TFR effect of −7.49. Positive CDR effects in phase 1 and negative TFR effects in phase 2 affected all of the five country groups.

Phase 3 exhibits a very different profile from those of the first two. On the global level, the downward pressure of TFR reduction on the growth rate (−3.60) was almost canceled out by the upward pressure of age structure change (2.16) and that of the CDR decline (1.38). A closer examination of the results on the country-group level reveals that there are three major causes of the stagnation of the growth rate decline.

Stalled Fertility Decline in China and India

The most striking difference between phase 2 and phase 3 is found in the TFR effect. On the global level it rose from −7.49 in phase 2 to −3.60 in phase 3, which implies that the fertility decline slowed down, exerting less downward pressure on the growth rate. The negative impact of the TFR change on the growth rate weakened from phase 2 to phase 3 in all of the five country groups except in pre-transition countries. The attenuation is most pronounced for China, with India a distant second.

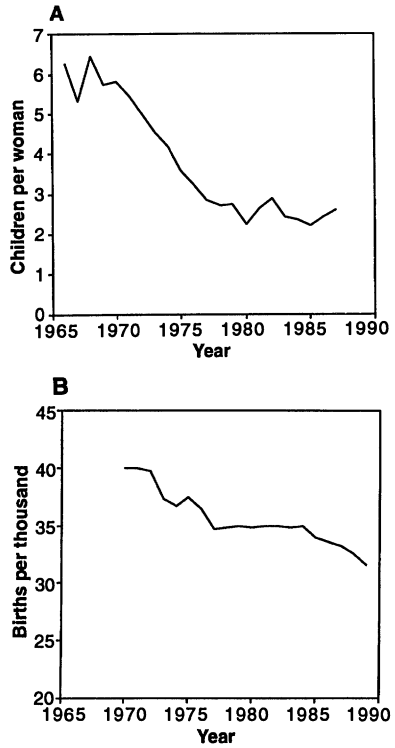

Fig. 3. Fertility trends in China and India. (**A**) Total fertility rate for China (mainland), 1966 to 1987, according to (*11*). (**B**) Crude birth rate for India, 1970 to 1989, according to Sample Registration System data adjusted for underregistration (*14*).

Both China and India started significant fertility declines around 1970. China's TFR remained above 6.0 children per woman in the mid-1960s except 1967, then fell steeply from 6.45 in 1968 to 2.24 in 1980. After the spectacular decline in the 1970s, however, the TFR kept fluctuating around 2.5 during the 1980s (Fig. 3A) (*11*). The fertility reduction was more modest in India during the 1970s than in China. Various estimates indicate that the TFR was around 6.0 in the 1950s and 1960s and fell from about 5.7 to 5.8 between 1966 and 1971 to about 4.7 to 4.8 between 1976 and 1981 (*12, 13*). The annual series of CBR estimates from the Sample Registration System reflects the fertility decline: the CBR, adjusted for estimated underregistration, fell from 40 births per 1000 in 1971 to 35 in 1977 (*14*). The decline stalled, however, as the adjusted CBR remained between 34 and 35 from 1977 to 1984 and then began to fall again after 1985 (Fig. 3B).

Studies on causes of the stagnation in the fertility decline in China suggest that many people still want to marry at young ages (*15*) and have two or more children (*16, 17*), leading to the relaxation of the government's one-child policy (*18, 19*). In India, family planning programs slackened after the 1977 election defeat of the National Congress Party, which was criticized as promoting birth control too strongly (*20, 21*). Perhaps the progress of family planning programs in China and India during the 1970s outpaced the increase in people's demands for fertility control.

Age Structure Changes

The effect of the CBR/TFR ratio on the growth rate indicates the intensity of upward or downward pressure exerted by age structure changes on the CBR and, in turn, on the growth rate. On the global level the effect changed its direction from −1.84 in phase 1 to 1.92 in phase 2 and then increased slightly to 2.16 in phase 3. The small difference in the size of the CBR/TFR ratio effect between phases 2 and 3 does not necessarily indicate that the age composition was not a major cause of the stagnation. A constant effect of the CBR/TFR ratio does not mean that the age structure remains unchanged; it implies that the age structure keeps changing in the same direction at the same pace. The age distribution of the world population changed in phase 2 in favor of higher growth rates; in phase 3, it continued to press the growth rate upward. Had the age composition remained constant in phase 3 then the CBR/TFR ratio effect would have been zero, allowing the world population growth rate to fall in the 1980s.

All of the five country groups exhibited similar trends in the CBR/TFR ratio effect: negative in phase 1 to positive in phase 3. The reversal could be understood in the context of the global population dynamics of the 1950s and 1960s, which are marked by the so-called "baby boom" and "population explosion." The "baby boom" occurred when the postwar fertility level rose in developed countries, and the "population explosion" was due mainly to the rapid increase in child population produced by the substantial decline of infant and child mortality in developing countries. Together they resulted in the accelerated growth of child population in the world (*22*). This led to a low CBR relative to the given level of fertility because the increase in the proportion of child population squeezed the proportion of population in the other age groups, including those at childbearing ages.

The direction of the age structure effect was reversed later as the large generation born in the 1950s and 1960s began to enter peak childbearing ages. Intercensal age-specific growth rates for Brazil and the United States in Fig. 4 illustrate that age patterns of population growth shifted with cohorts. In addition, a number of countries experienced significant fertility declines, which reduced

Table 1. Decomposition of the average annual change in the annual growth rate (per 10,000) of the world population. The decomposition is not exact because of some data problems (*10*). If the decomposition were exact, the average annual change during phase 1 (1.79), for example, would equal the sum of the three components for the world total (−0.54, −1.84, and +4.25), or 1.87.

Period	Phase 1 (average = 1.79)			Phase 2 (average = −3.26)			Phase 3 (average = 0.08)		
	TFR effect	CBR/TFR effect	CDR effect	TFR effect	CBR/TFR effect	CDR effect	TFR effect	CBR/TFR effect	CDR effect
World total	−0.54	−1.84	4.25	−7.49	1.92	2.23	−3.60	2.16	1.38
Pre-transition countries	0.13	−0.19	0.53	−0.06	−0.07	0.53	−0.38	0.18	0.46
Late-transition countries	−0.74	−1.16	3.76	−7.36	1.79	1.96	−3.46	1.60	1.18
China	−0.25	−0.75	2.08	−4.75	1.21	0.83	−1.82	0.74	0.22
India	−0.19	−0.18	0.73	−0.92	0.10	0.55	−0.18	0.18	0.38
Others	−0.29	−0.23	0.95	−1.69	0.48	0.59	−1.46	0.68	0.58
Early-transition countries	−0.64	−0.37	0.19	−0.88	0.21	−0.05	−0.44	0.24	−0.10
Weighting factor changes	0.69	−0.11	−0.25	0.79	0.02	−0.18	0.72	0.12	−0.20

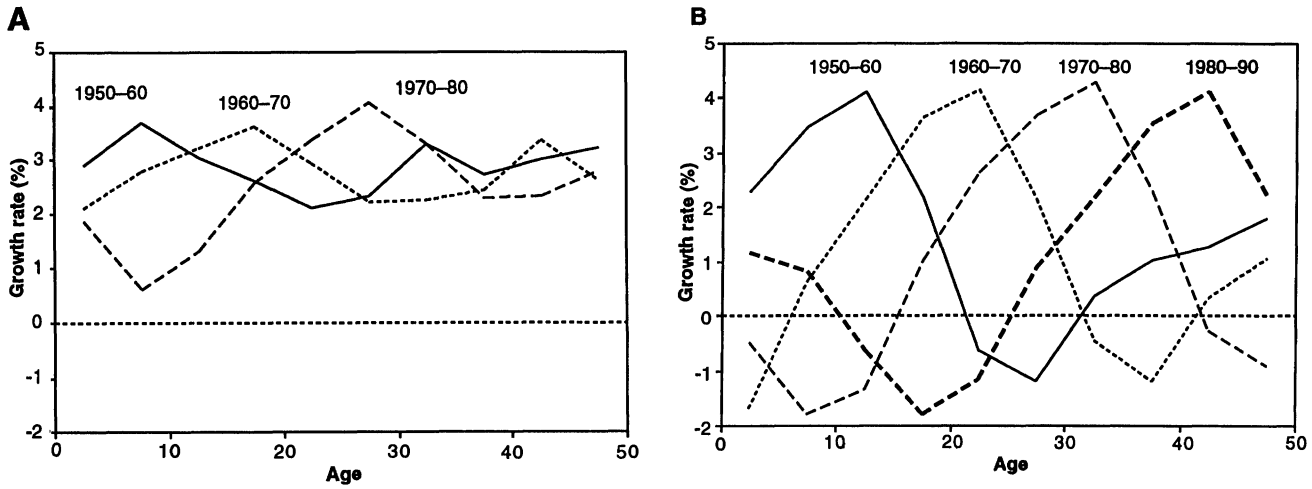

Fig. 4. Intercensal growth rates by age for (**A**) Brazil and (**B**) the United States. Calculated from data in (*28*).

the proportion of population in childhood and increased further the proportion of the population at childbearing ages.

Few Recent Starts of Fertility Declines

An increasing number of developing countries are undergoing fertility declines. It is expected, therefore, that the late-transition group (excluding China and India) would have exerted a stronger downward pressure on the growth rate in more recent periods. However, its negative TFR effect weakened slightly from −1.69 in phase 2 to −1.46 in phase 3. The attenuation can hardly be explained by stagnated fertility declines, since fertility has been falling in many populous late-transition countries such as Brazil, Egypt, Indonesia, Korea, Mexico, and Thailand without substantial slowdown as observed in China and India. The slight diminution of the negative TFR effect, therefore, seems to suggest that the number of countries with declining fertility might not have increased significantly in recent years.

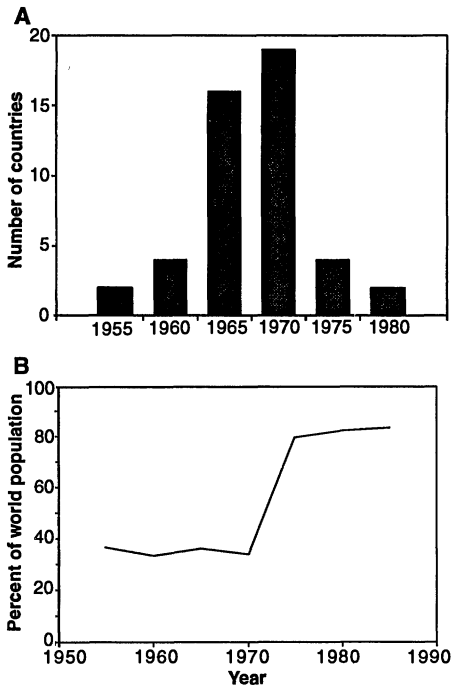

Fig. 5. Concentration of fertility decline initiations around 1970 shown in (**A**) distribution of late-transition countries according to the time of first TFR decline between two successive 5-year periods that is greater than 0.5 (year indications are approximate) and (**B**) proportion of the world population living in countries with TFR under 5.5. In both (A) and (B) declines for temporary reasons such as famine and war are excluded. In (B) countries are classified according to the estimated average TFR in the preceding 5-year period.

To examine this possibility, two kinds of analyses are conducted. In one, the first time the average TFR falls by 0.5 or more between two successive 5-year periods is identified for each late-transition country and the midpoint of the 10 years is used as a proxy for the start of significant fertility decline. The number of countries in which significant fertility declines began in the last few decades is not evenly distributed over time (Fig. 5A). More than three-quarters of the starts of significant fertility declines after 1950 are concentrated in the period centered around 1965 to 1970.

Second, a certain value of TFR can be selected so that countries with TFRs below this number are recognized as having already started significant fertility declines. Thus, 5.5 is selected because some countries had TFRs slightly below 6.0 before the introduction of family planning programs. Figure 5B shows that the proportion of the world population living in countries with TFRs below 5.5 fluctuated between 30 and 40% in the 1950s and 1960s and then suddenly leaped from 33.8% in 1970 to 79.5% in 1975. The rise then leveled off to 82.3% in 1980 and 83.3% in 1985. Thus a large proportion of the world population fell below a TFR of 5.5 between 1970 and 1975. Out of the increase of 45.7 percentage points from 1970 to 1975, 36.6 points are due to China and India.

Evidently fertility started to decline in many developing countries around 1970. After this wave, however, significant fertility declines started in only a few countries, leaving 67 countries still in the pre-transition category. This suggests a widening gap between developing countries that are relatively ahead in the demographic transition and those that are relatively behind.

The lack of another wave may be related to socioeconomic development and family planning programs, the two major determinants of fertility decline on the national level (*23*). First, the demographic gap seems to overlap with a growing gap in economic development: most countries classified as "least developed countries" by the U.N. General Assembly (*24*) are pre-transition countries that failed to achieve substantial economic growth during the 1980s. The World Bank reports that the annual growth rate of per capita gross domestic product in 1980 to 1989 varied widely among developing countries, ranging from 6.7% for East Asia to −2.2% for sub-Saharan Africa (*25*). Second, the expansion of family planning programs in very poor countries during the 1980s was limited by the slowdown of international population assistance. The total bilateral and multilateral population assistance, adjusted for inflation, grew by 4.6 times from the 1960s to the 1970s but increased by only 16% from the 1970s to the 1980s; in particular, assistance by the United States decreased by 10% from the 1970s to the 1980s (*26*).

Concluding Remarks

Three major questions arise from the above findings. First, what would the world pop-

ulation growth rate have been without the three factors that led to stagnation? The latest U.N. estimate of the actual rate is 1.74% for 1980 to 1985. Projections under some hypothetical scenarios indicate that the growth rate for this period would have been: (i) 1.65% if fertility declines in China and India had continued and if the TFR had fallen to 2.1 in China and 4.3 in India during the same time; (ii) 1.63% if the CBR/TFR ratio for 1980 to 1985 had remained unchanged from that of 1975 to 1980; (iii) 1.60% if the pre-transition countries had achieved the same TFR in 1980 to 1985 as that of late-transition countries (excluding China and India) in 1970 to 1975; and (iv) 1.40% if there had been a combination of all these conditions.

Second, has the stagnation of population growth rate in the early 1980s continued up to the present? The definite answer depends on the results of the 1990 round of censuses; it may take several years for some developing countries to publish their census results. Information available at present seems to suggest continued stagnation. The 1990 National Sample Survey on Population Change in China, Sample Registration System data in India up to 1989, and provisional results of total counts of the 1990 census of China and the 1991 census of India suggest that the TFR in China remained around 2.5 and that fertility in India began to decline slowly in the late 1980s. Also, it is almost certain that the age structure added to the world population growth rate. Women at peak reproductive ages of 20 to 35 in 1990 were born from 1955 to 1970, a period of rapid population growth of young children. Furthermore, there has been no indication so far of a new wave of significant fertility declines in the late 1980s. For example, population surveys conducted in 12 sub-Saharan African countries during the late 1990s by the Demographic and Health Surveys Program show persistently high fertility and low contraceptive use in most of those countries (*27*).

Finally, what are the prospective impacts on world population growth of the three factors behind stagnation? The clearest answer could be given for the age structure effect, which will soon be reversed again as people born during the 1950s and 1960s leave peak childbearing ages and are replaced by the cohorts of the 1970s. On the other hand, it is extremely difficult to predict when fertility declines will resume in China, accelerate in India, and begin in pre-transition countries. Considering the geographical distribution of pre-transition countries and the substantially greater room for fertility reduction in India than in China, the present analysis underscores the importance of socioeconomic development and family planning programs in sub-Saharan Africa and South Asia for the future trajectory of world population growth.

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3. The decomposition results (Table 1) must be viewed with caution because U.N. estimates are based on data at different levels of accuracy: (i) the U.N. accepts official data from most developed countries as sufficiently accurate; (ii) data from many developing countries are evaluated and corrected by various methods of indirect estimation; (iii) some developing countries lack data, particularly for early periods, and estimates for those periods are based on demographic models, conditions of the countries, data from neighboring countries, and the compatibility of the estimated early trends with recent data. The estimates that fall in the third category, however, are relatively few and are believed to be the best available educated guesses. It is thus expected that U.N. estimates on the global and large country-group levels are sufficiently accurate for the present analysis: although the numerical precision of the results may be questionable, their overall pattern is likely to be valid.
4. *World Population Monitoring 1991* (United Nations, New York, 1992).
5. The sharp drop in CBR between 1950 to 1955 and 1955 to 1960 is due to the 1958 to 1961 famine in China.
6. E. Kitagawa, *J. Am. Stat. Assoc.* **50**, 1168 (1955).
7. Kitagawa's decomposition method has two versions, one with interaction terms and the other without them. The latter is adopted here since interaction terms are likely to introduce unnecessary complexities to our results.
8. S. Horiuchi, *Popul. Bull. U.N.* **30**, 106 (1991).
9. The U.N. data set includes the expectation of life at birth (e_0). The inverse $1/e_0$ is a measure of overall mortality level independent of the age structure. It may be possible to interpret the ratio of the observed CDR to the inverse of e_0 as a measure of age structure effects on the CDR. The interpretation, however, is not as straightforward as the interpretation of the CBR/TFR ratio as a measure of age structure effects on the CBR.
10. Two kinds of data problems introduce minor discrepancies in Table 1. First, problems of international migration estimates make the sum effects of the TFR, CBR/TFR ratio, and CDR for the world total slightly different from the global growth rate change. Because data on international migration are lacking or inaccurate in many countries, U.N. estimates of net migration (the difference between immigrants and emigrants) for all countries in the world do not necessarily add up to zero, causing a minor disagreement between the global growth rate and the rate of net increase (the difference between the CBR and CDR). Second, countries with very small population sizes introduce a slight difference between the TFR, CBR/TFR, or CDR effect for the world on the one hand and the total of corresponding effects for the five country groups and the effect of weighting factor changes on the other. U.N. estimates of vital rates are not available for countries with population sizes under 300,000. Although the five country groups include none of them, U.N. estimates of vital rates for the world total include those smallest populations by assigning them average vital rates of the respective regions to which they belong. Discrepancies produced by these two data problems, however, remain very small.
11. TFRs for 1968 to 1981 are from *Analysis of China's One-per-Thousand Population Fertility Survey* (China Population Information Center, Beijing, 1984) and TFRs for 1982 to 1987 are from Li Bohua [*Asia-Pac. Popul. J.* **5**, 3 (June 1990)].
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