Population tradeoffs in China

JAMES W. VAUPEL[1] & ZENG YI[2]

[1]*Center for Population Analysis and Policy. Humphrey Institute of Public Affairs. University of Minnesota, Minneapolis, MN 55455, U.S.A.;* [2]*Institute of Population Research, Peking University, Beijing 100871, China*

Abstract. China's population of 1.1 billion is growing. China's population is also aging: the elderly may number 300 to 400 million by 2050. Efforts to reduce the population growth will increase the proportion elderly. To increase the size of the work force, a substantial delay in the age of retirement may be necessary. To reduce the number of births, some judicious mix of delayed childbearing and lower fertility will be required. The population policy choices made in China will determine the future size, age composition, employment structure, and family patterns of a population that currently includes more than a fifth of the world's people.

Introduction

Chinese policymakers are confronted with three difficult tradeoffs of one future population characteristic against another.
- By influencing the number of births, they can choose a smaller, older population or a larger, younger one.
- By altering the age of retirement, they can determine the size and average age of the working-age and retired populations. A later age of retirement will yield a larger and older working-age population and a smaller and older retired population.
- To reduce annual birth rates, they can encourage couples to have fewer children or to wait to older ages.

All three of these tradeoffs are between size (of the total population, the working-age and retired populations, or families) and aging (of the total population, the working-age and retired populations, or parents). The policy choices made will determine the future magnitude, age composition, employment structure, and family patterns of a population now numbering more than 1.1 billion, over fifth of the global total. The resulting demography of China will have major economic, political, social, and environmental impacts on China and the world.

There are no easy or quick solutions to the population tradeoffs, only compromises. If China's rapid population growth is to be reversed, the proportion of the population that is elderly will increase. If the proportion of the population that is retired is to be kept to manageable levels, the age of retirement will have to be substantially raised. If couples are permitted to have an average of

two children, slower population growth will require a radical delay in the age of childbearing.

Population growth since the revolution

The so-called theory of human hands – more people produce more and therefore there are no problems of over-population under a socialist system – governed China's population policy from the revolution in 1949 to the end of the 1960's. A few government leaders promoted use of contraceptives for health reasons; Premier Zhou Enlai, for example, endorsed birth control in 1956. In the political movement against rightists in 1957 and the Great Leap Forward in 1958, however, Chinese social scientists who warned against the potential economic problems of continued rapid population growth were criticized. Chief among them was professor Ma Yinchu, who was removed from his position as president of Peking University and was not rehabilitated until 1979. High fertility rates in the 1950's and 1960's and a rapid reduction in mortality rates resulted in population growth rates of two to three percent per year. China's population, which was 583 million in 1953, reached 705 million in 1964 and 830 million in 1970.

Starting in the early 1970's, an efficient family planning program was implemented. The total fertility rate dropped from nearly 6 children per woman in the 1950's and 1960's to about two and half children per woman today. The mainland Chinese population continued, however, to grow, expanding to more than 1.16 billion by July 1990. Currently, about 15 million persons per year are added to the population and the annual rate of increase is about 1.4 percent.

The children who were born in China's baby boom in the 1950's and 1960's have now reached childbearing ages. The number of women 15 to 49 years old increased from 269 million in 1984 to about 310 million in 1990 and is projected to further increase to 339 million by the turn of the century. This growth has resulted in a baby boom echo that will last for about 10 more years.[1]

Population aging

The elderly, from now until the middle of the next century, have already been born. In and out migration is insignificant in China and likely to remain so into the next century. Hence, if any particular mortality projection is adopted, the population over age 65 in China can be calculated for the next 65 years.

Projections are presented in this article for three scenarios of high, moderate, and low mortality (Table 1). Under the pessimistic scenario, mortality rates remain at their levels in 1981. Under the moderate scenario, mortality rates gradually decline to levels in 2050 that are comparable to levels already

Table 1. Life Expectancy at Birth in China under Alternative Mortality Assumptions.

Year		High mortality		Moderate mortality		Low mortality	
		Male	Female	Male	Female	Male	Female
1981	rural	65.8	68.6	65.8	68.6	65.8	68.6
	urban	69.3	73.0	69.3	73.0	69.3	73.0
	total	66.5	69.5	66.5	69.5	66.5	69.5
2000	rural	65.8	68.6	69.0	72.0	71.0	74.0
	urban	69.3	73.0	72.0	76.0	74.0	78.0
	total	67.6	70.8	70.5	74.0	72.5	76.0
2050	rural	65.8	68.6	75.0	77.5	79.4	85.6
	urban	69.3	73.0	78.0	81.0	81.9	89.1
	total	68.6	72.1	77.4	80.3	81.4	88.4

Note: Although no changes in rural and urban mortality are assumed in the constant mortality scenario, total life expectancy changes over time because the urban proportion of the population increases. We assumed that the proportion of the population that lives in urban areas would increase from the 1986 level of 36.9 percent to 40 percent in 1990, 50 percent in 2000, 65 percent in 2020, and 80 percent in 2050; a justification of this assumption is given in Zeng and Vaupel (1989). The medium mortality assumption is more or less the same as that used in many other projections by Chinese demographers; the underlying assumption is that there will be slow progress in reducing mortality rates in the next century. However, some recent research indicates that there might be a significant improvement in mortality in the next century, because of better personal health practices and biomedical advances. Ogawa (1988) presents a projection of mortality improvement that we adopt for the low mortality scenario.

attained in Japan. Finally, under the optimistic scenario, life expectancy approaches 85 years by 2050, a level that is thought by some gerontologists to represent the limit toward which human life expectancy is tending. The scourges of war, epidemic, and famine could push mortality rates far above the pessimistic projection; biomedical advances could increase life expectancy beyond 85 years. Nonetheless, the three scenarios bracket an informative range of possibilities.

Even when mortality rates remain unchanged, the elderly population multiplies several fold (Table 2). The population above age 65 in 2050 would be almost four times larger than in 1987. There were just under 2 million of the oldest-old, age 85 and older, in China in 1987: their number would expand by a factor of 8. This substantial growth is due in part to past growth in the size of successive birth cohorts and in part to the momentum of mortality progress: mortality rates are lower today than they were in the past, so children today have better chances of surviving to older ages.

Under the moderate mortality scenario, the number of the elderly increases 5 fold by 2050; under the optimistic scenario the growth is by a factor of almost 7. These dramatic changes look modest, however, in comparison with the explosion in the number of the oldest old: the nearly 50 or even 90

Table 2. Number of People in China Who are Over Age 65 and Over Age 85 in Selected Years under the Constant, Moderate and Low Mortality Assumptions Described in Table 1 (in Millions).

Year	High mortality		Moderate mortality		Low mortality	
	# 65+	# 85+	# 65+	# 85+	# 65+	# 85+
1987	59	2	59	2	59	2
2010	101	5	116	9	126	12
2030	183	8	232	18	263	30
2050	219	16	330	49	401	86

million elders 85 and older in 2050 are 25 or 45 times more numerous than in 1987.

The rapid aging of the Chinese population is attracting increasing attention, from both scholars and policymakers (Zeng, Zhang and Peng, 1990). China's National Committee on Aging was created in 1982 for coordinating activities related to the problems of aging. Special surveys on aging at the national level[2] and the local level[3] have been conducted, and several academic meetings on population aging have been organized.[4] Various studies show that although the proportion elderly is not very high at the moment (5.5 percent in 1987), the pace of the aging process will be very rapid (Banister, 1986; Wu, 1988; Zeng, 1989).

In Western countries, the on-going aging transition will be spread over one or two centuries; in China changes of similar magnitude will occur within a few decades. Although China has a GNP per capita that is lower than in many developing countries, the average age of its population and the proportion elderly will reach more or less the same levels as in the developed countries before the middle of the next century. Japan is regarded as a country with an extraordinarily rapid process of aging, but the aging of the Chinese population is likely to proceed even faster (Feeny, 1988; Ogawa, 1988).

The tradeoff of population growth versus aging

Chinese policymakers are constrained by the multiplication of the elderly population. Population policy can influence the size of future birth cohorts, but it is difficult to influence the future size of cohorts already born. The survival of cohorts already born may be somewhat uncertain, as indicated by the three scenarios with different mortality levels, but population policymakers generally have no control over survival rates. To the extent future birth cohorts are limited in size, the proportion of those already born will grow – and the population will grow older. If there are 330 million elderly Chinese over age 65 in 2050 out of a total population of 1 billion, then the elderly will constitute a third of the population. If the population numbers 2 billion, the

elderly will represent a sixth. There are no policy fixes to this tradeoff – some compromise along it must be reached.

The elderly currently comprise about five and a half percent of China's population of 1.1 billion. If that population total of 1.1 billion could be maintained, then our projections indicate that the proportion of the population over age 65 would grow to between 11 and 12 percent by 2010, to between 22 and 25 percent by 2030, and to between 31 and 38 percent by 2040, depending on whether the pace of progress in reducing mortality rates is moderate or more rapid (Figure 1). On the other hand, maintaining the proportion elderly at 5.5 percent would require a population of more than 2 billion in 2010 – and an immense population of more than 6 billion in 2050.
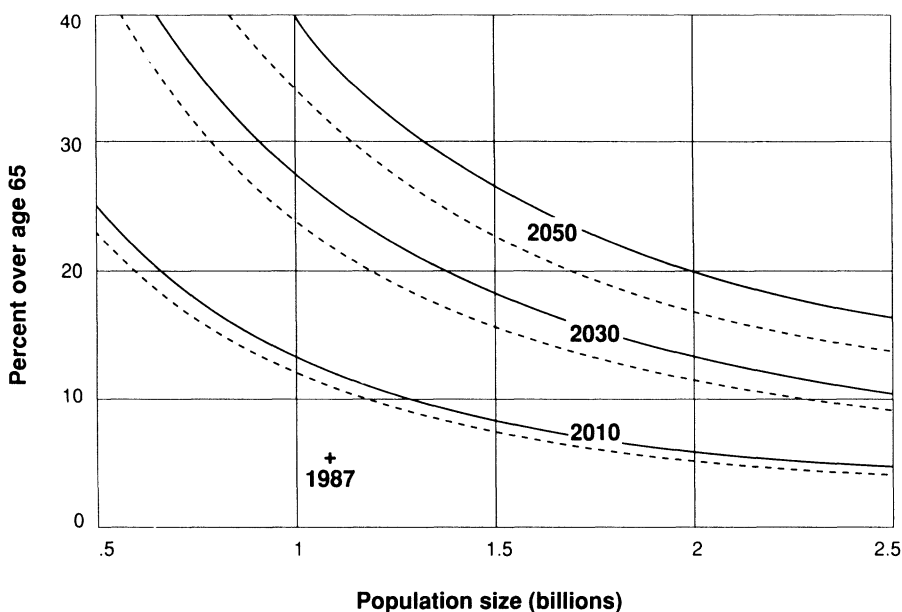

Fig. 1. Curves of possibilities of population size and population aging open to China in the years 2010, 2030, and 2050. Each curve is a hyperbola determined by the number of elderly (those 65 years old or older) given in Table 2: for any total population size along the horizontal axis, the proportion elderly on the vertical axis is simply the given number of elderly divided by this total population size. The dotted curves are based on the moderate mortality scenario and the solid curves on the more optimistic mortality scenario. The cross marks China's position in 1987: the elderly comprised five and a half percent of China's population of 1.1. billion in that year.

The range of policy options

To more realistically limit the possibilities of Chinese population growth, we considered three sets of policy options. Our low fertility scenario represents

an extreme policy designed to reverse China's population growth as quickly as possible. Under this scenario, total fertility rates would be rapidly reduced to 1.43 children per woman for the whole country in the year 2000. The total fertility rate would then further decline to an average of 1.1 child per woman in 2050.[5] In addition, the average age of childbearing was assumed to increase from its current level of about 26.4 to 28.6 in the year 2000 and a plateau of 31 by the middle of the next century.[6] The desirability and feasibility of such radical increases in the average age of childbearing will be discussed subsequently.

If the extremely low fertility levels of this scenario were realized, the Chinese population would increase to about 1.3 billion in the year 2020 and then decline by 2050 to more or less the same population of 1.1 billion that China currently has. However, the population over age 65 in 2050 would comprise about a third of the total population (Figure 2). This combination of extremely low fertility and extraordinary population aging is probably unacceptable to Chinese policymakers. It would be very difficult, especially in rural areas, for many families to accept a one-child limit and great difficulties might be faced in supporting such a large elderly population.
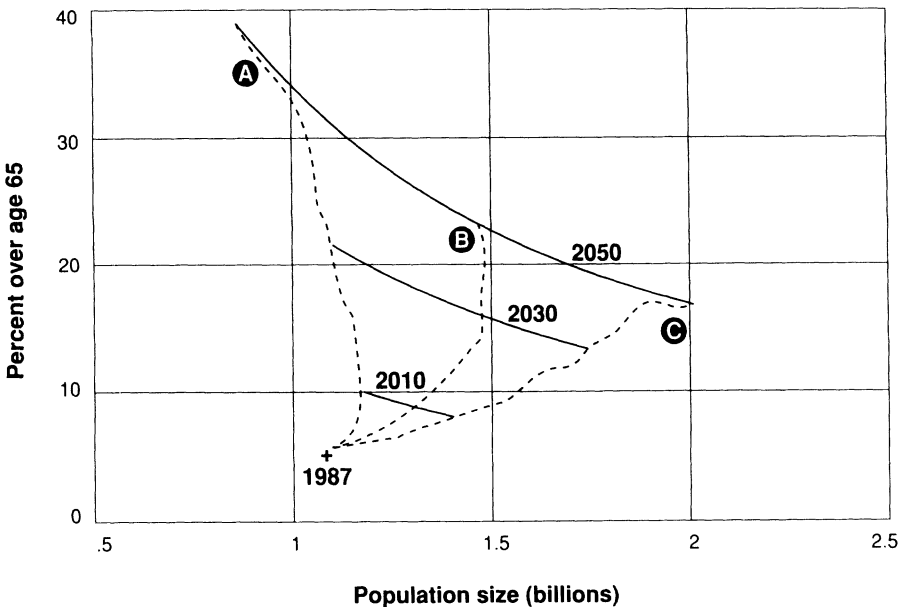

Fig. 2. Population possibility curves and three population trajectories under alternative scenarios. The hyperbolas in Figure 1 extend from infeasibly small to unacceptably large population totals and proportions of elderly. Here, the curves labelled A and C project the effects of policies at the extremes of potential fertility options; the intermediate curve B shows the effects of a moderate, compromise fertility scenario. A host of other intermediate policies could be designed to yield other results between the extremes: the hyperbolas graph the possibilities that are open to policymakers. For simplicity, it was assumed that mortality rates would decline moderately; a more rapid decline would shift the hyperbolas outward.

Our high fertility scenario represents the extreme policy of no further changes in fertility rates or patterns. Total fertility rates remain at their 1986 levels of 2.72 children per woman in rural areas and 1.96 children per woman in urban areas and the average age of childbearing remains at 26.5 in rural areas and 26.3 in urban areas. The population size of China increases to more than two billion in the year 2050. Such a large population is also considered unacceptable by Chinese policymakers.

Finally, our moderate fertility scenario assumes the same increase in average age of childbearing as in the low fertility scenario but a slower and less extreme decline in cohort fertility rates. In particular, the total fertility rate for the county as a whole falls to 1.94 in the year 2000 and to 1.78 by 2050.

This intermediate scenario was based on a balance of several considerations.

– It may be possible to gradually reduce the rural fertility level from its 1987 level of 2.72 children per woman to perhaps 2.1 children per woman and it may be feasible to cut urban fertility from the 1987 level of 1.96 children per woman to the level of 1.7 children per woman that currently prevails in the province of Taiwan. Reductions beyond this are likely to be very difficult to achieve. China is a heterogeneous country with some extremely poor rural areas and with sizeable minority groups with a combined population of more than 90 million. Furthermore, the projections in this article assume that China will urbanize very rapidly so that the proportion of urban increases from its level of 37 percent in 1987 to 80 percent by 2050: most of this growth will take place in smaller cities and burgeoning towns. The changing composition of the urban population, with a greater proportion in small cities and towns, will impede efforts to reduce urban fertility rates.

– It may be possible to gradually increase the average age of childbearing to 31 by the middle of the next century, although it is not clear whether such a change can or will be implemented. Even a gradual increase in the mean age of childbearing to age 31 (with a total fertility rate of less than two) would constitute a radical change in Chinese fertility patterns. Chinese fertility patterns have changed sharply over the last 30 years (Zeng, Vaupel and Yashin, 1985) and it is possible that further shifts will occur. Late ages of first and second childbearing are not unprecedented – in various European countries in the 19th century, marriage was delayed until age 30 or so and childbearing even later. Furthermore, such an increase in average maternal age may be desirable as life expectancy increases and as the population ages, because then there would be less likelihood that an older worker would have surviving grandparents as well as surviving parents.

– The moderate fertility scenario results in a trajectory of total population size that never exceeds 1.5 billion and that starts declining from its maximum value of 1.47 billion around 2030 (Figure 3).

– The percent of the population above age 65 under this policy scenario increases to 8.6 in 2010, 15.8 in 2030, and 23.1 in 2050, large increases but perhaps manageable.
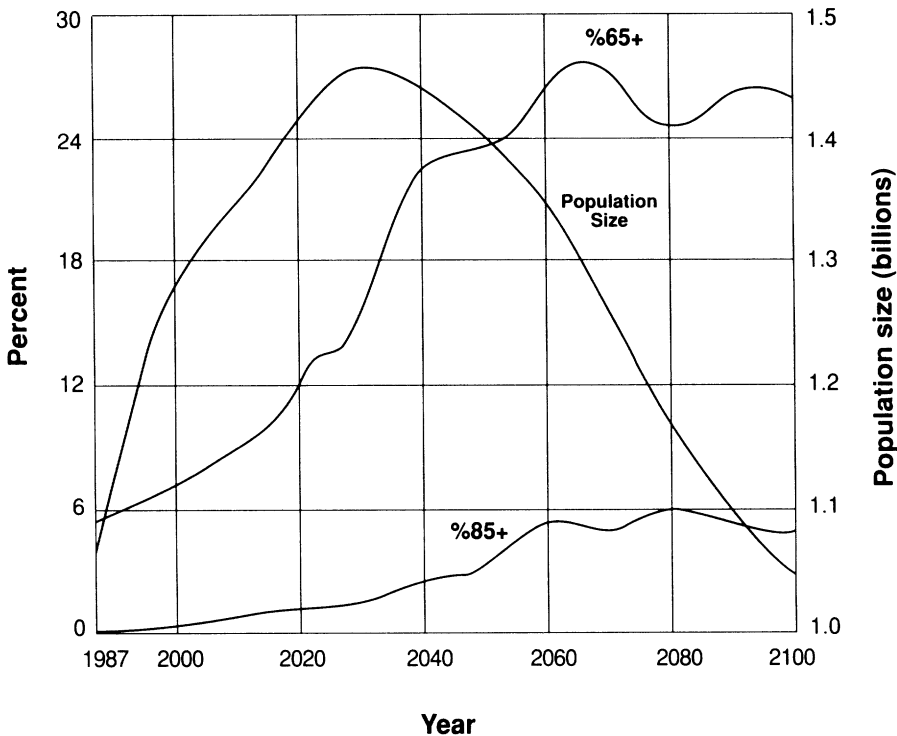
Fig. 3. Population growth and aging under the moderate fertility and mortality scenarios. The curves are extended to the year 2100 to gain some insights into the nature of long-run population change in China: even though the distant future is highly uncertain, such insights can help inform current policymakers. For simplicity, it was assumed that there were no changes in fertility or mortality after 2050. The population curve illustrates that it may take until the year 2100 for the Chinese population to decline to current levels even under a stringent birth-control policy. After 2050, when fertility and mortality rates level off, the proportion above ages 65 and 85 also levels off, albeit at unprecedented levels. That age composition becomes constant when fertility and mortality rates are held constant is a well-known consequence of Lotka's stable population theory (1939); that the proportion above age 65 could be a quarter of the total population (or more if mortality rates decline further) is a consequence of the new demography of low fertility and long life expectancy that is being achieved in most countries.

Other population trajectories similar to the trajectory of our moderate fertility scenario could be designed by raising the average age of childbearing a little more or less and compensating for this by lowering fertility rates a little less or more. For example, a scenario such that the total fertility rate falls to 1.6 by 2050 (instead of 1.78) and the average age of childbearing stays at the current value of 26.4 (instead of gradually increasing to 31) would lead to population growth and aging similar to that under our moderate fertility scenario.[7] A detailed analysis of the tradeoff between average number of children and average maternal age is presented in a subsequent section. What is important here is that reasonable fertility policies based on some combination of fertility reduction and delayed childbearing will lead to population tra-

jectories between the extremes of the low and high fertility scenarios; our moderate fertility scenario can be interpreted as an illustrative intermediate possibility.

Retirement age

What will the economic, political, and social effects be of the population aging implied by the moderate fertility scenario and various alternatives to it? Are the benefits of an even smaller total population so great that they out-weigh the costs of an age structure with a third or more of the population above age 65? Would it be more desirable to have an even bigger total popu-lation with a smaller proportion elderly?

A key consideration in addressing these difficult questions is the age of retirement. Indeed, in considering the consequences of population aging, it may be more infomative to track the proportion of the population that is above the usual age of retirement rather than the proportion of the population that is above some arbitrarily chosen age such as 65. In China, the age of re-tirement is under governmental control: this gives policymakers another option. By raising the age of retirement, the proportion of the population above this age can be decreased. In a sense, the difficulties posed by a rapidly growing elderly population can be ameliorated by changing the definition of elderly to start at an older age. To the extent that health and productivity decline past some age, such a redefinition of the elderly would be a sham. However, if the younger old are able to continue working then raising the age of retirement may be a reasonable policy option.

Research is needed on this. As life expectancy increases, will healthy, active life expectancy also increase (Verbrugge, 1984; Crimmins, Saito and Ingegneri, 1989; Rogers, Rogers and Branch, 1989)? How does the produc-tivity of older workers compare with the productivity of younger workers (Rhodes, 1983; Bluestone, Montgomery and Owen, 1990)? These are open questions: it is possible that the age of retirement could be raised over the next half century. Indeed, in the United States current law mandates a gradual increase in the age of retirement for full Social Security benefits from age 65 to age 67 (Social Security Bulletin, 1989).

Official retirement ages in China are still quite low: 60 for men and 55 for women. Various scholars and policymakers have begun to discuss the possi-bility of delaying the age of retirement. The three slogans promoted by the Chinese National Committee on Aging can be roughly translated as: elders should be cared for, elders should be productive if possible, and elders should be happy. The second slogan is an obvious attempt to encourage healthy re-tired people to continue to contribute to society.

The age of retirement in China has not yet been raised for two main sets of reasons.

First, in 1987 only 12.8 percent of females were above the female retire-

ment age of 55 and only 7.8 percent of males were above the male retirement age of 60. Altogether, just over a tenth of the total population is currently above retirement age. As this proportion increase, the benefits of raising the age of retirement will grow.

Second, early retirement is now used to open up employment and promotion opportunities for the large cohorts of younger workers born during the baby boom of the 1950's and 1960's. As the much smaller cohorts born in the 1970's and 1980's enter the labor force, a worker dearth will end the pressure for early retirement and increase the desirability of retaining older workers. A similar trend is now underway in the United States (Spencer, 1989).

If the age of retirement were gradually raised to age 70 by the year 2050, the proportion of the population above retirement age could be kept below 18 percent – under the moderate fertility and mortality scenarios (Figure 4B and Table 3). If, however, births are held to the levels of the low fertility scenario, the proportion of the population above age 70 will increase to almost 25 percent, even with moderate progress in reducing mortality rates (Figure 4A). If the age of retirement could be increased to 65 by the year 2015, to 70 by the year 2030, and to 75 by the year 2042, then the proportion above retirement age under the moderate fertility and mortality scenarios could be kept at current levels of about 10 percent until 2042 and under 13 percent until 2050. On the other hand, nearly 40 percent of the population will be above age 55 by 2050 under the moderate scenarios and more than 50 percent under the low fertility and moderate mortality scenarios. Increasing the age of retirement will reduce the proportion retired, but it will not affect the radical aging of the Chinese population.

Table 3. Ages such that Various Proportions of the Chinese Population are this Age or Older, under the Moderate Fertility and Mortality Scenarios.

Year	Percent of the Chinese Population						
	5%	10%	15%	20%	25%	30%	35%
1987	66	58	52	46	41	37	33
2000	69	61	54	49	45	41	37
2010	72	63	58	54	49	46	43
2020	73	67	62	57	54	51	48
2030	77	70	66	62	59	56	52
2040	79	74	70	67	63	58	54
2050	83	78	73	68	64	61	57

Family size versus maternal age

The two key policy levers in family planning influence the number of children couples have (i.e., the total fertility rate) and the age at which they have them. Our three fertility scenarios illustrate particular combinations of these two
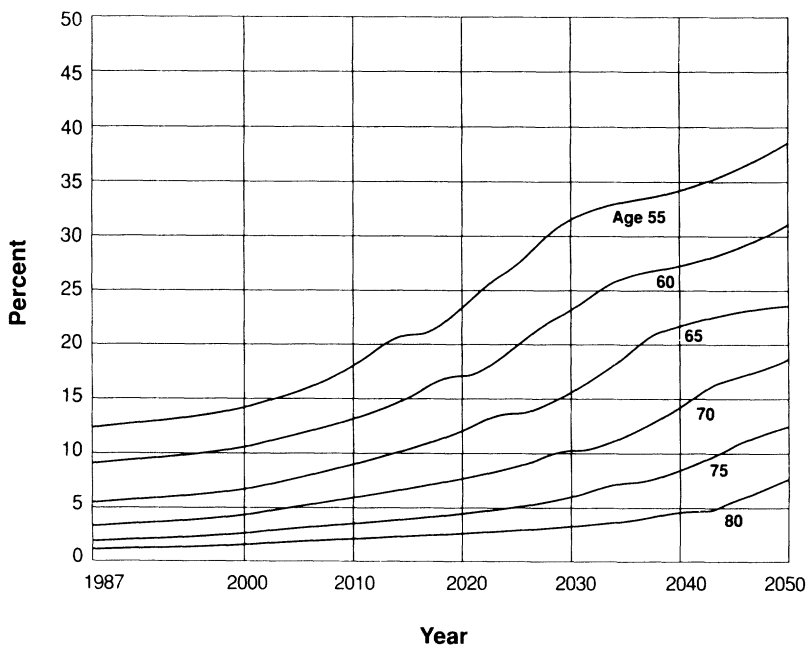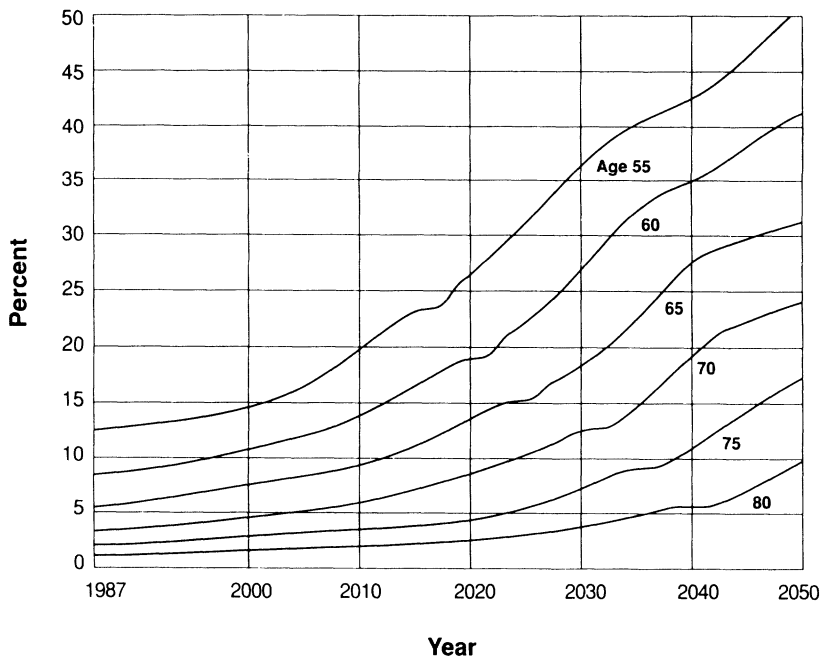
Fig. 4. Growth in the proportion of the Chinese population above various ages. Figure 4A is based on the low fertility scenario, whereas Figure 4B is based on the moderate fertility scenario. In both cases, it is assumed that moderate progress is achieved in reducing mortality rates.

levers; many other combinations are possible. The impact of different levels of the total fertility rate (TFR) have been extensively analyzed and are well understood. The impact of maternal age is more subtle and problematic. Hence, two important questions for policymakers are: (1) what are the short-run and long-run impacts of delayed childbearing, and (2) what is the tradeoff between the total fertility rate and maternal age? That is, to achieve a particular population size what combinations of average number of children and average age of childbearing are possible?

Consider, first, a population with no in or out migration and with an unchanging age-schedule of fertility and mortality. Such a stable population will grow (or shrink) at some constant rate. Now suppose that the fertility schedule is shifted to some older or younger average age: what will the new growth rate be when the population settles back into equilibrium? Keyfitz (1985) shows that an increase in the average age of childbearing will reduce a positive rate of population growth and make a negative rate of population growth less negative. Essentially, an increase in average maternal age lengthens the time between generations, thus making the absolute value of the rate of population growth smaller. Policies that change the average age of childbearing put populations in disequilibrium and it may take several decades for a population to more or less return to stability. Consequently, in investigating the impact of changes in maternal age, both the short-run disequilibrium and the long-run equilibrium effects have to be considered.

Change in the average age of childbearing can have a major short-run effect on population growth. Consider the simple case of a population in which everyone has all their children at age 24. Then, starting with some cohort, this age is suddenly delayed one year – to age 25. In the transition year, no babies are born. Thereafter, births return to their previous level. Population size, then, has been reduced by one year of births. Although this example is unrealistically simplistic, the general point holds roughly in more complicated situations – for every year childbearing is delayed, population size will be reduced in the short run by about a year of births.

In China, the short-run and long-run effects of delayed childbearing are likely to have opposite effects. The short-run effect will be to reduce population size. If China's population starts to decline in the next century, then the long-run effect of an increase in average maternal age will be to slow the rate of population decline.

To illustrate this point, we calculated the effects of a moderate fertility scenario in which the same assumptions are made as in our moderate fertility scenario except that the mean age of childbearing was assumed to remain at the current level of 26.4 (Table 4). The Chinese population reaches a peak of 1.47 billion in the year 2034 under our moderate fertility and mortality scenarios. If the average age of childbearing is held at current levels, as in the alternative fertility scenario, then the population totals 1.555 billion in 2034. Thus, the increase in maternal age reduces the population by 85 million persons in 2034. The gap grows until by 2075 the population under the alterna-

Table 4. Comparison of Population Size and Growth under Two Scenarios with Different Assumptions about Mean Age of Childbearing.

Year	Scenario with increasing mean age of childbearing		Scenario with constant mean age of childbearing	
	Population size (in millions)	Growth rate (%/year)	Population size (in millions)	Growth rate (%/year)
2000	1266	1.01	1287	1.06
2025	1451	0.35	1527	0.38
2034	1470	−0.01	1555	0.11
2042	1454	−0.20	1561	−0.01
2050	1426	−0.28	1545	−0.22
2075	1251	−0.61	1420	−0.91
2100	1075	−0.60	976	−1.88

Note: In the first scenario the mean age of childbearing gradually increases to 31; in the second scenario the mean age of childbearing remains at its current level of 26.4. Both scenarios otherwise follow the same moderate fertility and mortality assumptions. Population size peaks at a higher level under the second scenario but eventually declines to a lower level.

tive scenario is 169 million persons larger than under the delayed fertility scenario. However, there is then a crossover, due to the more rapid rate of population decline under the alternative scenario, so that by 2100 the population under the delayed fertility scenario is larger – by almost 100 million people. This nicely illustrates the point made above, that a delay in the age of childbearing can have different effects in the short and long run.

To compare the population impacts of various combinations of fertility levels and average maternal ages it is consequently necessary to choose some time horizon. The middle of the next century, 2050, seems a reasonable choice given the concerns of Chinese policymakers and given the many decades it may take to substantially lower fertility or delay childbearing. Furthermore, to facilitate comparisons, it seems reasonable to consider a limited range of policy options that can be summarized by a single statistic pertaining to fertility levels and a single statistic pertaining to maternal age. We chose to analyze a set of scenarios that are defined by the total fertility rate and the average age of childbearing of the cohort born in 2005. Later cohorts follow the same pattern; for earlier cohorts, fertility levels and maternal ages were determined by linear interpolation from current values.[8]

For various population sizes in 2050, we determined the pairs of alternative values for the total fertility rate (TFR) and average maternal age that would yield requisite population (Figure 5). The values of the TFR and average age of childbearing that produce a population of 1.5 billion are worth considering carefully, because, based on various demographic projections, many scholars believe that the Chinese population size may reach about 1.5 billion by the middle of the next century. At an average maternal age of 23, the required TFR is 1.6. At the current average age of childbearing in China
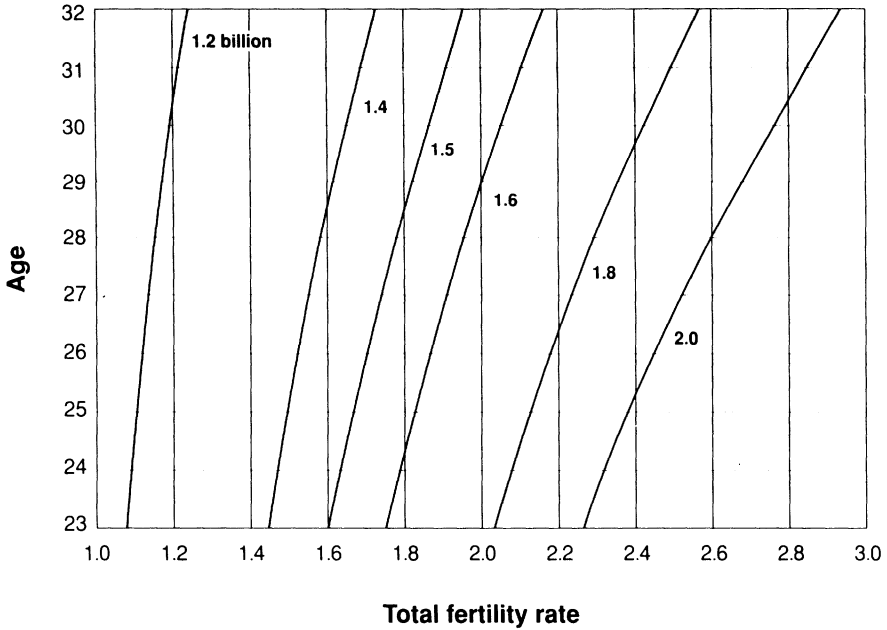
Total fertility rate

Fig. 5. Population size in China in 2050 for various combinations of total fertility rate (TFR) and average maternal age. Both the total fertility rates and the average ages of childbearing given in the figure pertain to cohorts born in 2005 and later: earlier cohorts, fertility levels and maternal ages were determined by linear interpolation from current values. The fertility levels are for the country as a whole: rural fertility levels were assumed to be a third higher than urban levels and the rural and urban levels were calculated to yield to the required national average. Average ages of childbearing in urban and rural areas are currently very similar and were assumed to remain identical. Note that the tradeoff curves are more vertical at lower levels of the total fertility rate: the lower the TFR the more the average age of childbearing has to increase to compensate for an increase in the TFR. When the TFR is below 2, the tradeoff is on the order of magnitude of 0.1 vs. 2 or more – a 0.1 decrease in the TFR is equivalent to an increase of two or more years in average maternal age. When the TFR is above 2, the tradeoff is on the order of a magnitude of 0.1 vs. 1 – a 0.1 decrease in the TFR is equivalent to about a one year increase in average maternal age.

of 26.4, the TFR is 1.71. If childbearing could be delayed to an average age of 30, the TFR could be 1.86. A delay to 32 would permit a TFR of 1.95.

Nearly everyone in China marries and more than 98 percent of couples have or adopt children (Zeng, Vaupel and Yashin, 1985). If only a tenth of couples have three children, hardly any have more than three, and two percent have none, then to achieve some specified TFR the required proportion of couples with only one child is 2.06 minus the TFR. To reach a TFR of 1.95, 11 percent of couples would have one child. To reach a TFR of 1.71, 35 percent of couples would have one child. It will be difficult in China to achieve more or less general adherence to a two-child norm; it will be very difficult to increase the proportion of one-child families in the country as a whole to more than a third. On the other hand, an increase in the average age of child-

bearing to 30 or 32 would also be a drastic change. It is not clear which point on the 1.5 billion population curve is most feasible or desirable.

Discussion

Population policy depends on tradeoffs among multiple competing objectives. Using techniques drawn from policy analysis as well as demography, we highlight in this article the tradeoff between population size and population aging. A population size that may be deemed desirable in the absence of consideration of population aging may be unacceptable when aging is taken into account. But what is the optimal place to be on any particular size/age tradeoff curve? Even if the optimum is uncertain, where approximately should policymakers aim – what is a reasonable target window?

Part of the uncertainty about this tradeoff stems from the uncertainty about where the age of retirement should be set. By raising the age of retirement, the proportion above retirement age can be reduced. The result, however, will be an older work force. Is it feasible and desirable to raise the age of retirement in China to 65, 70, 72 or even later? Research and informed discussion are needed here.

To achieve a particular total population size, policymakers in China have to rely on changes in birth rates. To lower the annual number of births, couples can have fewer children or they can wait to older ages before having them. Is it feasible to reduce total fertility rates in China to well below two children per couple? Is it desirable, especially given many couples' strong preference for two children? On the other hand, is it feasible or desirable to raise the average age of childbearing to, say, age 31? Research and informed discussion are also needed here.

The point of this article, then, is to elucidate three key population tradeoffs that policymakers in China will have to make. The aim is not to provide answers, but to provide some clarification of a difficult set of unavoidable compromises that confront Chinese policymakers.

China is a unique country, with the largest population in the world, a very rapid aging population, and an effective family planning system. Chinese policymakers face profound population problems but they also can consider population policy options that would be infeasible in many other countries. Because China is so important, understanding the nature of China's population dilemmas is significant in its own right.

Beyond this, however, China's experiences and policies may be of great interest to policymakers and concerned citizens in many other countries. Although China is unique, it is by no means alone in facing the challenges of population growth and population aging. China's example may have considerable relevance for population policy in countries as diverse as India, Japan, Mexico, Egypt, and the United States.

Acknowledgments

Notes

1. For further background, see Coale (1981, 1984), Keyfitz (1984), Song and Yu (1988), and Tien (1983).
2. The Population Research Institute of the Chinese Academy of Social Sciences, in cooperation with the State Statistical Bureau of China, conducted a national sample survey on aging in July, 1987. The sample size is 36,755 persons over 60 years old covering all provinces and municipalities in mainland China except Tibet.
3. For example, the Institute of Population Research at Peking University coordinated special surveys of the elderly in the cities of Beijing and Shanghai and the provinces of Hubei, Jiling and Liaoning, in cooperation with the population institutes at Fudan, Wuhan, Jiling and Liaoning Universities. The sampling fraction of all five local surveys is one per thousand of the elderly population.
4. For example, the Institute of Population Research at Peking University organized, in cooperation with the Cambridge University Group for the History of Population and Social Structure, an international conference on population aging and family in October 1987. The Population Research Institute of the Chinese Academy of Social Sciences organized two meetings on population aging in November 1988 and December 1989.
5. The projection model, which is decribed in detail in Zeng and Vaupel (1989), disaggregates the population by age, sex and rural/urban residence and casts fertility levels and timing in cohort terms: each cohort in rural and urban areas are assigned fertility levels and a mean age of childbearing. To simplify the presentation we report period fertility for the whole county. For the low fertility scenario, cohort TFR's in rural areas fall from 1.8 for the cohort born in 1972 to 1.7 for the cohort born in 1975 and 1.6. for cohorts born after 1985. Cohort TFR's in urban areas fall from 1.4 for the cohort born in 1972 to 1.3. for the cohort born in 1975, 1.2 for the cohort born in 1985, 1.1 for the cohort born in 2005, and 1.0 for cohorts born after 2035. For the moderate fertility scenario, cohort TFR's in rural areas fall from 2.5 for the cohort born in 1972 to 2.4 for the cohort born in 1975, 2.3 for the cohort born in 1985, and 2.1 for cohorts born after 2005. Cohort TFR's in urban areas fall from 1.9 for the cohort born in 1972 to 1.8 for the cohort born in 1975, and 1.7 for cohorts born after 1985. Finally, for the high fertility scenario, cohort TFR's remain constant at 2.72 in rural areas and 1.96 in urban areas.
6. These figures are period averages. In our model we assumed that in both rural and urban areas the mean age of childbearing increases to 30 for the cohort born in 1985 and to 31 for cohorts born after 2005. For cohorts born in 1972 we assumed the mean age of childbearing is 28.5 in rural areas and 28.0 in urban areas. For further discussion of the policy option of delaying childbearing, see Bongaarts and Greenhalgh (1985).
7. Cohort TFR's in rural and urban areas were assumed to be 0.1 and 0.2 lower than described

in note 8, so that rural TFR's fall to 2.0 and urban TFR's fall to 1.5 for the cohorts born after 2005. Both the size of the population and the proportion above age 65 were close to the values under the moderate fertility scenario: in all years from 1990 through 2050 the relative difference in values was less than 3 percent.

8. These fertility levels are for the country as a whole: rural fertility levels were assumed to be a third higher than urban levels and the rural and urban levels were calculated to yield the required national average. Average ages of childbearing in urban and rural areas are currently very similar and were assumed to remain identical.

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