Chapter 9 Population Aging in China: Challenges, Opportunities, and Institutions

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Following drastic fertility and mortality declines in the second half of the twentieth century, China at the turn of the twenty-first century is joining the ranks of aging societies elsewhere in the world at a rapid pace. Two and half decades ago, when China began its one-child-per-couple fertility policy in an attempt to further slowing down its population growth, concerns were raised about the serious social and economic consequences of this state-engineered fertility reduction of the most extreme form. With a government birth control program that advocated late marriage, longer birth interval, and fewer births, fertility level in China was already halved in one decade's time in the 1970s, from a total fertility rate of 5.8 in 1970 to 2.7 in 1979. The one-child policy, many critics argued, would not only accelerate an aging process that was already going to be rapid due to the rapid fertility decline achieved then, it would also artificially alter the Chinese kinship and family the networks, the primary traditional sources of elderly support in Chinese society.

After more than two decades of speculation and anticipation, population aging has finally arrived as a demographic and social reality in China. Two and half decades ago, when the concerns of population aging were first aired, China's population was growing at about 1.5 percent annually, and the share of China's population aged 60 and above was

only 7.6 percent, and those aged 65 and above constituted only 4.9 percent of the total population.[1] Today, population growth rate in China stands at roughly half of the level two decades ago, and China's 2000 census revealed that the shares of the elderly population had risen to 10.5 and 7.1 percent for those aged 60 and 65 above respectively. By 2005, more than 140 million people in China are 60 years or older, a population size that exceeds the total population of Japan, and approximately the same as the total population of Bangladesh or Russia. If ranked as a separate country, the elderly population of China alone would make the seventh largest population in the world. While China's population aging level -- in terms of the share of the elderly population of the total population -- is only half of that in western industrialized and aging societies today, China's per capita income level is only one quarter to one fifth of these other countries. Rapid aging in the absence of a standard of living and a social safety net comparable to other aging societies has earned China the title of a country that has become old before it has become rich.

Moreover, given the rapid pace of fertility decline and also an unusually rapid mortality decline earlier, there is little doubt that China's aging process shall accelerate. What we have seen, in other words, is only the beginning of a new historical era for China. If the current demographic parameters -- fertility level and mortality decline -- persist, China's total population size will reach its peak in less than two decades from now, and the share of its population aged 65 and over will exceed 20 percent by the year 2050. Such a population aging will not only be unprecedented in Chinese history and affect every aspect of the Chinese society; it will also exert profound impact for the rest of the world as China is playing an increasingly important role in the global economy.

[1] These numbers refer to the year 1982, based on the Chinese census conducted that year.

Rapid population aging in the context of a government-enforced low fertility and an economic transition from a socialist planned economy to a market based economy is a complex and challenging process. This chapter examines the complexity of this process and the consequences of China's rapid population aging. We do so in four steps. First, we highlight how sub-national demographic dynamics in China imply a far more serious aging scenario in some segments of the Chinese society than others, namely that urban China will soon be as old as the oldest populations in the world. Second, we illustrate how population aging in China can be affected by another recent important social and demographic change: increasing population migration. Third, we examine the economic consequences of aging by introducing the concept of the second demographic dividend that may result from an aging population, and thus suggest that population aging is not only a challenge, but also an opportunity. We provide our estimates of the potential positive economic consequences that China may achieve during its process of population aging. Lastly, we emphasize how such a potential positive economic gain will not come naturally but relies heavily on the institutional context, a challenge China also faces.

Population Aging: National and Sub-national Trends

With a few exceptions (Zeng and Vaupel 1989, Poston, Gu, and Luo 2005), earlier literature examining the trends and consequences of population aging in China mostly treats China as a whole, and leaves out the important sub-regional differences (e.g. Liang, Tu, and Chen 1986, Banister 1992, Poston and Duan 2000). One of the most salient features of China's society prior to its economic reforms in the late 1970s, however, was the creation and maintenance of a dual society within one country (Whyte 1996, Knight

and Song 1999). Urban and rural China followed different economic and social systems, with population residing in urban received state guaranteed employment, housing, education, health care and other benefits, while those living in the countryside relied mostly on themselves and their local communities under the People's Commune system. Fertility as well as mortality decline that laid the foundation for population aging closely mirrored this dualistic nature of the society. Both mortality and fertility declined earlier and to a much lower level in urban China than in rural China. The one-child policy, which serves to accelerate population aging, has mostly been implemented among the urban population, who had few alternatives to compliance (Wang 1996). Treating China as a whole, as we show below in this chapter, grossly understates the seriousness of population aging in China.

One Country, Two Systems

Over the past four decades, China has evolved into a country with several sub-national demographic regimes. Such sub-national demographic differences exhibit in both mortality and fertility levels, and across both provinces and in particular, between China's urban and rural areas. In 2000, just as in 1980, mortality difference between China's richest provinces in the coast areas and the poor ones located inland, and between China's urban and rural populations, resembles that between developed and developing countries in the world. Measured by life expectancy at birth, in 2000, population in three of China's largest cities, Beijing, Shanghai, and Tianjin, all enjoyed a level of 75 and above, about ten years longer than that for China's poorest provinces. In the same year, city residents enjoyed a level of life expectancy that was 5.6 years higher for males and

6.3 years higher for females than those resided in rural areas (Wang and Mason 2004). These differences in health and mortality result largely from the diversity in standard of living and in access to health care, a legacy of the socialist uneven development only amplified following China's reforms in the last two and half decades.

Fertility, a more important demographic force than mortality affecting the population age structure, shows an even greater gap between urban and rural China. Such a difference is both long-standing and profound. Figure 1 provides a comparison of fertility trends between urban and rural China between 1963 and 1987, when reliable fertility data by urban and rural regions were available. Urban fertility level started to diverge from the rural level in the early 1960s, immediately following the fertility rebound after China's Great Leap Forward famine of 1959-1961. As early as in the mid 1960s, urban fertility level was only half of that for the rural population. Fertility decline accelerated since the late 1960s, when the Chinese government started to impose a more restrictive birth control policy among its urban population than among the rural population. Urban total fertility rate declined to around 3 by the beginning of the 1970s, a level not achieved in rural China until a full decade later. Moreover, fertility level in urban China dropped below the replacement as early as three decades ago, in 1974, years before the implementation of the one-child policy in 1980. Throughout the 1980s, and in fact the 1990s though not shown in the figure, urban fertility level stayed barely above the one-child requirement, while rural fertility level stayed well above the replacement level. Thus, in contrast to rural China where the majority of Chinese population resided, in urban China, fertility decline started much earlier, and to a level that is well below the replacement level as early as over two decades ago.

[Figure 1 Fertility Trends in Urban and Rural China]

What defines urban versus rural population in China is a complex and controversial subject. First of all, there is the question of what is considered urban. In China, the definition has been an evolving one, from administrative based to residential based (Chan 1994). For over two decades since the late 1950s, urban and rural sectors of China were segregated into two worlds, with little migration allowed without the government's approval. The divide between the two was largely administrative or political. Urban Chinese received preferential treatment by the state from free education, guaranteed employment, to free medical care and other social welfare provisions, whereas rural Chinese who labored under the commune system did not. The chief mechanism used by the government to enforce this two-tier system was a strictly controlled household registration system (Cheng and Selden 1994). Urban Chinese were entitled to hold the non-agricultural household registration, while rural Chinese were registered under the agricultural household status. Urban and rural Chinese, in other words, were differentiated by their household registration status. Since the late 1970s, however, this household registration system has undergone major changes and is being phased out. Increasingly, urban and rural Chinese are no longer differentiated only based on their political, or household registration, status, but on residential, or where they work and live. One such example is with China's 2000 census, which classified urban status based on population density and distance to a local government (Chan and Hu 2003). With this new definition, urban population constituted 36 percent of China's total population in 2000.

Secondly, and in addition to the issue of what constitutes urban, there is the question of how to determine a person's type of residence. With increasing migration of the last two decades in China, it is also increasingly more challenging to decide whether a person's residential status should be the place of household registration, or current residence. If temporary rural to urban migrants are counted as urban population, in some migrant-concentrated cities population size could easily be inflated by 20 percent or more.

In our study of divergent aging trends in China, we adopt a rather restrictive urban and rural definition. Specifically, we follow population as they were classified at the time of the 1982 population census, a differentiation largely followed household registration type. We recognize that using such a definition does not allow a realistic portrayal of China's population distribution by residence type over time, as both migration and urbanization have been redefining the geographic distribution of the Chinese population. For our purposes, however, such an approach is appropriate, because we are following the real life course experiences of two segments of the population that have been under the differential treatments by the state and that have followed vastly different demographic trajectories especially in terms of fertility levels.

Divergent Aging Profiles

The sharply divergent paths of fertility and mortality decline imply that the population aging process also starts much earlier in urban than in rural China. With the extremely low fertility in urban areas for the past two and half decades, future population aging will also be more severe among this segment of China's population than the rural segment. In

this section, we first examine differential aging trends in urban and rural China without considering the impact of migration between the two sectors of the society. We intend to answer the question that given past differences in demographic profiles, what would future aging trends look like for the two segments of the Chinese population?

To do so, we use the cohort-component population projection method to project changes in urban and rural populations for the period of 1982 to 2050. We use 1982 as our starting point as that was the year of China's first national census after its fertility decline began and when the controversial one-child policy was then recently launched. To project the future population of China, we use an assumption of a total fertility rate of 1.6 throughout the time period of year 2000 to 2050, and of a mortality level that will increase female life expectancy at birth from 74.7 years in 2000 to 79 in 2050, and a male life expectancy from 71 to 75 years old. Our fertility assumption is higher than the fertility level dictated by Chinese birth control policy and higher than what is reported in the official Chinese news media, but consistent with what is believed to be the current fertility level in China (Retherford et. al 2005). Projections of urban and rural population involve more assumptions, and the assumptions we used are given in Table 1.

[Table 1 about here]

China's population aging process will soon accelerate, and the trend is unlikely to be reversed during the first half of the twenty first century. In Table 2 we present projected old populations for China for selected years, between 1982 and 2050. In Figure 2 we plot trends in population aging for China as a whole, and by urban and rural population for the period of 2000 to 2050. As shown by these results, Ten percent of China's total population will be above 65 in roughly a decade time from now, by 2017. In

thirty years, by the late 2030s, one in five persons in China will be an elderly person over age 65. In just ten years, there will be 200 and 125 million Chinese over the age 60 and 65 respectively, and within 25 years, the numbers will further increase to 300 and 200 million. Whereas it takes 35 years for China's elderly population to double from 5 percent to 10 percent of the total population, the next doubling, from 10 to 20 percent, would only take 20 years or less. Meanwhile, China will also see its number of the oldest old, those aged 85 and higher, quadruple between now and the year 2050.

[Table 2 and Figure 2 about here]

Due to past different fertility and mortality levels, aging trends also differ drastically between urban and rural China. China's urban population will experience a much more rapid aging process than their rural counterparts. Ten percent of China's urban population is already aged 65 and over today. In slightly over a decade from now, 15 percent of China's population who were classified urban at the start of China's one-child policy will be 65 years and older, a level of aging that is comparable to that in the more developed world now. In twenty years, by 2025, aging level among urban Chinese will reach 20 percent, a level found only in the two oldest major populations, Japan and Italy, today. Moreover, due to China's one-child policy of the last two and half decades, aging trend will continue well into the twenty-first century. Assuming fertility stays at the current level among urban Chinese, at about 1.3 children per couple, by 2050, 35 percent of China's urban population will be aged 65 and older. While only a small proportion of China's total population, the sheer size of urban Chinese elderly will be by no means small. It stands at 20.6 million in the year 2000, 34.1 million by 2015, 45.6 million by 2025, and 55.9 million by 2050.

In rural China, the level of population aging will lag behind that in urban China by more than a decade, as shown in Figure 2. It will be not until 2033 that the percentage of the population aged 65 and over reaches 15. If fertility and mortality levels stay as assumed, population aging for the majority of China's population will level off at about 20 percent by the middle of the twenty-first century. The number of the elderly in rural China, nevertheless, will still be staggering. It stands at 67.9 million in 2000, 93.3 million by 2015, 128.2 million by 2025, and 229.1million by 2050.

Migration and Its Potential Impact on Aging in Rural China

Rural Out-Migration and Impact on Aging

Population aging in both urban and rural China is likely to be affected by another important demographic change in the Chinese society that began two decades ago, namely rural to urban migration (see Chapter 11). China's economic growth and policy change that removed control over migration across administrative boundaries have resulted in an unprecedented increase in migration, most of which from rural to urban areas. The Chinese 2000 census counted 80 million people as migrants, who had been away from their place of household registration for more than six months. At the aggregate or the population level, migration redefines the ratio between working population and the elderly in urban and rural China. For urban China, the large inflow of young rural labors not only helps to drive the urban centered economic growth but also helps to pay taxes and fees that could be used towards supporting the urban elderly. For the rural elderly, the picture may well be different.

To assess the potential impact of rural to urban migration on population aging for the rural elderly, we carry out another set of population projection with assumptions of rural to urban migration. For the volume of rural-urban migration, we assume a net out-migration from rural China of 6 million per year at the start of our projection period, 1982 (shown in Table 1). This number is slightly below the 7.7 million estimated by Chan and Hu for 1990 (2003, 58). We increase the number of out-migrants to 8 million by 1990, to 14 million by 2000, and to 21 million by 2014. The assumed increase in migration is based on the past trajectory of rural to urban migration. By 2015, we assume such out-migration will cease. We use age pattern of labor-related migration from the 2000 census as the age pattern of assumed rural to urban migration. This age pattern, by sex, is plotted in Figure 3.

[Figure 3 about here]

Out-migration of young people from rural areas alters the aging trend in rural China considerably. In Figure 4, we present results comparing future population aging trends in rural China with consideration of out-migration. As shown in this figure, aging in rural China will be much more serious with out-migration compared with no out-migration. In only five years, by 2009, the share of rural population aged 65 and above will reach 10 percent, in less than 15 years, by 2018, the share will reach 15 percent. With migration, the peak of aging will come earlier, by 2040 instead of 2044, and at a higher level, 25 percent instead of 20 percent. Taking migration into consideration, we find that aging in rural China will be much closer to urban China than when migration is not accounted for.

Social Support versus Family Support

The comparisons above based on population projections illustrate future population aging trends at the societal level. Urban and rural China will face different aging prospects due to past and future demographic profiles. Rapid aging at the societal or the aggregate level raises new challenges for social support, such as increased burden of pension payment and increased contribution among the working population. They also pose new challenges for family support. The two forms of support are not affected in the same way by the same aging trends delineated above. Rural migrants can make up for the labor shortage in urban areas, but they cannot be expected to make up for the shortage of family caregivers for urban elderly in the future. A large number of rural migrant labors in urban China, at the same time, also contribute to decreased family support to elderly in rural China.

In both urban and rural China, demographic and social changes have resulted changes in living arrangement and in a noticeable shrinkage in the average household size. Average household size for China as a whole dropped from 4.36 persons in 1982 to 3.45 in 2000. In urban China, the average household size in 2000 was only 3.16. At the same time, the share of elderly Chinese living alone or with a spouse only increased substantially. In 1982, among male elderly aged 65 and above, 27.6 percent lived either alone or with a spouse only. In 2000, the share increased to 37.2 percent. For females, the share increased from 24.3 to 29.8 percent. The share of elderly living alone is higher in urban than in rural China. In urban China, the share in 2000 was 41.4 percent for males and 33.7 for females (Zeng and Wang 2003). While rural to urban migration can help to solve China's aging problem in urban areas at the aggregate level, it cannot do the

same to alleviate the pressure of lacking family support. For most urban elderly, the scenario of two single children supporting four parents will soon be a social reality. In 2000, 5.3 percent of all households in China are composed of a single elderly person or an elderly couple only. The share is projected to double by 2030, and may make up to 15 percent of all Chinese households by 2040 (Zeng et. al forthcoming).

For rural elderly, increased aging level due to fertility decline and out-migration may not affect family support in the same way as in urban China. This in part is due to the higher number of children the rural elderly have in comparison with urban elderly under the one-child policy rule, and in part due to the particular migration pattern currently observed in China (Roberts 1997). Rural to urban migration so far has largely followed a circular pattern, with most rural migrants returning or at least planning to return to their home villages when they reach old age. Migrants also send a large share of their income back to their rural families, supporting those left behind. If the majority of rural young migrants do not return to their natal villages, however, rural out-migration could result in a scenario where population aging and lack of family support that is more precarious for rural than for urban elderly Chinese in the future (Zeng and Vaupel 1989, Zeng et. al forthcoming).

Economic Consequences of Aging

Population aging not only poses new challenges, it also presents new opportunities. Most discussions of population aging tend to focus on only the negative consequences of this new human experience at the societal level, and ignore the possibilities that new opportunities may well be ushered in by this new demographic

reality. An aging population, just like a young population, also brings with it resources and new opportunities. The extent to which that such opportunity can be seized, moreover, depends on the institutional arrangements of a given society.

Demographic Dividend of Aging

To quantify and to assess the potential economic opportunities associated with population aging, we need to introduce the concept of demographic dividend, and especially the second demographic dividend. Recent demographic literature has focused largely on the demographic dividend brought about by fertility decline and the decline in support ratio (Bloom and Williamson 1998, Mason 2001, Bloom, Canning et al. 2002). Such a dividend is only the first dividend of demographic transition, resulting from a faster increase in the number of producers than of consumers. Along with population aging, however, there is also a second demographic dividend (Mason and Lee 2004).

The second dividend arises because changes in age structure influence the processes that lead to the creation of wealth. A possibility – one that has occurred in other East Asian economies – is that population aging will lead to rapid accumulation of capital. If this occurs, the capital-intensity of the economy and, hence, output per worker will rise. Traditionally, the effect of population on capital-deepening is considered in the standard neo-classical model that assumes that a constant saving rate (Solow 1956). The approach taken here, however, builds on elaborations of the neo-classical model that treat saving and wealth as endogenous (Tobin 1967; Mason 1987; Willis 1988; Lee 1994). Population aging, as we demonstrate below, may lead to increased saving and possibly increased capital accumulation.

The concept of lifecycle wealth and its relationship to population age structure is central to understanding the second demographic dividend. The lifetime budget constraint implies that the current lifecycle wealth of an individual, a cohort, or a population must equal the present value of the future stream of consumption less the present value of the future stream of labor income.[2] In the absence of intergenerational transfers (familial support, PAYGO pension systems, bequests, etc.), lifecycle wealth consists entirely of capital, i.e., real assets held by each individual, a cohort, or the population. Capital represents one form of lifecycle wealth.

Lifecycle wealth is closely related to the direction of resource flows. The lifecycle wealth associated with upward flows – from younger age groups to older age groups – is positive. Current members of the population can expect to receive more in benefits than they pay in costs in present value terms. This is possible because the current population is receiving net transfers from generations that are not yet born. The flip side of transfer wealth is the implicit debt imposed on future generations.

The lifecycle wealth associated with downward flows – from older age groups to younger age groups – is negative. Many members of the population have already received benefits but they have not yet incurred the costs associated with downward transfers. A newly married couple, for example, faces childrearing costs but may anticipate few additional transfers from their parents. Hence, their childrearing lifecycle wealth is strongly negative.

The relationship between lifecycle wealth and age structure can be readily summarized given sufficiently strong assumptions. Lee (1994) has shown that given steady-state golden rule growth, the ratio of lifecycle wealth to labor income (or

[2] Any bequests are included in consumption.

consumption) is equal to the difference between the mean age of producing and the mean age of consuming.[3] The mean ages are "dollar-weighted" average ages. The difference between the two measures the lag in years between the age at which a dollar is earned and the age at which it is consumed. The greater this lag the greater is lifecycle wealth. If the population consumes before it produces, on average, its lifecycle wealth is negative.

With increases in life expectancy the expected duration of retirement rises. Individuals must accumulate additional wealth or face substantial reductions in standards of living during old age. The wealth can come in several forms, however. One possibility is the accumulation of additional capital. The other is the accumulation of transfer wealth – increases in the obligations of future generations to provide old age support either through public pension plans or as part of familial support systems. Either form of wealth can meet the retirement needs of a growing elderly population, but increases in capital influence the level of output and economic growth, while increases in transfer wealth do not (Lee 1994). A third possibility is that neither transfer wealth nor

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[3] The difference between mean age of producing and the mean age of consuming ($A_{Y^l} - A_C$) is equal to the ratio of lifecycle wealth (W) to labor income (or consumption):

$$\frac{W}{Y^l} = \frac{W}{C} = A_{Y^l} - A_C,$$

where the mean ages of producing and consuming are:

$$A_{Y^l} = \int_0^w aN(a)Y^l(a)da \Big/ \int_0^w N(a)Y^l(a)da$$

$$A_C = \int_0^w aN(a)C(a)da \Big/ \int_0^w N(a)C(a)da.$$

capital is accumulated. In this case, favorable effects on productivity are not achieved and standards of living among the elderly deteriorate. Which of the three possibilities, or a combination of them, materializes depends largely on the institutional arrangements, which we shall return to discuss in a later section of this chapter.

The Second Demographic Dividend for China

To illustrate the potential demographic dividend associated with population aging in China, we carry out a set of analyses with available Chinese data. Our production and consumption profiles are based on data for urban China for the year 2000, and our population age structures are based on those projected using 1982 as the basis and with assumptions similar to those in Table 1. The calculations are for China as a whole. The analysis presented below relies on a highly stylized model of the economy. Suppose that the cross-sectional age profiles of production and consumption – the shape but not the level – are held constant. The profile of production reflects persistent effects of experience and obsolescence. We abstract from changes in labor force behavior, e.g., changes in retirement behavior and changes in returns to experience related to increases in educational attainment or other forces. The profile of consumption reflects preferences about own consumption and preferences about the consumption of others reflecting altruism or political processes.

China's aging population structure leads to a substantial decline in the resources that must be reallocated from working generations to children and a substantial increase in the resources that must be shifted from workers to the elderly. The shift is quite

evident in Figure 5, which shows the distributions of aggregate consumption and labor income by age for 1982, 2000, and 2050 and the associated age reallocations.[4]

[Figure 5 about here]

Two inter-age flows, from workers to children and from workers to the elderly, are summarized by the arrows shown in the figures. The foot of the arrow is located at the mean age of the outflow from workers and the head of the arrow is at the mean age of the inflow to recipients. The width of the arrow is the per capita reallocation. Given golden-rule, steady state growth the area of each arrow is equal to aggregate lifecycle wealth that must be maintained to support each age reallocation (Lee 1994; Lee 2000). In the case of downward flows, flows from older to younger age groups, the lifecycle wealth is negative. It is negative because those who are alive are obligated to make transfers to those who have not yet been born.

The effects of age structure on lifecycle wealth are quite pronounced (Table 3). In 1982, transfers are strongly downward from workers to children and total life cycle wealth is more than nine times total labor income and negative – dominated by the downward flow to children. As population aging proceeds, flows to children decline and are dominated by flows to the elderly. By 2050, steady state lifecycle wealth will be 2.6 times labor income. Steady state lifecycle wealth required to support consumption by the elderly will rise to 7.1 times labor income. The important implication of Table 2 is that population aging in China must lead to rapid growth in the capital stock, to an enormous expansion of public or familial-based transfer programs, or to a significant decline in living standards among the elderly.

[Table 3 about here]

[4] For a detailed discussion of the theoretical underpinnings of intergenerational transfers see Lee (1994).

Suppose that the reallocation system for the elderly relied entirely on capital throughout the entire history under consideration. Prior to reform this would assume that the state was implicitly funding pensions by investing in state enterprise. After reform capital accumulation became a combined responsibility of the family, the market, and the state. Demographic conditions in 1982, under steady-state golden rule assumptions, would imply a capital-output ratio of 2.6. Demographic conditions in 2050, again under steady-state golden rule assumptions, imply a capital-output ratio of 7.1. Given simple assumptions, an increase in the capital-output ratio of this magnitude would lead to a doubling of output per worker.[5] The impact on the rate of growth of output per worker depends on the time frame over which the capital deepening occurs. Evenly spread over a century, output per worker would have to grow at 0.7 percent per year. Spread over 50 years, output per worker would grow at 1.4 percent per year as a result of capital deepening.[6] Such a growth in output per worker is what can be considered the second demographic dividend in the Chinese case.

[5] Given a Cobb-Douglas production function, the relationship between output per worker and the capital-output ratio is:

$$\frac{Y}{L} = \left(\frac{K}{Y}\right)^{\frac{b}{1-b}}$$

Given an elasticity of output with respect to capital (b) of 0.35 a rise in the capital-output ratio from 2.0 to 7.1 would produce essentially a doubling of output per worker.

[6] See Lee, Mason, and Miller (2003) for a dynamic simulation analysis of Taiwan. The simulated transition from a low to a high capital-intensive economy required closer to fifty than to 100 years.

Institutions and the Second Demographic Dividend

The extent to which the second demographic dividend can be realized, however, depends on the mechanisms or institutions used to reallocate resources. Resources can be reallocated from surplus ages to deficit ages in different forms and relying on different institutions (Table 4). Three forms are available in complete economies: capital, transfers, and credit. Capital can be accumulated at surplus ages; later, at deficit ages it yields capital income and can be liquidated. An important point to note is that capital can only be used to reallocate resources from younger to older ages. Second, those in deficit ages can rely on current transfers from those in surplus ages. Third, individuals can rely on credit markets. Those at surplus ages can lend to children relying on loan repayments later in life when they are at deficit ages. Credit markets play a small role in inter-age reallocation systems, however, because of constraints on indebtedness.[7]

[Table 4 about here]

Economic reform complicates the picture in China because the institutions and mechanisms used to achieve reallocations are themselves under drastic transformation. In a market economy, three institutions are involved in reallocations. In many societies, the family is the principle institution responsible for reallocating resources across age groups, and in virtually all societies, families dominate reallocations to children. Two other institutions, the market and the state, vary in their importance depending on the economic system. In pre-reform China, market institutions played little or no role and the state played a dominant role. In post-reform China, the emergence of a market economy

[7]Credit could play an important role if children financed their own consumption by borrowing from adults with a lifecycle surplus. The debt would be repaid when children reached lifecycle surplus ages and their creditors reached lifecycle deficit ages. When children's consumption is financed through transfers from parents and, to a lesser extent, the state, there is little demand for credit for lifecycle purposes.

and the recognition of private property have expanded the mechanisms available for resource reallocations with important economic implications.

Our calculations of the second demographic dividend for China are thus suggestive because there are many complexities not addressed. One is that in pre-reform China a large portion of lifecycle wealth, perhaps all, was held as transfer wealth rather than as capital. Lifecycle wealth represented the pension obligations or the implicit debt of future generations as embodied in the state and its organs, e.g., state owned enterprise (SOE). To an unknown extent economic reform destroyed that lifecycle wealth. A continuing issue in China will be through what mechanisms and to what extent lifecycle wealth should be replenished. Transfer wealth will necessarily play a major role, because the greatest obligations are to those who are near or who have already reached retirement. For them, accumulating capital is not an option, only transfer wealth. The question then is the extent to which pension obligations are absorbed by the state (taxpayers), shifted to private firms including SOEs that are privatized, or shifted to families.

A second complication for China is separating the transitional issues associated with economic reform from the ongoing issues that arise with population aging. Establishing a large-scale PAYGO pension system would most readily meet the short-term objective of fulfilling obligations to current pensioners. Such a strategy, however, will commit China to a path that foregoes the second demographic dividend.

Direct econometric support for the existence of a second demographic dividend comes in the form of studies of the effect of demographic factors on aggregate saving. Saving rates must rise above their equilibrium level to produce an increase in the capital-output ratio. There is no doubt in East Asia that aggregate saving rates are well above

equilibrium, but there are many competing hypotheses about why saving rates are so high in East Asian economies. A number of studies have found evidence to support the view that saving rates have been influenced by changes in age structure (Mason 1987; Mason 1988; Kelley and Schmidt 1996; Higgins and Williamson 1997; Deaton and Paxson 2000) and life expectancy (Bloom, Canning et al. 2003; Kinugasa 2004). The magnitudes of estimated effects are sensitive to the methods and data employed.

The available evidence supports the conclusion that the demographic transition has led to more rapid growth in output per capita in many East Asian countries where the demographic transition has been especially rapid. China has clearly enjoyed significant gains in output per effective consumer as a result of the first dividend. Whether or not China will enjoy a second dividend remains to be seen. Demographic change offers an opportunity for significantly more rapid economic growth, but only if the policy environment is supportive. It would be a serious error, however, to reach any welfare conclusions about demographic change, in general, and fertility decline, in particular. Two reasons for this seem to be particular important to emphasize. The first is that capital deepening is achieved by reduced consumption. The resulting growth in output per worker is not a free lunch but comes at the expense of reduced material standards of living among those who are saving at such high levels. The second point is that rapid fertility decline in China may have involved an enormous sacrifice on the part of parents forced to have a single child. We do not know how many children would have been born in the absence of the one child policy. Nor do we know how to value the costs imposed by the loss of reproductive freedom.

Conclusion

Following rapid mortality and especially fertility declines in the latter half of the twentieth century, China's aging process has already been well under the way and is unfolding not only at a massive scale and a rapid pace, but also with enormous complexities. It is complex due to its demographic and institutional legacies that have created multiple sub-national demographic regimes, and due to drastic changes in its economic and social institutions.

This chapter highlights some of these complexities. First, we have shown that if examined at a sub-national level, such as by urban and rural areas separately, we witness and anticipate a vastly different picture of population aging in China than the one treating China as a whole. Due to an earlier onset of fertility decline and a more stringent government birth control policy, urban China has become old not only earlier but also much faster than rural China. By 2023, when the overall aging level for all China will only be 12 percent, the share of population aged 65 and above will reach 20 percent among China's urban population. In other words, in less than twenty years, this segment of the Chinese population will be as old as Japan and Italy, the two oldest large populations in the world today. Moreover, unless fertility increases substantially in the near future, in about forty years, there will be one elderly out of every three persons in this segment of the Chinese population.

Second, a massive migration process can further complicate aging trajectories in urban and rural China. Constant out-flows of rural young labors, while helping to pay for urban infrastructure and therefore supporting urban elderly in some ways, will also lead to an increase in aging level in rural China. In the peak years, around 2020, out-

migration of young people can result an increase in rural aging level by as much as 70 percent compared with the trajectory in the absence of out-migration. The impact of migration on aging, however, is most likely to be restricted to the macro or the societal level, and temporary. Whereas rural migrants can make up for labor shortages in urban areas, they cannot be used as substitutes of children for providing familial support to urban elderly parents. At the same time, given that most rural migrants are likely to resettle back to the countryside, and with their remittances back home while away, the negative impact of rural out-migration may not be as serious as it appears.

Third, population aging in China not only poses new challenges but also presents new opportunities. One such opportunity is an increased level of saving and capital accumulation. With the right institutional setting and incentives, China's aging demographic profile can lead to increased capital accumulation and in turn, increased output per worker due to capital deepening. This increase is what is known as the second demographic dividend. Based on urban China's consumption and production profiles of 2000 and the projected population age structures, we estimate that this second demographic dividend can amount to as much as a 1.4 percent increase in output per worker annually for the fifty-year period between 2000 and 2050.

To realize this second demographic dividend, however, it is crucial to have the appropriate institutional arrangements that allow or even enforce current surplus to be saved in the form of capital, rather than spent as transfer to pay for an ongoing pension scheme or as credit. China's economic reforms of the last two decades have included a component of establishing a capital market and have allowed private ownership of capital and property. Institutional changes of such type facilitate the realization of the second

demographic dividend. At the same time, however, increasing pressure for transfer payment to the rapidly increasing retirees also puts a strong constraint on both the individual and the state to accumulate capital. Turning the demographic challenge of aging into an economic opportunity depends largely on the institutional context, a factor far more complex and unpredictable than future demographic trajectories.

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Figure 1 Trends of China's Fertility Decline by Urban/Rural Population, 1963-1987

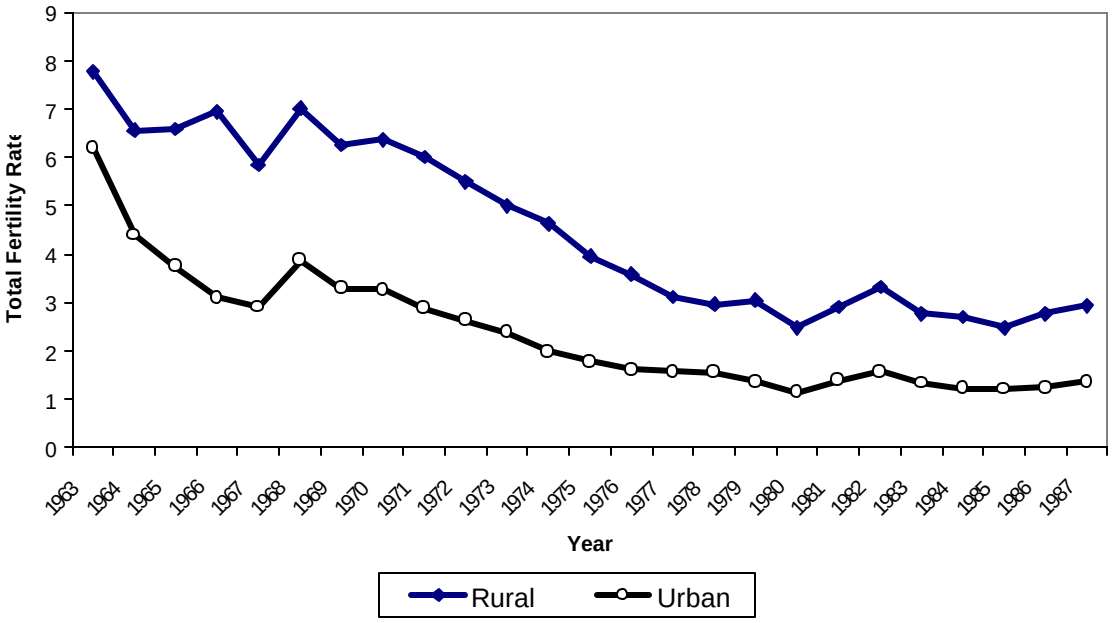

Figure 2 Projected Aging Trends, China, 2000-2050

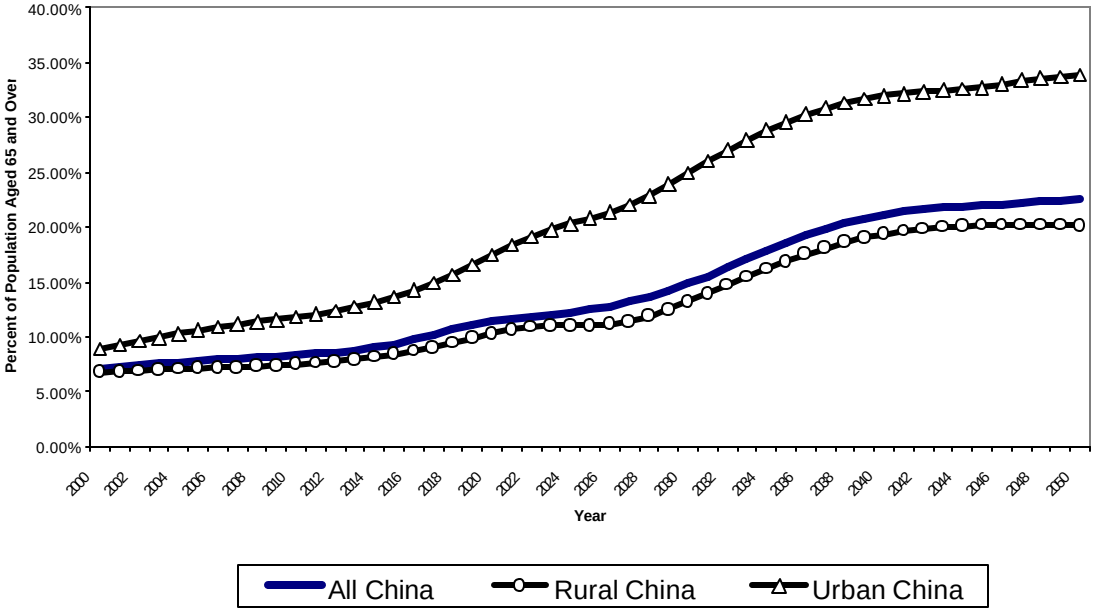

Figure 3 Age Pattern of Non-Marriage/Non-Housing Related Migration, China, 2000

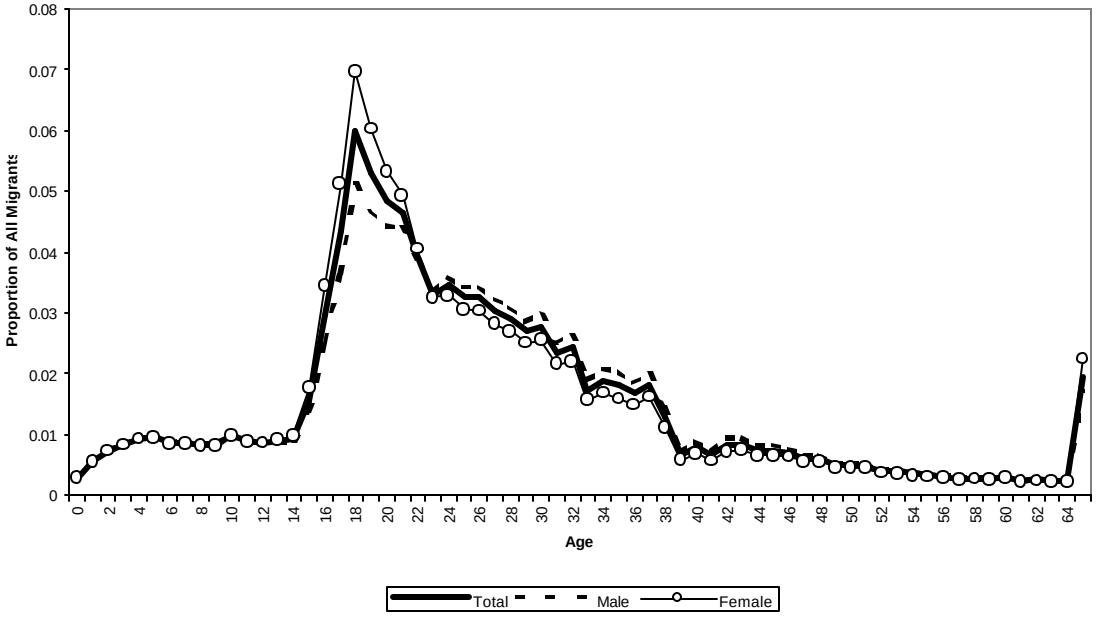

Figure 4 Aging in Rural China, Potential Impact of Out-Migration

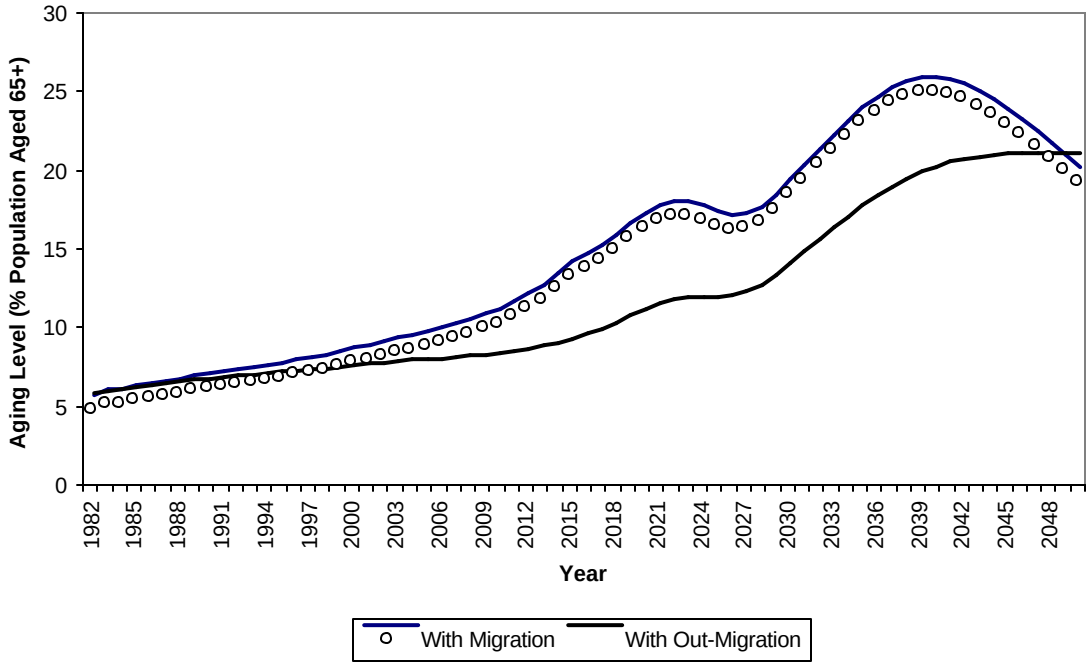

Figure 5.a. Consumption and Income Profiles, China, 1982

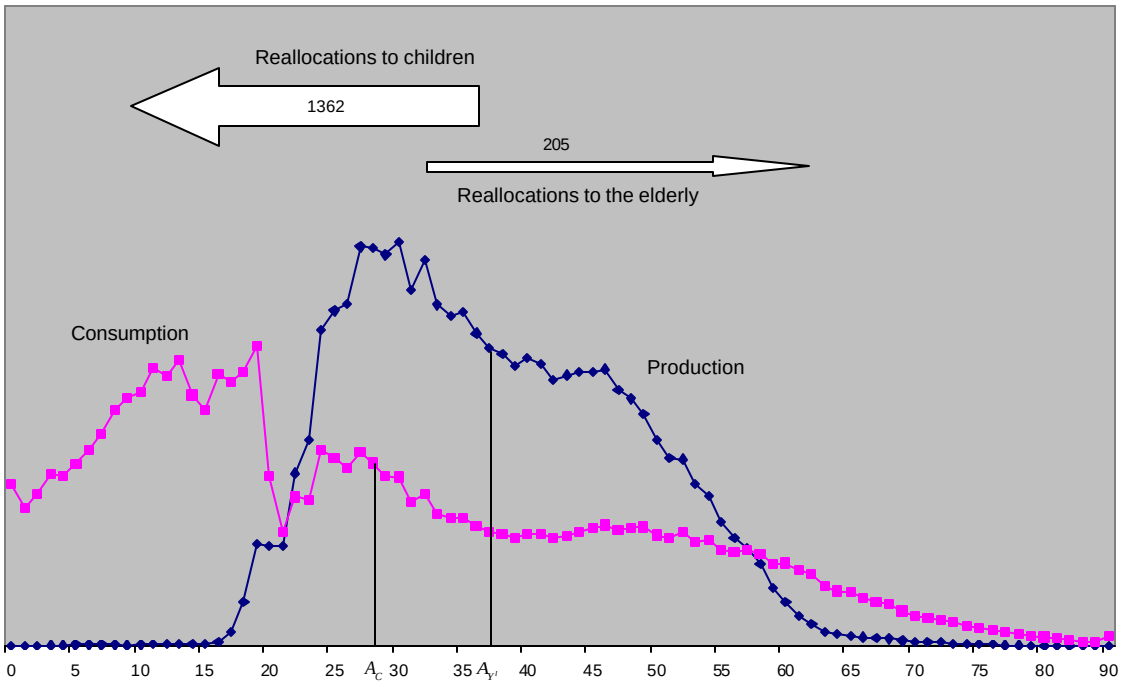

Figure 5.b. Consumption and Income Profiles, China, 2000

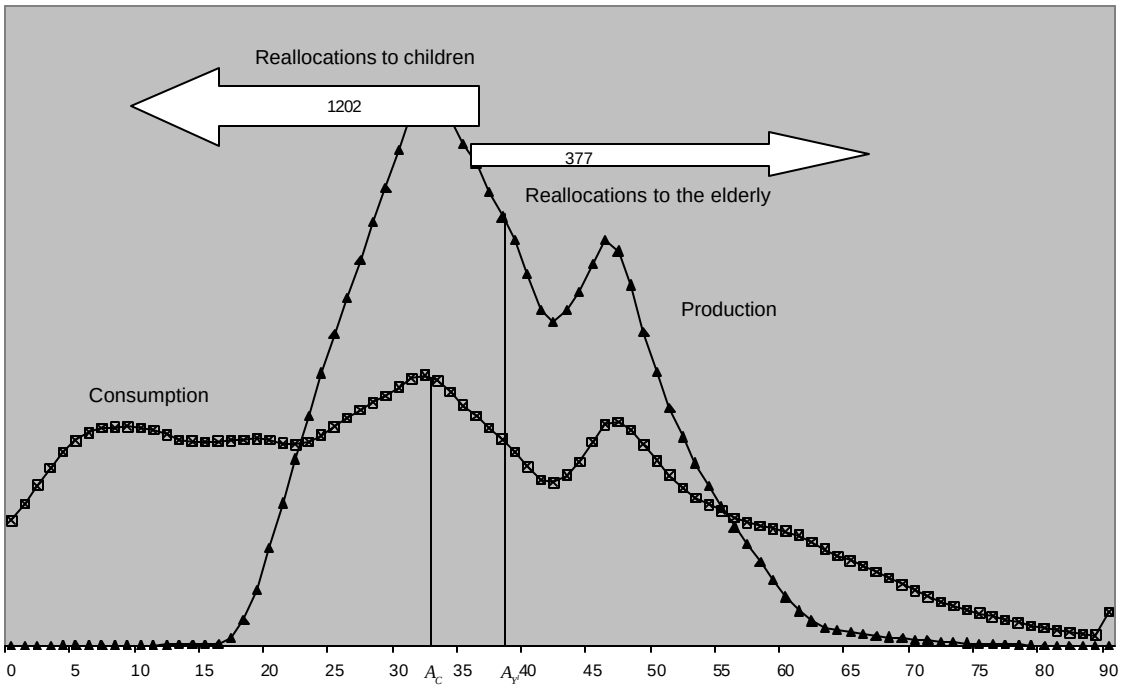

Figure 5.c. Consumption and Income Profiles, China, 2050

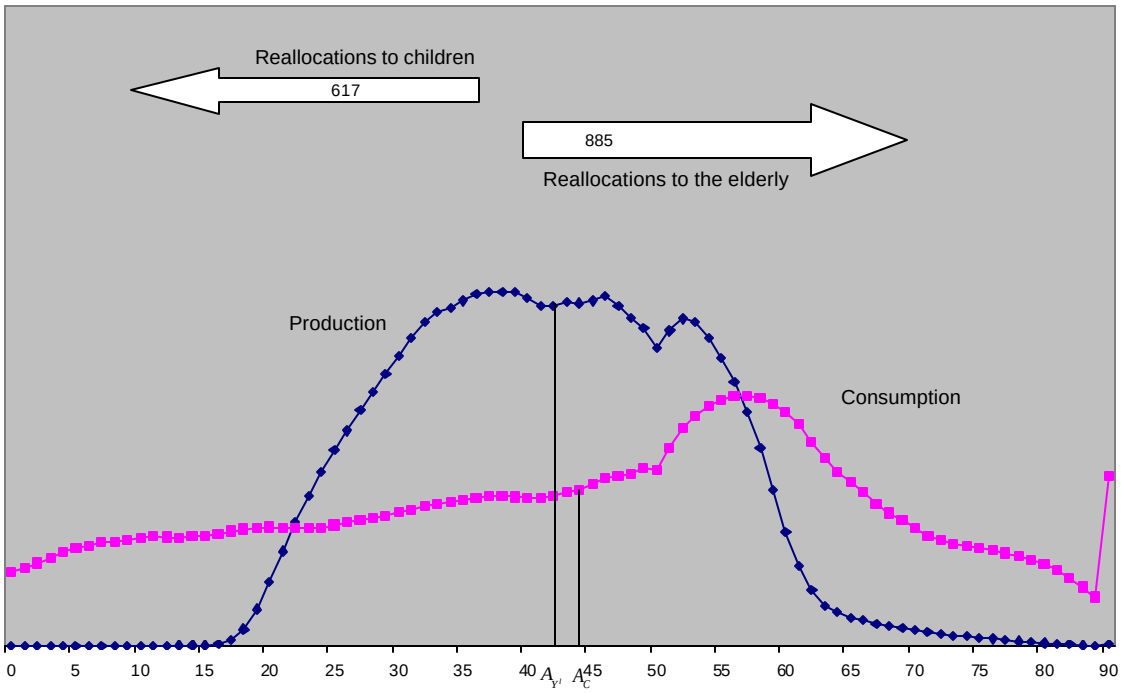

Table 1 Assumptions Used for Projecting Aging Trends in China

	Urban China		Rural China, w/o Migration		Rural China, w/Migration			
	1982	2050	1982	2050	1982	2000	2014	2050
Fertility (TFR)	1.6	1.29	2.6	1.8	2.6	1.8		1.8
Mortality (e0) Male	70	78	66.2	75	66.2			75
Mortality (e0) Female	72	82	69.4	79	69.4			79
Annual Migration ('000)					-6,000	-14,000	-21,000	0

Table 2 Projected Old Age Population (millions), China, Selected Years, 1982-2050

	Age		
Year	**60+**	**65+**	**85+**
1985	84.8	55.3	1.7
1990	99.4	65.4	2.6
1995	115.9	76.5	3.4
2000	130.4	89.4	4.4
2005	143.5	100.6	5.2
2010	163.9	109.5	6.2
2015	200.0	125.2	7.2
2020	219.8	154.8	8.4
2025	256.8	169.8	9.1
2030	313.3	200.2	9.8
2035	349.2	247.7	12.3
2040	359.4	275.2	17.1
2045	362.4	279.7	18.0
2050	368.6	278.0	24.0

Table 3. Mean ages and lifecycle wealth variables

	1982	2000	2050
Mean age of consumption	28.0	32.5	44.4
Mean age of production	37.3	37.8	41.8
Ratio of Lifecycle Wealth to Labor Income			
Total	-9.2	-5.3	2.6
Support of child dependents	-11.2	-7.8	-4.5
Support of elderly dependents	2.0	2.5	7.1

Note: Calculations use age-profiles of household consumption and labor income estimated from the 2000 Urban Income and Expenditure Survey. Estimate of life cycle wealth for the support of child dependents is based on the mean age at childbearing in 2000 from the population projection for China. Lifecycle wealth calculations assume golden rule, steady-state growth.

Table 4. Reallocation System

	Institution		
Form	Family	Market	State
Capital	Housing	Factories	Public infrastructure
	Consumer durables	Inventories	State owned enterprise
	Education	Farms	Funded pension plans
Transfers	Childrearing costs	Public debt	Public education
	Support of elderly		Public health care
	Bequests		Unfunded pension plans
Credit	Familial loans	Consumer credit	Student loans

Note: Adapted from Lee (1994).