This PDF is a selection from a published volume from the National Bureau of Economic Research

Volume Title: The Economic Consequences of Demographic Change in East Asia, NBER-EASE Volume 19

Volume Author/Editor: Takatoshi Ito and Andrew Rose, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-38685-6
ISBN13: 978-0-226-38685-0

Volume URL: http://www.nber.org/books/ito_08-2

Conference Date: June 19-21, 2008

Publication Date: August 2010

Chapter Title: Introduction to "The Economic Consequences of Demographic Change in East Asia"

Chapter Authors: Takatoshi Ito, Andrew Rose

Chapter URL: http://www.nber.org/chapters/c8144

Chapter pages in book: (1 - 15)

Introduction

Takatoshi Ito and Andrew K. Rose

The world currently faces dramatic short-term economic problems like the ongoing global financial crises. But a number of long-term economic problems also exist. Of these, only one is both hugely important and reasonably predictable: the long-run demographic issue. Many advanced countries have followed a similar pattern of change in their demographic composition, and are now reaching a final stage of aging. A predictable crisis, due to the adverse effects of the aging population, is looming in many advanced countries. The situation is perhaps most acutely in East Asia, where particularly rapid demographic change is occurring now.

Over the past decades, almost all industrial countries have experienced large decreases in the fertility rate. Their populations have simply become older and older. Since women are having fewer babies, and people are living longer, populations across the industrial world are aging; Japan is one the most extreme examples of high life expectancy and low fertility. Most rich countries now have fertility rates below the replacement rate of 2.1 children per woman; if this effect continues, their population will actually begin to shrink. This will not occur any time soon for most countries, but it is already happening in Japan and will soon be the case for Korea. This aging of the population has already had enormous economic and social consequences, and these consequences are likely only to rise in importance over time.

A number of economic consequences of an aging society have been inves-

Takatoshi Ito is a professor in the graduate schools of public policy and of economics at the University of Tokyo, and a research associate of the National Bureau of Economic Research. Andrew K. Rose is the B. T. Rocca Professor of Economic Analysis and Policy at the Haas School of Business, University of California, Berkeley, and a research associate of the National Bureau of Economic Research.

tigated by many authors.[1] First, an aging population is expected to lower the (total and per-capita) growth rate, as the working population (in absolute number and as the ratio of total population) declines. Thus an aging society is expected to be a drag on economic growth. The second feature stems from the fact that many countries use a Pay-As-You-Go (PAYGO) feature to finance their pension systems; that is, they use the current young's premium payments for the current retired pension benefits. The pension system is thus an income transfer from working generations to retired generations, often using fiscal deficits to mitigate the transfer problem. In many countries, the Pay-As-You-Go pension system is about to run into a problem as the baby boomers are about to retire and drastically change the support ratio. This is happening not only in Japan but also in Korea, Hong Kong, and in the near future, China (which has adopted a one-child policy). Third, as most health care costs are publicly provided in almost all countries, the aging population is expected to increase government spending on health considerably. As society ages, such expenditures have to be covered from a smaller tax base of the working population, and the aged have higher health care expenditures. It is no surprise that many countries have shifted to fund government expenditures by indirect value-added-taxes rather than personal income tax, as population ages. Fourth, the ratio of savers and dissavers changes as the ratio of working to retired population changes. Thus a demographic change has impacts on saving and asset holding behavior of the aggregate household sector, thus affecting asset prices (such as housing, stock, and bond prices), unless the supply side adjust to this change.

This volume consists of a selection of papers presented at the nineteenth annual East Asian Seminar on Economics (EASE-19) on June 19–21, 2008, in Seoul, Korea. The main theme of the conference was the economic consequences of the demographic transition in East Asia, an area of the world currently experiencing a dramatic demographic transition.

The conference for this book took place in June 2008, a few months before the rapid global financial meltdown which took place in the wake of the Lehman Brothers collapse. Many workers close to or in retirement lost a sizable portion of their savings as a result. For young workers, the 2008 financial shock may turn out to be a short-term (though deep) financial cycle, and its consequences may be dominated by long demographic trends. The financial shocks of 2008 and its consequences on saving and consumption are not treated in the chapters in this volume.

1. For the last two decades, the NBER "Aging" group has been active in publishing various lines of work related to aging. See their website, http://www.nber.org/programs/ag/ for a guide to a summary of activities as well as the past papers and books. The NBER group on Aging and Health has been issuing quarterly bulletin since 2002; see http://www.nber.org/aginghealth/2009no1/2009no1.pdf. The most recent conference volume in the 20-year long series is Wise (2009). The NBER group also produced the two volumes on the U.S.–Japan comparison in aging. See Noguchi and Wise (1994) and Hurd and Yashiro (1997).

In the rest of this introduction, we first highlight several themes that run through several chapters in this volume, and weave those themes into several relevant questions. We then give summaries of the chapters, linking them to our themes.

Demographic Transition

It is easy to understand the demographic transition from a low-income developing state to a high-income advanced state. Health and family behaviors across countries and time have a number of common features in economic development. There are four phases. Poor undeveloped states have fertility and mortality rates which are both high. There are many children per family, but people tend to die young, sometimes very young. During the second phase of development, the mortality rate begins to decline due to better nutrition and sanitary conditions, but the fertility rate remains high. As a consequence, the population grows, with a higher child dependency ratio as more children survive. As development continues, the country enters a third phase where the fertility begins to fall and eventually catches up to the falling mortality rate; this leads to a drop in the child and total (child plus elderly) dependency ratios. The drop in the dependency ratios implies an increase in gross domestic product (GDP) per capita, since the share of working-age people in the total population grows. In short, even if the GDP *per worker* had remained the same, the GDP *per capita* (population) would increase in this state. Thus, the first demographic dividend can be reaped. There is little controversy in the literature about the certainty of events and economic benefits about this dividend. However, longer life expectancy and lower fertility eventually causes population aging.

In the fourth and last phase, both the fertility and mortality rates become low. In this stage, the elderly and total dependency ratios rise due to the shrinking number of workers (resulting from the lower fertility rate) and the rising number of elderly (resulting from the lower mortality rate). The first dividend disappears. There is a controversy, both theoretically and empirically, whether there is the second demographic dividend at the final stage. The second demographic dividend occurs if individuals do more lifecycle saving to prepare for a longer stretch of retirement, funded either by private savings or a fully funded pension scheme. If much of the wealth remains at home (as opposed to flowing out of the country), this accumulated wealth for retirement increases the capital/labor ratio. The higher capital/labor ratio, due to accumulated life-cycle saving, promotes growth. However, the second dividend will not materialize if the pension scheme is of the PAYGO type.

The East Asian countries are at various stages of the demographic transition. Japan is in the final phase of demographic transition; Korea and China are in the third phase (the latter due in part to the one-child policy); and the

Association of Southeast Asian Nations (ASEAN) countries (except Singapore) are in the second phase. This volume studies East Asian countries, and will attempt to give some insights concerning the demographic transition that the rest of the world may experience in the future. This book covers topics such as economic growth, economic security of the elderly, national saving and external assets, female labor participation, and expenditures of public education.

In this volume, most papers explain the economic consequences, such as economic growth, of demographic transition. They do not study the other direction of causality, how the fertility rate is affected by economic growth. Therefore, an interesting question of an interaction between economic growth and the fertility rate is not dealt with squarely. However, that topic is amply covered in the literature of demography.

Throughout the volume, an assumption is typically maintained that the retirement age is sixty-five. In the pension systems of most advanced countries, a full pension requires delaying the start of benefits until the age of sixty-five. An option of having pension benefits start at a younger age is an option, but the total benefits are then reduced. Of course, as the general health level and work aspirations of older people is rising in many countries including those in East Asia, a revision of the retirement age may be desirable for the sustainability of the pension system. However, this is beyond our scope in this volume.

Economic Growth

Although the demographic transition has many effects, economic growth is among the most important of all implications. The first three chapters of the volume examine prospects of economic growth among Asian countries based on demographic changes that have occurred and that are projected to occur.[2]

Mason, Lee, and Lee (chap. 1 in this volume) provide a fine overview of the common patterns of demographic transition in the major countries of East Asia. First, they show dramatic change in the support ratios between 2008 and 2050: The population ratio of the old (age sixty-five and older) increases in Japan from 17 percent to 38 percent, Hong Kong from 11 percent to 33 percent, Korea from 7 percent to 35 percent, Singapore from 7 percent to 33 percent, China from 7 percent to 24 percent, Thailand from 7 percent to 23 percent, and Taiwan from 8 percent to 26 percent.

The authors are particularly concerned with the methods through which resources (not only income, but also healthcare) can be provided for the needs of the elderly. This question is relevant in predicting whether or not there is

2. Kelley and Schmidt (2005) provide a comprehensive survey of the literature on this topic.

a second demographic dividend. They contrast PAYGO systems with fully funded systems. In PAYGO systems, no extra capital (in the form of reserves) is accumulated during the period of the first demographic dividend, whether the transfers are provided by the state or through more informal family arrangements. On the other hand, if transfers are provided by fully funded savings from the workers themselves, there is extra capital accumulation. The latter (but not the former) can give rise to a second demographic dividend of economic growth. The authors show the inverse relationship between the fertility rate and educational and health expenditures (a proxy for human capital formation) per child in the region. Taiwan, Japan, and Korea are a group of countries with a very low fertility rate accompanied by very high health care and education expenditure in relation to average labor income of ages thirty through forty-nine. India, the Philippines, and Indonesia are just the opposite. Although the authors emphasize the relation between higher human capital investment and the fertility decline, they admit that the direction of causality direction is unclear. Japan and Taiwan are shown to rely more on public transfers and family transfers, thus effects of raising capital is not clear. Through a simulation model for ASEAN countries, based on Mason and Lee (2007), the authors show that asset accumulation patterns would be very different depending on the assumption on intergenerational transfers. In the case of low transfers (35 percent of old age consumption by transfers), the amount of assets would rise to seven times labor income in 2050; while in the case of high transfers (65 percent of old age consumption by transfers), assets would rise to two times labor income in 2050. The model assumes that open capital markets, so that some assets may take the form of foreign assets, so it is not straightforward to make inference from assets accumulation to the domestic capital-labor ratio. The result is suggestive of the possibility of second demographic dividend.

Bloom, Canning, and Finlay (chap. 2 in this volume) also focus on the shifting age structure in Asia. The authors examine how much effect the aging would affect economic growth in the process of dissolving the first demographic dividend. The authors employ reduced-form regressions, explaining per capita growth by demographic factors, in addition to a standard set from the convergence growth model, such as the real GDP per capital at the initial year. The demographic factors include young-age share (in population) and old-age share at the initial year of regression, the five-year changes in the young-age share and old-age share. The long run effect of demographic composition is estimated from the coefficients of the young-age share and old-age share at the initial year. The old-age share turns out to be insignificant in affecting the per capita growth, while the young-age share at the initial year turns out to affect growth negatively. The magnitude of the long-run effect is estimated as follows: a 10 percentage point decrease in the youth-age share will increase the economic growth per capita by 2.2 percentage points, leading to a higher steady state income per capita in the long

run. The short-run effects of the changes in the young-age and old-age shares are estimated from coefficients of five year changes in those shares: a one percentage point decrease in the youth-age share over a five year period increases per capita economic growth by 0.7 percentage points. A 1.0 percentage point increase in the old age share over a five year period decreases per capital economic growth by 1.5 percentage points. The positive impact of a decline in youth age share and the neutrality of the old age share on economic growth per capita are consistent with Kelley and Schmidt (2005).

The authors infer that the difference between the short and long run effects of the old-age share comes from various behavioral responses of people to demographic change. The authors emphasize an increase in female labor participation rate, the quantity-quality trade-off for children, a change in saving behavior and a change in social security (such as postponement of retirement age), with literature survey of these behavioral responses. These behavioral responses to aging may partially, if not totally, mitigate the adverse effect of aging on growth. The authors conclude that that population aging may not significantly impede economic performance in Asia in the long run.

Mason, Lee, and Lee (chap. 1 in this volume) and Bloom, Canning, and Finlay (chap. 2 in this volume) are complementary in that they provide two different sets of explanations concerning why Asian growth may not slow down due to the disappearing first demographic dividend—certainly not as much as a naïve model would predict. The former emphasize a possible second dividend (higher capital labor ratio due to higher life-cycle saving), while the latter emphasize behavioral change of people in response to changing fertility and life expectancy.

Hahn and Park (chap. 3 in this volume) investigate the relationships between: (a) the speed of demographic transition and per capita income growth, and (b) the speed of demographic transition and human capital accumulation. They employ both cross-country regression and micro-level household survey data of Korea. Although the authors motivate the study by invoking an endogenous growth model with endogenous fertility, an empirical part of the study is not explicitly derived from the theory, as the authors admit. The contribution of this chapter thus lies in its empirical undertaking.

In this cross-country (141 countries) study, Hahn and Park specify a growth regression, which is essentially common with that of the two preceding chapters; it includes a speed of demographic transition. Three sets of regressions are examined, each having standard variables of convergence growth model along with one of the three demographic variables: (a) the change in fertility rate (an average yearly change); (b) the change in the working-age population ratio; and (c) the change in population growth rate. They find that an increase in the speed of fertility decline increases the growth rate of per capita income; a faster increase in working-age popu-

lation ratio also increases the growth rate of per capital income. Finally, a higher population growth rate increases the growth rate of per capita income. Although the authors do not directly examine it, the regression is quite close to testing the degree of first dividend, which is directly specified in Bloom, Canning, and Finlay (chap. 2 in this volume).

Next, Hahn and Park examine the relationship between the speed of demographic transition of a country and the speed of its human capital accumulation. They find that countries with faster changes in working-age population ratio or faster decline in population growth rate, also experience a faster increase in years of schooling at all levels.

In the second half of the chapter, Hahn and Park examine a different data set. The household level survey in Korea is used to test the quality-quantity trade-off. Educating a child requires considerable resources in terms of both time and money. Indeed, a standard explanation for the decline in fertility is the trade-off between child quality and the quantity of children; this states that richer parents tend to prefer fewer "high quality" children in whom they invest their resources rather than more but "lower quality" children. This commonly heard hypothesis is rarely tested directly. Hahn and Park make use of a Korean micro data to investigate investment in human capital and take the quality-quantity trade-off seriously. It is found that with many reasonable control variables, the per-child expenditure on education is negatively influenced by the number of children. Reassuringly, their empirics are quite consistent with the quality-quantity trade-off, a rare but important feat in this mostly theoretical area of work.

Japan

Japan is a large open economy that stands out as the most rapidly aging country in the world. It has the longest life expectancy as well as one of the lowest fertility rates. This means that Japan's soon-to-retire baby boomers will enter the final phase of the demographic transition (with a shrinking population), something that has not been experienced by any other society. The Japanese population peaked in 2004, and Japan is now in the phase of declining population. By 2080, the population is estimated to be half its current size. In 2004, the Japanese total fertility rate was 1.26, one of the lowest in the world. The aging of Japanese society is very rapid; the proportion of the elderly (sixty-five years and above) will rise from 20.2 percent in 2005 to 30 percent by 2023, rising further to more than 40 percent by 2052.

Accordingly, three chapters in this volume focus on Japan. Ogawa, Mason, Chawla, and Matsukura (chap. 4 in this volume) describe the past, present, and future of the demographic transition, using many indicators. Takayama (chap. 5 in this volume) focuses on the Japanese social security system that is mostly a PAYGO system. The rapid aging is expected to cause great stress on the PAYGO pension system. Ohtake and Sano (chap. 6 in this volume) will examine the political economy of education support for the young.

Ogawa, Mason, Chawla, and Matsukura provide an overview of Japan's truly unprecedented demographic transition. Compared with other countries, Japan experienced a very short baby boom; the fertility rate rapidly rose and then dramatically fell after World War II. A large number of Japanese women have become, and are projected to remain, unmarried and childless. Some of this low fertility may be involuntary, since the ideal number of children (as expressed by mature Japanese) remains higher than the actual fertility rate. Nevertheless, the decrease in fertility is only part of the larger picture. Even more important is the fact that the expected Japanese lifespan has increased quickly. Mortality is becoming an increasingly important demographic feature, and Japan correspondingly has a low fraction of lifetime devoted to work. Few of the elderly are now living with married children, and expect to depend on care provided by children. The authors provide a fascinating and compelling portrait of these stylized facts with a terrific visual display of quantitative information. They show that Japan benefited from the first dividend in the 1950s and 1960s, reaching 1 percentage point of economic growth rate at the peak. However, the first dividend turned negative in the 2000s, and is projected to remain negative for a long time. The second dividend was large in the 1980s, reaching 1.5 percent at the peak, but this has gradually declined to less than 0.5 percent in the 2000s. Since the current retired and the soon-to-retire baby boomers have accumulated large private wealth, how these elderly utilize or spend their wealth has impacts on the future course of the economy.

The authors examine the mix of public and private transfers as well as private wealth reallocation in life cycle. A number of interesting findings are highlighted. They find that the impact of the rapid growth of the elderly population on transfers has been remarkable. Transfers to the old (sixty-five years and older) increased three-fold between 1984 and 2004, in which public transfers increased 4.4 times, while the amount of net familial transfers declined by 75 percent. Conversely, net public transfers are negative for the working population (ages twenty to fifty-nine). In 2004, the peak of negative transfers occurred approximately at age fifty-seven. The authors find that the Japanese relatively young elderly (in their sixties and seventies) provided more assistance to adult children and /or grandchildren than financial transfers they receive. This is quite an interesting finding.

The authors suggest that the second dividend is still a possibility, given that large private wealth has been accumulated, and conclude, "the Japanese elderly represent a powerful asset to keep the country on a sound and steady growth path in the years to come. Furthermore, over the past decade or so, they have been informally playing the role of the society's safety net by providing financial assistance to their adult children and grandchildren suffering from financial difficulties."

Takayama provides a comprehensive survey of the past, present, and future of the Japanese pension system. He describes the original pension

system, the 2004 reforms, and related problems such as the incentives problem stemming from high rates of social security contribution (higher than taxes), and worsening demographic support ratio. He uses the "balance sheet" approach to analyzing pensions throughout, and focuses on inter- and intragenerational equity. The Japanese system is quite generous; many of the elderly are better off than most workers. There have been many implementation problems associated with Japanese pensions, especially and most visibly in recent years (most infamously when fifty million social security files were discovered to be unmatched to people). However, these short-term problems pale in comparison to the more serious long-term problems. There are two such problems. First, as a PAYGO system, Japan has to pay benefits to retirees that have been promised in the past. This phenomenon is known as the "legacy debt" problem. More importantly, the Japanese population is shrinking and projected to decline for the foreseeable future; creating a sustainable system for the future is a second and separate problem, apart from that of legacy debt. As the demographic transition makes it harder and harder to keep benefit level (replacement ratio) from falling and keep contribution rate from rising, the current younger generation necessarily is worse off than the current retired in their life-time net benefit from the pension system.[3]

In 2004, the Japanese system was changed so as to become more sustainable, since it was, and remains, currently underfunded (unless the economy suddenly begins to grow at a much higher rate than a rate commonly believed to be possible). The 2004 reform includes: a new system of indexation that depends on wage growth rate; increased but also capped contributions; a reduced replacement rate; and increased government subsidies to the basic pension scheme from the general budget. Takayama shows that this reform makes the system substantially less desirable for the young generation. The higher contribution rates hurt the young to the benefit of the elderly. The present value of future benefits is only around 80 percent of contributions, which seems unfair to younger generations to come. Takayama reviews five policy options that have been proposed in Japan: privatizing the second-tier proportional-to-earning portion; move to a fully funded pension; switch to universal pension; move to notional defined contribution; and introducing minimum guaranteed pension. Either proposal has benefits and shortcomings. We are left with a depressing picture indeed, though of an important critical assessment of an important Japanese public policy.

Ohtake and Sano (chap. 6 in this volume) poses an interesting political economy question on the relationship between aging and public education support. Do the elderly support government expenditure on education? If

3. For those who think the issue in a broader intergenerational transfers, a generational accounting may be a better way of examining the issue. See Takayama, Kitamura, and Yoshida (1999).

the elderly are median voters, one would theoretically expect the elderly not to support education, since they receive no direct benefits from public education. Indeed, transfers to the elderly may come at the expense of education, given that they compete in the municipal government budgets.

However, the elderly may be supportive of public education, if they are altruistic vis-à-vis the younger generation. Alternatively, the elderly may be self-interested, if the extra human capital provided by education provides an indirect benefit to the elderly. The literature has a large number of mixed empirical results linking the importance of the elderly and their support for public spending. But there has been relatively little empirical analysis covering Japan, and this chapter fills the gap.

Ohtake and Sano use a panel data set covering Japan's 47 prefectures between 1975 and 2005. The authors use panel data analysis with fixed effect; divide the sample into two periods: between 1975 and 1985, and from 1990 to 2009. They find that a higher share of the elderly increased the expenditure on compulsory education per student by local governments in the 1970s–1980s. However, the reverse became true in the 1990s–2000s. Then Ohtake and Sano also ask *why* there was a change in attitudes of the elderly towards educational spending after 1990. They examine four possible reasons. First, it is possible that the elderly suddenly became selfish rather than altruistic around 1990 (though this is hardly an explanation). Second, the young became uninterested in politics and thus increasingly absent from the voting booth. Simultaneously the elderly continue to faithfully participate in elections. Combined with demographic gravity (which is tilting toward the elderly), the elderly have thus seized political power and now control the local governments, which duly implement policies that are beneficial to the elderly. A third hypothesis is that the change in the household structure has caused the decline in support of public education. The ratio of the elderly living alone (as opposed to living with children and grandchildren), has increased and this might gradually reduce the altruism of the elderly. Fourth, the change in the sign of coefficient may have been caused by the change in the public finance system of local governments.

There were fewer three-generation families by the end of the sample, but the authors show that this explanation does not explain the patterns observed. The same negative result is obtained in a specification that includes different living arrangements of the elderly in the regression. The authors then speculate that the change arose from the switch in the public subsidy system, where discretionary power and burden of the local government in public education spending has increased since 1985. For example, the subsidy from the national government for the salary of public school teachers has been gradually reduced.

Ohtake and Sano provide evidence suggestive of generational conflict in terms of support for public education. As admitted by the authors, going

to municipal data rather than prefectural data would sharpen the results, as most public education decisions are done at the municipal level.

Korea

Two chapters examine issues in Korea. Publicly-provided pensions are a relatively new phenomenon in Korea, where intergenerational transfers within family have been the norm historically. What is the relationship between these different types of transfers? Do public transfers crowd out those from family members? Kim (chap. 7 in this volume) pursues this fascinating issue empirically with the four data sets: Korean Labor and Income Panel Study, the Korean Longitudinal Study of Ageing, and the Korean Retirement and Income Study. Moreover, Kim compares the result with a comparable data set from the United States.

First, Kim describes notable features from the three Korean data sets. For example, he finds that Koreans have given to their parents much more than comparable Americans. About 62 percent of Korean households give some transfers to their parents or parents-in-law; in contrast, only 16.5 percent of American households make transfers to their parents or parents-in-law. Recall Ogawa et al.; while Japanese (relatively young) elderly give transfers to their adult children, the Korean elderly are on the receiving end of transfers.

Second, Kim shows that some of the transfers are motivated by altruism, since an increase in public support negatively affects private transfers. In 1980, three-quarters of elderly income took the form of transfers; in 2003, the ratio had fallen to just quarter. This has happened in part because of public policy; Kim finds evidence that expectations of public pensions have crowded out private transfers. Transfers are also motivated by exchange motive, as more care for grandchildren is rewarded by more transfers to the elderly by their adult children.

Third, the eldest takes on the heavy burden of supporting the parents. In return, Koreans also differ from Americans since they give concentrated bequests, often to their eldest son (in America, by way of contrast, bequests tend to be spread evenly). Fourth, investing in an additional year of education into child tends to result in higher transfers to the parent (when they become old), by an equivalent of ninety U.S. dollars. Kim concludes that investment in child's education is not worthwhile as an investment vehicle for retirement, at least measured in purely pecuniary terms.

Kim concludes that the current trend towards deteriorating familial support mechanisms in Korea is thereby shifting burdens to the public sector and the elderly themselves. Perhaps though future generations may become more self-reliant and accumulate wealth, possibly giving rise to a second demographic dividend.

Lee (chap. 8 in this volume) investigates the labor force participation

(LFP) of older males (sixty and above) in Korea over the past fifty years, taking advantage of the availability of a long span of data through the Population and Housing Census. The author is interested in understanding the increase in LFP for Korean men from the 1960s to the mid-1990s, while in other OECD countries, the LFP tends to have declined. Lee shows that there was a substantial decline in LFP from 1997 to 2000, most likely due to the East Asian financial crisis. He shows that the increase in LFP from 1965 to 1995 is largely due to an increase in LFP in rural areas, from 46 percent in 1965 to 70 percent in 1995. Population aging in rural areas is produced by the mass-migration of younger people to urban areas, which contributed to an increase in LFP among older males. The average size of farm households decreased from 6.4 persons in 1963 to 2.8 persons in 2006.

Lee uses an econometric model of LFP using data that are pooled over time, and links it to education, marital status, family size, and various regional characteristics. Age, as expected, is negatively correlated with labor participation. Among city dwellers, college graduates tend to stay in the labor market, but among rural dwellers, all levels of education have a negative impact on labor market participation. Married men were much more likely to be in the labor force than single men. The family size is negatively correlated with the labor market participation. Older men in rural areas were much more likely to be active in the labor force than their counterparts in the city. Being a farmer has strong impact on the labor participation rate, and the coefficient is much higher in rural areas than in city. From these, Lee concludes that losing family labor in rural households owning to rural-urban migrations was a major cause of the rise in the LFP of older males between 1980 and 1997.

The author pursues empirical analysis using a relatively untouched micro data set concerning housing and population. Unfortunately, the data set has a number of disadvantages, including an absence of income data. Thus, all the data set allows one to observe is whether a given participant is working (or working occasionally). Reassuringly, those data line up well with those from other surveys. With help of different sources, Lee observes that the ratio of the income of farm households to the income of urban households shows a long-term declining trend, except for the late 1960s. People living in rural areas are much less prepared financially for old-age security than city dwellers. The average amount of net savings of rural households was only 76 percent of the net wealth held by urban households.

Lee concludes that older males in rural areas tend to stay in the labor force longer involuntarily because of insufficient savings. Lee hypothesizes that this results from the shrinking size of the families located on farms (as the young leave the farms for the cities); rural income and wealth are both low, and farmers may find it difficult to save for retirement.

The Kim and Lee chapters are complementary in understanding the status and behavior of the elderly in Korea: Kim focuses on intergenera-

tional (monetary and in-kind) transfers without distinguishing rural and city dwellers; Lee focuses on the difference in labor market participation among the rural and city dwellers based on micro survey, but without income information. Ideally, comprehensive micro information on income, labor participation, and asset holding, with rural-city distinction, would be desirable in such an analysis.

China

While the demographic transition probably has its most visible effects on growth and transfers to the elderly, it also has a large number of other effects. The consequences for health and fertility decision are among the most important.

Almond, Edmund, and Lee (chap. 9 in this volume) ask the important question "What are the long-term effects of maternal malnutrition?" History matters if there are important effects, since even short-term deprivation during pregnancy can affect up to two subsequent generations.[4] But are health and labor productivity really be affected by conditions in the distant past? This chapter provides persuasive evidence that the answer is clearly positive. The authors use the awful Chinese famine of 1959–1961 associated with the "Great Leap Forward." This famine is a natural experiment which seems independent of education, labor market, and other such phenomena that might otherwise be confounding issues (i.e., it is plausibly exogenous). The authors examine people born during this period of time examined using data from the 2000 census, for example, some forty years later. Because weaker people are more likely to die in a famine, any estimated effects are likely to be conservative (because of selection bias). The authors find that those in gestation during the famine were disproportionately on leave from work in 2000, were supported disproportionately by other household members, and have smaller houses. They also have less human capital, are less likely to be married, are more disabled, are more likely to be female, and are less likely to work. Further, there is also an "echo effect" for subsequent generations. These strong and persuasive negative consequences are basically the same, independent of whether one relies on time-series or cross-sectional variation in the data set. Also, comparable features are *not* apparent in those born in Hong Kong during the same period of time. While this is a clever use of a natural but narrow experiment, it has potentially broad implications, since there continues to be tremendous inequality in nutrition access in developing countries.

As discussed in the Mason, Lee, and Lee (chap. 1 in this volume) and Bloom, Canning, and Finlay (chap. 2 in this volume), one possible response of low fertility is higher educational investment into child(ren)—the quantity-

4. Females are born with their eggs, so malnutrition during pregnancy can affect grandchildren as well as children.

quality trade-off. However, if a woman has no children, the trade-off cannot be taken advantage of. Indeed, low fertility means that many women will never have children, while others have multiple children. With no children, human capital investment disappears. This poses an important problem to models of endogenous economic growth as well as to society; the possibility of childless woman is often neglected in the literature.

In the literature, many studies have examined the determinants of the fertility rate, and it is well known that the fertility rate is negatively correlated with woman's educational attainment and income level. It is true that that a higher proportion of women in East Asia have recently gained higher education and mainstream jobs, but the speed of the decline in fertility rate in Japan, Korea, Taiwan, and Hong Kong is remarkable. Lui (chap. 10 in this volume) tackles this problem along three innovative lines. First, the variable to be explained is the *desired* number of children rather than the *actual* number of children at the time of data collection, since women bear children in different ages. The author takes advantage of a survey that asks women for their desired number of children (the sum of existing children and "the number of additional children the respondent plans to have") as well as other information that affects the decision. Second, the childless phenomenon is seriously examined. An ordinary least squares (OLS) regression to explain the fertility rate might produce a fitted value of *negative* children (at least for some combination of right-hand-side variables). In order to fix this problem, Lui uses alternative techniques: Tobit, the generalized Poisson regression, and a binary dummy variable approach. Third, Lui utilizes interesting questions on the survey of controls to sharpen the results.

Lui (chap. 10 in this volume) shows that the status of being married, having siblings, and living in a larger house all have positive impacts on the number of desired children. Further, schooling, age, experience (number of years) of work, and commuting time all have negative impacts on the number of desired children. Both the squared schooling and the squared experience of work have positive coefficient, so that the negative effect of very high education attainment is mitigated. Interestingly, income is statistically insignificant in Tobit and Probit regressions, and has a positive coefficient in the generalized Poisson regression. The dummy variables that are unique from the survey also give interesting insights. Factors lowering desired fertility include (a) a perceived negative impact on job and career; (b) lack of confidence in the education system; (c) ignorance concerning how to raise children; (d) distaste for children; and (e) a lack of confidence in the existing marriage. Although the number of respondents who evinced the distaste for children (d) is small, 4.5 percent, it has the largest magnitude of coefficient. There are also positive factors for desired fertility, including (f) a taste for children; (g) a perceived social responsibility to have children; and (h) a desire to have children in order to secure old-age support. Putting the results all together, Lui contributes to the literature of fertility decisions

in an innovative way. This type of work is very much needed in other East Asian countries with very low fertility rates.

References

Hurd, M., and N. Yashiro, eds. 1997. *The economic effects of aging in the United States and Japan.* Chicago: University of Chicago Press.

Kelley, A. C., and R. M. Schmidt. 2005. Evolution of recent economic-demographic modeling: A synthesis. *Journal of Population Economics.* 18: 275–300.

Mason, A., and R. Lee. 2007. Transfers, Capital, and Consumption over the Demographic Transition, R. Clark, N. Ogawa and A. Mason (eds.), In *Population Aging, Intergenerational Transfers, and the Macroeconomy,* eds. R. Clark, N. Ogawa, and A. Mason. Gloucestershire, United Kingdom: Elgar Press.

Noguchi, Y., and D. A. Wise. 1994. *Aging in the United States and Japan.* Chicago: University of Chicago Press.

Takayama, N., Y. Kitamura, and H. Yoshida. 1999. Generational accounting in Japan. In *Generational Accounting around the World,* eds. Auerbach, Alan J., Laurence J. Kotlikoff, and Willi Leibfritz, 447–69. NBER: University of Chicago Press.

Wise, D., ed. 2009. *Developments in the economics of aging.* Chicago: University of Chicago Press.