Population Aging Policies in East Asia and the United States

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As a result of successful efforts to reduce fertility and mortality, East Asian populations are beginning to age, in some cases rapidly. Policies in response to population aging range from attempts in Singapore to reverse it by encouraging more births to efforts in Japan to accommodate it by increasing employment opportunities for older workers. The population of the United States, which had a longer postwar baby boom, is aging more slowly than these two countries and may be able to learn from the East Asian experience with aging policies.

IT IS WELL KNOWN THAT THE INDUSTRIALIZED COUNTRIES OF the West have completed their demographic transitions from high to low fertility and mortality. As a result, they are experiencing population aging, as well as slowing population growth. Perhaps less well recognized in the United States is the fact that many East Asian countries are going through the same changes—in some cases at an accelerated pace without parallel in Western experience.

Although Western countries no doubt can learn from each other, it also may be instructive to review how East Asian policy-makers are responding to population aging. Just as in Europe, some are responding with pronatalist measures, whereas others—Japan, in particular—are focusing on ways to accommodate aging and reduce the impact on economic growth and public expenditures.

Population Aging

Although the age used in defining the elderly population varies across countries, no matter what the definition, the populations of East Asia are aging rapidly as a result primarily of fertility decline and secondarily of increased survival (*1*). In 1990, the United States had a greater proportion of its population aged 65 and over, but by 2025 it may be surpassed by Japan and nearly overtaken by Singapore (Table 1). Because of the rapidity of the demographic transition in these Asian countries, population aging is occurring at an unprecedented pace. Moreover, in some countries, there is substantial aging at a much lower level of economic development than was the case in the West. Of equal, if not greater, importance for planning, however, are changes in the absolute numbers of the elderly over the next 35 years. In the United States and Japan, the numbers are projected to double, whereas in China a tripling is projected and in South Korea, Singapore, and Malaysia, a quadrupling.

Given that the elderly populations of 2025 have already been born, no policy—however well implemented—can change the absolute numbers. Accommodationist policies can be designed only to meet whatever challenges are entailed by these numbers. In this article, I discuss policies aimed at (i) ensuring fiscal viability of public pension systems, (ii) delaying retirement and thus dampening increases in the ratio of nonworkers to workers and reducing potential labor shortages, (iii) expanding the availability of health and long-term care services, and (iv) encouraging family care of those elderly who cannot care for themselves. No attempt will be made to discuss for every country all of its programs and policies; rather, the focus will be on the most substantial and innovative ones.

In the near term, policies to reverse population aging can only lower the proportion of the population that is elderly by increasing the numbers and proportions at younger ages. These policies generally take two forms: pronatalist policies, that is, policies to encourage births, and immigration policies. Besides potentially changing the ratio of workers to nonworkers, these policies can also directly reduce labor shortages, albeit in the former case with a considerable lag.

Policies to Reverse Population Aging

Pronatalist policies. Pronatalism is rarer in the United States than in Europe or in some countries of East Asia, perhaps because the U.S. population is less aged or because it is aging more slowly. There are four countries in East and Southeast Asia with pronatalist policies—Cambodia, Laos, Malaysia, and Singapore (*2*). Only the last has specifically cited slowing population aging as a policy rationale. Cambodia and Laos are rebuilding populations ravaged by civil war, and Malaysia is eager to increase the size of its domestic market for economic reasons, although some would argue that another motivation is the maintenance of a majority ethnic Malay population.

Singapore Prime Minister Lee Kuan Yew first suggested a pronatalist policy in 1983 because more-educated women were not marrying and reproducing to the extent that less-educated women were. Negative public reaction to this population quality or eugenic argument resulted in the policy being repackaged as a way of addressing population aging and labor shortages. In 1987, incentives for having three or more children were introduced. The underlying goal was not for all women to have three children, but to increase the average to 2.1 children—the so-called replacement level at which each couple would replace itself in the next generation

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(allowing for mortality) and population size would not decline. [Ironically, just two decades earlier disincentives to having more than two children had been introduced (*3*).] The 1987 incentives for the birth of a third child included a tax rebate of about $10,000, and for working mothers, an additional rebate of 15% of earned income.

It was recognized, however, that the below replacement fertility of the 1980s was not so much a result of married Singaporeans having fewer children, but rather a result of later marriage. Cheung (*4*) has calculated that if 1970 marriage rates were combined with 1986 rates of fertility within marriage, the total fertility rate in 1986 would have been 2.8 children per woman rather than 1.4. Accordingly, the government has established a unit to provide computerized matchmaking services and organize activities that will encourage singles to meet—the most notorious of which are the "love boat" cruises.

Fertility rebounded to 1.6 births per woman in 1987 and to 1.9 in 1988, but the latter increase could be only a short-term response to the fact that it was an auspicious year in the Chinese calendar for giving birth. The government is now trying to fine tune the incentive package by including tax rebates for second births to mothers before their 29th birthdays, but given increasing female labor force participation and scarcity of child care, there is doubt that the incentives will have a substantial long-run effect. European experience with incentives suggests that although shifts in timing of births may occur, the ultimate number of births may not be greatly affected.

Even so, some Japanese policy-makers are beginning to consider encouraging a higher birth rate. In his 1989 inaugural address, Prime Minister Toshiki Kaifu expressed his willingness to implement such measures, and the Ministry of Health and Welfare is trying to design a more pronatalist child allowance system (*5*). As in Singapore, attention is focusing on more-educated women. In June 1990, Finance Minister Ryutaro Hashimoto created a political uproar by reportedly suggesting that the policy of encouraging female higher education should be reconsidered in light of its contribution to the low birth rate. His remarks, later denied, were especially troublesome given the governing Liberal Democratic Party's recent difficulties on women's issues and memories of the pronatalist policy before and during World War II (*6*).

Immigration policies. The United States has more experience with immigration than pronatalism, and some have argued that its relatively more open door compared with Europe will enhance its long-run economic vitality (7). Several East Asian countries are also beginning to increase immigration in an attempt to alleviate labor shortages and change age distributions. There has been an increasing flow of immigrants, as workers have been attracted to job opportunities in neighboring countries with more advanced economies (*8*). But the increase is slow, given concerns about illegal immigration, the potential changes in ethnic composition, and the difficulties that some European countries have experienced with guest workers.

Japan, known for its homogeneity and xenophobia, is proceeding cautiously. In contrast to the United States, where immigration accounts for almost one-third of population growth, the proportion in Japan is miniscule. Nevertheless, the numbers of foreign workers, legal and illegal, are increasing (*9*). In the past, illegal immigrants could not find work, but now they can, and some estimate that as many as 300,000 are currently in Japan. In December 1989, the Japanese parliament passed an employer sanctions law that provides for fines up to $14,000 for employing illegal alien workers, in contrast to the maximum fine of $10,000 in the United States (*10*). It also increased the number of categories of skilled workers who would be legally admitted, and public opinion is moving toward the acceptance of such workers, although the need is for less skilled workers to do jobs, such as those in construction, that Japanese are reluctant to do.

Singapore has embraced the immigration strategy more enthusiastically, but the potential effect on the population's ethnic composition is causing concern for minority Malays (15%) and Indians (7%). In particular, the recent decision to grant permanent residency status during the next 5 years to as many as 100,000 people from Hong Kong, who are expected to be almost all ethnic Chinese, has been interpreted as a move to increase the Chinese majority, despite reassurances from the government (*11*). A law to discourage illegal immigration has also been passed, but the penalties, three lashes of the cane and at least 3 months in jail, are directed to workers and not employers.

Hong Kong, which also has below-replacement fertility and is experiencing substantial out-migration in anticipation of China's resumption of control in 1997, is also encouraging immigration. The government recently announced a plan to bring 12,000, mostly semiskilled workers into its population of 5.8 million. The bulk are expected to come from China, with the Philippines as a secondary source (*12*). South Korea is also experiencing both the departure of its natives and the arrival of foreign workers, including illegals from Bangladesh, Pakistan, and the Philippines (*13*). But the issue does not yet appear to be an overall labor shortage—unemployment is up—but an unwillingness of some Koreans to take low-paying blue-collar jobs. In Taiwan, where fertility in 1985 was 1.9 children per woman, estimates of the number of illegals range as high as 200,000 in a population of 19 million. Nevertheless, the government faces conflicting labor and business interests and has yet to institute sanctions or pay for deporting the illegals (*14*).

Finally, the Japanese have come up with an interesting twist on

Table 1. Demographic indicators. Figures are based on the medium estimates and projections from (*34*), as calculated by the United Nations in 1988. Assumptions used in official estimates and projections by individual governments may result in figures different from those presented in this table.

Country	1990 population size ($\times 10^3$)	1985–90 population growth rate (%)	1985–90 total fertility rate (children/woman)	1985–90 expectation of life (years)	Proportion of population ≥65 (%)		Population size ≥65 ($\times 10^3$)	
					1990	2025*	1990	2025*
United States	249,235	0.8	1.83	75.4	12.6	19.6	31,404	58,956
Japan	123,457	0.4	1.70	78.1	11.7	23.7	14,444	30,477
South Korea	43,582	1.2	2.00	69.3	4.7	13.9	2,048	7,593
China	1,135,496	1.4	2.36	69.4	5.8	13.0	65,859	194,032
Singapore	2,702	1.1	1.65	72.8	5.6	19.1	151	618
Malaysia	17,339	2.3	3.50	69.5	3.8	9.3	659	2,593

*It is assumed that by the period 2020 to 2025, the total fertility rate in the United States will be 1.95 children per woman, in Malaysia 2.08, and in all the other countries 1.80. The assumed expectation of life for 2020 to 2025 is around 81 years for Japan, 80 for the United States, 78 for Singapore, and 77 for the others.

the immigration option—rather than importing the young, exporting the old (*9*). In 1986, a Ministry of International Trade and Industry official proposed the Silver Columbia Plan in which by the 500th anniversary of Columbus's landing in America, overseas retirement communities for the Japanese would be opened. He reasoned that housing and services would be cheaper in Spain, Australia, and various Asian countries. However, there was considerable public outcry in some of these countries against the idea of potential colonization by the Japanese, and the plan has been shelved. Still the government is encouraging Japanese companies to build leisure facilities abroad.

Policies to Accommodate Population Aging

Public pensions. Like the United States, Japan has recently reformed its public pension system to ensure its future fiscal viability (*15*). The United States opted to reduce benefits by raising the age of eligibility in the 21st century, among other measures. Japan has changed the formula by which benefits will be calculated for future retirees, so that the percentage of wages replaced will not soar as the system reaches maturity.

Current contribution rates (employee and employer combined) are similar, 14.3% in Japan and 15.3% in the United States (*9*). To support benefits under the old Japanese system, the rate for males would have had to increase to 38.8% in 2025. The framers of the 1985 reform, which reduced future benefits, projected a new ultimate rate of 28.9%. However, since 1985, the economy has grown more slowly and the population has aged more rapidly than expected, so that some economists are now predicting contribution rates as high as under the old regime. The Ministry of Health and Welfare would like to raise the age of eligibility for public pensions for employees from the current 60 years to 65, because projections indicate that contribution rates could be reduced by about 5 percentage points, but parliament has not been willing to go along. The average retirement age has only recently been increased from 55 to 60 years, and raising the eligibility age would place pressure on employers to raise the retirement age even further.

In Singapore, which has a fully funded provident fund rather than a pay-as-you-go system as in Japan and the United States, attempts to raise the benefit eligibility age also have been resisted. The combined contribution rate peaked at 50% in 1984. The rate for employers was reduced to 10% in 1986 in the face of recession, while that for employees remained at 25% (*16*). The former has since been raised and the latter reduced with the ultimate goal of an equally shared total rate of 40%. To encourage the employment of persons 55 and over, the government has proposed reduced rates for them and their employers. Even so, as recently as 1986, only 37% of the population between the ages of 50 and 54 belonged to the fund, so that a substantial proportion of the population would be unaffected by such incentives (*17*).

It is expected that pensions and provident funds will become increasingly important sources of income for most East Asian elderly, as is true for the Japanese. However, in the short run, coverage rates, benefits, or both are low (*18*). A lesson for the less advanced countries can perhaps be found in the experiences of the United States, Japan, and Singapore in adjusting eligibility ages and contribution rates. The political costs of changing the rules are high, and it may be better to initially legislate future increases in ages and rates, although predicting the demographic future is risky.

Employment policies. Support of the elderly is often thought of in dichotomous terms of public support (for example, pensions) versus support by families, but many elderly are quite capable of continuing to earn income. Moreover, given potential labor shortages, it may be economically advantageous to some societies to delay the retirement of workers (*19*). Critical to work incentives for the elderly are regulations governing retirement ages, but perhaps more important are rules affecting eligibility for benefits, either from public or private pensions. The motivation of the Singaporean government's attempts to raise the benefit eligibility age and reduce contribution rates in old age was clearly to encourage the employment of the elderly. The former change would provide an incentive to the employee, whereas the latter would encourage both the employer and the employee.

Although there are cultural differences in attitudes toward retirement, financial incentives are thought to account at least in part for the higher labor force participation of older Japanese compared with Americans. In 1987 in Japan, 48% of males and 22% of females ages 60 and over were in the labor force; in the United States, the percentages were 28 and 14, respectively (*20*). Although mandatory retirement ages have been outlawed in the United States, workers are eligible for reduced Social Security benefits at 62 and full benefits at 65, and substantial drops in hours of work and increases in retirement are clustered around these ages (*21*). Although in Japan the declines in participation by age are not so dramatic, there is evidence that pension eligibility has an effect on hours and retirement (*22*).

In Japan, legislation on mandatory retirement age has been proposed but not passed. The Ministry of Labor has had to rely on its powers of persuasion to influence employers to raise the age limit from the traditional 55 years to 60, a campaign begun in 1973. Progress has been made, but in 1987, 23% of firms with 30 or more employees still set 55 as the age limit, whereas 18% specified ages in the 56 to 59 range (*23*). Because wages are linked to duration of employment and private retirement allowances are based on last salary, as well as duration, firms have been reluctant to raise the limit.

The Ministry of Labor can require firms that have not raised the limit to 60 to present a plan for doing so, but public disclosure is the only penalty for noncompliance. Instead of relying on a stick to raise the retirement age, Japan relies more on carrots. Having achieved an average retirement age of 60, the ministry is now aiming for 65, and since 1986, it has given firms that retain workers beyond a set age limit of 60 as much as $300 per month per worker. Firms with more than 6% of their employees in the 60 to 64 group receive about $130 per excess older worker per month (*24*).

Given that employees are not eligible for public pension benefits until 60, there is also an incentive for those who "retire" earlier to find another job. For individuals, however, the stick analogy is more apt than the carrot, especially since their new jobs usually provide lower status and pay and no job stability. At the same time, the government provides carrots to firms to "reemploy" these older workers. Since 1984, firms hiring retiring persons 55 to 64 have been given one-time payments of $3,000 for each full-time and $1,500 for each part-time worker, and since 1981, those hiring such workers through public employment offices have been given one-third to one-fourth of the first year's wages up to $14,500. There are subsidies for research on improving the employment conditions of older workers and loans and subsidies for setting up "older worker firms" in which workers 60 to 64 can work for three or more years. The central government also subsidizes a chain of municipal labor exchange centers for older workers called Silver Manpower Centers.

It is unknown what effect these programs are having on labor force participation because any effect must be measured net of other influences, such as changing attitudes toward older workers, availability of public and private pensions, health of older workers, their other economic resources, and overall economic conditions. Nor is it clear if the programs and incentives, including those for individ-

uals inherent in gaps between retirement and benefit eligibility ages, would be appropriate in the U.S. context, where employment programs are targeted primarily to lower-income elderly (*25*). However, there is evidence that many older Americans who are not working would like to. A 1986 survey found that of Japanese and Americans ages 60 and over who were not currently working, 22 and 27%, respectively, would like to work (*26*).

Many U.S. workers express a preference for retiring gradually through part-time work. Moreover, there is evidence that over a quarter of U.S. workers do in fact go back to work for a few years after retirement, usually with lower pay and lower status, as in Japan. These workers tend to be lower and upper, but not middle, class. Burkhauser and Quinn (*21*) suggest that substantial changes in both public and private pensions will be required before U.S. middle-class workers will stay at work past their early 60s. The changes legislated in the 1983 Amendments to the Social Security Act, such as increasing the benefit credit for retirement after age 65, reducing the benefit loss of earnings above an exempt amount, and in the 21st century, increasing the eligibility age and the benefit loss for early retirement, are expected to have limited effects on labor force participation.

Burkhauser and Quinn (*21*) argue that additional programs to reduce the costs of part-time work for both the employer and the employee (for example, the fixed costs to employers of health insurance per employee and the loss of public and private pension benefits for employees) will be necessary to further stimulate labor force participation. Policy-makers must decide whether the costs of such programs would be worth the benefits in terms of overall economic productivity and social welfare. The Japanese have clearly decided that the benefits of programs for older workers are worth the cost, which in 1987 was approximately $1.3 billion, up 60% in just 2 years (*27*).

Health and long-term care policies. To contain costs, Japan has been forced to redesign its health policy toward the elderly. Virtually all the population has health insurance, but in 1973 copayments were eliminated for those over 70. As a result, health care use by the elderly and costs increased dramatically. Accordingly, in 1983 nominal fees for the elderly were reinstituted, among other reforms, to contain and share the costs of their care (*9*).

Even so, by 1968, almost a third of total medical costs were attributable to those over 70, and their per capita medical costs were over four times the national average. Especially problematical have been the lengthy hospital stays of elderly Japanese—roughly eight times as long as those of their U.S. counterparts (*28*). Although only about 1.5% of those 65 and over are in homes for the aged at any one time (in comparison to about 5.0% in the United States), about 2.5% are in hospitals. Less stigma is attached to being in hospitals than being in homes for the aged, thus, "social hospitalization" sometimes results.

As in the United States, home care programs have been slow to develop in Japan, but in 1989 the government proposed a 10-year plan to reduce hospital care for the bedridden at a cost of $43 billion—nearly four times the expenditures on similar services in the 1980s (*29*). Of the 5% of the 65 and over population that is bedridden, 42% are in hospitals, 20% in skilled nursing facilities, and 36% at home. The goal under the so-called Golden Plan is to change these percentages to 12, 24, and 35, respectively, with the remaining 28% in newly created geriatric rehabilitation centers. There are also plans for significant increases in the number of visiting homemakers, respite care centers, and day nursing homes.

The rest of Asia is spending substantially less on health and long-term care of the elderly. In Singapore, where most elderly do not have health insurance, part of each person's provident fund account has been set aside since 1984 to pay for hospitalization (*30*). In China also, few elderly have health insurance, and the expectation is that families will provide most long-term care. About 2% of the 60 and over population in Singapore is living in homes for the aged, whereas less than 0.5% is in China (*17, 31*).

Family policies. About 75% of East Asian elderly do indeed live with their children (compared to 15% in the United States), but in Japan, South Korea, and Taiwan, co-residence is declining (*32*). As we know in the West, assistance can be given across household boundaries, and living together is no guarantee of well-being, economic or social. Nevertheless, Asian policymakers are concerned about the changes and are paying increased lip service to the importance of family care, as well as providing some incentives.

In Japan and Singapore, tax rebates are given to children who support their elderly parents, and there are housing programs to encourage living together (*18*). In China, both the 1950 and 1980 Marriage Laws stressed the duty of parents and children to support each other (*32*). Interestingly, given the one-child-family policy, the 1980 law emphasized the responsibility of daughters—not just sons, as in the past, when married daughters were not considered members of their natal families—and added the stipulation that grandchildren also have a duty to their grandparents, both maternal and paternal.

Emphasis on family care, however, may be on a collision course with increased female labor force participation, a concomitant of economic development that may be beyond governments' control and potentially a partial solution to labor shortages due to population aging and slowing population growth. As women are generally the caretakers of the young, they are also the caretakers of the old. Ogawa (*33*) has projected the numbers of elderly needing care and the numbers of nonworking housewives in Japan and found that the ratio of such elderly to housewives will increase from 42 to 100 in 1985 to 123 to 100 in 2025. Clearly, some U.S. policy-makers have already recognized the possible role conflicts of work and elder care for women, as indicated in the proposed family leave policy that would allow leave for both child and parent care.

Concluding Remarks

The population aging and slowing population growth of the more developed countries of East and West are new phenomena in world history. Societies face many choices as they try to balance the needs of the elderly with the needs of the rest of the population. There is much to be learned about what will maximize social welfare—not least of which is an improved understanding of each society's values and expectations about old age. In the long run, policies based on age may not be fiscally sustainable and the focus may have to shift to need—a nebulous concept. In the meantime, lessons can be learned from the policy successes and failures of countries undergoing similar transitions.

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Ultrafast X-ray Pulses from Laser-Produced Plasmas

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A high-temperature plasma is created when an intense laser pulse is focused onto the surface of a solid. An ultrafast pulse of x-ray radiation is emitted from such a plasma when the laser pulse length is less than a picosecond. A high-speed streak camera detector was used to determine the duration of these x-ray pulses, and computer simulations of the plasmas agree with the experimental results. Scaling laws predict that brighter and more efficient x-ray sources will be obtained by the use of more intense laser pulses. These sources can be used for time-resolved x-ray scattering studies and for the development of x-ray lasers.

DURING THE LAST 20 YEARS THERE HAS BEEN GREAT progress in the development of subpicosecond laser sources at infrared, visible, and ultraviolet wavelengths (*1*). Recently, ultrafast x-ray sources have been demonstrated; this development is based on emission from high-density, laser-produced plasmas (*2–4*). X-rays from these sources are incoherent but have high brightness as a result of the small size, short lifetime, and high temperature of the radiating plasma. Pulses with a duration of a picosecond or less have been observed, more than an order of magnitude shorter than those produced by any other x-ray source. Experimental demonstration of ultrafast x-ray sources was made possible by the development of high-power, ultrashort pulse lasers (*5, 6*) and by improvements in the time resolution of picosecond x-ray detectors (*7*). The applications of such fast x-ray sources and detectors include time-resolved x-ray scattering of rapidly evolving materials (such as diffraction from structures undergoing rapid phase transitions) (*8*), time-resolved photoemission (*9*), and flash-lamp pumping of x-ray lasers (*4, 10*).

When a solid is illuminated by intense laser light, electrons in the material absorb energy and are rapidly heated. Hot electrons can subsequently ionize the much cooler atoms, forming an x-ray–emitting, high-temperature plasma spark at the surface of the solid. Laser-produced plasmas have been investigated since the 1960s in inertial-confinement fusion studies (*11*), and recently they have been used as a medium for x-ray lasers (*12*). Incoherent x-ray emission from plasmas has long been recognized as a useful laboratory light source and has been used for time-resolved absorption measurements (*13*), photopumping short-wavelength lasers (*14*), x-ray microscopy (*15*), and x-ray lithography (*16*). A general comparison of laser-produced plasmas with other x-ray sources is difficult because of specific system requirements. However, it is generally true that laser-produced plasmas yield x-rays with much higher peak power but lower average power than do synchrotrons and other high–average power sources such as rotating anode tubes.

Plasmas produced by short laser pulses are fundamentally different from plasmas produced by long laser pulses (*17, 18*). Laser pulses with a duration of 1 ps or more allow significant expansion of the

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