

## *Chapter 2*

### **DEMOGRAPHY OF AGING ACROSS ASIA**

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## 1. Introduction

The Year 2000 was a demographic watershed in Asia. After a century of growth, the number of children reached a peak in 1999 and, with the turn of the millennium, has begun a slow, gradual decline. At the same time, mortality has dropped dramatically. Life expectancy at birth increased from 41 in the early 1950s to 60 by the early 1980s and is projected to reach 68 between 2000 and 2005. Three phenomena—the enormous, sustained baby boom that characterized the twentieth century, the decline in fertility that will characterize the twenty-first, and the continuing, steady decline in mortality—all have major implications for the size and age structure of Asian populations.

All across Asia, the proportions of national populations age 65 and above are expected to grow rapidly over the next 50 years. This process of population aging is already clearly visible in the economically advanced countries of East Asia. It is beginning in the Southeast Asian countries that have successfully increased life expectancy and reduced fertility, and it can be anticipated even in the South Asian countries where the number of children today is still high. Population aging will present many challenges to societies and economies, such as providing health care for the elderly, assuring economic security for the elderly, and sustaining economic growth.

In the next section, we take a broad look at population aging in Asia and sub-regions. In Section 3, we present population and labor force projections recently prepared by the United Nations (UN 1998) and International Labour Organization (ILO, 1996). For projection purposes, we also take a more detailed look at some Asian countries in each sub-region. They include the Philippines, Thailand, Indonesia, India, Japan, Korea, and Bangladesh. Detailed data on other countries can be found in two recent surveys by the East-West Center (East-West Center 2002) and by Asian Development Bank (Mason 2002).

Demographic trends will have a sustained and irreversible impact on the nature of the support system on which the elderly rely. We describe these changes in more specific terms in Section 4. As population aging proceeds in Asia, the region must deal with three broad sets of social and economic changes: changes in the size and basic character of health care; the need to develop a larger and comprehensive

approach to old-age security; and changes in economic conditions. Section 5 discusses the implications of population aging for these changes. Section 6 concludes the paper.

## 2. **Aging and Population Change: Overview**

Population aging began in Asia during the 1970s. Before then, rapid growth in the number of children was producing a younger population. Between 1950 and 1975, the percentage of the population under age 15 rose from 37 to 40 percent and the mean age dropped from 21.9 to 19.7 years of age. By the mid-1970s, the trend towards a younger population had reversed itself. Growth in the number of children slowed relative to the number of working-age and the number of elderly (Figure 1). By 2000, if UN values are accurate, the percentage who were children had dropped to 30 percent of Asia's population while the percentage in the working ages had risen to sixty-four percent. The percentage elderly had increased gradually during this period and will continue to rise for the foreseeable future. By 2050, 17% of those living in Asia are expected to be 65 or older; 19% under the age of fifteen; and, 64% between the ages of 15 and 64. The median age will have reached 39 (UN, 1998, medium projections).

More detailed snapshots of Asia's projected age- and sex-structure are provided by the age pyramids for 2000, 2025, and 2050 (Figure 2). The age pyramid for 2000 is similar to those found in other relatively young populations. There is a broad base consisting of large numbers of children and a narrow top consisting of the relatively few numbers of elderly. In the past, new cohorts of ever-increasing size entered the population, enlarging the base. In the future, however, the base of the age pyramid is expected to be stable with population growth concentrated at older ages.

<Figures 1 and 2 here>

The relative stability of Asia's young population is already apparent among the youngest age groups. In 2000, the 0-4-year-old cohort and the 5-9-year-old cohort have essentially the same population size, and neither cohort is as large as the 10-14-year-old cohort. In the future, entering cohorts are projected to be similar or somewhat smaller than preceding ones. The major demographic phenomenon will be a "filling out" of the pyramid at older ages. As this occurs, all but the oldest cohorts are projected

to stabilize at around 300-350 million people per five-year age group. Between 2000 and 2025, 99% of Asia's projected population growth is accounted for by the population 30 and older and only 1% by the population under the age of 30. In contrast, the population under the age of 30 accounted for 70% of the growth between 1950 and 1975 and nearly 40% of the growth between 1975 and 2000.

The changes in Asia's population are being driven by three inter-related demographic phenomena. The first is a sustained "baby boom" that produced the largest cohort of youth in the past and, possibly, in the foreseeable future. The baby boom led to accelerated growth in the number of children between 1950 and the late 1970s and more modest growth until 1999. The second demographic event is the emergence of relative stability in the number of children. After more than a century of growth, the number of children in Asia is expected to begin a period of very slow, sustained decline. The third demographic event is the region's mortality transformation. Life expectancy at birth increased from 41 in the early 1950s to 60 by the early 1980s and is projected to reach 68 years for 2000-05.

The impact of these events on the regions age structure are traced out in Figure 3 which charts Asia's population from 1950 to 2050 separately for 15-year-age groups: 0-14, 15-29, 30-44, 45-59, 60-74, and 75+. This representation of age-structure is advantageous in that it facilitates following cohorts over time. The impact of the "baby boom" is evident in the accelerated growth of the child population, those aged 0-14, between 1950 and 1980 and more gradual growth during the last two decades of the 20th century. The child population more than doubled in size, increasing from about 500 million in 1950 to about 1.1 billion in 2000.

<Figure 3 here>

Asia's baby boom was different than the post-World War II baby boom that occurred in the US and many other Western countries. It was much longer lasting, and it occurred for different reasons. The baby boom of the West resulted from an increase in rates of childbearing. Asia's baby boom was primarily the result of a decline in infant and child mortality.

The baby boom had an enormous impact on age structure that will continue well into the 21st century. The first group of baby boomers reached young adulthood in 1965 producing accelerated growth

in the young adult population (15-29). In 1980 the first Asian baby-boomers had their thirtieth birthday and in 1995 reached forty-five years of age. As baby boomers enter these age groups during the next few decades, the most rapid growth in Asia's population will be among those in the prime working ages (30-59). Growth in the older population will accelerate begin in 2010 (or 2015) when the first baby boomers turn 60 (or 65).

Asia's future age structure will be influenced as much by the near stability of future cohorts of children as by the rapid growth of the baby boom generation. The year 2000 produced a generation of children in Asia, the Y2K-generation, that is smaller than the preceding one. As the Y2K-generation ages, growth in the number of young adults and prime-age adults will stabilize and possibly begin to decline. As this occurs, the older cohorts, baby boomers, will continue to enlarge the absolute and relative numbers belonging to older age groups.

The impact of continuing changes in mortality on age structure is less apparent in Figure 3 than changes in size of cohorts of children. However, declining mortality at older ages will have an important impact. As life expectancy rises in the future, the gains in survival rates will be increasingly concentrated at older ages. As a consequence, older age groups grow more rapidly during their high growth period than do younger age groups. Likewise, once growth ceases older cohorts decline somewhat more gradually than do young cohorts. Thus, declining mortality in the future will reinforce the shift to an older population.

In percentage terms, the older population will be the most rapidly growing segment of Asia's population during the first half of the 21st century. The average annual rate of growth for the 60-74 year old population is projected at 2.9% and the 75+ population at 3.4%. In contrast, the 0-14 population is projected to decline at an annual rate of 0.2%, the 15-29 population is projected to be essentially the same in 2050 as in 2000, the 30-44 and 45-59 populations are projected to increase at 0.5% and 1.5% annually, respectively.

The aggregate patterns for Asia are dominated by its two most populous countries, China and India. However, the general trends and the demographic forces that are influencing regional trends are

also operating in other Asian countries. The speed and timing of the transition to an older population will vary considerably among the countries within the region. In general, the countries of East Asia are furthest along in the aging process, followed by Southeast Asia, and South Asia. Japan and, then, Singapore have the oldest populations in Asia. Among Asia's major countries, Pakistan has the youngest population (measured by the median age in 2000). There 42% are under the age of 15 and only 5% are 65 and older. Aging measures for the study countries examined in detail in this chapter are reported in Table 1.

<Table 1 here>

### 3. **The Projected Growth of Elderly Population and Labor Force**

#### 3.1. *Population Projections to 2050*

This study makes detailed use of population projections prepared by the United Nations Population Division and released in 1998 (UN 1998). Any population projection is based on a set of assumptions about long-range trends in demographic variables. The reality that emerges during the coming decades may differ considerably from projected values depending on a variety of social, political, economic, and demographic forces. Political instability, new rounds of economic crisis, the emergence of new infectious diseases, and the more rapid spread of HIV/AIDS could lead to substantial, unanticipated deterioration in mortality conditions and depressed levels of fertility. More optimistically, medical breakthroughs could lead to a substantial extension of life and more rapid increases in life expectancy than anticipated. The future course of fertility in post-transition societies is very uncertain. How low fertility will decline, how long it remains at sub-replacement levels, and whether new baby booms will occur is primarily a matter of speculation.

Despite these uncertainties, population projections provide an important and useful framework for thinking about the future. At this point, we rely on a single projection (the medium variant) to describe the broad demographic trends in Asia. Below, alternative projections are considered in some detail. The UN

projections do not consider alternative mortality variants, but two such variants have been prepared as discussed in Appendix A.

The methodology is summarized here, but the interested reader can find a more detailed explanation in Zlotnik (1999). The methodology used by the United Nations requires estimates of the population by sex and age category in a base year (1995) and subsequent trends in age-specific rates of fertility, mortality, and international immigration from 1995 to 2050.

An estimate of the base year population in each country is obtained by revising and updating the most recent population census using available data on fertility, mortality, and, in principle, immigration. Decennial population censuses are conducted in most Asian countries in years ending with 0 or 1; hence, the most recent direct data on population were collected in 1990 or 1991. In most countries, more recent estimates of fertility and mortality are available from surveys and/or civil registration systems. The most comprehensive data are available for fertility and child mortality. Many countries do not have recent data on adult mortality. Few countries have reliable information on international immigration. Of the 32 countries of East, Southeast, and South Asia with populations of 150,000 or more, 21 have estimates of fertility available after 1993; 18 have estimated of child mortality available after 1993; 5 have estimates of adult mortality after 1993. Thirteen additional Asian countries had estimates of adult mortality for the 1990-93 period (Zlotnik 1999, Table 1).

The UN Population Division prepares three sets of projections used here. They differ in their assumptions about future trends in fertility. The medium variant distinguishes three groups of countries. The first consists of countries with total fertility rates (TFR) above replacement level (2.1 births per women). (The TFR is the average number of children women would bear were they subject to the age-specific birth rates prevailing during the period in question.) In these countries, the total fertility rate is projected to decline smoothly until it reaches 2.1 births per women at which time it remains constant throughout the remainder of the projection. The second group consists of countries with a total fertility rate between 1.5 and 2.1 births per women. In these, the fertility rate is projected to converge to 1.9 births

per women. The third group consists of countries with very low fertility, a TFR below 1.5 births per woman. In these countries, the TFR is projected to rise to a target level of 1.7 births per woman.

Of the seven countries examined in this study, four belonged to the high fertility group. Of these, Indonesia is projected to reach replacement level first, in 2000-05; India five years later; and the Philippines and Bangladesh in 2010-15. Two countries, South Korea and Thailand, are low fertility countries where the TFR is projected to increase to 1.9 births per woman during the first part of the 21st century (Table 2).

<Table 2 here>

In the low-fertility variant, the total fertility rate for high fertility countries is projected to decline to 1.6 births per woman; for low fertility countries to 0.4 births per women below the target fertility level used in the medium-fertility variant. Thus, the TFR in South Korea and Thailand are projected to decline to 1.5 births per woman. In the high-fertility variant, the total fertility rate for high fertility countries is projected to decline to 2.6 births per woman. The TFR for the low fertility countries is projected to rise to 0.4 births per woman above the target level, a TFR of 2.3 in South Korea and Thailand (Zlotnik, 1999).

UN population projections are based on a single set of mortality assumptions, rather than alternative variants as employed to characterize fertility. In most countries, life expectancy at birth is expected to increase steadily, based on the recent or medium-term experience, but more slowly as high levels of life expectancy are reached. Countries with a life expectancy under 65, for example, are projected to gains 2-2.5 years in life expectancy per quinquennium. When life expectancy reaches 70, the gain per quinquennia is only 1.0 years. At higher levels, the increase per quinquennium drops to 0.3 to 0.5 years of life. The mortality pattern is assumed to converge to an ultimate life table with a life expectancy of 82.5 for males and 87.5 for females, although no country reaches the ultimate life expectancy by the end of the projection period (Zlotnik, 1999). Mortality assumptions for 3 Asian countries, Cambodia, India, and Thailand, explicitly include the impact of HIV/AIDS. Details of the procedures followed are available in Zlotnik (1999).



The projected life expectancy, at ten-year intervals, for each of the study countries is reported in Table 3. In every country a steady increase in life expectancy is anticipated. The most rapid projected increase occurs in countries with low levels of life expectancy in 1990-95, Bangladesh, Indonesia, India, and the Philippines. Slower increases are anticipated in Thailand and South Korea. The projections anticipate substantial convergence in mortality conditions. By 2040-45, the difference between the lowest and the highest country, Bangladesh and South Korea, is only 5.4 years. In 1990-95, the difference was estimated at 15.3 years.

<Table 3 here>

The final component of the UN population projections is international migration. The information about international migration is limited and unreliable, but in most instances international migration is a relatively small component of population growth. In some instances, however, political instability or natural disasters have generated large-scale movements between countries. These are largely unpredictable in nature and no attempt is made to capture them in the UN projections, although the projections do anticipate the return of refugees to the country of origin in some instances. The six study countries are all classified as population “exporters”, although Thailand is a net exporter only for the period 2000-05. Thereafter, no net international migration is projected. Net outflows by South Koreans are projected to decline and stabilize at zero by 2020-25. The other study countries are projected to experience net outflows on a continuing basis. As a percentage of its population, the Philippines has the largest projected net outflows, averaging 0.1% of the population per year between 2000 and 2050. Indonesia and Bangladesh both have net outflows equal to 0.06% of their population per year. The absolute number of out-migrants from India exceeds that from the other study countries, but is only 0.01% of the population per year. Obviously, net migration is a relatively small component of population growth even in the Philippines. The impact on age structure may be substantially larger than these net rates suggest to the extent that the age distribution of immigrants is heavily concentrated in particular age groups. Data on the age distribution of projected migrants are not available by the UN. Hence, the extent

to which immigration is influencing population aging in Asia cannot be directly assessed. This is an issue, however, to which we return below.

### *3.2. Labor Force Projections to 2050*

The previous section examines the impact of population momentum on population aging in Asia. Population momentum also had deep implications for the size and age distribution of the labor force (economically active population). The broad labor force trends for Asia are summarized by Figures 4 and 5, which show both the historical and projected labor forces in ten-year age groups for males and females. In many respects, the labor force trends are similar to the population trends described above. This is hardly surprising as a key determinant of the size of the labor force in any age group is the size of the population in that age group. The values presented here, unless otherwise indicated, are based on the UN's medium variant population projections.

<Figures 4 and 5 here>

In some countries, the labor force trends differ from the population trends because of important changes in labor force participation rates (activity rates). As discussed in more detail below, the activity rates of three demographic groups, in particular, are changing in many countries. First, many teenagers and young adults are extending their time in school and delaying their entry to the labor force. Second, activity rates among women have increased as rates of childbearing have declined. Third, activity rates among older males have dropped.

Estimates and projections of participation rates primarily rely on the International Labour Organization's Economically Active Population Estimates and Projection (EAPEP) for 1996. The EAPEP provides estimates and projections of labor force participation rates by sex and five-year age groups for the period 1950-2010 at ten-year intervals and for 1995. These projections were extended to 2050 by making additional assumptions, the details of which are provided in Appendix B. The participation rates

were combined with UN population from the 1998 Revision to yield estimates and projections of the labor force by age and sex.<sup>1</sup>

The labor force transition for Asia is dominated by its two largest countries, China and India. However, most Asian countries have similar experiences with slight variation in the timing and speed of the transition. The region and Asian countries have experienced substantial labor force growth that has come in waves, affecting the youngest first followed by successively older age groups. This phenomenon is very similar to what we have seen in the previous section, and directly reflects the impact of population momentum. The size of the child labor force, those aged 10-19, accelerated during the 1960s and 1970s, reached a peak in 1980, entered a period of decline that is projected to continue.<sup>2</sup> Growth in the size of the labor force in this age group ceased earlier than its corresponding population because of the rapid decrease in activity rates of the age group since 1980. The young-adult labor force, those aged 20-29, increased most rapidly during 1970's and 1980's and is projected to reach a peak in 2010. The prime-age male and female labor force, those aged 30 to 49, has been increasing rapidly for the last two decades and is projected to peak in 2030. An older labor force, those aged 60 and over, is relatively small and has increased slowly during the last 50 years. Its era of rapid increase is not expected to begin until 2010 or later. In percentage terms, the elderly labor force is projected to increase most rapidly during the next 50 years. However, declining activity rates among the elderly could slow this growth considerably.

The total labor forces and labor force aged 65 and over of Asia, sub-regions, seven Asian countries are provided in Table 4. Note that the broad changes experienced in individual Asian countries are similar to those of the region as a whole. There are differences in timing and magnitudes. South Korea and Thailand are further along in their transitions and their labor forces are expected to grow little or not at all between 2000 and 2050. The elderly labor forces are expected to grow substantially in both countries but less so than in India, Bangladesh or elsewhere. Japan is much further along in the transition

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<sup>1</sup> The 1996 labor force projections published by ILO use earlier UN population projections.

<sup>2</sup> The activity rates for those in this age group are assumed to be constant after 2010 but one can well imagine continued decline in those rates with further reductions in the size of the child labor force.

and, unlike most Asian countries, population decline is anticipated by the UN projections. Although Japan's elderly labor force is expected to grow modestly, its total labor force is projected to decline by 20 million workers between 2000 and 2050.

<Table 4 here>

Changes in labor force participation rates have an important impact on the size and key characteristics of the labor force. The changes that have occurred in Asia, shown in Figures 6 and 7, are similar to those that individual Asian countries have also experienced. Three general changes have been pervasive. First, adult men aged 25-54 are reducing their participation slightly, while adult women are increasing theirs. Second, young men and women aged 15-24 are postponing their entry in the labor market. Third, elderly men are withdrawing from the labor force at a younger age. The effects of these changes are to concentrate the labor force at prime ages and to increase the number of women as compared to men.

The inverse U shaped profile of activity rates by age for men (Figure 6) is typical of most countries. The activity rates of men aged 24-54 are slightly decreasing in some countries because more workers are being discouraged in weak labor markets. Younger workers aged 15-24 show declining activity rates mostly due to the increase in the age limit for compulsory schooling and the growing trend among the young for higher education. In some instances, young people are discouraged and not seeking work because they think no work is available for their skills.

<Figure 6 here>

For men aged 55 and over, activity rates have declined substantially for the last 50 years and are projected to continue to decrease, although more gradually, in the future. This is mostly because they have been discouraged and have ceased seeking work as employment opportunities for this age group have shrunk. Rapid technological progress has made their skills and competencies obsolete, reducing their productivity. Employers appear to be reluctant to employ or even to retain older workers on the grounds that aging reduces productivity, and seniority-based remuneration raises the cost of employing older workers. Many older persons have lost their job opportunities because employment has shifted out of

agriculture. Jobs in agriculture have been the most important source of employment for the elderly, and this sector is not subject to the labor market rigidities that exist in an urban setting. Rapid changes in educational systems might also have given middle aged and younger workers a competitive advantage over their older counterparts. In some countries, mandatory early retirement provisions have affected activity rates among the elderly. Finally, for some developed countries such as Japan and Korea, higher standards of living, an increased preference for retirement, and the development of pension systems have contributed to lower activity rates among older men.

In most Asian countries, pension programs are sufficiently small that they have had a modest influence on retirement. However, as Asian countries begin to implement new programs for the elderly, participation rates could decline more rapidly than projected. This possibility and other policy aspects of labor force activity by older adults are considered in more detail below.

The activity rate profile of women (Figure 7) is moving closer to that of men, although, even in 2010, women are considerably less likely to be in the labor force than are men. The increase in female participation, concentrated in the 25-59 age group, can be traced to a variety of important developments. Changes in family responsibilities, particularly delayed marriage and the decline in childrearing responsibilities, have played a particularly important role. The development of social infrastructure such as child-care, preschool and elderly-care facilities; changes in the work organization and the development of part-time work; the growth of new industries that require workers with dexterity and intelligence rather than brute strength have all contributed to the increased feminization of the labor force. Improved survey procedures also measure women's activities more accurately by asking women what they do rather than asking them for their profession.

The trend toward higher female participation in Asia is not replicated in the experience of Bangladesh or Thailand. Women aged 25-59 in both of these countries have much higher activity rates than do women in other countries in the region. As their levels are already so high, a small decrease is foreseen for the next 50 years.

For younger women in Asia, the trend in activity rates is similar to that for younger men. As they remain in school longer their participation rates have declined. The gender gap in participation has largely disappeared at this age as young women are as likely to be in the labor force as are young men. For women aged 55 and older participation rates are generally low, have changed very little, and are projected to remain relatively constant.

<Figure 7 here>

Activity rates vary widely among countries or sub-regions, reflecting varying labor market conditions, industrial structures, educational systems, gender bias, and pension systems. Two differences are particularly important. First, participation by elderly men varies widely. Whereas most of countries in Southeastern and South-central Asia recorded participation rates ranging from 50 percent to 60 percent in the mid-1990's, Japan and South Korea recorded rates of around 35 percent. Second, there are differences in the pattern of female participation. The M-shaped women's activity profile found in relatively developed countries in the region such as Japan and Korea was characteristic of the female life cycle in the 1950's through the 1970's. The bimodal shape was the result of women leaving the work force at around the age of 25 years to marry and raise children; a proportion returning later at around 35 years of age when their children had entered school or older children could take care of younger ones. This M-shape is not characteristic of other countries probably because of such factors as the dominance of agriculture sector, and/or different ways of child rearing. Even where the M-shape is found, the increase in female activity rates is causing its gradual disappearance.

The changing age structure of the Asian labor force reflects changes both in activity rates and changes in the underlying population. Declining activity rates among the young are reinforced by declining population growth rates among the young. Declining activity rates among the elderly, however, are more than offset by the rapid growth of elderly populations throughout Asia. The resulting age transition of the Asia population is shown in detail in Figures 8 and 9.

<Figures 8 and 9>

The proportion of Asian young male and female workers aged 10 to 19 has experienced a sharp decline for the last two decades. Although India and Bangladesh still will have a relatively high proportion of young workers (10-19) for the next few decades, they too will begin to experience the same shift occurring elsewhere in the region. Prior to 1990, Asia as a whole did not experience any change in the proportion of old labor force aged 50 and over, although in Japan the proportion of labor force aged 50 and over has already increased very substantially. Korea and Thailand are also beginning to experience an increase in the proportion 50 and older and the proportion of labor force aged 50 to 59 and aged 60 and over is projected to increase markedly for the next ten years. By 2050, one-third of the male labor force is projected to be 50 or older; a somewhat smaller fraction of the female labor force will be concentrated at these ages.

In conclusion, if the projections presented here prove to be accurate, declining labor force participation rates and stable or declining population will lead to a decline in the number of young workers. Continued increases in female labor force participation combined with a larger population in the prime working ages will lead to a significantly larger female labor force. The number of elderly workers will also grow substantially even though the proportion of elderly men participating in labor force is expected to decline.

#### **4. Demographic Characteristics and Support Systems for the Elderly**

##### *4.1. Demographic Characteristics of Older Population and Labor Force*

Currently Asia's older population is concentrated at younger ages but over time the older members will disproportionately increase their numbers. Of the population 55 or older in 2000, roughly half are between the ages of 55 and 64 and roughly half are 65 or older. Of those 65 or older, roughly two-thirds are aged 65-74 and the remainder are 75 and above. Between now and 2025 the age-distribution of Asia's older population is relatively stable, but between 2025 and 2050 the percentage of the older population aged 75 and above is expected to increase substantially. By 2050, among men, the

percentage 75 and above is projected to reach 23 percent of the older population; among women, the percentage 75 and above is projected to reach 30 percent (Table 5).

<Table 5 here>

In general, older women outnumber older men; they are also concentrated at older ages than older men. The reason is that, in most countries, survival rates for women are higher than for men. For the population 55 and older in 2000, Asia has about 9 men for every 10 women. At older ages, the sex ratio is even more unbalanced. Among those 75 and older, there are approximately 7 men for every 10 women. This is a persistent feature of Asia's population and is expected to change only modestly over the 50-year projection period.

The older labor force is concentrated at younger ages reflecting the decline in labor force participation rates at older ages. In 2000, about 70 percent of workers in the 55 and older age group were aged 55-64 and about 30 percent were 65 or older. A modest shift in the distribution toward older ages after 2025 is anticipated. Older men are much more likely to be in the labor force than older women. In 2000, there are about 190 older men for every 100 older women in the labor force. The dominance of men among older workers is even greater at later ages. Among those 65 and older, there were 250 men in the labor force for every 100 women. Again, little change is anticipated during the next fifty years.

The demographic characteristics of the older populations vary within Asia. In East Asia, a somewhat higher percentage of the older population is 75 or older. Over time the differences are expected to increase. By 2050, one-third of the older population is expected to be 75 or older in East Asia. In South Asia and Southeast Asia, about one-quarter will fall into the oldest age group. Japan's older population is much more heavily concentrated at the oldest age group than is true of other countries. By 2050, over 40 percent are projected to be 75 or older in Japan (Table 6).

<Table 6 here>

The gender balance also varies among the regions and countries of Asia. Currently, Southeast Asia has a relatively low sex ratio, i.e., relatively few older men, as compared with East and South Asia. Among the individual Asian countries, the older populations of Japan, South Korea, and Thailand are



most heavily weighted towards women. Bangladesh, on the other hand, has an unusually high sex ratio. Over the projection period, these differences become attenuated, although Japan, South Korea, and Thailand continue to have a relatively low sex ratio among their older populations.

The activity rates of the older population are projected to decline during the coming decades. In part, this reflects an earlier age at retirement and, in part, changes in the age distribution of the older population. The most rapid changes tend to be in the countries experiencing the most rapid aging: Japan, South Korea, and Thailand. As this occurs, the older population will depend more on transfers and their financial assets and less on labor earnings.

#### *4.2. Demographics and the Support System for the Elderly*

Many elderly rely on their marital partner both for personal and financial support. Here we deal only with broad demographic changes that bear on the support system. Several important studies provide more detailed information especially about the role of the family support system in Asia (Cho and Yada 1994; Mason, Tsuya et al. 1998; Hermalin 2002).

##### *4.2.1. Marital Status*

Over time the proportion of the elderly who are married can shift substantially because of changes in the proportion celibate, i.e., who never marry, the proportion who divorce, mortality rates, and the proportions who remarry after divorce or the death of a spouse. In most Asian countries relatively low percentages never marry and rates of divorce are low. In the future, these two factors may become more important. The proportions of young adults who have ever-married have declined precipitously in many Asian countries. The decline may be entirely the result of a preference for a later age at marriage, but it may be that the proportion who never marry will rise. Likewise, rates of divorce have also increased in many Asian countries and, if rates of remarriage are low, the impact on the support system could be considerable at some point in the future.

In contrast with the uncertain changes in celibacy and divorce, changes in mortality rates are having and will continue to have a large impact on the proportion of the elderly who are married. Thus, the proportion widowed is the focus of this section.

A substantial portion of the elderly and particularly elderly women are widowed. In the year 2000, for example, we estimate once women reach their late sixties (65-69) about half of all Korean and Indonesian women and about 40 percent of all Thai and Filipino women are widows. Among older women the proportions are even greater. Depending on the nature of the support system, the loss of a spouse can have a devastating impact on the marital partner who remains. The proportions of elderly men who are widowed are much lower. Of men in their late sixties, for example, we estimate that fewer than 15 percent were widowed in the year 2000.

Women are much more likely to be widowed than men for several reasons. First, men are subject to higher mortality rates and typically die at a younger age than do women. Second, wives are typically younger than their husbands, adding further to the number of years by which they can expect to outlive their husbands. Third, older women are relatively unlikely to remarry in Asia should their husband die. A final issue is whether or not the mortality of husbands and wives is independent or not. If the loss of a spouse greatly increases mortality risks among women, for example, we would expect to see lower proportions who are widowed. Although the evidence is indirect, statistical analysis presented in the appendix suggests that wives do not face substantially elevated mortality risks at the loss of their husband. On the other hand, husbands who experience the loss of a wife may be subject to greater mortality risks.

As mortality rates decline in the future, the proportion of men and women at any age who are widowed will decline in the absence of offsetting changes. Changes in any of the factors mentioned above, the age gap between husbands and wives, the proportions remarrying, and the correlation between mortality of husbands and wives, could also influence the proportions married. The results presented here, however, are based on the assumption that these other factors will remain constant and that only mortality changes will influence the proportions widowed. A detailed discussion of the methodology is presented in Appendix C.

Projections of the proportion widowed have been prepared for four Asian countries for which the requisite data were available. The trends are similar in all four countries, suggesting that it may be safe to generalize from their experience. As expected, the age-profiles of the proportions widowed shift steadily downward during the projection period. The changes are very substantial. A rough characterization is that, for women, the proportions widowed drops in half at each age group between 2000 and 2050. For men, the percentage changes are even greater and the proportions of males who are widowed reach low levels by 2050 (Figure 10).

<Figure 10 here>

Although these changes are large, they are not out of keeping with trends in Japan where the proportions widowed dropped very rapidly between 1970 and 1995. The steep decline reflects the very substantial increase in the proportion of men and women surviving to advanced ages.

The changes in widowhood have potentially far-reaching, but complex, implications for the support system for the elderly. In the future, older men and women can expect to have a surviving spouse to a much later age. That spouse may be an important resource providing personal care, companionship, and financial resources. On the other hand, that spouse may be a burden and a drain on the limited human and financial resources of his or her elderly partner.

#### *4.2.2. Population Dependency Ratio and the Economic Support Ratio*

In all economic settings, the existence of large populations that are not currently productive requires that economic resources be transferred from the productive population to the non-productive population. The relative sizes of those two groups determine in part the relative size of the transfers or the “burden” of the non-productive on the productive population.

The non-productive population consists of two age groups, the young and the elderly. As described above, the demographic transition is accompanied by important changes in the relative sizes of the productive and non-productive populations. In many Asian populations, rapid fertility decline has led to a rapid drop in the relative size of the child population and, consequently, a substantial rise in the

productive population relative to the non-productive population. As the transition has proceeded, however, the relative size of the elderly dependent population has increased, producing a decline in the productive relative to the non-productive population. This demographic phenomenon undermines the capacity of the productive population to support the non-productive population.

These demographic changes are measured in two ways. The first makes use of the population dependency ratio. This is a standard measure. The child dependency ratio is conventionally constructed as the ratio of the population 0-14 to the population 15-64. The old-age dependency ratio is constructed as the ratio of the population 65 and older to the population 15-64. The total dependency ratio is the sum of these two or the ratio of the dependent population (0-14 plus 65 and older) to the productive population (15-64).

The second measure is the economic support ratio, which is the ratio of the productive population to the consuming population. Often the productive population is calculated using weights to adjust for age-variation in the labor force participation rates and productivity of the working-age population. The consuming population is constructed using weights to adjust for age-variation in material “needs”. We use a simple variant of the economic support ratio here. For the productive population we use the labor force unadjusted for age-variation in productivity; for the consuming population we count children aged 0-14 as 0.5 and all adults as 1.0.

To summarize:

Child dependency ratio:	$\text{Pop}(0-14)/\text{Pop}(15-64)$
Old age dependency ratio:	$\text{Pop}(65+)/\text{Pop}(15-64)$
Total dependency ratio:	$(\text{Pop}(0-14)+\text{Pop}(65+))/\text{Pop}(15-64)$
Economic support ratio:	$(\text{Total labor force})/(0.5 \text{ Pop}(0-14) + \text{Pop}(15+))$

Dependency ratios and the economic support ratio are provided for the regions of Asia countries in Table 7. The table summarizes the important trends highlighted above. The major trends anticipated in

the region are a decline in the child dependency ratio and a rise in the old age dependency ratio during the next fifty years.

<Table 7 here>

In East Asia, the old age dependency ratio dominates the trend in the total dependency ratio that increases modestly between 2000 and 2025 and more substantially between 2025 and 2050. In Southeast and South Asia, the trend in the total dependency ratio is dominated by the child dependency ratio between 2000 and 2025. Thereafter, the total dependency ratio begins to rise in step with the old age dependency ratio.

The pattern for the economic support ratio is similar to the pattern for the total dependency ratio. They move inversely because producers are in the numerator and consumers in the denominator in the support ratio. In the year 2000, the number of workers per effective consumer varies from 0.52 in South Asia to 0.66 in East Asia, giving East Asia an advantage. By 2050, the demographic advantage of East Asia disappears entirely with its support ratio dropping to 0.52. In both Southeast and South Asia, the support ratio increases between 2000 and 2025, but begins to drop after 2025. Note however, that the support ratios in Southeast Asia and South Asia do not reach the level achieved in East Asia.

## 5. **Implications of Aging: Policy Options**<sup>3</sup>

### 5.1. *Health Care for the Elderly*

A key challenge for Asian countries is to adapt to the population's changing needs for health care. Population aging will place an increasing burden on national health care systems. Among the world's economically advanced countries, including Japan, health care spending per capita is about four times higher among people age 65 and older compared with those under age 65.

As people live longer, demand grows especially for care related to acute and chronic conditions, including cardiovascular diseases, cancer, obstructive pulmonary disease, and osteoporosis. At the same

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<sup>3</sup> See Mason, Lee, and Russo (2001) for a detailed discussion of this section.

time, general public health issues will remain important, while new and resurgent infectious diseases increasingly emerge around the world. Rising demand for treatment of both communicable and non-communicable diseases will place increasing claims on national resources. In developed countries spending on health care already has risen, in part reflecting population aging. In Japan, for example, health care spending more than doubled as a percentage of gross domestic product (GDP) between 1960 and 1997.

The main determinant of individual health care spending is not age itself, but the number of years remaining until a person's death. Studies have shown that individual health care expenditures increase substantially in the last two years of a person's life. In the US in 1996, for example, Medicare beneficiaries in the last year of life comprised just 6 percent of all beneficiaries but accounted for 21 percent of program payments. Thus, even if older people are healthier than in the past and live longer, spending on health care will rise because the proportion of the population in the last few years of life will rise. Similarly, spending for long-term care associated with disability will rise. Even though the prevalence of severe disability is falling in many developed countries among people ages 65 to 75, the elderly will comprise a larger proportion of the population.

Demand for health care increases as countries develop and per capita income rises, reflecting the increased resources available to meet the demand. Whatever the level of development, however, population aging presents challenges in financing and delivering health care. Asian countries increasingly will be faced with decisions about what type of health care to provide, for whom, and how to do so efficiently.

Many developing countries, including India, Indonesia, and the Philippines, currently focus on maternal and child health because they view it as the most cost-effective health measure in lives saved. In countries that have yet to achieve primary care for all, and where aging has not yet emerged as an important issue, paying for long-term care of the elderly is not a high priority. In Japan, Korea and Taiwan, however, where population aging is furthest along among Asian countries, the situation is

different. Japan, like the US, heavily subsidizes health care for the elderly and subsidizes long-term health insurance as well.

Providing health insurance helps expand access to health care. In developed countries most public insurance schemes explicitly involve some type of financial subsidy from high-income to low-income groups. People with few resources of their own typically need assistance in paying for insurance itself as well as in making co-payments for health services received. The developed countries of the region, Japan, Korea, Taiwan, have opted for employment-based health insurance schemes with government subsidies for the poor, disabled and elderly. These countries have followed similar historical patterns of health insurance development to achieve universal coverage of the population. First, government as employer covers public sector employees with health insurance financed through tax revenues and receipts from public enterprises. Second, private employees in the formal sector are covered through government-mandated employment-based health insurance. This is tantamount to a wage tax. Third, agricultural workers, self-employed and workers in the informal sector are covered through government sponsored insurance groups financed through a combination of taxes and premiums. This incremental pattern is being largely replicated by the Philippines and Thailand. These national systems ultimately achieve universal coverage of their populations but at high expenditure levels. In the final step, price controls and other government regulations attempt to restrain health care expenditures. These employment-based systems amount to distortionary labor taxes, which are costly because they discourage work and encourage over-use of the health care system.

## 5.2. *Old-Age Security*

### 5.2.1. *Job opportunities for older workers*

As populations age, the labor force decisions made by older workers will become increasingly important to the workers and their families, to employers, and to governments. For some older workers, continued employment will be crucial to maintaining an adequate standard of living. Many will be supporting not only themselves, but their aging parents. Employers will look increasingly to older

workers as working-age populations begin to decline and labor shortages emerge. Governments will depend on the taxes paid by older workers as tax revenues fall short of the resources required to fund public pension programs, costly health care programs, and other important public services.

Throughout Asia and much of the world, however, older workers are withdrawing from the labor force at a younger and younger age. For some, deteriorating health may dictate early retirement but, in general, the elderly are healthier and have lower rates of disability than in the past. Why then are they withdrawing, just when they are needed most? What, if anything, can be done to reverse this trend?

Fifty years ago, the great majority of Asia's workers were self-employed mostly in agriculture. The decision to work or not to work was dictated by personal circumstances – wealth, health, responsibilities, preferences, etc. As economies have industrialized, more and more workers have become employees of governments and private firms. Decisions to work are increasingly governed by complex policies that reflect the influence of firms, labor unions, and public officials. The resulting labor market rigidities often discourage or, in some instances, virtually prohibit continued employment by older workers.

The trend towards earlier retirement is a persistent feature of economic development. In developed countries men now retire much earlier than was the case in the 1950s. In Asia the trends are similar, although older Asian men are much more likely to be working than are men in the West. The picture is more complex for women. In most Asian countries, participation rates among older women are generally low and have not changed in any systematic fashion. The situation for women is likely to change dramatically in the future because younger cohorts of women have much higher rates of labor force participation than earlier generations of women.

The direct correlation between rising levels of economic development and earlier retirement suggests that many people are spending longer in retirement because they can afford to do so. Retirement may not even be an option where levels of development are low, because most people have no choice but to work as long as they are able. Retirement is a luxury available only to the relatively well-off. Rising



incomes are only partly responsible for the decline in work among older adults. Labor market rigidities and a wide range of disincentives shoulder much of the blame.

In Asia as throughout the world, most governments impose mandatory retirement ages. For most Asian countries the statutory retirement age is below 65—for example, 60 in the Philippines and Korea, and 55 in Indonesia and India. Many countries have been slow to adjust mandatory retirement ages upward despite rapid improvements in health and life expectancy that enable people to continue to be productive longer than in the past. Many people today want to work longer than laws permit them to. In the US the elimination of a mandatory retirement age several years ago reversed the downward trend in employment rates for older workers, and it did not reduce employment among younger workers.

Many Asian governments allow firms to force older workers into early retirement when there are general downturns in the economy or when particular sectors or firms decline or when firms restructure their production processes. Despite evidence to the contrary, dismissing older workers is thought to help job prospects for young employed men, who are viewed as the primary family breadwinners.

Older women may be especially vulnerable to such policies as they are frequently viewed as secondary rather than primary breadwinners in the family. During Korea's recent economic crisis, for example, female employment declined more rapidly than male employment, unemployed female workers were more likely to withdraw from the labor force, and when women were re-employed they were less likely to obtain regular positions than their male counterparts.

There is little reason, however, for governments to encourage early retirement. In fact, the practice can reduce employment and income and dampen economic welfare in general. Cutting the number of older workers does not increase employment among young workers. Older and younger workers frequently have different skills, and labor markets rarely shrink and grow in the same sectors or occupations. In well-functioning economies the number of jobs is not fixed but changes with the number willing to work.

Public policies are not entirely to blame for job losses among the elderly. The wage system in some Asian countries, Japan and Korea in particular, is based on seniority rather than on performance.

Firms find themselves paying older workers far more than they are contributing to the bottom line. Efforts, some of which are underway, to tie wages more closely to performance and to increase flexibility in job assignments and hours worked could greatly ease pressures to force older workers into retirement.

In developed countries public pension programs have had a substantial effect on retirement. In the US large increases in Social Security benefits have been partly responsible for the decline in the percentage of older people who remain in the labor force. Even more generous programs in Europe have led to the low rates of employment among older Europeans. Pension programs have undermined work incentives by cutting the link between work effort and standards of living among the elderly. In Asia, public pension programs have been modest to this point and, consequently, have not greatly influenced older workers. However, it is likely that the expansion of public benefit programs currently being considered in many Asian countries would lead to further declines in the age at retirement.

Particularly in aging societies, policies that undermine labor force participation or dictate early retirement are damaging. Under such policies older workers who are not yet prepared for retirement are forced to accept a lower standard of living during their retirement years. Given the importance of the family support system in Asia, some of the extra burden of support imposed by such policies will be shouldered by the families of the elderly.

### *5.2.2. Family Support System*

In most traditional Asian societies, the elderly live in extended, multigenerational households and rely on their adult children, their spouses, and other family members for material needs and personal care. During the 1980s, more than three-quarters of the elderly in Asia were living with children or family (World Bank, 1994). During the 1990s, about two-thirds were living with their adult children, ranging from about one-half in Kazakhstan to more than four-fifths in Pakistan and Bangladesh (Bongaarts and Zimmer, 2001).

Today, the traditional family support system is under pressure from demographic, social, and economic change. In countries where fertility has been low for decades, the elderly have few adult

children to provide support, and many of these children have moved away from their family homes. Marriage rates have dropped sharply in some countries, and women are entering the work force in increasing numbers. Middle-aged women, the traditional caregivers, may have less time than they did in the past to care for elderly family members. Increasing exposure to the West may also be introducing new ideas about marriage, family, and individualism—ideas that clash with the traditional sense of responsibility for the elderly.

It is not clear how quickly or to what extent these pressures will undermine traditional family support systems. Family support for the elderly is already on the decline in some of Asia's most economically advanced countries. The percentage of Japanese elderly living with their children dropped from 80 percent in 1950 to 50 percent in 1990 (Ogawa and Retherford, 1997). In South Korea, the proportion of elderly women living with their children declined from 78 percent in 1984 to 47 percent in 1994. In Taiwan, the proportion of elderly parents living with a married son declined from 82 percent in 1973 to 70 percent in 1986 (Weinstein et al. 1994).

In 1997, only 8 percent of South Korean women of childbearing age indicated that they wished to live with their children when they grow old (Lee, 1998). Although the actual proportion of elderly living with their children has not gone down in the Philippines, fewer working-age adults wish to live with their children in the future (Natividad and Cruz, 1997).

The changes in living arrangements probably indicate a broader decline in family support. In 1996, only 15 percent of elderly men and women in Japan mentioned children as a source of income, down from 30 percent in 1981 (Ogawa and Retherford, 1997).

Even if the elderly continue to live with their children, the family support system will become less effective as the elderly live longer and have fewer children. Lee, Mason, and Miller (2000) show that by 2050 a fully functioning family support system will be able to meet only about one-half of the retirement needs of the elderly in East Asia's low-fertility countries. To meet their retirement needs fully, the elderly will have to work longer, save more, or rely on substantially enhanced public programs.

The challenge for public policy is to assess the viability of family support systems and to devise programs that will be supportive or complementary. Several governments have adopted such policies. In Singapore, children are now legally responsible for the support of their elderly parents. Many East and Southeast Asian countries are providing adult day care and other support services aimed at helping children care for their elderly parents, and Malaysia and Singapore have revised their public housing policies to accommodate multigenerational living arrangements. Malaysia also provides families with tax incentives for elderly care (World Bank, 1994).

### 5.2.3. *Public Support Programs*

During the past 60 years, national governments throughout the world have come to play an increasingly important role in providing old-age security for their citizens. Many Asian countries offer some type of support program for the elderly. Japan and Singapore have large-scale programs with close to universal coverage, but in most countries coverage is restricted to narrow population groups (Table 8). The Employees Provident Fund in India, for example, restricts coverage to employees in one of 177 prescribed occupations working in establishments with at least 20 workers.

<Table 8 here>

The relatively modest scope of programs in most Asian countries is also reflected in financial measures of their size. In 1993, the proportion of public expenditure earmarked for social security programs was only 2 percent in the Philippines and 8 percent in South Korea, compared with 22 percent in the United States and more than 40 percent in most European countries.

Public pension programs offer two important advantages. First, they represent a politically acceptable means of providing an economic safety net for those of the elderly who might otherwise experience severe levels of poverty. Second, national programs allow risk pooling. Individuals who must provide for their own retirement needs may make poor investments. They may suffer a disability that curtails their income-earning capacity or experience unusual longevity and outlive their savings. Public

programs can spread these risks and provide a monthly benefit that lasts as long as the beneficiary survives. Most also include some form of disability insurance.

Public programs entail their own set of risks, however. First, providing wide coverage may entail enormous administrative hurdles, particularly in low-income countries with large numbers of agricultural, self-employed, casual, domestic, and informal-sector workers. It is notoriously difficult to collect pension payments in sectors where labor turnover is high and documentation is weak (Bailey 1997). Recent legislation in the Philippines, for example, requires that household help and self-employed workers be covered, but there is a substantial gap between coverage under the law and coverage in practice.

Second, public pension programs are only feasible in countries with a substantial degree of political stability. The taxing ability of a government may decline, or the political regime may change, with new leaders backing out of promises made by their predecessors. As governments obtain privileged access to large pension reserves, they may also make unwise investments or pursue large-scale public infrastructure projects without adequate scrutiny of potential risk and return (World Bank 1994).

Third, public pension programs that are not carefully designed will prove to be unsustainable as the number of elderly increases relative to the working-age (and taxpaying) population. Many countries have pay-as-you-go systems in which current retirees are supported not by their own savings, but by contributions from current workers. Current workers will, in turn, be supported in old age by the next generation of workers. As the number of retirees increases relative to the number of workers, either payroll taxes must rise to high levels, or benefits must be reduced to low levels, or some combination of the two. There is little doubt, for example, that Japan's public pension program will face enormous difficulties in the coming years.

### *5.3. Economic Conditions*

During the past few decades, demographic changes have favored economic growth in many Asian countries. Changes in age structure have contributed to rapid labor force growth, higher saving and investment rates, and unprecedented increases in per capita income (Bloom and Williamson, 1998;

Mason, 2001). Demographic conditions will continue to favor economic growth in Asia for several decades or more except in Japan, where labor force growth has turned negative and population aging may begin to depress saving rates.

The impact of demographics on saving and investment have been especially important in East Asia (Lee, Mason et al. 2001; Williamson and Higgins 2001). For the most part East Asian countries had very low rates of saving and investment in 1960 – near zero or even negative in Indonesia, Thailand, South Korea, Singapore, and Taiwan (Figure 11). By 1990, saving and investment rates ranked among the highest in the world. The rapid accumulation of wealth caused in part by demographic change has been crucial to East Asia's rapid economic growth.

<Figure 11 here>

The heavy concentration of population at the working ages should continue to favor economic growth in most Asian countries. Eventually, however, as the working-age population declines relative to the retired population, conditions will turn less favorable to economic growth. In many Asian countries, the period of extraordinarily high rates of saving and investment may give way to an era of lower rates of saving and investment and slower economic growth.

Aggregate economic growth will almost surely slow as aging becomes more pervasive and countries begin to experience negative labor force growth and lower saving rates. Living standards may continue to improve, because of productivity increases and greater investment in human capital. With continued increases in life expectancy, further increases in per capita wealth are possible, although at a slower pace than in the past.

Slower economic growth should not be viewed with undue alarm, especially among Asia's most successful economies. The extremely high rates of economic growth that some Asian countries have achieved in recent decades have been inherently transitory—in part, catching up with the West and, in part, a consequence of the demographic transition from high to low fertility and mortality. Countries that have successfully seized the economic opportunities presented by the demographic transition have been able to reach higher standards of living that will enable them to cope better with the challenges of

population aging. In the future, as their population ages, their economic growth is likely to slow to the levels in the world's mature economies.

Prospects are much less promising for countries that are struggling with their development efforts and are not developing the economic and political institutions that are essential for meeting the needs of an aging society. The aging process is so rapid in Asia that little time is left to respond.

## 6. **Concluding Remarks**

Asia has entered a new demographic era. The number of children, those aged 0-14, reached a peak in the year 2000 after decades of rapid and sustained growth. During the 21<sup>st</sup> Century, the number of children may stabilize at the current level of around 300 - 350 million. Or, if fertility rates drop to low levels, Asia could experience a period of sustained decline in the number of children.

During the next few decades, the adult population will continue to grow, older populations especially rapidly. Between 2000 and 2050, the 60-74 year old group is expected to increase at annual rate of 2.9% and the 75+ population at 3.4%. By 2050, 17% of Asia's population will be 65 and older while the percentage under 15 will shrink to 19%. This is a remarkable change from the 1970s when the percentage under age 15 reached 40% of the total and the percentage 65 and older was only 4%.

In the absence of demographic solutions to the aging problem, Asian countries must depend on economic and social policies that meet the needs of the elderly and promote strong economic performance. What aging societies lose in sheer numbers of workers they can gain back through a more productive economy. A top priority is to tap the productive potential of older workers by eliminating mandatory retirement ages and labor market rigidities that hurt both older workers and the firms that employ them. Public pension reform must pay close attention to potentially adverse effects on incentives to work and save. Health care policy must insure that efforts to provide high-quality health care do not lead to waste and inefficiency in the health sector. Well-functioning financial markets and institutions are essential so that older workers can earn an adequate return on their retirement savings and protect

themselves against the risks of old-age. A favorable investment environment, and integration into the global economy, will help many elderly to maintain their economic independence.

Countries in Asia can cope with the demographic changes ahead, but only if they begin to prepare now. Governments must take immediate steps that will both help the elderly and benefit broad development concerns. While political crises and short-term economic problems engage the attention of many Asian leaders, preparing for the needs of an aging society can no longer be postponed.



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## Appendices (Technical Notes)

### Appendix A. Population Projections

The United Nations Population Division published updated population projections in 1999. Three variants are provided that make different assumptions about fertility trends as discussed in the text. The UN projections do not consider the implications of different mortality trends. Alternative scenarios were prepared so as to assess the impact of changes in the pace of mortality change.

For each of the three UN variants (high, medium and low fertility), two new projections were constructed – a high and a low mortality variant. The high mortality variant assumes that projected increases in life expectancy occur half as rapidly as in the UN projections. The low mortality variant assumes that increases occur twice as rapidly as in the UN projections. In both cases, changes in the age structure of survival follow the same pattern as in the UN projections. The chief advantages of this approach are its simplicity, the variants could be constructed using information that is publicly available, and its consistency with the UN methodology. There are several disadvantages. More complex mortality variants are not considered. For example, the implications of more rapid improvements in survival chances at older ages and slower improvements at younger ages are not considered. Also, for the low mortality variant we can construct projections only to 2025.

The alternative variants are constructed using a simple device. Survival rates were calculated from the population and birth data that are available in the UN variants. All variants assume that the survival rates for 1995-2000 are the same. Increases in survival rates that occur during a five-year period in the UN variants, require ten years in the high mortality variant. Increases in survival rates that occur over a ten-year period in the UN variants require only five years in the low mortality variants. Hence, life expectancy in the high mortality variant in years 2015-20 is the same as life expectancy in 2005-10 in the standard mortality variant. Life expectancy in the low mortality variant in years 2020-25 is the same as life expectancy in the 2045-50 in the standard mortality variant. For the high mortality variant, survival rates are linearly interpolated as is necessary.

Varying survival rates also influences the number of births because of changes in the number of women in the childbearing ages. The number of births was adjusted so as to maintain the ratio of the number of births to the population aged 25-39 across alternative mortality variants. A summary of the alternative projections is provided below for the regions of Asia and for six Asian countries. More detailed results are available.

## **Appendix B. Economically Active Population Estimates and Projections**

Historical estimates and projections of the economically active population rely on the ILO, *1996 Economically Active Population Estimates and Projections* (EAPEP). The EAPEP provides estimates and projections of labor force participation rates (activity rates) by sex and five-year age group for the period 1950-2010 at ten-year intervals and for 1995.

The economically active population comprises all men and women who supply labor for the production of economic goods and services as defined by the UN systems of national accounts and balances, during a specified time period. Activity rates for each age group are the ratio, expressed as a percentage, of the economically active population in a given age group to the population in that age group.

Data on labor force are drawn from population censuses and especially from sample surveys of the economically active population. The labor force data are adjusted where necessary, to conform to a standard concept of economically active population, which consists of all employed and unemployed persons. Historical estimates and projections of the labor force are obtained by applying ILO estimates of activity rates to the population estimates and projections prepared by the UN Population Division. The most recent ILO results rely on the UN's 1996 population estimates and projections. The labor force results presented here are updated using activity rates from the ILO and more recent population data, the *1998 Revision*.

ILO projections are based on projected activity rates for men and women in five-year age groups. The youngest age group is 10-14 and the oldest age group is 65 and older. Activity rates were projected

for 1995, 2000, and 2010 by extrapolating trends in the historical data. A variety of functional forms were used. However, the trends were constrained by assumptions about the likely course of activity rates. The assumptions are summarized by ILO as follows (ILO, 1996):

Men: Activity rates for all age groups continue to decrease, more markedly in the 15-19 age group and 55 years and over. However, in the more developed countries, which registered sharp drops in activity rates in both age groups concerned over the last two decades, the rate of decrease should gradually slow down.

Women: Activity rates increase in the great majority of countries or territories concerned in the 25-54 age group, irrespective of the trend registered over the period as a whole or in the last decade. The assumption also predicts that the profile of women's activity rates will move closer to that of men, although female levels will not exceed male levels. For a very small number of countries and/or territories in Asia, characterized by very high female activity rates, the decline registered between 1950 and 1990 continues but a much slower rate of decrease.

Two problems were addressed in employing the EAPEP projections of activity rates in this work. The first is that the EAPEP does not provide estimates and projections of activity rates for the period 2020-2050. Because the assumptions made by ILO were designed to work only until 2010, it is unlikely that the projections of activity rates for the period 2020-2050 would follow the same patterns as those for the period 1950-2010. One obvious difficulty of projecting beyond 2010 is that the rate of decrease/increase must slow as they reach low/high levels, but these natural constraints are not incorporated into the ILO methodology. Of course, there are many other possibilities that are not considered. To prepare long-term projections, we made a strong, but simple assumption, that age- and sex-specific activity rates remain constant after 2010. Thus, changes in projected labor force aggregates

after 2010 are due entirely to changes in the age- and sex-distributions of the populations, not due to changes in activity rates.

The second problem is the use of 65 and older as the upper age group by the ILO. This is a problem for countries experiencing substantial changes in the age-distributions of their elderly populations because activity rates drop rapidly with age. As a simple expedient, we assume that labor force participation rates of the elderly decrease linearly beginning at age 65 and reaches zero at age 90. Thus, changes in the age distribution of the 65 and older population influence the average activity rate of that population. Given the crude approximation of this approach, however, we report labor force values only for the 65 and older group and not for sub-groups of the elderly population.

Our projections for the period 2020-2050 will overestimate or underestimate the actual labor force participation to the extent that the trends in activity rates between 1950 and the early 1990s persist into the future. It seems likely that the errors for prime age males will be relatively small. The young and the elderly, however, have registered substantial drops in their activity rates that may persist into the future. For the elderly, much will depend on employment opportunities, improvements in standards of living, health conditions, and the evolution of public and private pension programs.

Young females have also experienced declining activity rates that may drop below levels projected here. Activity rates among women in the prime working ages have increased. If this continues, our long-range projections will understate the female labor force in these ages. Activity rates for older women will be governed by the same forces that apply to men. In addition, as women more actively participate in the labor force at younger ages, their labor force behavior at older ages may become similar to that of the behavior of men. Hence, the trend in participation by older women is very much an open question.

## **Appendix C. Methodology for Forecasting the Proportion Widowed**

Forecasts of the proportion widowed are based on a model first applied to Japan (Mason, Ogawa, and Fukui, 1992). The variable analyzed is the transition rate,  $\Delta W_{at}^s$ , where

$$\Delta W_{at}^s = W_{a+5,t+5}^s - W_{at}^s$$

The change in the proportion currently widowed during a five-year span for a cohort of men or women (s), age a, in year t. If mortality rates were independent of marital status and neglecting remarriage, the change in the proportion widowed could be calculated directly knowing only the proportion married at the beginning of a period and the proportion experiencing the death of a spouse during any subsequent time period. The latter could be calculated from the joint age distribution of husbands and wives at the beginning of the period and age- and sex-specific mortality rates.

The change in the proportion widowed differs from the directly calculated value for several reasons. First, mortality rates may not be independent of marital status. In particular, the probability of dying may be elevated for those who have recently experienced the loss of a spouse. Under these circumstances the proportion widowed will increase by less than the proportion experiencing the death of a spouse. Second, some widows or widowers will remarry. Again, the proportion widowed will increase by less than the proportion experiencing the death of a spouse. The forecasting model used here allows for the impacts of marital-status-dependent mortality and remarriage using regression techniques.

To simplify the analysis, we assume no remarriage for the moment, thus, the change in the absolute number of widows, can be represented by the following accounting identity.

$$W_{a+5,t+5} = q_{at}^1 W_{at} + q_{at}^2 d_{at} M_{at}$$

where  $W_{at}^1$  and  $M_{at}^1$  are the number of widows and married women aged  $a$  in year  $t$ ,  $q_{at}^1$  is the probability that a widow aged  $a$  in year  $t$  will survive five additional years,  $q_{at}^2$ , is the survival probability for a woman who is widowed during the five year period, and  $d_{at}$  is the five year death rate for husbands of women aged  $a$  in year .

Dividing both sides by the total number of women aged  $a$  in year  $t$  and representing the survival rate for women in general by  $q_{at}$ , this yields

$$q_{at}w_{a+5,t+5} = q_{at}^1w_{at} + q_{at}^2d_{at}m_{at}$$

where  $q_{at} = N_{a+5,t+5} / N_{at}$ ,  $w$  and  $m$  are the proportions widowed and married, respectively, and  $N_{at}$  is a population aged  $a$  in year  $t$ . Finally letting  $\varepsilon_{at} = q_{at}^1 - q_{at}$  and rearranging terms, the transition rate is given by:

$$\Delta w_{at} = \frac{\varepsilon_{at}}{q_{at}} w_{at} + \frac{q_{at}^2}{q_{at}} d_{at} m_{at}$$

The transition rate can be represented, then, as a homogeneous linear function of the proportion widowed and the product of the proportion married and the death rate for husbands. If mortality is not systematically related to marital status, i.e.,  $q_{at} = q_{at}^1 = q_{at}^2$ , then the expression for the transition rate simplifies to  $\Delta w_{at} = d_{at} m_{at}$ . A similar expression is used to model the transition rate for men.

The death rates for husbands and wives are not available but can be approximated using information about the mortality rates for men and women and the age distribution of husbands and wives.



Death rates for men and women,  $\delta_{at}^s$ , are approximated using intercensal survival techniques, i.e., the death rate for persons aged  $a$  and sex  $s$  between  $t$  and  $t+5$  is calculated as:

$$\delta_{at}^s = \frac{N_{at}^s - N_{a+5,t+5}^s}{N_{at}^s}$$

The joint age distributions of husbands and wives are based on tabulations of the joint distributions of husbands and wives heading intact households at the beginning of each intercensal period. Letting  $h_{axt}$  represent the proportion of married men aged  $x$  who have wives aged  $a$ , then the death rate for wives of men aged  $x$  is given by :

$$\hat{d}_{xt}^m = \sum_{a=u-u+5}^{v+} h_{axt} \delta_{at}^f$$

where  $u-u+5$  is the youngest intercensal age group applicable to the model, and  $v+$  is the oldest (open ended) age group. The death rate of husbands can be calculated in a symmetrical way.

Estimation of the transition equation requires the imposition of restrictions on the age pattern of marital status related mortality differences. In particular, we will assume that the relative differences in survival between marital status groups do not vary with age. In the case of the mortality of spouses, we assume that  $\alpha = \varepsilon_{at} / q_{a1}$  and anticipate that  $\alpha$  will be greater than zero, and  $d_{at} = \gamma \hat{d}_{at}$  while anticipating that  $\gamma$  will be greater than one. And in the case of survival of those who become widowed during the period and survival in general, we assume that  $\beta = q_{at}^2 / q_{at}$  and anticipate a value substantially less than one but greater than zero. Our final estimation is arrived at by substituting into the transition rate equation mentioned before yielding :

$$\Delta w_{at}^s = \alpha w_{at}^s + \beta \gamma \hat{d}_{at}^s m_{at}^s$$

The equation is estimated separately for men and women, in each country for the periods for which data are available. (For Thailand, due to data availability, the model is estimated for 10-year rather than 5-year periods. The model is estimated using ordinary least squares regression.

The model does not yield transition rates for the uppermost age category. Consequently, we rely on a crude approximation, assuming the transition rate to the oldest age interval is a constant proportion of the transition rate to the oldest closed interval. The proportions used are the average values for the period analyzed. For example, in most instances the upper age interval is 85+ in which case:

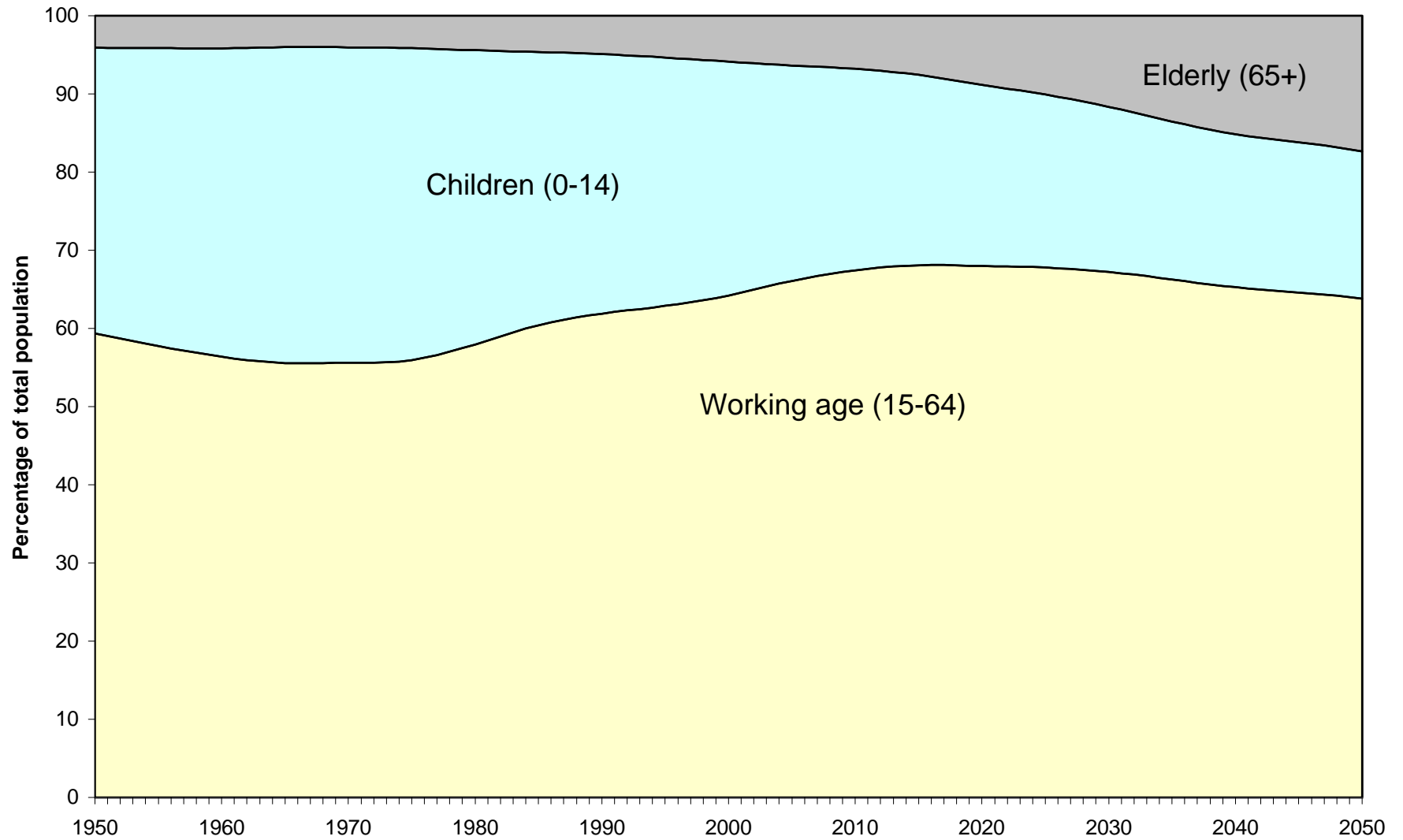
$$\Delta w_{80-84,t}^s = \hat{\alpha} w_{75-79,t}^s$$

The estimated parameters for the four countries for which forecasts were prepared are:

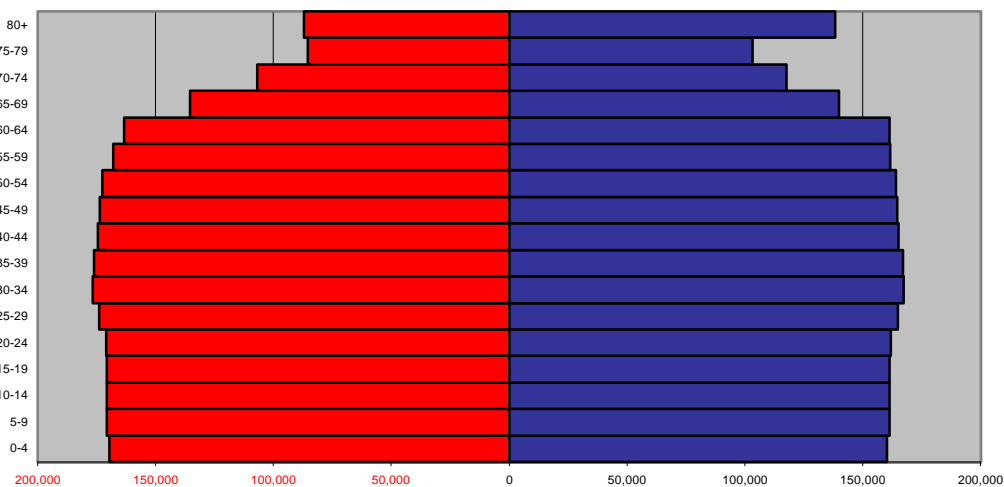
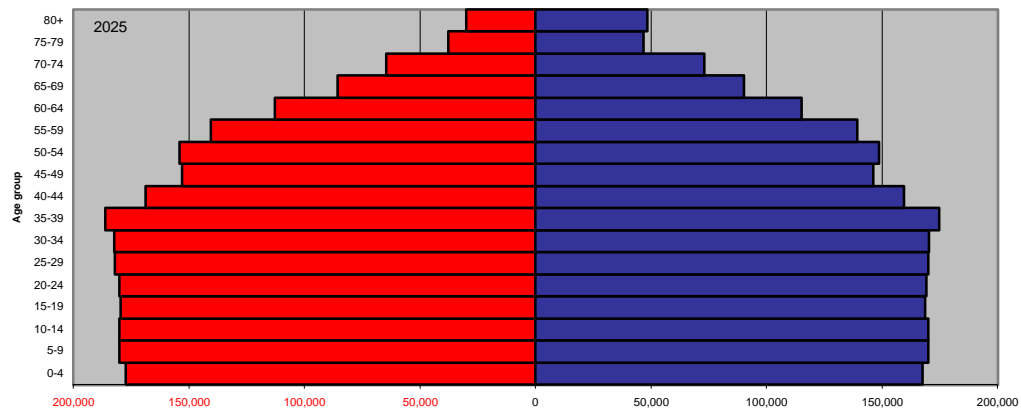
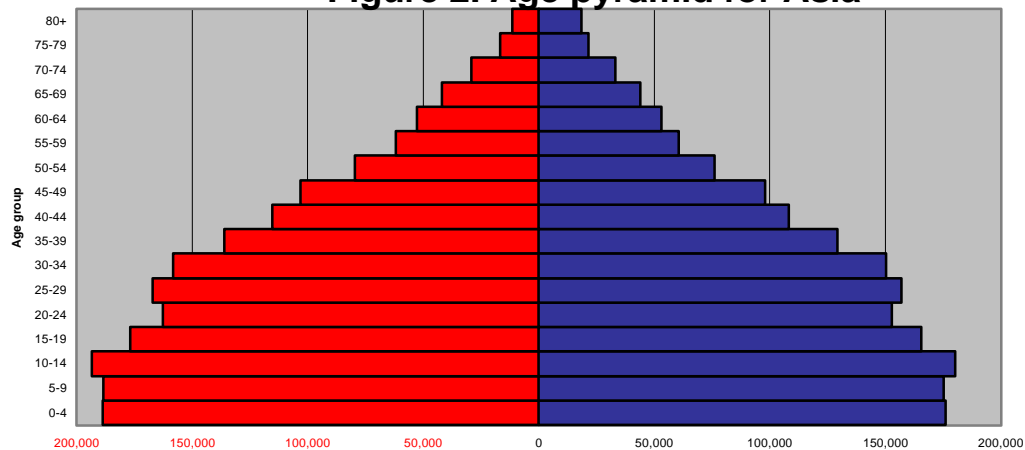
		$\alpha$	$\beta\gamma$	$\hat{\alpha}$
Indonesia	Males	0.469	0.000	1.140
	Female	0.123	0.485	0.188
South Korea	Males	0.091	0.418	0.457
	Female	0.030	0.741	0.056
Philippines	Males	0.422	0.000	0.820
	Female	0.126	0.486	0.328
Thailand	Males	1.009	0.179	2.449
	Female	0.411	0.672	0.948

The forecast uses intercensal survival rates calculated from UN population projections and the most recently available data on the joint age-distributions of household heads and their wives.

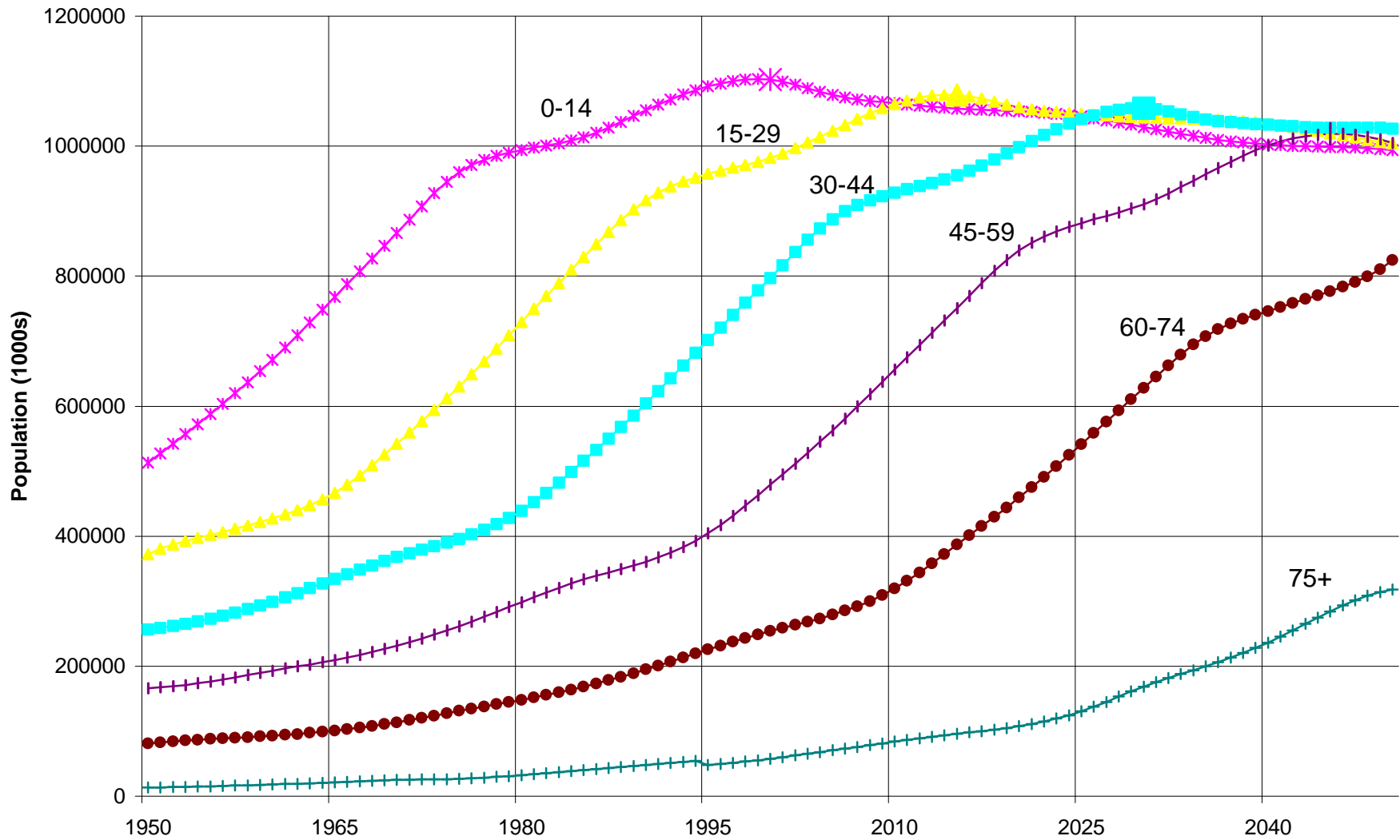
**Figure 1. Asia's age transition**



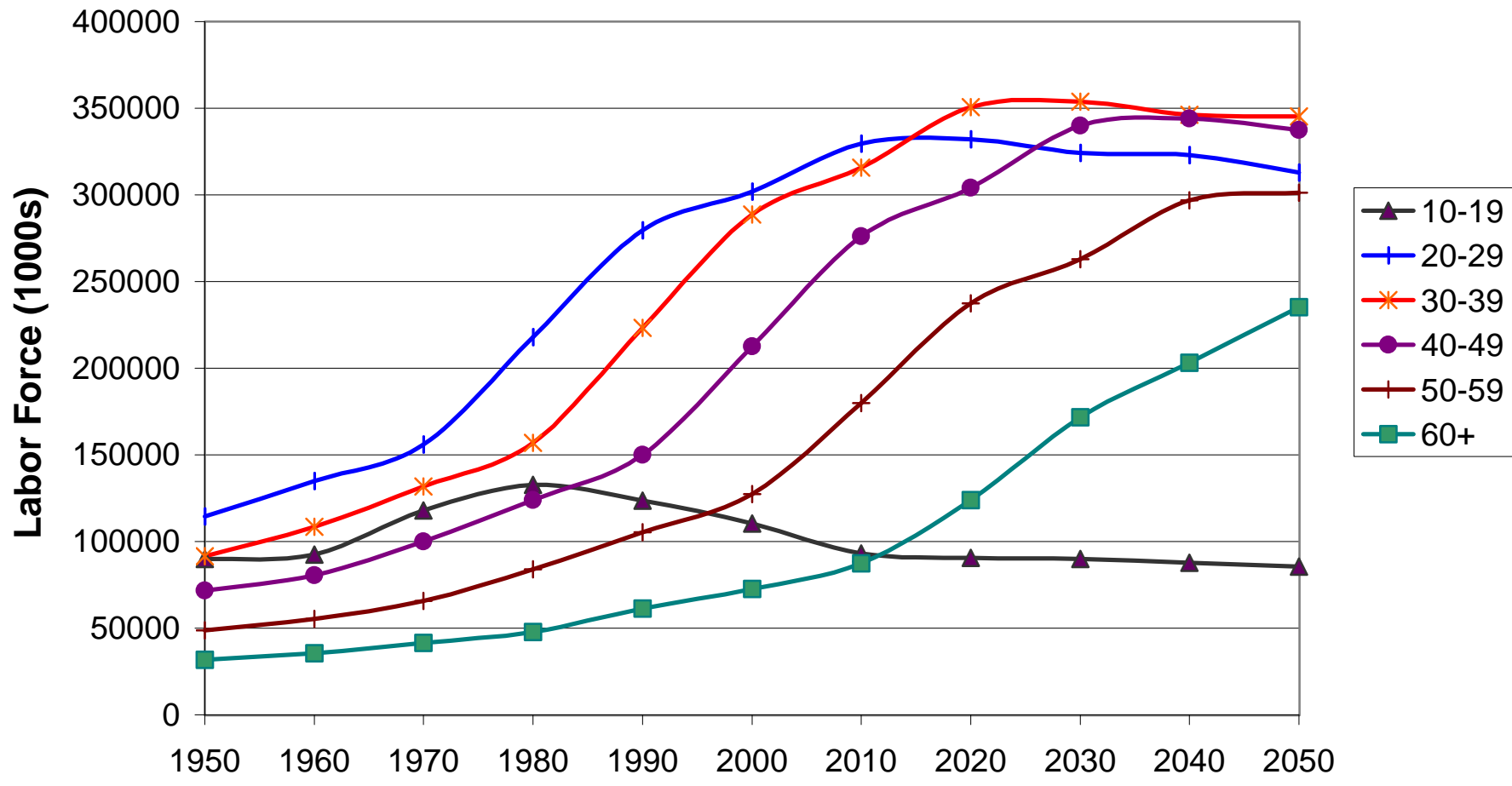
**Figure 2. Age pyramid for Asia**



**Figure 3. Population of Asia  
fifteen year age groups, 1950-2050**

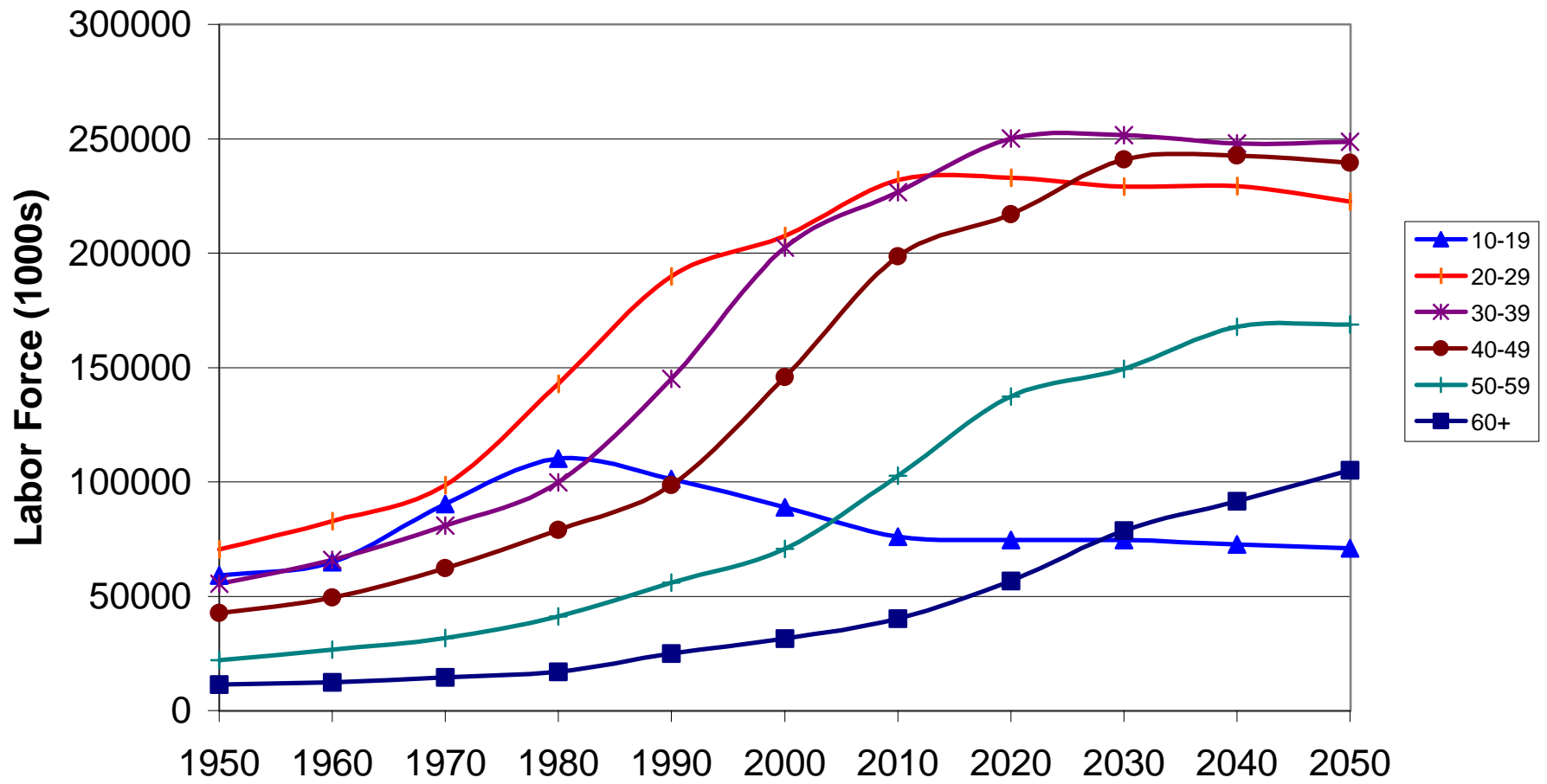


**Figure 4: Male labor force of Asia  
ten year age group 1950-2050**



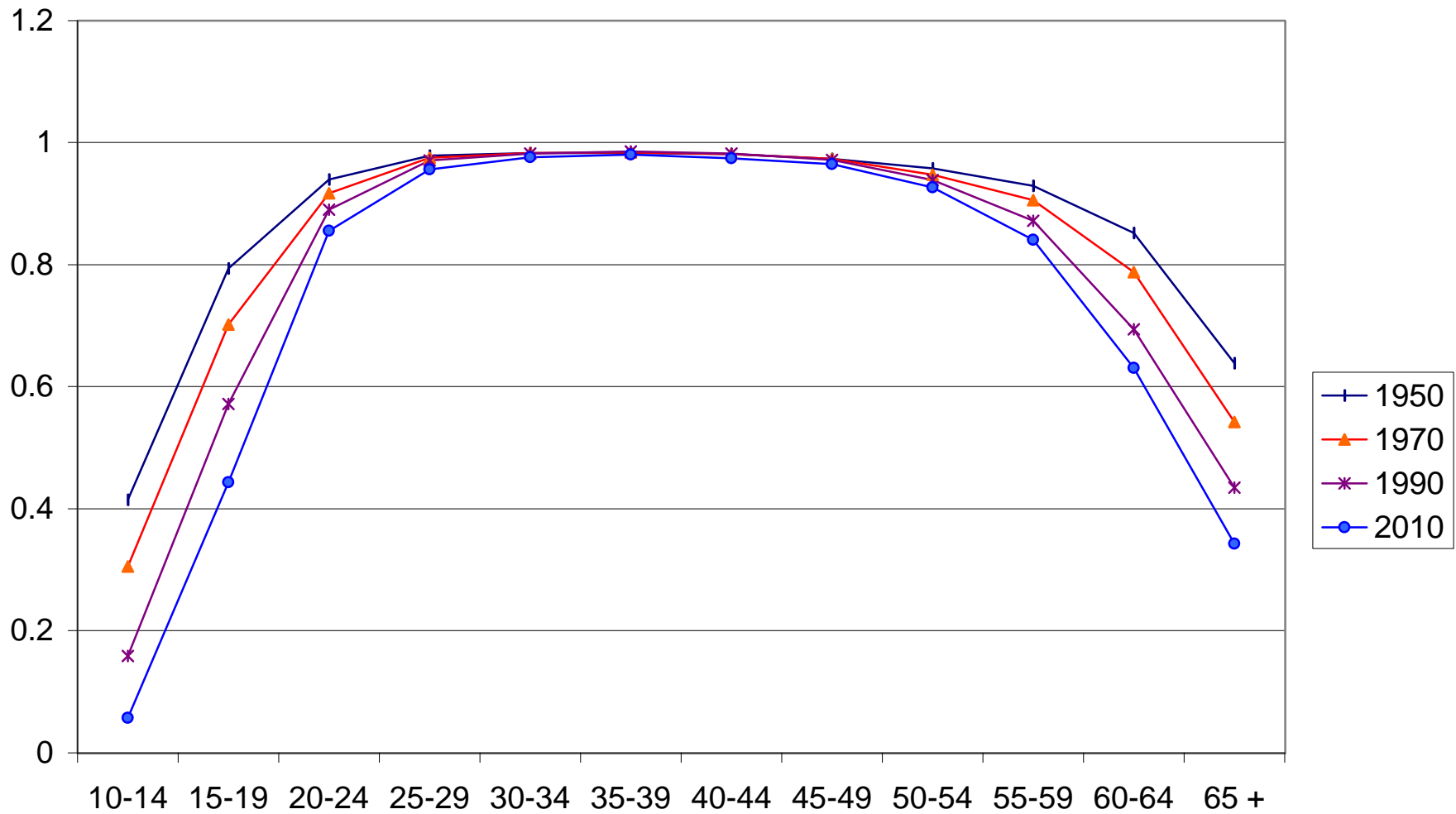
Source: ILO, 1996. UN, 1999. Calculations by authors.

Figure 5. Female labor force of Asia  
Ten year age group 1950-2050



Source: ILO, 1996. UN, 1999. Calculations by authors.

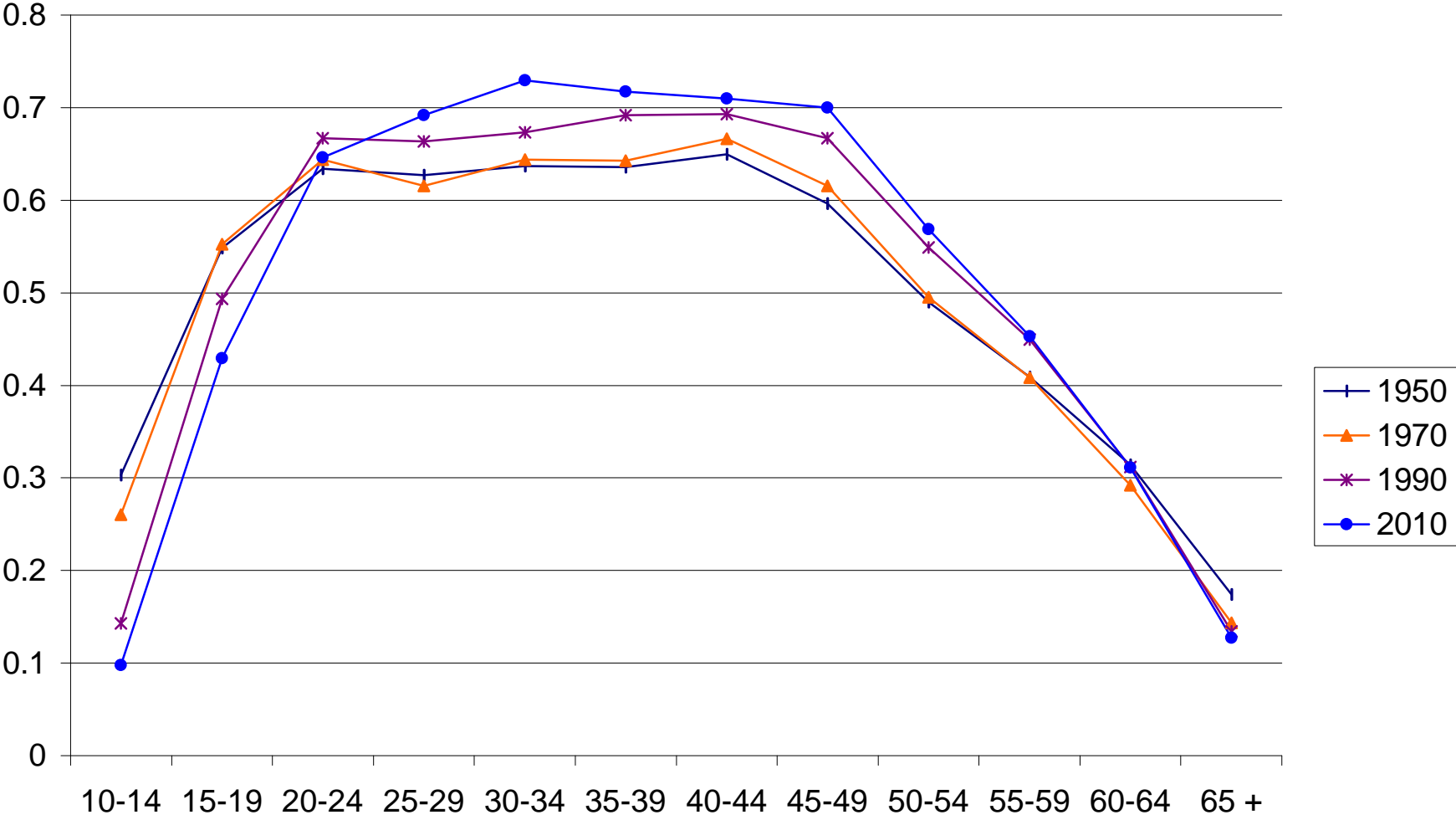
**Figure 6. Male labor force participation rates of Asia by age group**



Source: ILO, 1996.

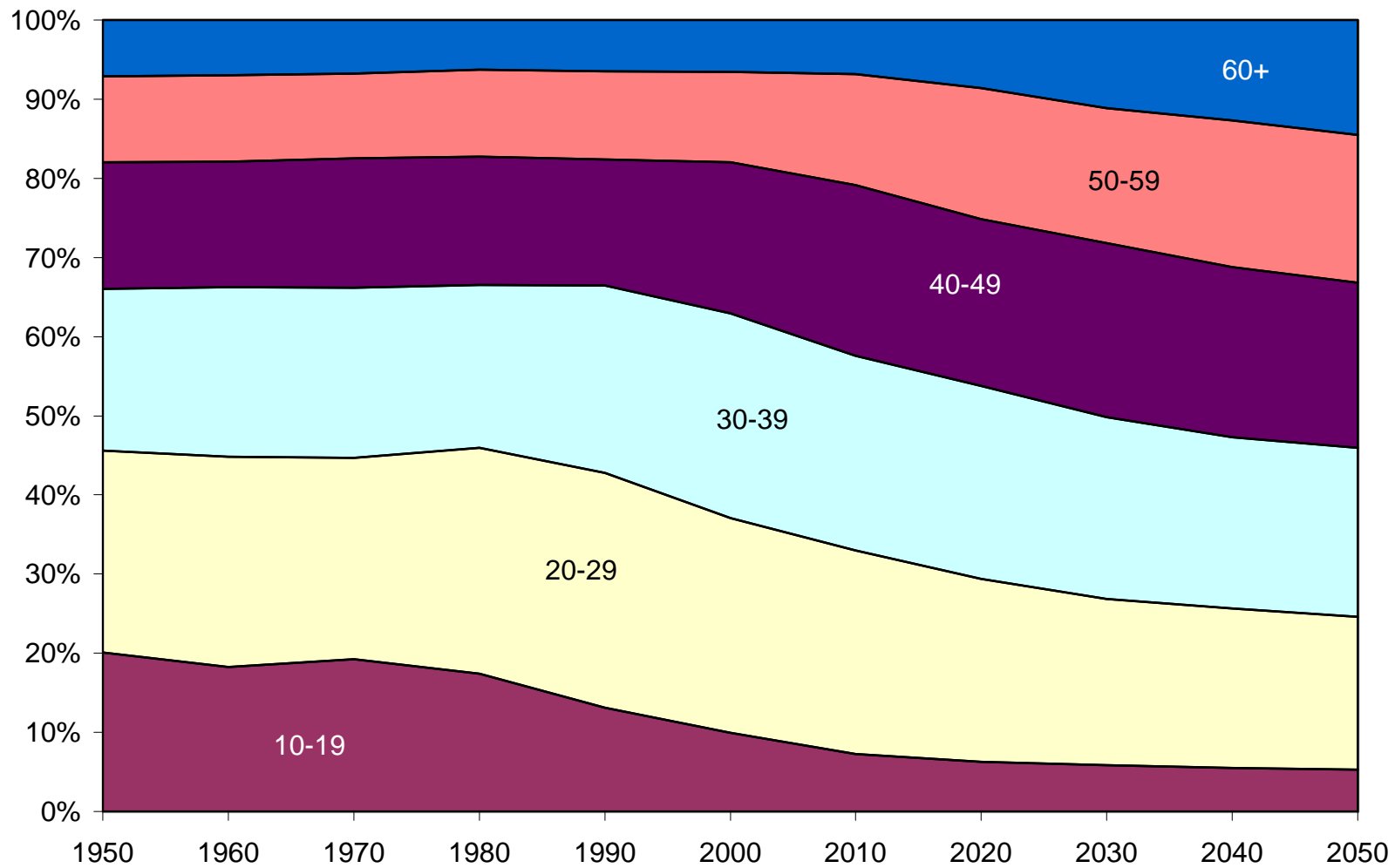


Figure 7. Female labor force participation rates of Asia by age group



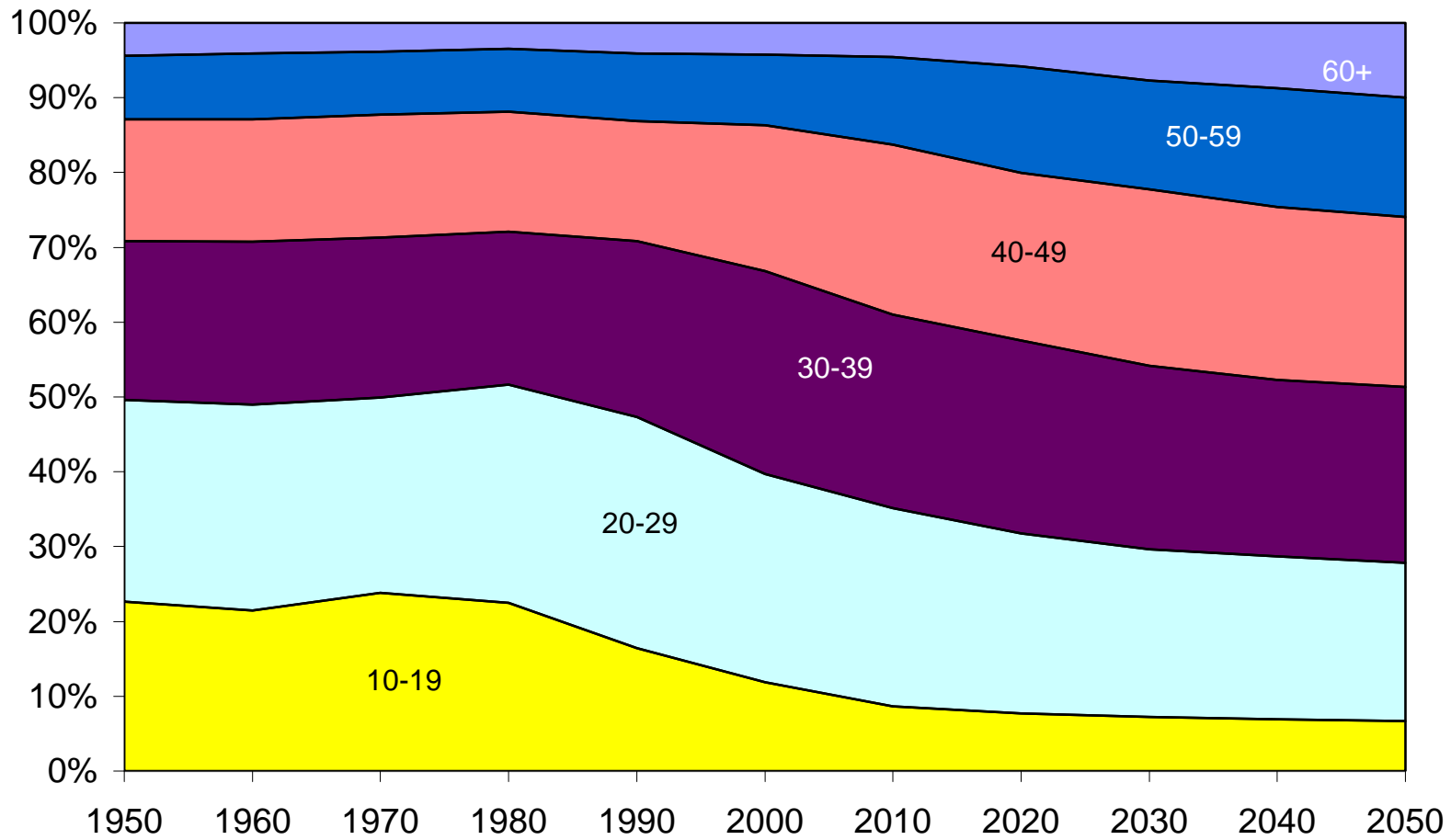
Source: ILO, 1996.

**Figure 8. Male labor force transition in Asia**



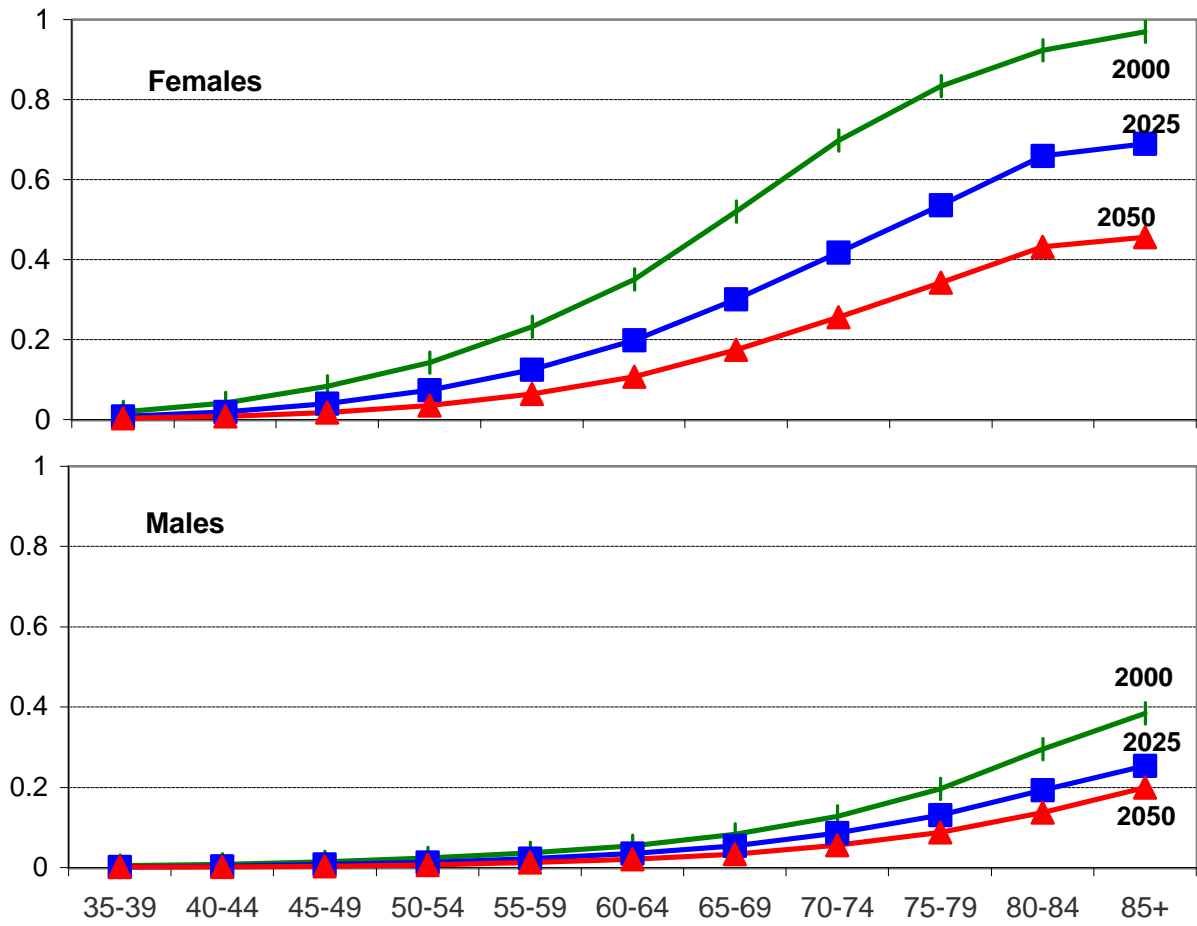
Source: ILO, 1996. UN, 1999. Calculations by authors.

**Figure 9. Female labor force transition of Asia**



Source: ILO, 1996. UN, 1999. Calculations by authors.

Figure 10A. Projections of proportion widowed, South Korea



**Figure 10B. Projections of proportion widowed, The Philippines**

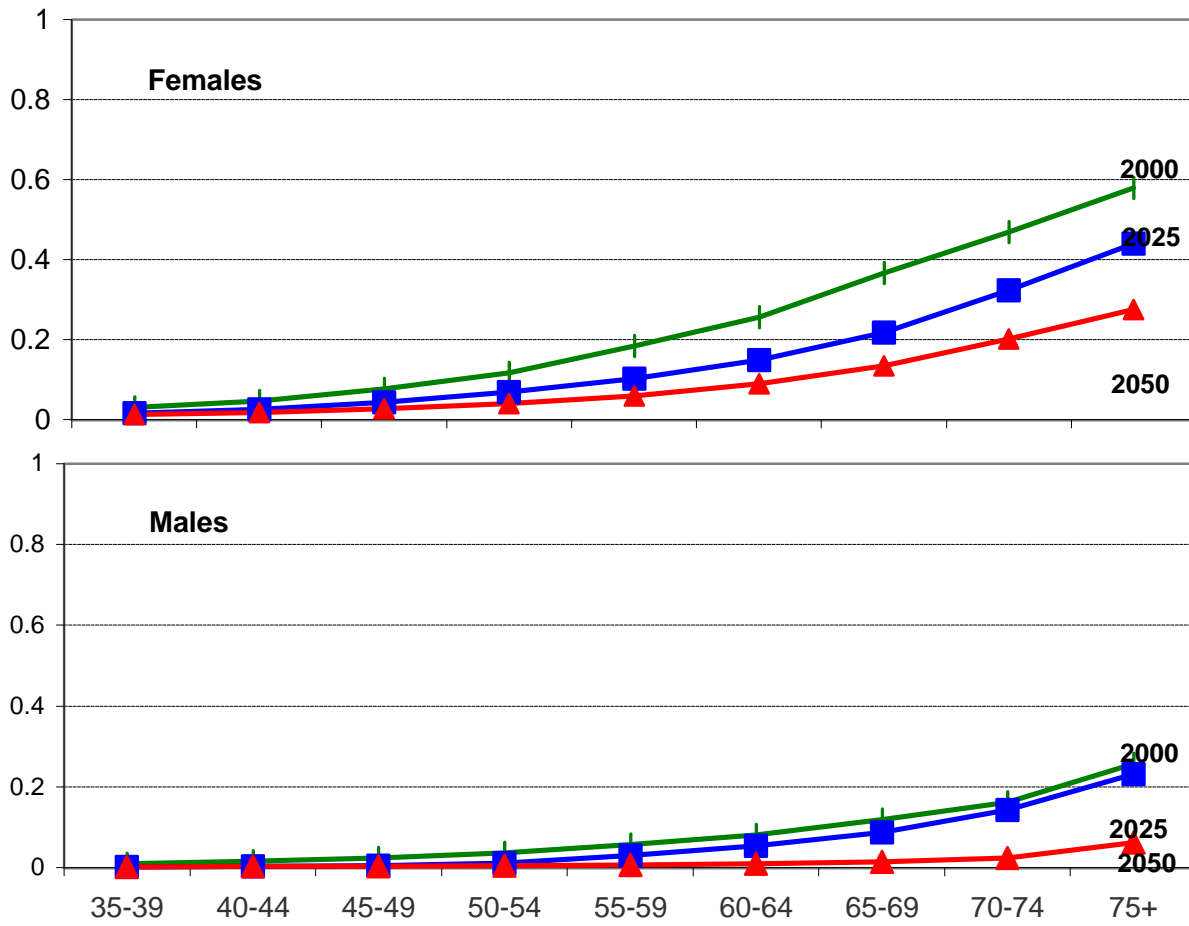


Figure 10C. Projections of proportion widowed, Indonesia

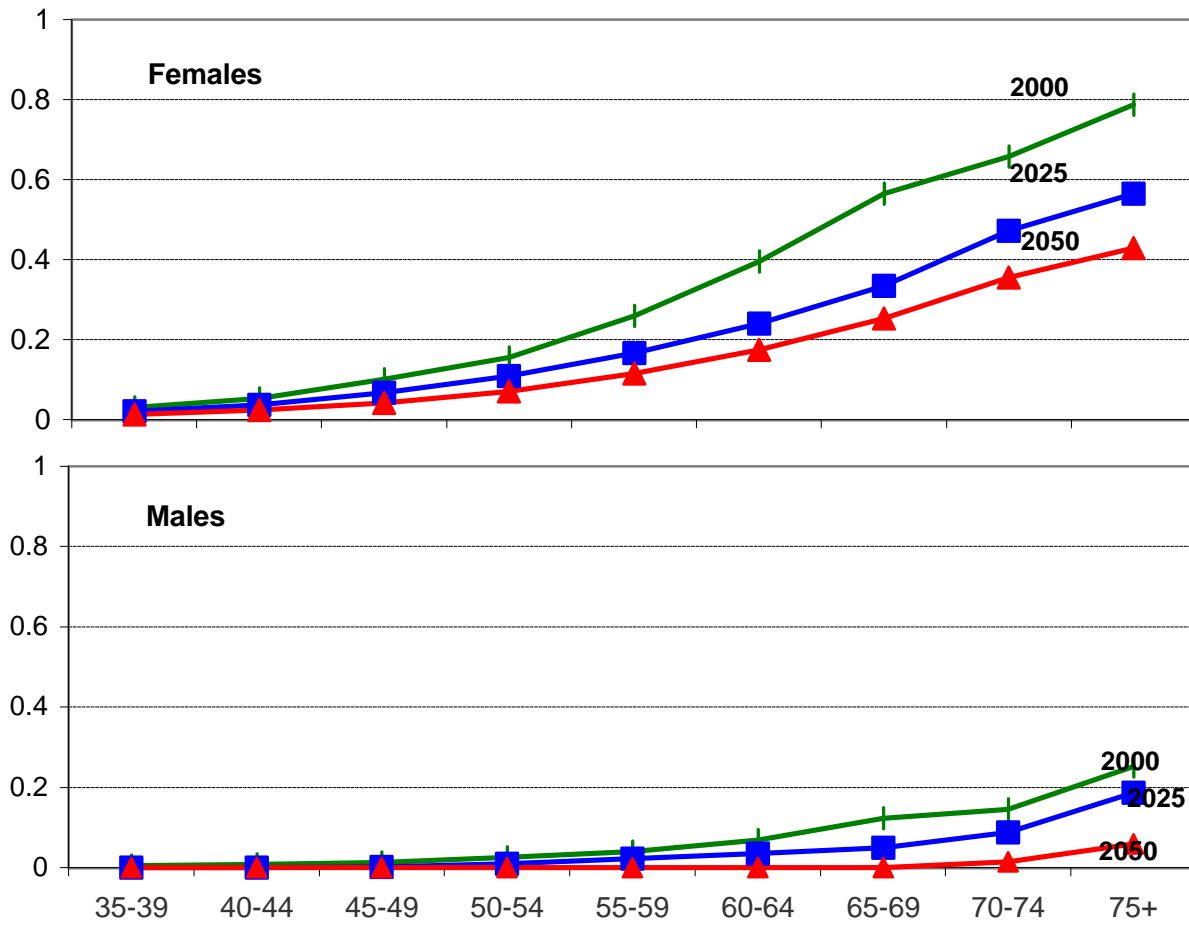
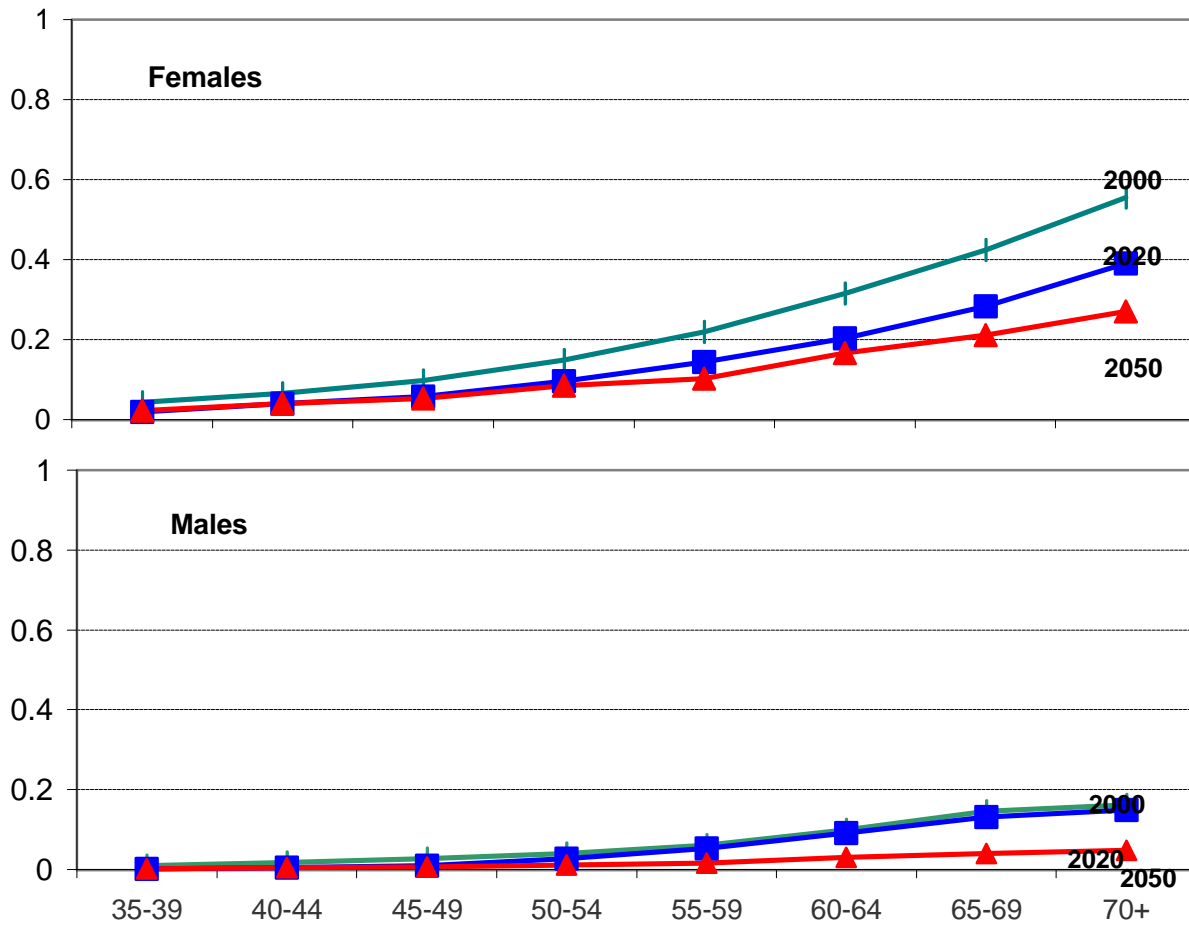
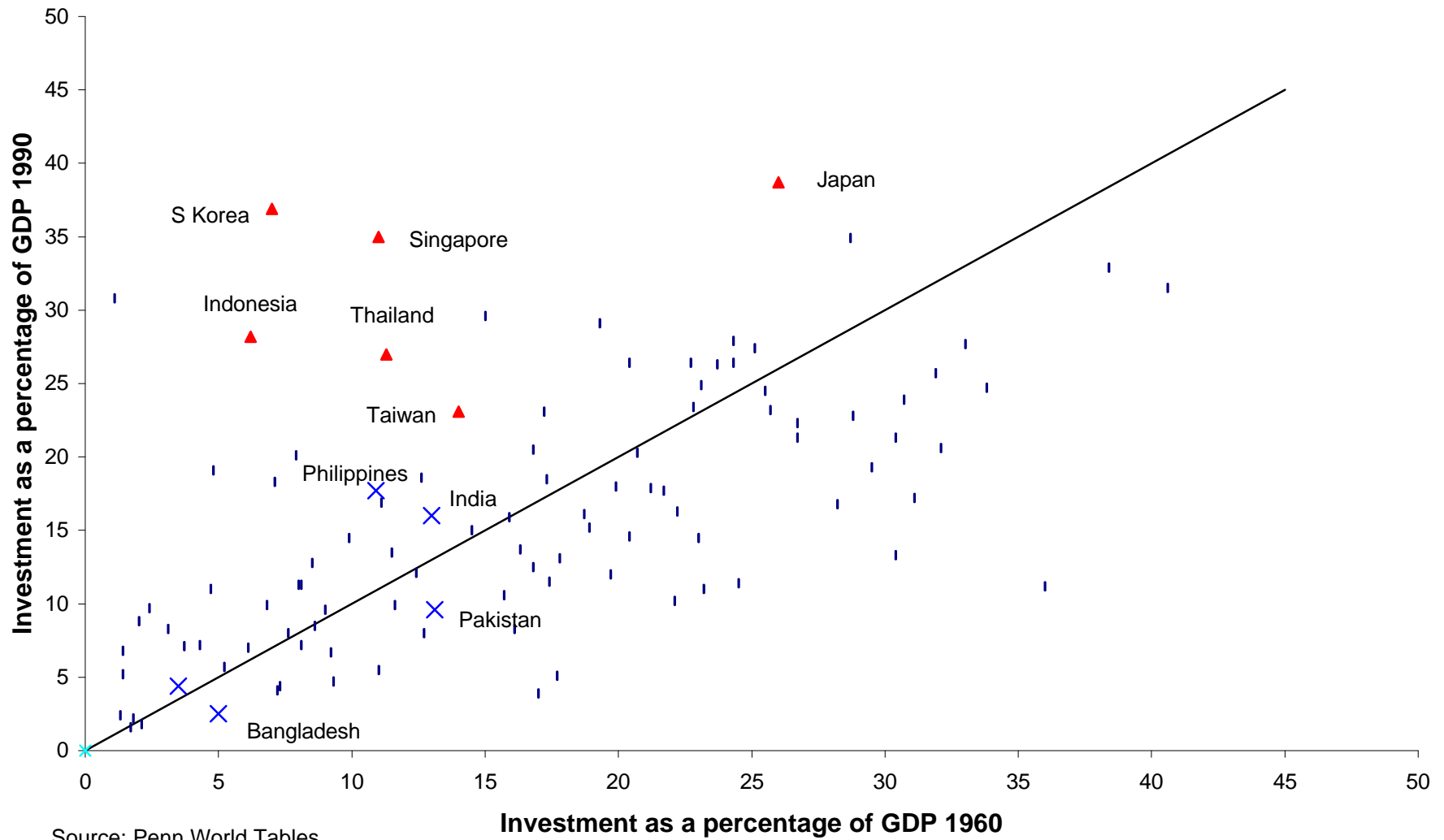


Figure 10D. Projections of proportion widowed, Thailand



**Figure 11. Investment, 1960 vs. 1990**  
**Slow and fast transition populations**



Source: Penn World Tables



Table 1. Summary measures of aging for Asia, major regions, seven Asian countries.

	Elderly population (1000s)			Growth rate of Elderly Population		Old age dependency ratio		
	2000	2025	2050	2000-25	2025-50	2000	2025	2050
	Asia	207,349	454,964	864,614	3.14	2.57	0.086	0.144
East Asia	114,390	241,217	389,089	2.98	1.91	0.113	0.21	0.383
Southeast Asia	24,503	58,253	131,138	3.46	3.25	0.074	0.124	0.262
South Asia	68,457	155,494	344,388	3.28	3.18	0.076	0.112	0.216
Japan	21,614	32,383	33,323	1.63	0.11	0.250	0.447	0.584
South Korea	3,152	8,020	12,665	3.74	1.83	0.094	0.226	0.417
Indonesia	10,001	23,078	51,500	3.34	3.21	0.073	0.123	0.26
Philippines	2,758	7,786	18,558	4.15	3.47	0.061	0.105	0.216
Thailand	3,576	8,924	17,077	3.66	2.60	0.084	0.178	0.382
Bangladesh	4,149	10,494	29,787	3.71	4.17	0.081	0.123	0.232
India	50,466	111,934	231,266	3.19	2.90	0.068	0.112	0.221

Source: UN Population Division, 1998.

Note: All data employ the medium fertility variant.

Table 2. Fertility assumptions, medium UN projections.

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Country	1990-95	1995-00	2000-05	2005-10	2010-15	2015-2020
Japan	1.43	1.47	1.54	1.61	1.68	1.73
South Korea	1.65	1.69	1.76	1.83	1.89	1.90
Indonesia	2.58	2.26	2.10	2.10	2.10	2.10
Philippines	3.62	3.19	2.76	2.33	2.10	2.10
Thailand	1.74	1.74	1.78	1.85	1.90	1.90
Bangladesh	3.11	2.82	2.53	2.24	2.10	2.10
India	3.13	2.72	2.31	2.10	2.10	2.10

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Source: UN 1998.

Note: For countries included in this table TFR is constant after 2015-2020.

Table 3. Projected life expectancy, study countries.

Country	1990-95	2000-05	2010-15	2020-25	2030-35	2040-45	Projected Increase
Japan	79.5	80.3	81.1	81.9	82.7	83.4	3.9
South Korea	70.9	73.5	75.4	77.1	78.4	79.4	8.5
Indonesia	62.6	67.3	70.5	72.9	74.9	76.6	14.0
Philippines	66.3	69.8	72.3	74.4	76.3	77.7	11.4
Thailand	68.8	69.4	72.8	75.4	76.0	76.6	7.8
Bangladesh	55.6	60.7	65.3	69.2	71.9	74.1	18.5
India	60.3	64.2	67.3	70.4	72.7	74.2	13.9

Source: UN Population Division, 1998.

Table 4. Total labor force, labor force aged 65 and over, regions of Asia and seven countries (1000s)

	Total labor force			Labor force aged 65 and over		
	1950	2000	2050	1950	2000	2050
Asia	687,012	1,786,136	2,478,075	20,774	50,671	193,278
East Asia	366,935	874,564	853,782	9,115	20,562	53,051
Southeast Asia	84,805	260,621	426,501	3,456	8,469	45,054
South Asia	235,272	650,951	1,197,792	8,203	21,640	95,173
Japan	36,650	68,164	48,178	1,465	4,837	5,633
South Korea	7,449	23,881	23,789	201	700	2,239
Indonesia	32,149	102,856	163,584	1,834	3,518	14,673
Philippines	8,194	32,067	67,555	279	1,080	6,196
Thailand	10,894	37,173	40,340	269	932	3,772
Bangladesh	24,153	68,471	127,918	946	1,903	12,310
India	169,907	445,770	738,140	5,278	16,199	65,206

Source: ILO, 1996. Calculations by authors.

Table 5. Demographic characteristics of the older population and labor force, Asia

	55-59	60-64	65-74	75+	Total
Age distribution of men 55 and older (percent)					
2000	29.0	24.7	33.2	13.1	100.0
2025	29.8	24.0	31.8	14.4	100.0
2050	22.5	21.9	32.5	23.1	100.0
Age distribution of women 55 and older (percent)					
2000	26.2	23.0	33.4	17.3	100.0
2025	27.1	22.4	31.8	18.6	100.0
2050	19.7	19.6	31.3	29.4	100.0
Sex ratio (100 x men/women)					
2000	101.9	98.8	91.6	69.3	92.1
2025	100.9	98.0	91.8	71.1	91.8
2050	103.9	101.2	94.0	71.5	90.7
	55-59	60-64	65+	Total	
Age distribution of the labor force (percent)					
2000	43.6	27.8	28.6	100.0	
2025	44.5	27.6	27.9	100.0	
2050	38.5	27.6	33.9	100.0	
Sex ratio (100 x male workers/female workers)					
2000	193.4	210.6	254.1	213.6	
2025	187.8	201.4	235.5	203.6	
2050	193.0	207.4	238.7	211.3	

Sources: UN, 1999; ILO, 1996; calculations by authors.

Table 6. Demographic characteristics of the older population

	Percentage of population 55+			Sex ratio, population 55+			Percentage 55+ in labor force		
	2000	2025	2050	2000	2025	2050	2000	2025	2050
Asia	12.1	20.1	29.8	92.1	91.8	90.7	41.6	39.6	35.3
East Asia	16.8	18.4	33.6	92.2	90.5	88.8	36.9	33.8	28.4
Southeast Asia	13.9	14.1	24.2	84.8	86.6	87.4	51.4	52.8	47.3
South Asia	15.4	16.6	26.6	92.1	91.5	90.7	45.8	44.3	41.1
Japan	22.9	37.5	43.1	81.6	82.7	83.7	40.7	33.8	29.2
South Korea	13.9	17.6	34.7	77.5	82.7	83.5	43.0	39.1	31.4
Indonesia	12.1	13.7	23.4	87.4	87.4	86.0	52.7	50.8	44.5
Philippines	13.4	13.9	21.0	90.9	91.6	89.6	55.9	53.4	49.6
Thailand	16.2	17.1	31.2	83.6	85.1	84.6	47.5	45.2	37.4
Bangladesh	12.2	12.4	17.0	106.8	96.6	96.3	65.0	64.9	57.3
India	13.7	15.6	21.6	94.1	95.6	93.9	45.7	43.7	40.8

Sources: UN, 1999; ILO, 1996; calculations by authors.

Table 7. Summary of Dependency Ratios and Economic Support Ratios, Medium Variant, Asian Countries, 2000, 2025, and 2050.

	Total dependency ratio			Child dependency ratio			Old age dependency ratio			Economic support ratio		
	2000	2025	2050	2000	2025	2050	2000	2025	2050	2000	2025	2050
East Asia	0.462	0.474	0.649	0.349	0.265	0.266	0.113	0.210	0.383	0.761	0.675	0.575
Southeast Asia	0.568	0.460	0.570	0.494	0.336	0.308	0.074	0.124	0.262	0.709	0.705	0.661
South Asia	0.649	0.472	0.522	0.573	0.360	0.306	0.076	0.112	0.216	0.658	0.660	0.623
Japan	0.468	0.673	0.838	0.217	0.226	0.254	0.250	0.447	0.583	0.637	0.582	0.545
South Korea	0.393	0.477	0.678	0.299	0.252	0.270	0.094	0.226	0.417	0.647	0.622	0.564
Philippines	0.676	0.458	0.521	0.615	0.353	0.305	0.061	0.105	0.216	0.677	0.672	0.649
Thailand	0.450	0.453	0.660	0.366	0.274	0.278	0.084	0.178	0.382	0.787	0.728	0.653
Indonesia	0.546	0.456	0.573	0.473	0.333	0.313	0.073	0.123	0.260	0.683	0.695	0.652
Bangladesh	0.622	0.428	0.523	0.569	0.344	0.309	0.052	0.084	0.213	0.753	0.761	0.728
India	0.620	0.459	0.531	0.540	0.336	0.300	0.081	0.123	0.232	0.641	0.638	0.601

Source: See text.

Table 8. Coverage of schemes providing cash benefits to the old aged, disabled and/or survivals

Countries (coverage rate in 1992)	Coverage of schemes (1999)	Special schemes
Japan (100%)	National pension program: All residents aged 20-59. Voluntary coverage for residents aged 60-64 and citizens residing abroad aged 20-64 (employees' pension insurance: employees of firm in industry and commerce)	Public employees, private school teacher, agriculture, fishery and forest sector
Singapore (100%)	Employed persons earning more than \$50 a month. Also some self-employed workers.	Public workers
Philippines (52.6%)	All private employees 60 or less. House helpers and self-employed earning at least 1,000 pesos a month	Government employees, military personnel
Thailand (n.a.)	Employees of firm with 10 or more workers. Voluntary coverage for the self-employed	Civil servants, private school teacher
Indonesia (6.9%)	Establishments with 10 or more employees or a payroll of 1 million rupees or more a month	Public employees, military personnel
Bangladesh (0.0%)	None	Public employees
India (0.9%)	Employees of establishments with 20 or more employees in 177 categories of industries. Employees earning over 5,000 rupees a month is excluded	Public employees, railway industry and coal-miners
China (21.1%)	Employees in state-run enterprises. Private, collective and foreign invested companies depend on local government regulations	Government and party employees, cultural, scientific, and educational institutions

Source: Social Security Administration (1999), ILO (1995).