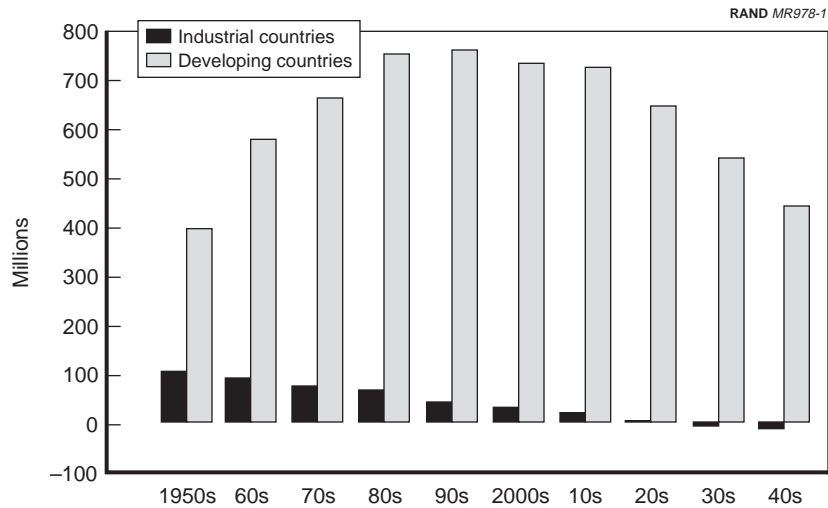


### **POPULATION GROWTH**

Over the past 50 years, the developing countries (as conventionally defined by the United Nations) added 3.2 billion people to the world's population, which has now reached 6.0 billion. Over the next 50 years, if current moderate projections hold, this same group of countries will add another 3.1 billion people to the world's population. Substantial population growth does not seem to have gone away.

Fifty years is a long period for a projection. However, shorter projections show the same trends. From 1975 to 2000, developing-country populations will have grown by 1.9 billion people (reaching 4.9 billion). From 2000 to 2025, they will continue to grow by an additional 1.8 billion people. Figure 1 shows population growth by decade in the industrial and developing countries. The peak decade for population growth in developing countries is the 1990s. Even if, as projected, growth falls off a little, it will still be well over 700 million per decade over the next 20 years, and then will decline only gradually. Industrial countries, on the other hand, will contribute little to world population growth and could as a whole experience negative growth toward the middle of the next century.

Projections naturally involve some uncertainty but are not pure speculation. After all, of the population in the year 2025, more than half have already been born, and of the population a decade from now, at least 80 percent are already among us. Historical experience



SOURCE: United Nations (1996) and projections using the World Bank (1997a) model.

**Figure 1—Population Increments by Decade in Industrial and Developing Countries (millions)**

with patterns of childbearing can be applied to estimate the remaining proportions.<sup>1</sup>

The projections show continued substantial growth despite the fact that fertility has moderated in developing countries. In the 1950s, total fertility was estimated at 6.0 children per woman. By the first half of the 1990s, it had fallen almost by half, to 3.3 children per woman. Annual population growth, about 2.1 percent a year in the 1950s, is below 1.8 percent and falling.

Despite these fertility declines and even assuming they will continue, the annual increments to developing-country populations will still be large. While fertility has fallen overall, very high fertility persists in many countries: Total fertility in Uganda, for instance, has been estimated recently at 6.9 children per woman, and it is only one of

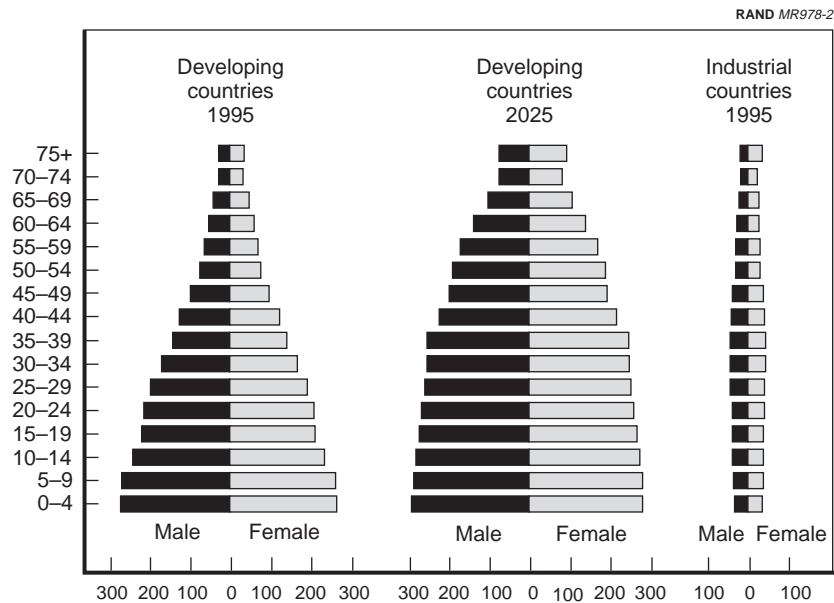
<sup>1</sup>Such projections almost always assume that current attempts to reduce the rate of population growth will continue and will not be weakened. If, instead, fertility were to cease to decline, the developing-country population would grow by 2.4 billion, not 1.8 billion, in 2000 to 2025, and by 5.8 billion, not 3.1 billion, in 2000 to 2050.

about two dozen countries with fertility at 6.0 or higher. About another two dozen countries have fertility between 5.0 and 5.9 (World Bank, 1997a). In addition, annual increments are large because developing-country populations are much bigger now and are predominantly young, with a median age of about 23. Young populations include many potential childbearers, whose children in turn will continue to swell the population. As a result, the number of babies born in developing countries should keep increasing for another two decades. The population growth rate will moderate during this period only because, as the population ages, the number of deaths will also go up.

If each couple were to have no more children than those necessary to replace themselves, developing-country populations would still continue to grow because of their young age structures. This is illustrated in Figure 2 with population pyramids, which show the distribution of population by age and sex. Each cohort (each group of people born in contiguous years) moves upward in the pyramid as it ages, and the upper levels of the pyramid therefore expand over time, as the contrast between 1995 and 2025 shows. Even if each cohort only reproduces itself (so that the lowest rung of the pyramid resembles the preceding ones), population will still grow, especially at older ages. This phenomenon, known as population momentum, will account for almost three-quarters of the population growth in developing countries over the next 25 years and for practically all the growth in East Asia. Momentum is largely absent, by contrast, in the pyramid for industrial countries (the last pyramid), which has a narrow base.<sup>2</sup>

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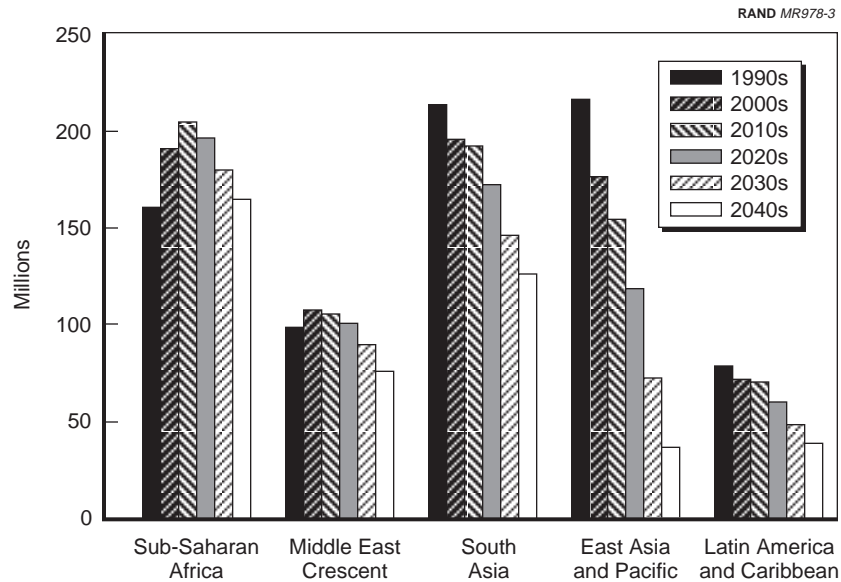
<sup>2</sup>Momentum can also be compared to the long-term interest on the national debt, continuing almost indefinitely into the future. The debt exists because of a previous excess of government expenses over revenue. Momentum exists because of a previous societal "excess" of births over deaths. The quicker a balanced budget is reached, the smaller the long-term debt. Similarly, the quicker a balance of fertility and mortality is reached, the smaller the long-term population momentum. If a balanced budget cannot be reached this year, reducing the deficit will at least slow the growth in the national debt. Likewise, reducing fertility will at least slow the increase in population momentum. Even if the government achieves a balanced budget, and keeps it balanced indefinitely, interest charges will continue on the accumulated debt. Even if fertility stays at replacement level indefinitely, population will continue to grow because of the accumulated momentum. Finally, just as only applying a government budget surplus to the principal on the national debt will reduce future interest payments, only fertility below replacement will reduce future population momentum.



SOURCE: World Bank (1997a, 1997b) and projections using the model used there.

**Figure 2—Population Pyramids: Distribution of Population by Age and Sex (millions)**

Continued substantial population growth can be expected in every developing-country region. Of the 1.8 billion additional people that can be expected in the next 25 years, East and Southeast Asia and the Pacific will contribute about 400 million (Figure 3). More will come from sub-Saharan Africa (almost 500 million) and South Asia (480 million). The increments will be smaller, but still substantial, in the Middle East crescent (260 million for this band of mostly Islamic countries stretching from Morocco to Kazakhstan) and in Latin America and the Caribbean (170 million). Although population growth will be most impressive in sub-Saharan Africa—leading to a population 75-percent larger by 2025 than it is today—other regions will also show impressive expansion. Latin America, for instance, will have 33 percent more people by 2025, and much of the increase will undoubtedly go to expand such already massive urban agglomerations as Mexico City.



SOURCE: Estimated using the World Bank (1997a) projection model.

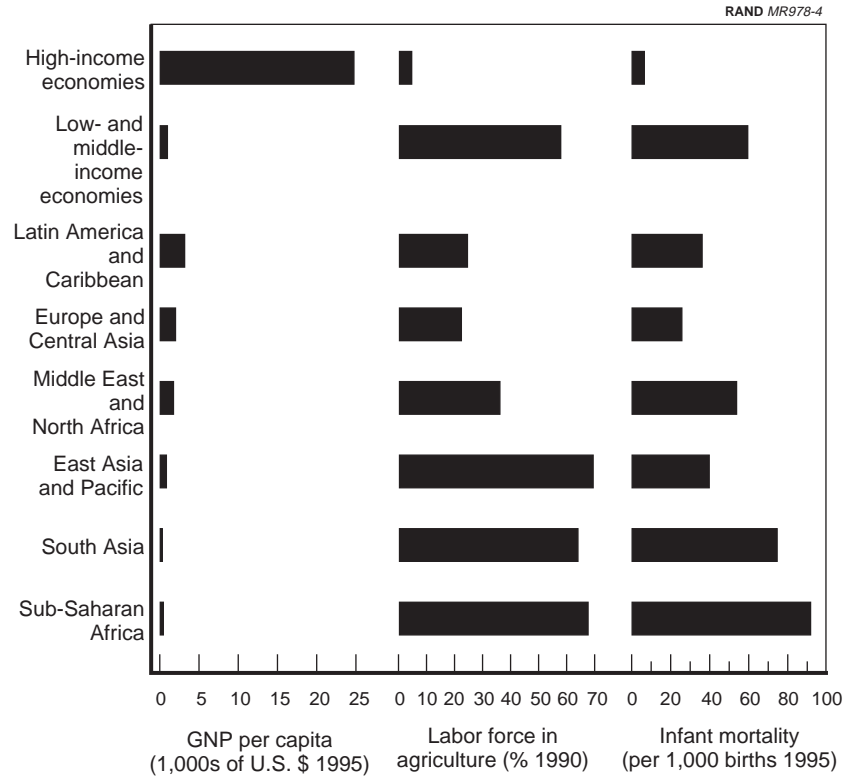
**Figure 3—Population Increments by Decade in Developing-Country Regions (millions)**

**IMPLICATIONS OF HIGH FERTILITY**

Expanding megacities will be among the substantial changes that these large population increments will bring. Countrysides will probably be more densely settled, and infrastructure and human services will be either substantially more extensive or under greater stress. The half century of growth since World War II has, for example, seen the Philippines increase from 70 to 226 people per square kilometer of land, and Bangladesh from 290 to 821 people per square kilometer. (At the latter density, the United States would have 7.7 billion people, not 270 million.)

Contrasts between the rapidly expanding developing countries and the steadily growing industrial economies can be extreme. Figure 4, for instance, compares income levels (gross national product, or

GNP, per capita), the labor force in agriculture, and infant mortality.<sup>3</sup> Average income in developing countries is less than one-twentieth of that in industrial countries. The proportion of the labor force in agriculture is on average more than 10 times as large as in indus-



NOTE: Regional averages are weighted by population (or by number of births, for infant mortality) and exclude high-income economies. Data from World Bank (1997b).

**Figure 4—Indicators for High-Income Economies and Low-and Middle-Income Regions**

<sup>3</sup>The groups compared, strictly speaking, are high-income economies versus low- and middle-income economies, as defined in World Bank (1997b). “Europe and Central Asia” includes only the low- and middle-income economies in that region.

trial countries. And babies in developing countries die at a rate more than eight times that of industrial countries, producing average life expectancies about a dozen years shorter.

How much of the difference in development and human welfare is explained by rapid population growth? A number of previous studies have produced inconclusive and even conflicting results. Cross-national regression analyses with data from the 1970s suggested that population growth did not affect national income, but studies of the 1980s suggested a negative impact.<sup>4</sup> Population growth, after all, provides not only more consumers of societal resources and services but also more workers and producers of goods, a greater pool of human resources for developing new products and technology. The relevance of expanded pools of consumers and producers may depend on economic and social policies that are often enacted with little attention to population. The net effect of population on development could therefore vary across countries and periods and could be difficult to assess.

What is clear, however, is that different sources of population growth have different economic implications. A population growing through migration often puts the migrants to work, earning some return from their labor.<sup>5</sup> A population growing because of substantially longer life expectancies could in principle keep older people working longer to prevent any increase in dependency, although societal preferences and practices may preclude this. But a population growing because of high fertility must accept that those added to the population will spend years as dependents, becoming socialized and educated, before they are productive.

### **Dependency and Savings**

The South Korean experience can illustrate how high fertility contributes to large numbers of dependents. Total fertility was well above four children per woman until 1970, and for every 100 persons

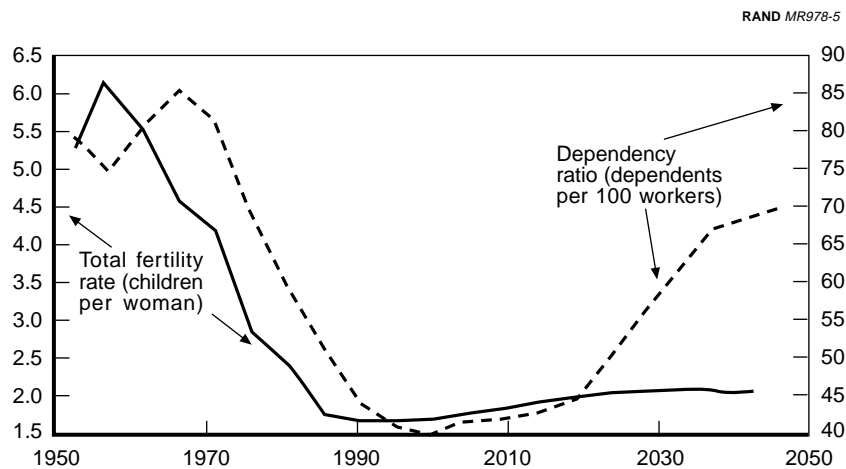
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<sup>4</sup>See Ahlburg (1996) for a recent review of this general area.

<sup>5</sup>Smith and Edmonston (1997) conclude, for instance, that U.S. residents gain economically from the presence of immigrants because of the additional labor (generally remunerated at lower rates than the average) and the increased specialization.

of working age (15–64) there were between 70 and 90 dependents (either younger or older). But fertility was declining rapidly, and the dependency ratio followed it down, so that now there are only 40 dependents per 100 persons of working age, fewer than the 50 per 100 typical in other industrial countries (Figure 5). The dependency ratio will rise again in the future as the population ages, but since the mid-1980s, South Korea has enjoyed a relatively light dependency burden and will for several more decades.

A key argument in a landmark study 40 years ago was that a light dependency burden should be good for economic growth (Coale and Hoover, 1958). Among the effects of the dependency burden, the way it depresses savings has recently received renewed attention. Arguments about this have gone back and forth among economists, but improved models now confirm this effect cross-nationally (Kelley and Schmidt, 1996). An analysis of household income and expenditures in Great Britain, Taiwan, Thailand, and the United States concludes that “in all countries except Thailand, more children depress



SOURCE: United Nations (1996) and World Bank (1997a).

**Figure 5—Total Fertility Rate and Dependency Ratio, South Korea, 1950–2050**



the saving rate” (Deaton and Paxson, 1997, p. 106).<sup>6</sup> Careful analysis of the experience of East Asian countries suggests that their reductions in fertility in the past decades relieved not only dependency burdens but also dependence on foreign capital by contributing to high saving rates (Higgins and Williamson, 1997; Williamson and Higgins, 1997; Lee et al., 1997; Bloom and Williamson, 1997).

Saving rates are indeed exceptionally high in East Asia: 35 percent of gross domestic product (GDP) in Northeast Asia and 33 percent in Southeast Asia, in contrast to 21 percent in the countries of the Organization for Economic Cooperation and Development (OECD) and only 10 percent in South Asia.<sup>7</sup> Relying less on government services, the multitude of households save substantial amounts as their members save to provide for retirement; possibly to fund bequests to the next generation; sometimes to hedge against financial setbacks; and occasionally to anticipate large expenditures, such as those for children’s education. Over their lives, people ordinarily save most in their middle years when they are most productive, provided their child-rearing expenses have declined. And as life expectancies rise, Asian workers, increasingly less confident of being able to depend on children in old age and unprotected by elaborate social security schemes, have also been pressed to save more for retirement.

Figures 6 and 7 show trends in dependency ratios, savings, and investment in Northeast and Southeast Asia.<sup>8</sup> As expected, savings

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<sup>6</sup>However, Deaton and Paxson go on to try to estimate the aggregate effect of population growth on the saving rate and find it is trivial (and actually has the reverse sign). They achieve this contradictory result with a model that assumes a stable population (contrary to the typical situation in a developing country, in which life expectancies are rising and fertility is falling) and unchanging age profiles of income and saving (contrary to their own empirical findings). These unusual assumptions may be largely responsible for their perverse aggregate results: A stable population, for instance, will have a different distribution of age groups—and therefore different proportions of high-saving and low-saving households—than a population nearing the end of fertility transition.

<sup>7</sup>For present purposes, Northeast Asia covers Japan, South Korea, Taiwan, Hong Kong, and Singapore; Southeast Asia covers Indonesia, Malaysia, the Philippines, and Thailand.

<sup>8</sup>The graphs show unweighted averages across countries, leaving out Taiwan for dependency ratios. Savings and investment rates cover five-year periods centered around the given dates, except that the last point is for 1990–1992 (Williamson and

and investment generally moved in the opposite direction from dependency, rising as lower fertility reduced the size of dependent cohorts. To determine whether this apparent link is causal requires investigating many possible complicating factors. For instance, strong economic growth itself can produce greater savings, as households find their incomes augmented by unexpected windfalls. When such relationships are accounted for, however, the results still suggest that dependency has a strong effect on savings.

For Northeast Asia, the net effect of a dependency ratio above 60 percent in the early 1970s was to depress savings by 5.2 percentage points (as a share of GDP), whereas the net effect of a dependency ratio close to 40 percent in the early 1990s was to increase savings by 8.4 percentage points (Williamson and Higgins, 1997).<sup>9</sup> These percentages are not trivial. For South Korea, for example, an 8.4-point increase was worth additional savings of close to US\$25 billion a year in the early 1990s. This figure exceeds the total official development assistance received by all of East Asia and the Pacific in 1991 (US\$17 billion) and is equal to more than half the assistance received by all developing countries combined (US\$47 billion).

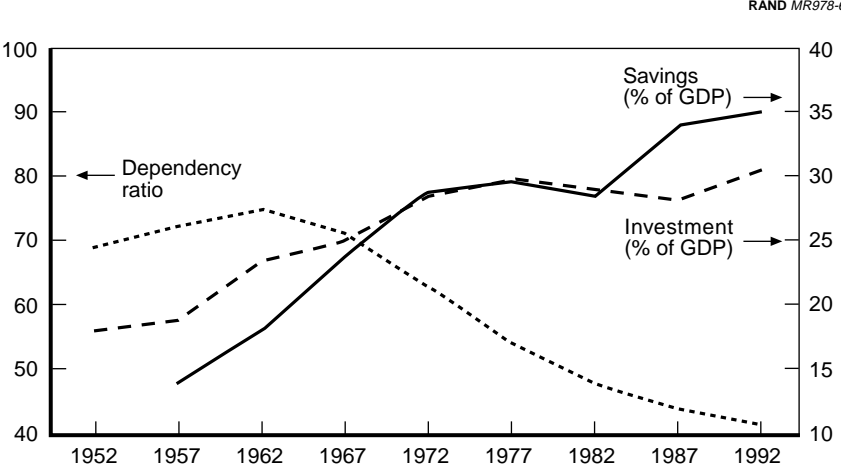
Net effects of dependency on investment were similar: A reduction of 3.7 percentage points in the early 1970s contrasts with an increase of 5.4 percentage points in the early 1990s. The dependency burden contributed to these countries' international debt from 1950 to 1980, but the lighter dependency burden has contributed to positive current account balances since then. A similar, but slightly more moderate, pattern of net effects on savings and investment has been demonstrated for Southeast Asia (Williamson and Higgins, 1997).

The net effect of dependency ratios was large enough to produce all the decline in foreign capital dependence after 1970 in both Northeast and Southeast Asia, by itself turning these regions from net debtors to net creditors on world capital markets. It also produced

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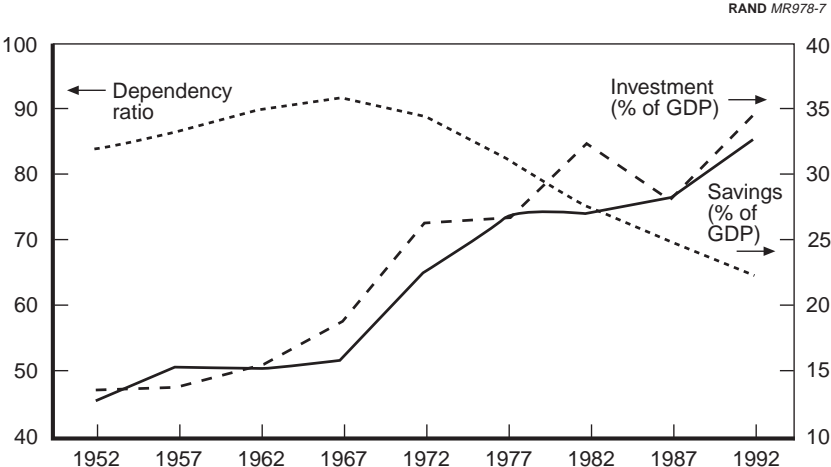
Higgins, 1997). Dependency ratios are for the middle of each period (United Nations, 1996).

<sup>9</sup>That is, savings were depressed or increased by the amounts given relative to what they would have been if "population age shares" had been at the 1950–1992 means.



SOURCE: Based on Williamson and Higgins (1997).

**Figure 6—Dependency, Savings, and Investment in Northeast Asia**



SOURCE: Based on Williamson and Higgins (1997).

**Figure 7—Dependency, Savings, and Investment in Southeast Asia**

substantial capital deepening: From 1965 to 1990, capital per worker grew 2.7 percent annually in the United States, but 6.6 percent annually in Thailand, 7.6 percent in Japan, 8.6 percent in South Korea, and 8.7 percent in Taiwan (Summers et al., 1995). (Although the United States appears disadvantaged in this comparison, it actually benefited by using East Asian savings to finance its perennial trade deficit.) The substantial liquidity these savings created, plus the additional investment attracted from foreign sources, could have contributed to the financial excesses, given lack of effective bank regulation, that led to the Asian currency crisis in 1997.<sup>10</sup> Clearly, a savings bonus from favorable demography can cut two ways: Failing to use it productively can be, eventually, as injurious as investing it well can be beneficial.

The large effects of reduced dependency on savings owed something to the fact that these economies were rapidly growing, and the impact of dependency changes could be magnified by other factors. But this issue aside, East Asia does not appear to be a special case. Modeling suggests that the effect of a given demographic shock on the current account balance has been no different in the rest of the world. However, in such regions as South Asia, where dependency reductions have so far been smaller, the impact has been correspondingly less positive (Williamson and Higgins, 1997; Bloom and Williamson, 1997).

### **Education and Health**

Smaller birth cohorts should reduce the pressure on schools, allowing improvements in education. Across developing countries, expenditures per pupil rise as the proportion of the population that is of school age declines. But education spending in total does not necessarily increase, and enrollment rates do not always rise (Schultz, 1987). The “demographic bonus” from declining fertility, which could be spent to increase enrollment or improve the quality

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<sup>10</sup>Krugman (1998) provides an interpretation of the crisis that explains its untraditional character: Implicit government guarantees for banks and finance companies, coupled with poor regulation, led to distorted investment decisions and an eventual collapse in asset prices.

of education, is sometimes spent instead on ineffective educational systems or on other things besides education.

Where the “demographic bonus” does go to improve education, the results can be salutary. For instance, South Korea raised net secondary enrollment from 38 to 84 percent between 1970 and 1990 and more than tripled expenditure per secondary pupil (Ahlburg and Jensen, 1997).<sup>11</sup> Demographic factors were not the only ones at work, but for East Asia as a whole they are estimated to have contributed 3–4 percent of the rise in enrollment and 10–13 percent of the increased expenditure (Williamson and Higgins, 1997).

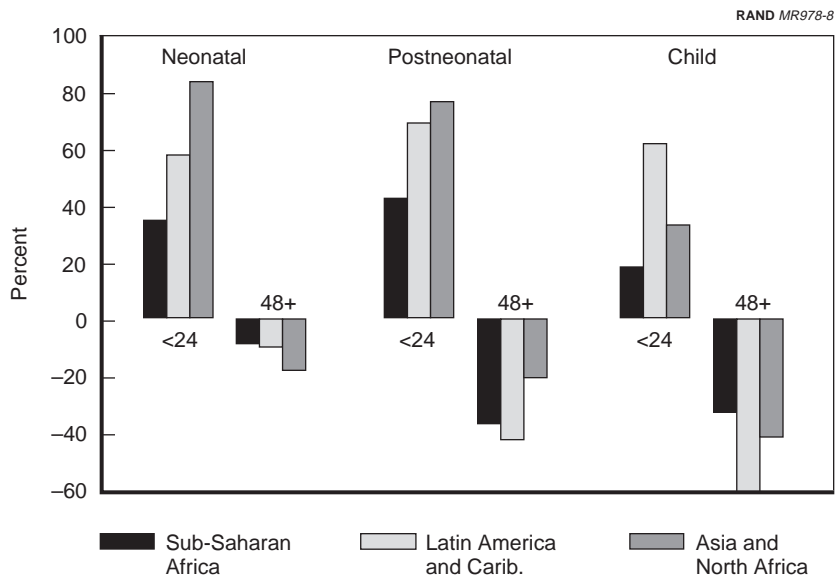
Lower fertility presumably is a boon not only for the educational system as a whole but also for individual parents in educating their children. With fewer children, parents should have more resources, time, and energy to spend on each child. Empirical studies generally confirm that fewer children means each gets more education, although the effect is neither universal nor necessarily sizable (see, for example, Rosenzweig and Wolpin, 1980; Knodel et al., 1990; Foster and Roy, 1993; Lloyd, 1994). One of the larger effects is for the Dominican Republic: In households that had avoided any unwanted births, 56 percent of children completed primary school, as opposed to only 39 percent of children in households with two or more unwanted births. This effect of “unwantedness” is similar, although weaker, in the Philippines but does not appear in Egypt or Kenya (Montgomery and Lloyd, 1996).<sup>12</sup> As with the demographic bonus at the societal level, the effect of fertility on education at the household level may depend on context. When parents see improved futures for their children with education, consider it an affordable priority, bear at least some costs of sending children to school, and have begun to plan their families with children’s education in mind, lower fertility can contribute to more educated children (Lloyd, 1994).

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<sup>11</sup>In the 1960–1985 period, high enrollment levels (especially at the primary level but also at the secondary level) accounted for more than twice as much economic growth in Korea as the level of investment (Page et al., 1993).

<sup>12</sup>Montgomery et al. (forthcoming) confirm the effect of unwantedness in further analysis but suggest it may be smaller, less than a year of schooling completed on average in the countries where it appears.

Lower fertility also produces healthier children. Closely spaced children, large numbers of children in each family, and children born to younger mothers are all more common before fertility declines, and such children all face higher mortality risks. Even up to the age of five years, the risk of death is greater if the interval since the preceding birth is shorter. The risk of death in the first month of life (the neonatal period) is 35–60 percent higher after a birth interval under 2 years than after an interval of 2–4 years (as Figure 8 shows for three regions). On the other hand, if the interval is longer than four years, the risk of neonatal death is reduced by 10 percent. Deaths in the postneonatal period (one month to one year) and in early childhood (1–4 years) show even more striking effects (Figure 8). Some of these effects of child survival may reflect limits on household resources for nutrition or health care, but physiological factors are also at work.



NOTE: Medians for 12 sub-Saharan, 10 Latin America, and 6 Asian–North African countries, excluding cases where the preceding sibling died before the following child’s second birthday (Sullivan et al., 1994).

**Figure 8—Percentage Change in Risk of Death When Preceding Birth Interval Is Shorter or Longer than 24–48 Months**

Close spacing interferes with breastfeeding, which has an important role in child nutrition and in protecting the child from infection.

Child survival is also affected by birth order, although this is not evident in sub-Saharan Africa. In several countries in that region, the risk of mortality under age 5 is still as high as one in five, and the risk in the region as a whole is equally high for all children (Figure 9). But in other regions, first, second, and third children clearly benefit from lower mortality, while children beyond the sixth continue to bear substantially greater risk. The effect of the mother's age is similar: Children of older mothers (35 and older) do not seem to be at greater risk in sub-Saharan Africa because every child is at high risk, but elsewhere children of older mothers bear a 10–25 percent greater risk. Even in sub-Saharan Africa, however, children of mothers under 20 have a 20–30 percent higher risk of death than do children of older mothers.