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*Chapter Ten*

# Migration, Urbanization, Resources, & Development

Andrei Rogers

## WORLD URBANIZATION AND THE PROBLEMS OF HUMAN SETTLEMENTS

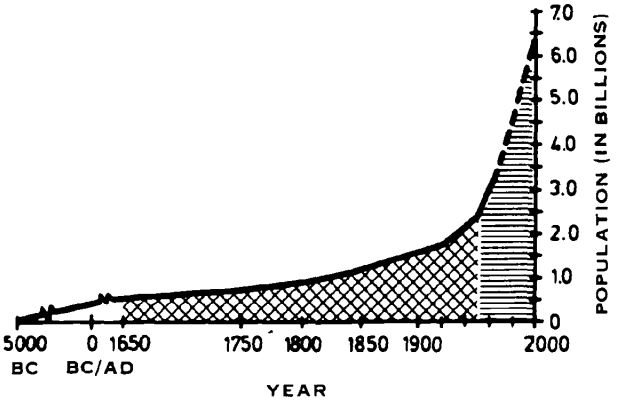
Representatives from 132 nations assembled in Vancouver in June of last year to convene Habitat, the United Nations Conference on Human Settlements. The conference was a global inquiry into solutions of the critical and urgent problems of human settlements created by the convergence of two historic events: unprecedentedly high rates of population growth and massive rural-to-urban migration.

World population in 1975 numbered about 4 billion and exhibited a growth rate of just under 2 percent a year. At this rate of growth the world's population would double in about 35 years and would total approximately 6.5 billion by the end of this century.

Figure 10-1 illustrates the enormous increase in the speed with which world population has grown during the past three centuries. From the beginning of human time to 1650, world population grew to a total of about a half billion. The second half billion came by 1830, and the second billion was added in only another hundred years. It took just 30 years to increase this total to 3 billion and the fourth billion came a little over 15 years later.

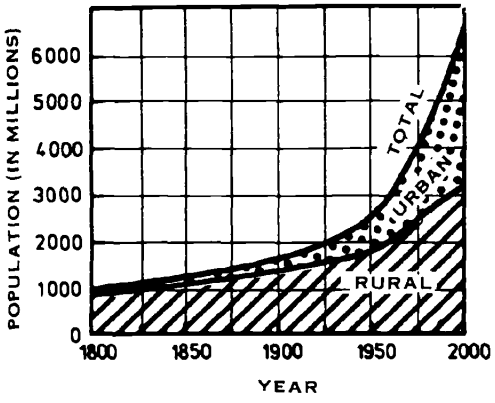
Urban population growth has been even more explosive (Figure 10-2). Roughly 1.6 billion people—40 percent of the world's population—live in urban areas today. At the beginning of the last century

The author is indebted to Frans Willekens for programming and carrying out the computer-generated urbanization scenarios described in this paper.




Source: Berelson (2) (1974), p. 4.

**Figure 10-1.** World Population through History




Source: United Nations (34) (1976), p. 3.

**Figure 10-2.** Growth of the World's Urban and Rural Populations: 1800-2000 (in millions).

the urban population of the world totaled only 25 million. The United Nations estimates that about 3.1 billion people, twice the size of today's urban population, will be living in urban areas by the year 2000.

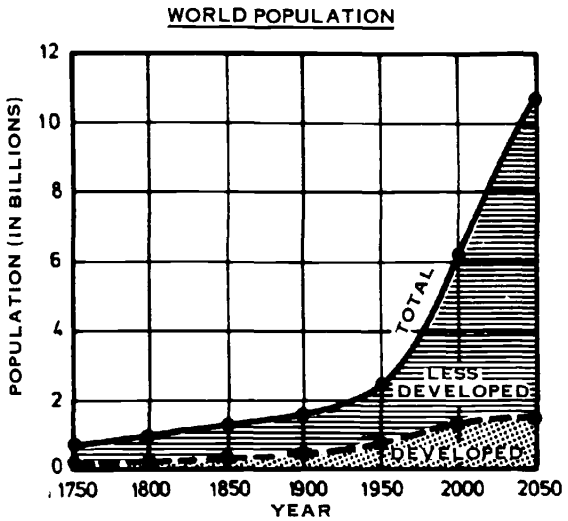
Rapid rates of population growth and urbanization occurred first among nations that first experienced modernization. Thus, for two-thirds of the world these rates did not reach significant levels until

very recently, generally after World War II. It is convenient, therefore, to examine the population situation separately for the developed and the less developed parts of the world.

**Urbanization in Developed and Less Developed Countries**

Less than one-third of the world's population lives in developed parts of the world, defined by the United Nations to comprise all of Europe, Northern America, Japan, Temperate South America, Australia and New Zealand, and the Soviet Union. The rest of the world's people, about 2.9 billion of them, live in the economically poorer, less developed world.

Birth rates in less developed countries are, on the average, about twice as high as those in developed countries. Although death rates in the former also exceed those in the latter, the gap is smaller and becoming narrower. The difference between births and deaths is natural increase, and rates of natural increase in the less developed world far exceed those in the developed nations. Consequently, the population growth rate of the less developed countries is two and a half times that of the developed (2.4 percent against 0.9 percent); and their share of the global population total is rapidly increasing and is expected to exceed three-fourths by the year 2000 (Figure 10-3).




Source: Keyfitz (1976), p. 29.

**Figure 10-3.** Population Growth of Today's Developed and Less Developed Countries.

A large proportion of the population of the less developed world is engaged in agriculture. In consequence, a relatively small fraction of this population is urban—only about one-fourth. The corresponding fraction for the developed world is close to seven-tenths (Figure 10-4). But because of their considerably larger share of the world's population, less developed countries today have as large an urban population as do the developed countries, each having an urban population of just under four-fifths of a billion people.

Urban populations are growing much more rapidly than the total populations of which they are a part. Table 10-1 shows that this is specially true in the less developed world. Between 1950 and 1970 the total population of the developed countries increased by 26 percent, and that of the less developed countries by 54 percent; during the same period the urban population of the developed countries grew by 57 percent, while that of the less developed countries increased by over 146 percent.

The latest United Nations projections of urban populations up to the year 2000 for seven major areas of the world are graphed in Figure 10-5. These are drawn on a logarithmic scale so that parallel slopes depict equal rates of growth. They indicate that urban growth rates in Europe, Northern America, and the Soviet Union are likely to slow down to relatively moderate levels, whereas those of East and South Asia, Latin America, and Africa are likely to continue to be comparatively high. Between 1975 and the year 2000 the urban population of Europe is likely to increase by a third, that of Northern America and the Soviet Union by one-half. It may double in East Asia, treble in South Asia and Africa and grow two and a half times in Latin America.

Historically, urban growth and urbanization have occurred together, but they do not measure the same attribute to national population. Urban growth refers to an increase in the number of people living in urban settlements. Urbanization refers to a rise in proportion of a total population that is concentrated in urban settlements. The latter measure, therefore, is a function not only of urban growth but also of rural growth (Figure 10-6). Thus urban growth can occur without any urbanization if the rural population increases at a rate equal to or greater than that of the urban population.

Table 10-2 traces the urbanization process in the world's developed and less developed regions and in eight of its major geographical areas. In striking contrast to the substantial differences among urban growth rates in Table 10-1 and Figure 10-5, differences in the rates of urbanization are relatively minor, except in three instances. The Soviet Union and Latin America exhibit above-average rates of urbanization; in Oceania the pace of urbanization is below average. Urbanization in

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Figure 10-5

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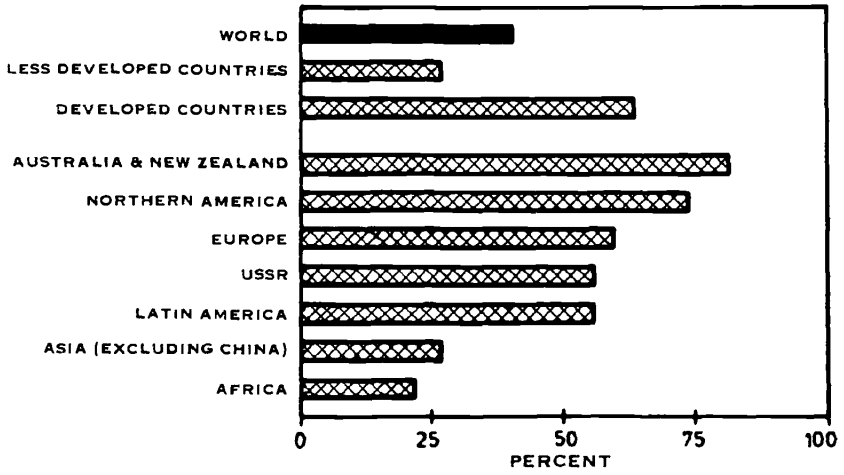
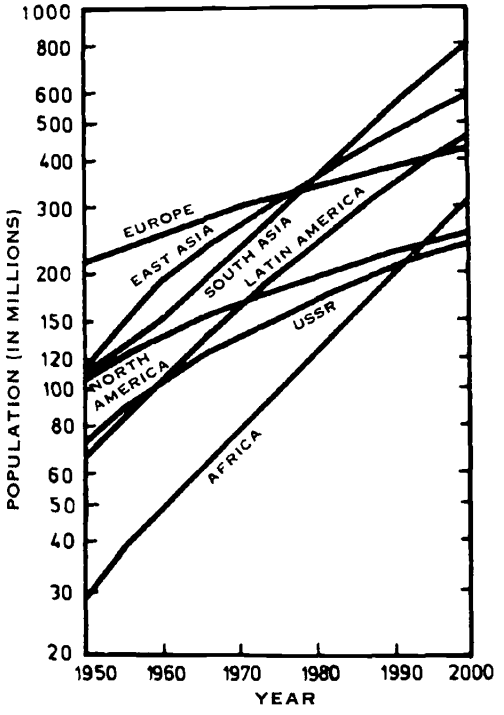



Source: Berelson (1974), p. 14.

**Figure 10-4.** Percentage Population Urban in Major World Regions, 1970.




Source: United Nations (34) (1976), p. 21.

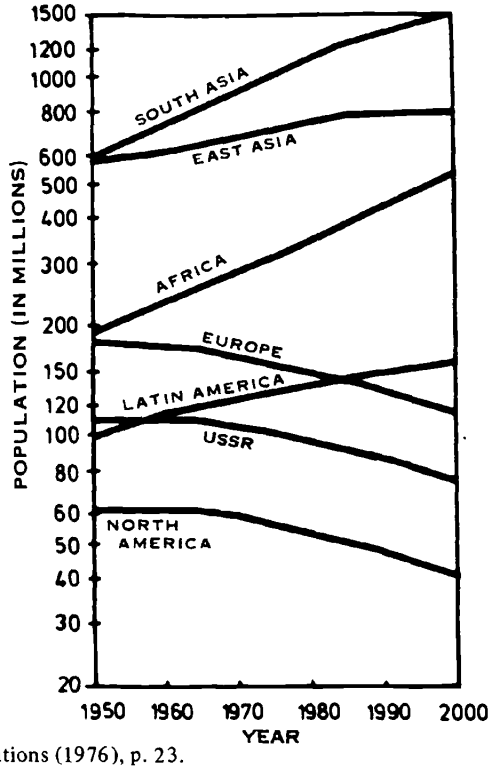
**Figure 10-5.** Urban Population, 1950-2000, in Seven Major Areas.

**Table 10-1. Population Estimates and Projections (Medium Variant) and Average Annual Rate of Growth: World Total, Regions, Countries or Areas, Urban and Rural, 1950-2000**

| *Regions, countries or areas* | *Total: T<br>Urban: U<br>Rural: R* | *Total population (in thousands)<br>Annual rate of growth (percentage)* | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *1950* | *Rate* | *1960* | *Rate* | *1970* | *Rate* | *1975* | *Rate* | *1980* | *Rate* | *1990* | *Rate* | *2000* |
| *(1)* | | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* | *(11)* | *(12)* | *(13)* | *(14)* |
| *World Total* | T | 2,501,243 | 1.8 | 2,985,937 | 1.9 | 3,609,600 | 1.9 | *3,967,005* | 2.0 | 4,373,210 | 1.9 | 5,279,041 | 1.7 | 6,253,135 |
| | U | 714,681 | 3.4 | 1,006,942 | 2.9 | 1,350,032 | 2.9 | *1,557,685* | 2.9 | 1,799,528 | 2.8 | 2,385,646 | 2.6 | 3,103,214 |
| | R | 1,786,562 | 1.0 | 1,978,995 | 1.3 | 2,259,568 | 1.3 | *2,409,320* | 1.3 | 2,573,682 | 1.1 | 2,893,395 | 0.9 | 3,149,921 |
| More Developed Regions | T | 857,305 | 1.3 | 975,748 | 1.1 | 1,084,018 | 0.9 | *1,131,715* | 0.9 | 1,181,072 | 0.8 | 1,277,570 | 0.6 | 1,360,557 |
| | U | 457,339 | 2.5 | 586,192 | 2.0 | 717,626 | 1.7 | *782,582* | 1.6 | 849,670 | 1.5 | 983,935 | 1.1 | 1,106,942 |
| | R | 399,966 | −0.3 | 389,556 | −0.6 | 366,393 | −1.0 | *349,133* | −1.0 | 331,402 | −1.2 | 293,635 | −1.5 | 253,615 |
| Less Developed Regions | T | 1,643,938 | 2.0 | 2,010,189 | 2.3 | 2,525,582 | 2.3 | *2,835,290* | 2.4 | 3,192,138 | 2.3 | 4,001,471 | 2.0 | 4,892,579 |
| | U | 257,342 | 4.9 | 420,750 | 4.1 | 632,407 | 4.1 | *775,103* | 4.1 | 949,858 | 3.9 | 1,401,711 | 3.5 | 1,996,272 |
| | R | 1,386,596 | 1.4 | 1,589,439 | 1.4 | 1,893,175 | 1.7 | *2,060,187* | 1.7 | 2,242,280 | 1.5 | 2,599,760 | 1.1 | 2,896,307 |
| *Africa* | T | 218,833 | 2.2 | 272,753 | 2.5 | 351,594 | 2.6 | *401,138* | 2.8 | 460,686 | 2.9 | 613,714 | 2.8 | 813,119 |
| | U | 28,878 | 5.1 | 47,991 | 4.7 | 76,997 | 4.8 | *98,059* | 4.8 | 124,789 | 4.7 | 199,300 | 4.3 | 306,780 |
| | R | 189,955 | 1.7 | 224,762 | 2.0 | 274,597 | 2.0 | *303,079* | 2.1 | 335,897 | 2.1 | 414,414 | 2.0 | 506,339 |
| *Europe* | T | 391,968 | 0.8 | 42,514 | 0.8 | 459,085 | 0.6 | *473,128* | 0.6 | 486,611 | 0.5 | 513,779 | 0.5 | 539,812 |
| | U | 214,751 | 1.6 | 251,785 | 1.6 | 296,903 | 1.4 | *317,700* | 1.3 | 338,548 | 1.2 | 381,799 | 1.1 | 424,996 |
| | R | 177,217 | −0.2 | 173,369 | −0.7 | 162,182 | −0.9 | *155,428* | −1.0 | 148,063 | −1.1 | 131,980 | −1.4 | 114,816 |
| *America, North* | T | 218,633 | 2.0 | 267,577 | 1.7 | 318,008 | 1.5 | *342,609* | 1.6 | 371,480 | 1.7 | 440,143 | 1.5 | 513,373 |
| | U | 125,371 | 3.0 | 168,589 | 2.4 | 214,936 | 2.1 | *239,241* | 2.2 | 267,408 | 2.2 | 334,545 | 2.0 | 408,618 |
| | R | 93,262 | 0.6 | 98,988 | 0.4 | 103,072 | 0.1 | *103,368* | 0.1 | 104,072 | 0.1 | 105,598 | −0.1 | 104,755 |
| *America, South* | T | 111,365 | 2.8 | 146,662 | 2.7 | 191,401 | 2.6 | *218,324* | 2.6 | 248,984 | 2.5 | 320,578 | 2.3 | 402,755 |
| | U | 47,371 | 4.6 | 74,725 | 4.2 | 113,845 | 3.8 | *137,825* | 3.7 | 165,587 | 3.4 | 232,133 | 2.9 | 311,050 |
| | R | 63,994 | 1.2 | 71,937 | 0.8 | 77,556 | 0.7 | *80,499* | 0.7 | 83,397 | 0.6 | 88,445 | 0.4 | 91,705 |
| *Asia* | T | 1,367,737 | 1.8 | 1,643,691 | 2.1 | 2,027,420 | 2.1 | *2,255,458* | 2.2 | 2,513,851 | 2.0 | 3,068,977 | 1.7 | 3,636,335 |
| | U | 219,284 | 4.6 | 348,495 | 3.5 | 496,462 | 3.6 | *595,268* | 3.6 | 713,856 | 3.5 | 1,008,499 | 3.2 | 1,385,689 |
| | R | 1,148,453 | 1.2 | 1,295,196 | 1.7 | 1,530,958 | 1.6 | *1,660,190* | 1.6 | 1,799,995 | 1.4 | 2,060,478 | 0.9 | 2,250,646 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Europe* | T | 391,968 | 0.8 | 42,514 | 0.8 | 459,085 | 0.6 | *473,128* | 0.6 | 486,611 | 0.5 | 513,779 | 0.5 | 539,812 |
| | U | 214,751 | 1.6 | 251,785 | 1.6 | 296,903 | 1.4 | *317,700* | 1.3 | 338,548 | 1.2 | 381,799 | 1.1 | 424,996 |
| | R | 177,217 | −0.2 | 173,369 | −0.7 | 162,182 | −0.9 | *155,428* | −1.0 | 148,063 | −1.1 | 131,980 | −1.4 | 114,816 |
| *America, North* | T | 218,633 | 2.0 | 267,577 | 1.7 | 318,008 | 1.5 | *342,609* | 1.6 | 371,480 | 1.7 | 440,143 | 1.5 | 513,373 |
| | U | 125,371 | 3.0 | 168,589 | 2.4 | 214,936 | 2.1 | *239,241* | 2.2 | 267,408 | 2.2 | 334,545 | 2.0 | 408,618 |
| | R | 93,262 | 0.6 | 98,988 | 0.4 | 103,072 | 0.1 | *103,368* | 0.1 | 104,072 | 0.1 | 105,598 | −0.1 | 104,755 |
| *America, South* | T | 111,365 | 2.8 | 146,662 | 2.7 | 191,401 | 2.6 | *218,324* | 2.6 | 248,984 | 2.5 | 320,578 | 2.3 | 402,755 |
| | U | 47,371 | 4.6 | 74,725 | 4.2 | 113,845 | 3.8 | *137,825* | 3.7 | 165,587 | 3.4 | 232,133 | 2.9 | 311,050 |
| | R | 63,994 | 1.2 | 71,937 | 0.8 | 77,556 | 0.7 | *80,499* | 0.7 | 83,397 | 0.6 | 88,445 | 0.4 | 91,705 |
| *Asia* | T | 1,367,737 | 1.8 | 1,643,691 | 2.1 | 2,027,420 | 2.1 | *2,255,458* | 2.2 | 2,513,851 | 2.0 | 3,068,977 | 1.7 | 3,636,335 |
| | U | 219,284 | 4.6 | 348,495 | 3.5 | 496,462 | 3.6 | *595,268* | 3.6 | 713,856 | 3.5 | 1,008,499 | 3.2 | 1,385,689 |
| | R | 1,148,453 | 1.2 | 1,295,196 | 1.7 | 1,530,958 | 1.6 | *1,660,190* | 1.6 | 1,799,995 | 1.4 | 2,060,478 | 0.9 | 2,250,646 |
| *Oceania* | T | 12,632 | 2.2 | 15,771 | 2.0 | 19,323 | 2.0 | *21,308* | 1.9 | 23,482 | 1.8 | 28,109 | 1.5 | 32,715 |
| | U | 8,142 | 2.4 | 10,396 | 2.7 | 13,561 | 2.4 | *15,262* | 2.3 | 17,156 | 2.2 | 21,298 | 1.8 | 25,584 |
| | R | 4,490 | 1.8 | 5,375 | 0.7 | 5,762 | 1.0 | *6,046* | 0.9 | 6,326 | 0.7 | 6,811 | 0.5 | 7,131 |
| *USSR* Union of Soviet Socialist Republics | T | 180,075 | 1.7 | 214,329 | 1.3 | 242,768 | 1.0 | *255,038* | 1.0 | 268,115 | 0.9 | 293,742 | 0.7 | 315,027 |
| | U | 70,884 | 3.9 | 104,961 | 2.7 | 137,328 | 2.3 | *154,330* | 2.2 | 172,185 | 1.9 | 208,071 | 1.5 | 240,498 |
| | R | 109,191 | 0.0 | 109,368 | −0.4 | 105,440 | −0.9 | *100,708* | −1.0 | 95,930 | −1.1 | 85,671 | −1.4 | 74,529 |

Source: United Nations (1976), pp. 22-49.




Source: United Nations (1976), p. 23.

**Figure 10-6.** Rural Population, 1950-2000, in Seven Major Areas.

**Table 10-2. Estimated and Projected Percentage of Population (Medium Variant) in Urban Areas: World Total, Macro Regions and Regions, 1950-2000**

| *Macro regions and regions* | *Percentage of estimated and projected population in urban areas* | | | | | | |
|---|---|---|---|---|---|---|---|
| | *1950* | *1960* | *1970* | *1975* | *1980* | *1990* | *2000* |
| *(1)* | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* |
| *World Total* | 28.57 | 33.72 | 37.40 | *39.27* | 41.15 | 45.19 | 49.63 |
| More Developed Regions | 53.35 | 60.08 | 66.20 | *69.15* | 71.94 | 77.02 | 81.36 |
| Less Developed Regions | 15.65 | 20.93 | 25.04 | *27.34* | 29.76 | 35.03 | 40.80 |
| *Africa* | 13.20 | 17.60 | 21.90 | *24.45* | 27.09 | 32.47 | 37.73 |
| *Latin America* | 40.90 | 48.51 | 56.85 | *60.42* | 63.76 | 69.74 | 74.80 |
| *Northern America* | 63.65 | 69.83 | 74.15 | *76.53* | 78.78 | 82.88 | 86.41 |
| *East Asia* | 16.55 | 24.63 | 28.53 | *30.66* | 32.90 | 37.73 | 43.19 |
| *South Asia* | 15.53 | 18.05 | 21.09 | *22.96* | 24.97 | 29.59 | 35.04 |
| *Europe* | 54.79 | 59.22 | 64.67 | *67.15* | 69.57 | 74.31 | 78.73 |
| *Oceania* | 64.46 | 65.92 | 70.18 | *71.63* | 73.06 | 75.77 | 78.20 |
| *USSR* | 39.36 | 48.97 | 56.57 | *60.51* | 64.22 | 70.83 | 76.34 |

Source: United Nations (1976), p. 54. (34)

the remaining regions, however, may be seen to be proceeding at a relatively similar pace, with percentage urban shares increasing by approximately one-half of a percent every year. The differences are a consequence of variations in rates of rural growth.

**The Problems of Human Settlements**

Problems of urbanization are problems of national human settlement systems: those networks of spatially dispersed concentrations of people and economic activities. Cities, towns, and urban agglomerations are nodal centers of life in modern societies, and changes in urbanization trends appear as changes in the spatial and hierarchically structured patterns of such centers.

The major problems of urbanization arise because urban growth is polarized and spatially imbalanced. Growth does not generally occur proportionally at all nodes of a national settlement system. Particularly in less developed countries, it usually falls unequally on the larger (20,000 or more) and often already overcrowded centers of urban life (Table 10-3).

Regional disparities in rates of urban growth are even more dramatic at the level of the individual urban settlement. Table 10-4 sets out recent United Nations projections of the growth of some of the less developed world's largest urban centers. The size of the population growth multiplier, the urban momentum, for some cities is truly awesome. During the 25 years between 1975 and 2000, Lima, Mexico City, Jakarta, and Teheran all are expected to triple their populations; Sao Paulo and Seoul are projected to grow by a factor of 2.5; and Addis Ababa, Nairobi, Lagos, and Kinshasa are to increase fourfold.

As with rapid population growth in general, rapid urban growth increases the difficulties of providing a population with the necessary sustenance, employment, services, and infrastructure. A rapidly burgeoning urban population strains health and education budgets, complicates the reduction of unemployment levels, and exacerbates problems connected with provision of adequate supplies of food, energy, housing, water, and transport and sanitary facilities. The "demographic investment" needed just to maintain present doubling or tripling of institutional plant within the next 25 years. That these areas are to be found mostly in countries least able to afford such an investment only multiplies the difficulties associated with the resolution of human settlement problems.

The magnitude of the accumulating demands for services and infrastructure in less developed countries may be illustrated with data on the provision of housing. According to the 1965 United Nations estimate (Table 10-5), the less developed regions of Africa, Asia, and Latin America required the construction of 392 million housing units

lajor Areas.

tion (Medium Variant)
1950-2000

| *ation in urban areas* | |
|---|---|
| *1990* | *2000* |
| *(7)* | *(8)* |
| 45.19 | 49.63 |
| 77.02 | 81.36 |
| 35.03 | 40.80 |
| 32.47 | 37.73 |
| 69.74 | 74.80 |
| 82.88 | 86.41 |
| 37.73 | 43.19 |
| 29.59 | 35.04 |
| 74.31 | 78.73 |
| 75.77 | 78.20 |
| 70.83 | 76.34 |

**Table 10-3. Average Annual Growth Rates in Total, Urban, and Rural Populations: Selected Countries, 1950-1960**

| *Major area and country* | *Total population* | *Reported rural population* | *Reported urban population*[a] | *Urban population in localities of* | | |
|---|---|---|---|---|---|---|
| | | | | *20,000 or more* | *100,000 or more* | *500,000 or more* |
| *South Asia* | 2.1 | 1.8 | 3.4 | 4.3 | 4.6 | 4.8 |
| India | 1.9 | 1.8 | 2.3 | 3.5 | 3.9 | 4.0 |
| Turkey | 2.8 | 2.3 | 4.7 | 6.8 | 6.6 | 7.4 |
| Philippines | 3.0 | 2.2 | 5.1 | 4.0 | 4.1 | 3.8 |
| Thailand | 3.0 | 2.2 | 8.3 | 6.9 | 5.3 | 4.9 |
| Iraq | 2.9 | 2.0 | 4.3 | 6.6 | 6.9 | N.A. |
| *Latin America* | 2.8 | 1.3 | 4.5 | 5.5 | 5.5 | 5.8 |
| Brazil | 3.0 | 1.5 | 5.2 | 6.3 | 5.8 | 6.8 |
| Mexico | 3.0 | 1.5 | 7.8 | 6.9 | 7.8 | 7.3 |
| Colombia | 2.8 | 1.2 | 5.0 | 6.6 | 7.5 | 9.4 |
| Chile | 2.3 | −0.2 | 3.7 | 4.7 | 4.1 | 5.1 |
| Peru | 2.3 | 1.2 | 3.7 | 6.0 | 5.3 | 4.7 |
| *Africa* | 2.1 | 1.6 | 4.5 | 5.4 | 6.5 | 5.3 |
| Egypt[b] | 2.4 | 1.5 | 4.1 | 4.1 | 4.9 | 3.5 |
| Nigeria | 2.6 | 2.1 | 5.4 | 7.6 | 11.6 | N.A. |
| Algeria | 2.3 | 1.1 | 5.5 | 7.1 | 6.3 | 3.4 |
| Zaire | 1.9 | 1.1 | 4.9 | 10.8 | 6.9 | N.A. |

N.A. = Not applicable.

[a]According to the national definition of an urban area.

[b]United Arab Republic.

Source: Farooq (1975), p. 137. (9)

during the fifteen-year period 1960-1975, with almost three-fourths of this total being required in Asia. This means that an average annual construction of 19.4 million housing units had to be built to satisfy demands arising from population increase, replacement of obsolescent stock, and elimination of existing shortages. Translated into per capita terms, the estimated requirement for this region is about eleven units per thousand population. Available statistics indicate that in most countries in Asia less than two housing units per thousand population were built each year during the 1960s (Mok, 1975, p. 98).

Rapid rates of urban population increase are but one element of the demands generated by growth. Increased consumption arising out of a growing per capita income also plays an important role. Continued urban growth at an annual rate of 4 to 5 percent, accompanied by a

an, and Rural

| ban population in localities of | |
|---|---|
| 100,000 or more | 500,000 or more |
| 4.6 | 4.8 |
| 3.9 | 4.0 |
| 6.6 | 7.4 |
| 4.1 | 3.8 |
| 5.3 | 4.9 |
| 6.9 | N.A. |
| 5.5 | 5.8 |
| 5.8 | 6.8 |
| 7.8 | 7.3 |
| 7.5 | 9.4 |
| 4.1 | 5.1 |
| 5.3 | 4.7 |
| 6.5 | 5.3 |
| 4.9 | 3.5 |
| 11.6 | N.A. |
| 6.3 | 3.4 |
| 6.9 | N.A. |

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**Table 10-4. Population Estimates and Projections for Fifteen Large Cities**

| City | Population (millions) | | | Multiple Increase over Base Year | |
|---|---|---|---|---|---|
| | 1950 | 1975 | 2000 | 1950-1975 | 1975-2000 |
| Cairo, Egypt | 2.4 | 6.9 | 16.4 | 2.9 | 2.4 |
| Addis Ababa, Ethiopia | 0.2 | 1.1 | 4.2 | 4.8 | 3.9 |
| Nairobi, Kenya | 0.1 | 0.7 | 3.4 | 5.5 | 4.5 |
| Lagos, Nigeria | 2.9 | 2.1 | 9.4 | 7.2 | 4.6 |
| Kinshasa, Zaire | 0.2 | 2.0 | 9.1 | 12.5 | 4.4 |
| Mexico City, Mexico | 2.9 | 10.9 | 31.6 | 3.8 | 2.9 |
| São Paulo, Brazil | 2.4 | 10.0 | 26.0 | 4.1 | 2.6 |
| Bogota, Colombia | 0.7 | 3.4 | 9.5 | 5.2 | 2.8 |
| Guayaquil, Ecuador | 0.3 | 1.0 | 3.1 | 4.0 | 3.1 |
| Lima, Peru | 0.6 | 3.9 | 12.1 | 6.4 | 3.1 |
| Jakarta, Indonesia | 1.6 | 5.6 | 16.9 | 3.6 | 3.0 |
| Teheran, Iran | 1.0 | 4.4 | 13.8 | 4.3 | 3.1 |
| Seoul, Korea | 1.0 | 7.3 | 18.7 | 7.1 | 2.6 |
| Karachi, Pakistan | 1.0 | 4.5 | 15.9 | 4.3 | 3.6 |
| Bangkok, Thailand | 1.0 | 3.3 | 11.0 | 3.4 | 3.4 |

Source: United Nations (1976), pp. 77-83. (34)

growth rate of urban per capita income of a similar level, means an annual growth rate of total urban income and demand for goods and services of about 9 percent. Compounded over the 30 years from 1970 to the end of the century, such a rate leads to a thirteenfold increase in throughput of materials and services.

> This rate of increase is hard to comprehend. It means, for example, that the metropolitan area of Mexico City, which in 1970 generated about $8 billion in total income (assuming that per capita income was $1,000 and population 8 million), would have a total income of $104 billion in the year 2000. This figure is greater than the total income today of any country in the world with the exception of the United States, the Soviet Union, West Germany, Japan, France, and the United Kingdom.[Ridker and Crosson, 1975, p. 217.]

An examination of future prospects for world population growth and urbanization reveals very forcefuly that the twin historic developments that have combined to create the problems of human settlements today will continue for the rest of this century and beyond in most parts of the world. The rate of world population growth, though apparently declining, will still be considerable for some time to

**Table 10-5. Estimated Housing Needs of Africa, Asia, and Latin America, 1960-1975 (millions of dwelling units)**

| Housing required to provide for: | Average Annual Requirements | | | | | | Total Requirements, 1960-1975 | |
|---|---|---|---|---|---|---|---|---|
| | 1960-1965 | | 1965-1970 | | 1970-1975 | | | |
| | Urban | Rural | Urban | Rural | Urban | Rural | Urban | Rural |
| *Population increase* | | | | | | | | |
| Africa | 0.4 | 0.9 | 0.5 | 1.0 | 0.7 | 1.1 | 7.8 | 14.7 |
| Asia | 2.2 | 4.0 | 2.7 | 4.2 | 3.2 | 4.5 | 41.0 | 62.1 |
| Latin America | 0.9 | 0.4 | 1.3 | 0.3 | 1.5 | 0.3 | 18.7 | 4.8 |
| Subtotal | 3.5 | 5.3 | 4.5 | 5.5 | 5.4 | 5.7 | 67.5 | 81.6 |
| *Replacement of obsolescent stock* | | | | | | | | |
| Africa | 0.1 | 1.1 | 0.1 | 1.1 | 0.1 | 1.1 | 1.8 | 16.1 |
| Asia | 1.1 | 6.3 | 1.1 | 6.3 | 1.1 | 6.3 | 16.5 | 94.0 |
| Latin America | 0.3 | 0.7 | 0.3 | 0.7 | 0.3 | 0.7 | 4.1 | 10.3 |
| Subtotal | 1.5 | 8.1 | 1.5 | 8.1 | 1.5 | 8.1 | 22.4 | 120.4 |
| *Elimination of existing shortages* | | | | | | | | |
| Africa | 0.1 | 0.7 | 0.1 | 0.7 | 0.1 | 0.7 | 1.8 | 10.7 |
| Asia | 0.7 | 4.2 | 0.7 | 4.2 | 0.7 | 4.2 | 14.6 | 62.6 |
| Latin America | 0.2 | 0.5 | 0.2 | 0.5 | 0.2 | 0.5 | 3.4 | 6.9 |
| Subtotal | 1.0 | 5.4 | 1.0 | 5.4 | 1.0 | 5.4 | 19.8 | 80.2 |
| Total | 6.0 | 18.8 | 7.0 | 18.0 | 7.9 | 19.2 | 109.7 | 282.2 |

Source: Mok (23) (1975), p. 99.

come, and rural-urban migration shows no signs of abating in most of the less developed world. Therefore, the number of people in the world will continue to increase in the near future, as will the proportion of people living in urban settlements. Populations in urban centers will continue to grow at an alarming rate, particularly in the larger urban agglomerations of the less developed world. The problems created by this transformation are manifold and involve large private and social costs. But there are obvious benefits too, and it is important to keep these in mind when considering policies for intervening in the urbanization process. A better understanding of the dynamics and consequences of urban-rural population growth and economic development appears to be an essential ingredient of such considerations, and this requires a focus on the *processes* of change together with their manifestations. We now turn to such an examination in the remainder of this paper.

Latin America,

| | Total Requirements, 1960-1975 | |
|---|---|---|
| 75 ural | Urban | Rural |
| 1.1 | 7.8 | 14.7 |
| 4.5 | 41.0 | 62.1 |
| 0.3 | 18.7 | 4.8 |
| 5.7 | 67.5 | 81.6 |
| 1.1 | 1.8 | 16.1 |
| 6.3 | 16.5 | 94.0 |
| 0.7 | 4.1 | 10.3 |
| 8.1 | 22.4 | 120.4 |
| 0.7 | 1.8 | 10.7 |
| 4.2 | 14.6 | 62.6 |
| 0.5 | 3.4 | 6.9 |
| 5.4 | 19.8 | 80.2 |
| 9.2 | 109.7 | 282.2 |

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## THE DEMOGRAPHIC TRANSITION

Accelerated rates of population growth and urbanization are direct consequences of higher rates of natural increase (births minus deaths) and rates of net urban migration (urban immigration minus urban outmigration). Explanations of temporal and spatial variations in the patterns exhibited by these two sets of rates generally have taken the form of descriptive generalizations phrased in terms of transitions or revolutions. Specifically, the *vital revolution* is commonly held to be the process whereby societies with high birth and death rates move to a situation of low birth and death rates. The *mobility revolution* is the transformation experienced by societies with low migration rates as they advance to a condition of high migration rates. These two revolutions occur simultaneously and they jointly constitute the demographic transition.

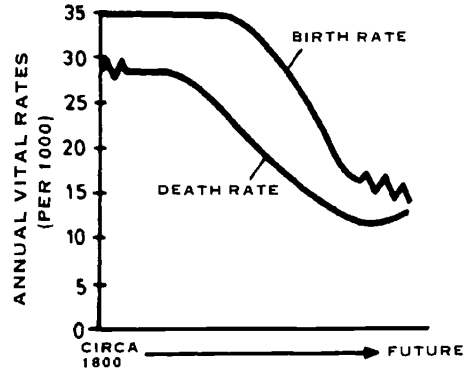
### The Vital Revolution

As traditional, largely illiterate, rural and agricultural-based populations have become transformed into modern, largely literate, urban, industrial-service dominated societies, they have at the same time moved from high levels to low levels of mortality and fertility. The belief that such a transition inevitably follows modernization has fostered the now often-voiced view that "development is the best contraceptive."

The general description of the vital revolution was originally developed some fifty years ago as an explanation of the demographic experiences of nineteenth-century Europe. This revolution begins with the control of deaths. Improvements in health care, in sanitation, in general standards of living, in nutrition, and in personal cleanliness all act to postpone death and to reduce mortality rates.

Control over deaths is followed, after some lag, by control over births. The principal factor underlying the reduction of the birth rate appears to be the voluntary regulation of fertility. The lag between the onset of mortality decline and that of fertility decline creates an asymmetry that leads to rapid population growth due to natural increase (Figure 10-7).

The changes in fertility and mortality that constitute the vital revolution are more readily understood if developed and less developed countries of the world are considered separately. The birth rate in the less developed world in 1960 was approximately 42.8 per thousand, while that in the developed world was half that. The death rate in the less developed regions also was higher than that of the developed regions, but the magnitude of the difference was roughly half of that



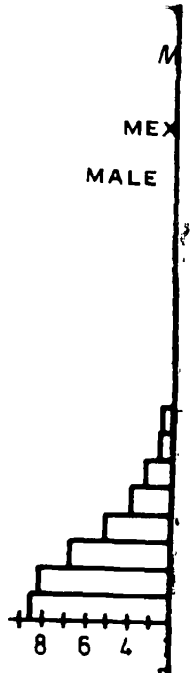

Source: Coale (4) (1969), p. 66.

**Figure 10-7.** Dependency Burden, Annual Rate of Increase, and Relative Size of Population Aged 15 to 64 Years: Two Alternative Projections.

between the two birth rates. As a result the population of the developed countries in 1960 was growing at a rate of 12.5 per thousand, whereas that of the less developed countries was increasing at the rate of 22.5 per thousand.

Because of their much higher fertility, less developed nations have a much "younger" age composition than developed countries, and therefore a far greater built-in tendency for further growth. A country with a recent history of high birth rates, such as Mexico, for example, exhibits an age pyramid with a broad base that tapers off sharply at the older age groups. A country with a history of low birth rates, such as Sweden, on the other hand, has an age composition that yields an almost rectangular age pyramid (Figure 10-8).

Populations in which children outnumber parents potentially have a larger number of parents in the next generation than today and therefore acquire a built-in *momentum* for further growth, even if their fertility immediately drops to bare replacement level. Bare replacement level under conditions to modern mortality means that each family reduces its fertility to about 2.1 to 2.3 children on the average. If average family size in developing countries dropped to bare replacement immediately, this would produce a zero growth population only after 80 years or more and one that would then be about two-thirds larger than the current one (Figure 10-9). If the drop were to take about 70 years to achieve, then this increase would be 450 percent. In other words, the momentum with the immediate fertility decline is about 1.66, and with delayed decline it is approximately 5.5.




Source: Berelson (19

Figure 1

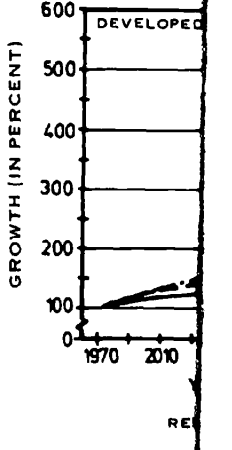



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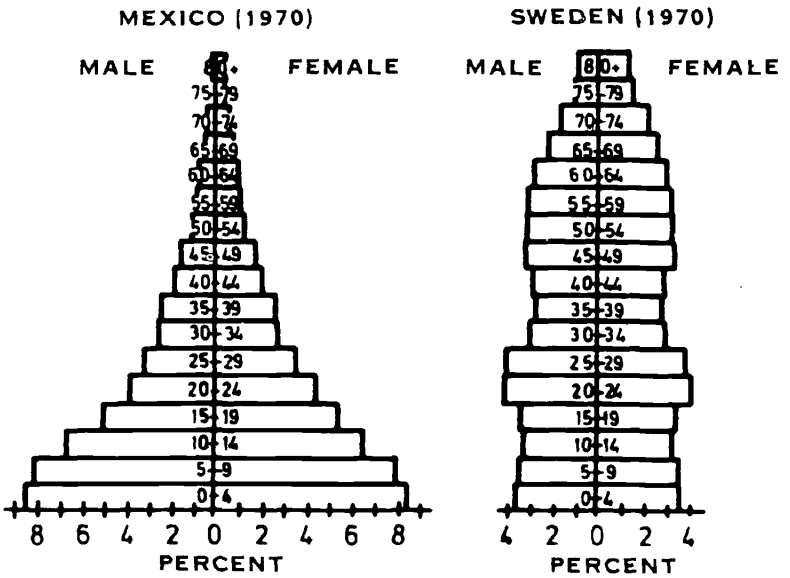
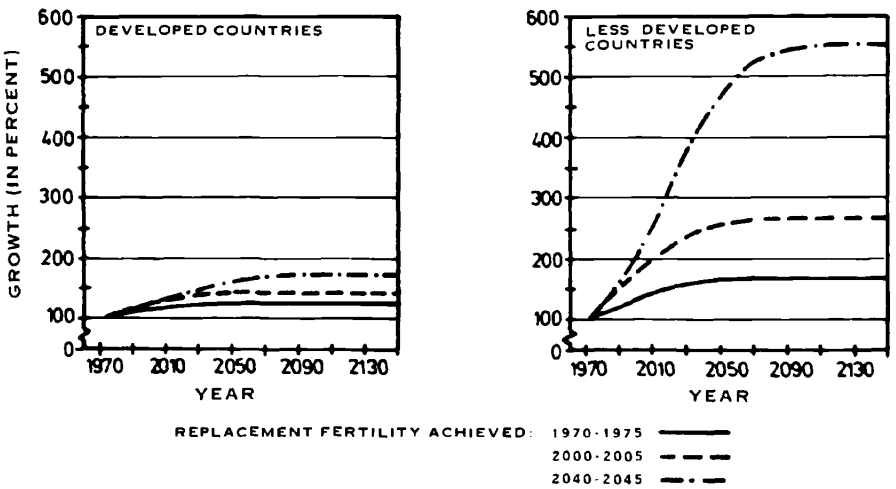
Figure 10-9. Mon
oped Countries.




Source: Berelson (1974), p. 12.

**Figure 10-8.** Young and Old Population Age Compositions.




Source: Berelson (1974), p. 13.

**Figure 10-9.** Momenta of Population Growth for Developed and Less Developed Countries.

Populations in all developed countries have gone through a process of demographic change in which a decline in mortality eventually was followed by a drop in fertility. Demographers refer to this transformation as the demographic transition, and associate it with socioeconomic changes that arise during a nation's industrialization and modernization. Although the process has been far from uniform, and its linkages with changes in socioeconomic variables have not been clearly identified, the universality of this revolution in developed countries is nevertheless quite impressive.

The vital revolution deals only with vital rates and neglects internal displacements attributable to migration. This latter contributor to spatial demographic change also exhibits a historical pattern—one that is described by the generalization known as the *mobility revolution.*

**The Mobility Revolution**

The primarily *temporal* aspect of the vital revolution has a *spatial* counterpart that Zelinsky has called the mobility transition or revolution, describing it in the following terms:

> There are definite, patterned regularities in the growth of personal mobility through space-time during recent history, and these regularities comprise an essential component of the modernization process. . . . A transition from a . . . condition of severely limited physical and social mobility toward much higher rates of such movement always occurs as a community experiences the process of modernization. [Zelinsky, 1971, pp. 221-22.]

Zelinsky's hypothesis is that for any specific community the vital and the mobility revolutions follow a parallel transitional sequence. He argues that as humanity has extended its control first over deaths and then over births, it also has increased people's ability to move from one community to another. Thus, whereas in premodern societies opportunities for territorial movement were limited, in most modern societies many individuals can migrate without major difficulties. The transition from the premodern to the modern condition is the mobility revolution, and its three principal phases appear to be:[1]

I. *Premodern Society.* High fertility and mortality, low natural increase, and little geographical mobility.

[1]This three-way division essentially collapses Zelinsky's five phases. The first is his premodern traditional society; the second combines his early and late transitional societies; and the third represents his advanced and superadvanced societies.

II. *Transitional Society.* A decline in mortality in the early stages of this phase is followed, after a lag, by a corresponding decline in fertility. The lag produces a rapid increase in population. This increase is accompanied by massive rural-to-urban migration, which gradually rises to a peak and then slackens.

III. *Modern Society.* Low fertility and mortality. Vigorous urban-to-urban migration and intraurban commuting. Net rural-to-urban migration declines and may even take on negative values as the population increasingly shifts outward from metropolitan agglomerations toward smaller communities.

In the premodern traditional societies of medieval Europe, early nineteenth-century Japan, and most of pre-World War II Asia and Africa, individually motivated migration over substantial physical distances was relatively uncommon. Difficulties of long-distance transportation, low levels of communication exchange between spatially distant localities, minimal disposable per capita incomes, and strong social ties all contributed to the evolution of communities whose demographic growth was relatively undisturbed by migration. Such societies were in Phase I of the mobility revolution.

Phase II begins with the onset of industrialization and modernization. Physical and social barriers to internal migration decline and the incentives for territorial movement increase. Rapidly growing rural populations experiencing the second phase of the vital revolution and structural changes in the technology of agricultural production combine to impel increasing numbers of individuals to migrate in search of improved social and economic opportunities. This geographical shift is directed mostly toward the larger urban centers.

During the final phase of the mobility revolution, urban-to-urban migration and commuting are the predominant forms of territorial movement. Rural-to-urban migration declines and its decrement to rural population may be more than offset by the size of the reverse flow. This late stage of Phase III has been called counterurbanization, and it appears to be occurring today in the United States, in Sweden, and in the Federal Republic of Germany (Morrison and Wheeler, 1976).

The hypothesis that rates of internal migration rise in the course of national socioeconomic development has been proposed on several occasions and has received empirical support in a number of empirical studies (e.g., Zelinski, 1971; Parish, 1973; and Long and Boertlein, 1976). Residential mobility in Japan, for example, has increased from a 1-year rate of 9.5 percent in 1960 to 12.8 percent in 1970. Kuroda (1973) reports a parallel rise in Japan's interdistrict migration rate from about 5.8 percent in the early 1950s to approximately 8 percent

in 1970. A simple plot of these rates against per capita income as a proxy for development and modernization suggests a decidedly positive association.

Data for nations in the late stages of modernization indicate that rates of geographical mobility ultimately tend to stabilize and perhaps even decline. For example, annual migration data for the United States between 1948 and 1971 exhibit insignificant year-to-year variations in the rate of residential mobility (U.S. Bureau of the Census, 1976). Figure 10-10 shows that a slight *decline* may have occurred in the United States during the decade of the 1960s.

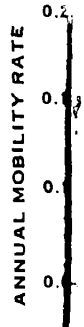
Rising income and declining family size give households more freedom to move. Thus increased economic development and reduced fertility levels should raise rates of internal migration. But other factors push in the reverse direction. Economic development stimulates the labor force participation of wives, and working wives reduce the ease with which couples can relocate. Low fertility populations have a comparatively high proportion of the aged, whose rates of migration are relatively low. This compositional effect acts to reduce aggregate movement rates. The gradual reductions of regional differentials in well-being that seem to follow modernization dampen some of the stimulus for migration. Finally, the improved locational accessibility characteristic of modern societies allows people to increasingly substitute commuting for migration.

The transitional society of Phase II of the mobility revolution experiences the particular form of population redistribution that is urbanization. As Kingsley Davis has observed, this is a new and relatively recent step in the social evolution of human society.

> Although cities themselves first appeared some 5,500 years ago, . . . [b]efore 1850 no society could be described as predominantly urbanized, and by 1900 only one—Great Britain—would be so regarded. Today, . . . all industrial nations are highly urbanized, and in the world as a whole the process of urbanization is accelerating rapidly. [Davis, 1965, pp. 41-53.]

Urbanization is a finite process all nations go through in the course of their transition from an agrarian to an industrial society. Such urbanization transitions can be depicted by attenuated S-shaped curves (Figure 10-11). These tend to show a swift rise around 20 percent, a flattening out at a point somewhere between 40 and 60 percent, and a halt or even a decline in the proportion urban at levels above 75 percent.

Nations that are still predominantly agricultural and rural have a built-in tendency for continued urbanization. This "urbanization




Source: L.H. Long a

**Figure 10-10.** Re
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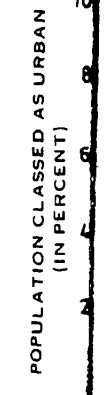


Source: Davis (1965

**Figure 10-1**

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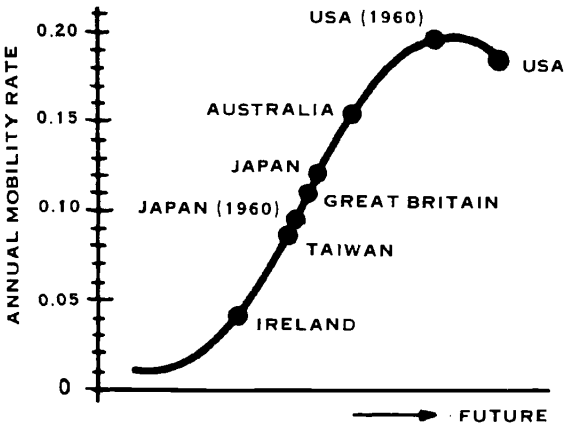
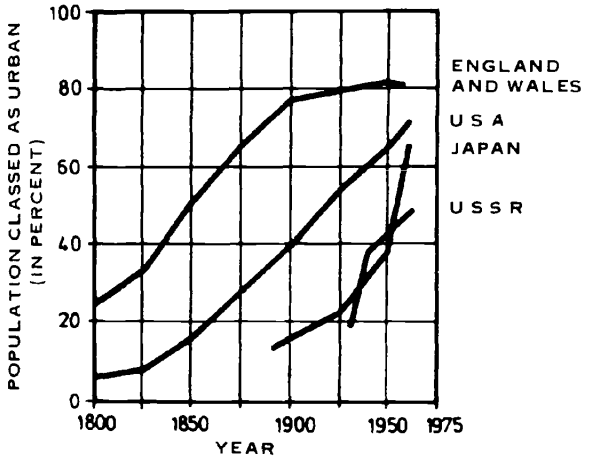



Source: L.H. Long and C.G. Boertlein (1976), pp. 3 and 17.

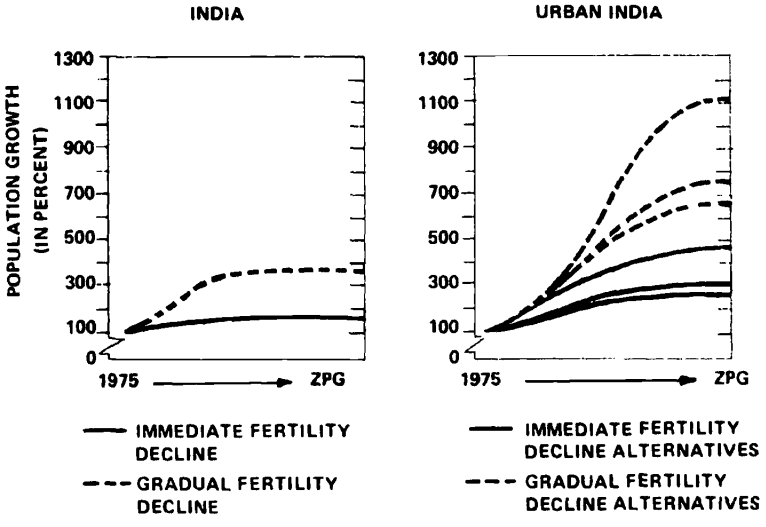
**Figure 10-10.** Residential Mobility Rate in Six Countries Around 1970 (and 1960 Where So Identified).




Source: Davis (1965), p. 47.

**Figure 10-11.** Historical Evolution of Population Classed as Urban.

momentum" is the spatial counterpart of the growth momentum that was described as part of the vital revolution. In most instances the size of the former is considerably larger than that of the latter. Figure 10-12 documents this for the case of India today. The principal spatial dynamics that contribute to such urbanization momenta are examined next.




Source: Rogers and Willekens (32) (1976), p. 32.

**Figure 10-12.** Urbanization Momenta of India's Population.

### The Demographics of Urbanization

Urbanization results from a particular spatial interaction of the vital and the mobility revolutions. It is characterized by distinct urban-rural differentials in fertility-mortality levels and patterns of decline, and by a massive net transfer of population from rural to urban areas through internal migration.

The few theoretical statements that have sought to explain the urbanization process seem to concur that this social phenomenon generally evolves physically in the following sequence (e.g., Gibbs, 1963):

1. During the initial period of city formation the rate of urban growth is exceeded by the rate of rural growth.
2. At some point in the history of the nation or region, a reversal occurs and the urban growth rate outstrips the rate of increase of the rural population, thereby initiating the growth of urbanization.
3. Eventually a "turning point" is reached as the proportion of the population that is urban exceeds 50 percent for the first time.
4. With the continuous decline in agriculture's share of the total labor force, the rural population ceases to grow and begins to decline.

5. In the late stages of industrialization, a decentralization of urban population occurs within urban centers and beyond, producing a more dispersed spatial pattern of population. In some instances rural (nonfarm) growth overtakes and once again exceeds urban growth.

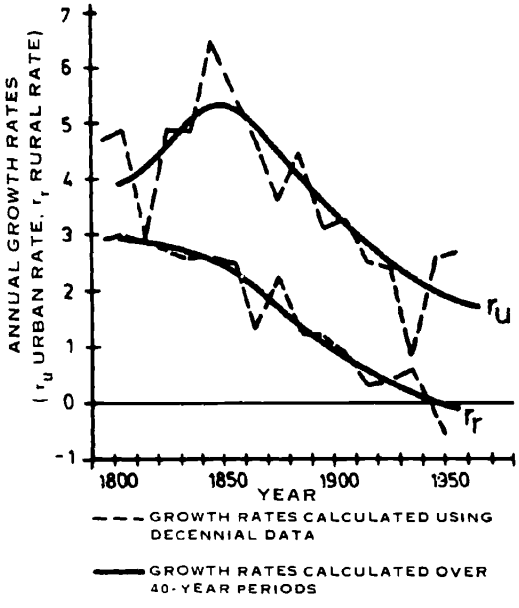
Figure 10-3 illustrates the path followed by urban and rural growth rates in the United States as the nation was transformed from a 5 percent urban population in 1790 to a 70 percent urban population in 1960. Already in the second stage of the above sequence in 1790, the nation reached the "turning point" just before 1920 and entered the fourth stage in the late 1940s. It currently is well into the fifth stage and recently has experienced the second reversal in growth rates: rural growth rates once again are higher than urban rates of growth (Morrison and Wheeler, 1976).

The pattern illustrated in Figure 10-13 for the United States seems to have some generality and apparently has also occurred in other countries, such as the Soviet Union:

> After more than a century of rising rates of increase in the urban population, from an average of 1.3 per cent per annum early in the 19th century to 6.5 per cent per annum average for the period between the censuses of 1926 and 1939, the Soviet Union is now experiencing declining growth rates. The highest rates of urban growth were achieved . . . when the proportion of urban population was still low . . . [and] the peak was reached in 1938 with an increase of 12.2 per cent in one year. . . . But the long-range trend has been downward with average annual increases of 4.1 per cent, 1950-1959, and 2.8 per cent, 1959-1970. A study of individual years, reveals a drop from 4.6 per cent in 1958 to 2.3 per cent in 1969, or a decline of one-half in a dozen years. [Harris, 1975, p. 77.]

If urbanization is a finite process, what are the spatial population dynamics that underlie it? How do urban and rural birth, death, and migration rates vary over time to produce the paths taken by urban and rural growth rates in countries such as the United States? We shall examine the three components of population change in turn, starting with mortality. Since the necessary data are very scarce and, in many instances, nonexistent, much of our discussion must necessarily be speculative.

Factors affecting mortality are likely to differ between urban and rural areas. Health care facilities, for example, are more readily available in urban areas. The number of deaths attributed to contagious diseases or automobile accidents, on the other hand, is apt to




Source: Eldridge and Thomas (8) (1964), p. 194.

**Figure 10-13.** Annual Growth Rates of Urban and Rural Populations in the United States: 1790-1960.

be lower in rural areas. On balance it appears that post-1930 rural mortality exceeds urban mortality levels, although in developed countries the differences have been narrowed considerably (Table 10-7). A recent United Nations calculation estimates the urban death rate around 1960 to have been "almost 8 points less than the rural in Africa, about 6 points less in East Asia and South Asia, and considerably less also in Oceania; in Europe and Northern America, on the other hand, the difference, if any, could have been only slight" (United Nations, 1974, pp. 17-18).

The fertility of urban women is lower than that of rural women virtually everywhere (Table 10-7). The principal factors associated with lowered birth rates—such as education, income, labor-force participation of women, age at marriage—are all correlates of urbanization. Thus fertility decline has tended to spread from city to village and from village to farm. United Nations estimates of urban and rural crude birth rates around 1960 revealed that "the urban crude birth rate was in general considerably below the rural crude birth rate. Only in Northern America was the difference rather slight. In Europe the rural birth rate exceeded the urban by 4 points, in East Asia and South Asia by about 7 points, in Latin America by 9 points, and in Oceania by 14 points" (United Nations, 1974, p. 18).

**Table 10-6. Co**
**1960 (percentag**

| *Regions* |
|---|
| *World* |
| More developed regions |
| Less developed regions |
| *Africa* |
| Western Africa |
| Eastern Africa |
| Northern Africa |
| Middle Africa |
| Southern Africa |
| *Northern America* |
| *Latin America* |
| Tropical South America |
| Middle America (Mainland) |
| Temperate South America |
| Caribbean |
| *East Asia* |
| China |
| Japan |
| Other East Asia |
| *South Asia* |
| Middle South Asia |
| South East Asia |
| South West Asia |
| *Europe* |
| Western Europe |
| Southern Europe |
| Eastern Europe |
| Northern Europe |
| *Oceania* |
| Australia and New Zealand |
| Melanesia |
| Micronesia and Polynesia |
| *USSR* |

Source: United Nat

**Table 10-6. Component Rates of Population Growth: World Total and Regions, 1960 (percentages)**

| *Regions* | *Growth rate r* | *Birth rate b* | *Death rate d* | *Natural increase rate n* |
|---|---|---|---|---|
| *World* | *19.2* | *35.8* | *16.6* | *19.2* |
| More developed regions | 12.5 | 21.5 | 9.0 | 12.5 |
| Less developed regions | 22.5 | 42.8 | 20.3 | 22.5 |
| *Africa* | *22.9* | *46.7* | *23.8* | *22.9* |
| Western Africa | 22.8 | 48.8 | 26.0 | 22.8 |
| Eastern Africa | 22.3 | 46.7 | 24.4 | 22.3 |
| Northern Africa | 25.7 | 46.5 | 20.6 | 25.7 |
| Middle Africa | 18.2 | 45.1 | 26.9 | 18.2 |
| Southern Africa | 23.1 | 41.1 | 18.0 | 23.1 |
| *Northern America* | *16.5* | *24.4* | *9.1* | *15.3* |
| *Latin America* | *28.0* | *39.9* | *11.8* | *28.1* |
| Tropical South America | 29.3 | 41.4 | 12.1 | 29.3 |
| Middle America (Mainland) | 32.6 | 45.0 | 12.4 | 32.6 |
| Temperate South America | 18.9 | 27.2 | 9.2 | 18.0 |
| Caribbean | 22.2 | 37.9 | 12.3 | 25.6 |
| *East Asia* | *17.4* | *35.2* | *17.8* | *17.4* |
| China | 17.7 | 37.4 | 19.7 | 17.7 |
| Japan | 9.6 | 17.3 | 7.7 | 9.6 |
| Other East Asia | 28.7 | 40.8 | 12.1 | 28.7 |
| *South Asia* | *23.9* | *45.8* | *21.9* | *23.9* |
| Middle South Asia | 23.0 | 45.9 | 22.9 | 23.0 |
| South East Asia | 25.6 | 45.9 | 20.3 | 25.6 |
| South West Asia | 27.3 | 45.4 | 18.1 | 27.3 |
| *Europe* | *8.8* | *19.4* | *10.1* | *9.3* |
| Western Europe | 11.4 | 18.5 | 10.8 | 7.7 |
| Southern Europe | 8.2 | 21.3 | 9.3 | 12.0 |
| Eastern Europe | 7.4 | 20.0 | 9.4 | 10.6 |
| Northern Europe | 6.4 | 17.4 | 11.0 | 6.4 |
| *Oceania* | *21.7* | *27.2* | *10.3* | *16.9* |
| Australia and New Zealand | 20.9 | 23.6 | 8.6 | 15.0 |
| Melanesia | 23.0 | 42.8 | 19.8 | 23.0 |
| Micronesia and Polynesia | 29.1 | 41.4 | 12.3 | 29.1 |
| *USSR* | *16.2* | *23.7* | *7.5* | *16.2* |

Source: United Nations (34) (1976), p. 50.

Populations in the

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The difference between the birth rate and the death rate is natural increase, and rural natural increase exceeded the urban in most parts of the world in 1960 (Table 10-7). Yet urban areas have been growing much more rapidly than rural areas. Clearly, the component of change fostering this growth is migration.

The urban population of the Soviet Union was growing at an annual rate of approximately 2.5 percent during the early 1970s. At the same time its rural population was declining at the annual rate of 1.1 percent. The urban growth rate was the sum of a rate of natural increase of 0.9 and a net migration rate of 1.6 percent. The urban rate of natural increase, in turn, was the difference between a birth rate of 17 per thousand and a death rate of 8 per thousand. The net migration rate was the difference between an inmigration rate of 27 per thousand and an outmigration rate of 11 per thousand. Expressing these rates on a per capita basis, we have the fundamental accounting identity (Rogers, 1976):

$$\begin{aligned} r_u &= (b_u - d_u) + (i_u - o_u) = n_u + m_u \\ &= (0.017 - 0.008) + (0.027 - 0.011) = 0.009 + 0.016 \\ &= -0.025 \end{aligned} \tag{10.1}$$

The corresponding identity for the rural population was:

$$\begin{aligned} r_r &= (b_r - d_r) + (i_r - o_r) = n_r + m_r \\ &= (0.019 - 0.009) + (0.014 - 0.035) = 0.010 - 0.021 \\ &= -0.011 \end{aligned} \tag{10.2}$$

We may contrast the above data for the Soviet Union, which is about 56 percent urban, with corresponding data for India, which is only 20 percent urban. The two accounting identities for India in the late 1960s were, respectively (Rogers and Willekens, 1976):

$$\begin{aligned} r_u &= (0.030 - 0.010) + (0.027 - 0.010) = 0.020 + 0.017 \\ &= 0.037 \end{aligned} \tag{10.3}$$

and:

$$\begin{aligned} r_r &= (0.039 - 0.017) + (0.002 - 0.007) = 0.022 - 0.005 \\ &= 0.017 \end{aligned} \tag{10.4}$$

Observe that the outmigration rates from urban areas in both countries are almost identical (0.011 and 0.010), and note that the rural outmigration rate in India is *lower* than its urban outmigration rate. The latter at first glance seems to contradict the view of a massive net

M

Table 10-7. Co
Total and Regio

| *Macro regions, regi urban and rural* |
|---|
| *World* |
| More developed regi |
| Less developed regio |
| *Africa* |
| Western Africa |
| Eastern Africa |
| Northern Africa |
| Middle Africa |
| Southern Africa |
| *Northern America* |
| *Latin America* |
| Tropical South Ame |
| Middle America (Ma |
| Temperate South A |
| Caribbean |
| *East Asia* |
| China |
| Japan |
| Other East Asia |
| *South Asia* |
| Middle South Asia |
| South East Asia |
| South West Asia |
| *Europe* |
| Western Europe |
| Southern Europe |
| Eastern Europe |
| Northern Europe |
| *Oceania* |
| Australia and New |
| Melanesia |
| Micronesia and Pol |
| *USSR* |

Source: United Nati

**Table 10-7. Component Rates of Urban and Rural Population Growth: World Total and Regions, 1960 (percentages)**

| *Macro regions, regions, urban and rural* | *Urban Population* | | | *Rural Population* | | |
|---|---|---|---|---|---|---|
| | *Growth rate* $r_u$ | *Birth rate* $b_u$ | *Death rate* $d_u$ | *Growth rate* $r_r$ | *Birth rate* $b_r$ | *Death rate* $d_r$ |
| *World* | *33.0* | *27.7* | *11.6* | *12.5* | *39.8* | *19.1* |
| More developed regions | 23.5 | 20.1 | 8.9 | −2.6 | 23.3 | 9.3 |
| Less developed regions | 45.5 | 37.9 | 15.4 | 16.5 | 44.1 | 21.7 |
| *Africa* | *44.8* | *41.6* | *18.0* | *18.0* | *47.8* | *25.1* |
| Western Africa | 49.9 | 41.1 | 20.0 | 17.9 | 50.2 | 27.1 |
| Eastern Africa | 49.9 | 44.6 | 18.9 | 20.1 | 46.9 | 24.8 |
| Northern Africa | 42.3 | 43.8 | 17.1 | 18.5 | 47.4 | 22.1 |
| Middle Africa | 58.6 | 47.2 | 20.6 | 13.0 | 44.8 | 27.7 |
| Southern Africa | 32.9 | 32.1 | 15.1 | 16.3 | 47.6 | 20.1 |
| *Northern America* | *24.3* | *24.2* | *8.9* | *−1.2* | *24.8* | *9.3* |
| *Latin America* | *44.6* | *35.1* | *10.8* | *12.7* | *44.2* | *12.6* |
| Tropical South America | 49.6 | 31.1 | 11.2 | 11.7 | 45.0 | 12.8 |
| Middle America (Mainland) | 47.0 | 42.7 | 11.5 | 21.1 | 47.0 | 13.0 |
| Temperate South America | 30.2 | 24.3 | 9.1 | −9.1 | 34.3 | 9.5 |
| Caribbean | 34.2 | 30.8 | 11.3 | 15.1 | 41.9 | 12.9 |
| *East Asia* | *48.6* | *29.8* | *12.9* | *8.6* | *36.7* | *19.3* |
| China | 50.3 | 33.9 | 15.4 | 9.7 | 38.2 | 20.7 |
| Japan | 29.2 | 15.8 | 6.6 | −5.9 | 18.5 | 8.6 |
| Other East Asia | 56.2 | 35.8 | 9.0 | 14.9 | 43.3 | 13.6 |
| *South Asia* | *36.7* | *40.0* | *17.2* | *21.2* | *47.1* | *22.9* |
| Middle South Asia | 32.6 | 39.6 | 17.9 | 21.1 | 47.2 | 23.9 |
| South East Asia | 43.3 | 42.2 | 16.2 | 21.9 | 46.7 | 21.1 |
| South West Asia | 46.4 | 38.0 | 15.1 | 18.6 | 48.9 | 19.5 |
| *Europe* | *17.9* | *17.8* | *10.2* | *−4.2* | *21.8* | *10.0* |
| Western Europe | 19.5 | 17.4 | 10.6 | −6.5 | 20.9 | 11.2 |
| Southern Europe | 21.0 | 19.3 | 9.1 | −2.2 | 23.0 | 9.4 |
| Eastern Europe | 19.2 | 17.3 | 9.6 | −3.8 | 22.6 | 9.3 |
| Northern Europe | 11.2 | 17.4 | 11.0 | −6.4 | 17.6 | 11.1 |
| *Oceania* | *26.2* | *22.5* | *8.9* | *13.2* | *36.3* | *13.1* |
| Australia and New Zealand | 25.8 | 22.2 | 8.9 | 1.8 | 29.0 | 7.5 |
| Melanesia | 47.9 | 45.8 | 13.8 | 22.4 | 42.7 | 19.8 |
| Micronesia and Polynesia | 47.6 | 35.5 | 9.1 | 25.8 | 42.6 | 12.9 |
| *USSR* | *34.5* | *20.8* | *6.5* | *−1.4* | *26.5* | *8.4* |

Source: United Nations (34) (1976), pp. 51-52.

transfer of people from rural to urban areas, but a closer examination of the fundamental accounting identity in Equation (10.1) readily shows that no such contradiction is implied.

Return migration and the much larger base population in rural India together account for much of the level of observed outmigration from urban areas. To see this more clearly we may rewrite Equation (10.1) as:

$$r_u = b_u - d_u + \frac{1-\upsilon}{\upsilon} o_r - o_u \tag{10.5}$$

where $\upsilon$ is the fraction of the population that is urban. Since India's population is about 20 percent urban and $o_r$ is 0.0007, we find that:

$$i_u = \frac{1-\upsilon}{\upsilon} o_r = \frac{0.80}{0.20} 0.007 = 0.028 \tag{10.6}$$

which is what we had in Equation (10.3) (except for a unit difference in the third decimal place due to rounding).

Equation (10.5) may be rearranged to give:

$$o_u = \frac{1-\upsilon}{\upsilon} o_r + (n_u - r_u) \tag{10.7}$$

a relationship which reveals that so long as $\upsilon$ is small, $o_u$ is likely to be large. Thus, for India, we have:

$$o_u = 4(0.007) + (-0.017) = 0.010 \tag{10.8}$$

whereas the corresponding data for the Soviet Union give:

$$o_u = 0.78(0.035) + (-0.016) = 0.011 \tag{10.9}$$

Curiously, both sets of data yield nearly identical values[2] for $o_u$ and $n_u - r_u$.

[2]This near equivalence suggests the potentially more useful alternative rearrangement of Equation (10.5):

$$o_r = {}_{1-\upsilon}\left[o_u + (r_u - n_u)\right] \tag{10.10}$$

In both the Soviet Union and in India the quantity in the square brackets is 0.027. When this quantity may be assumed to be approximately fixed (which is likely to hold only for countries not yet over 60 percent urban), then one can crudely estimate the rural-to-urban migration rate to be about 0.027 u/1 − u. This would give Mexico, for example, which in 1970 was roughly 59 percent urban, a rural-to-urban migration rate of 0.039. With a birth rate of 44 per thousand and a death rate of 10 per thousand, Mexico's urban population should then have been increasing at an annual rate of approximately 7.3 per annum. The reported rate for the 1950-1960 decade was 7.8 percent (Table 10-3).

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## ALTERNATIVE PROJECTIONS OF URBANIZATION

In a now classic analysis of the demoeconomic consequences of fertility reduction, Ansley Coale (1969) examined some of the ways in which the population characteristics of less developed countries are related to their poverty and how alternative demographic trends might affect their modernization.

Coale focused on nations rather than regions within nations, and consequently could ignore population gains or losses arising through migration. Moreover, he assumed that widespread famine could be averted, at least in the short run, and therefore posited only a single future course for mortality—a reduction that could be achieved and maintained. Thus fertility was left as the sole population-change variable considered to be responsive to government policy.

> We shall be concerned here with the implications, for the growth in per capita income and for the provision of productive employment, of alternative possible future courses of fertility. The specific alternatives to be considered are the maintenance of fertility at its current level and, as the contrasting alternative, a rapid reduction in fertility, amounting to fifty per cent of the initial level and occupying a transitional period of about twenty-five years. [Coale, 1969, p. 63.]

After generating the two alternative projections or "scenarios," Coale went on to examine what effects these contrasting fertility trends would have on three important population characteristics:

> . . . First, the burden of dependency, defined as the total number of persons in the population divided by the number in the labor force ages [fifteen to sixty-four]; second the rate of growth of the labor force, or, more precisely, the annual per cent rate of increase of the population fifteen to sixty-four; and third, the density of the population, or, more precisely, the number of persons at labor force age relative to land area and other resources. Then we shall consider how these three characteristics of dependency, rate of growth, and density influence the increase in per capita income. [Coale, 1969, p. 63.]

In this section we shall adopt Coale's scenario-building approach to focus on some of the demoeconomic consequences of rapid urbanization. Because this requires a view of urban and rural regions with interacting populations, we cannot ignore the impact of migration. We begin by describing the construction and evolution of four alternative population scenarios and then go on to examine the implications that these alternative trends in migration and fertility would have on

Coale's three important population characteristics: the dependency burden, the growth rate of labor force "eligibles," and the density of the population.

### The Dynamics of Urbanization: Four Scenarios

Multiregional population projections translate assumptions about future trends in mortality, fertility, and migration with respect to a specific initial population into numerical estimates of the future size, age composition, and spatial distribution of that population. Tables 10-8 and 10-9 present several such illustrative projections. As in the Coale paper, a hypothetical initial population of one million persons with an age composition and fertility-mortality rates typical of a Latin American country is projected one hundred and fifty years into the future. To his two alternative projections (*A*—Fertility unchanged; and *B*—Fertility reduced), however, we have added two others by vary-

**Table 10-8. Alternate Projections of the Population of a Less Developed Country: Migration Unchanged[a]**

*A. Fertility Unchanged*

| | | Population (thousands) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Projection Aa* | *Year* | *0* | *10* | *20* | *30* | *40* | *50* | *60* | *150* |
| *Urban* | 0-14 | 89 | 147 | 241 | 378 | 583 | 902 | 1,377 | 54,145 |
| | 15-64 | 104 | 168 | 275 | 420 | 656 | 1,005 | 1,536 | 60,897 |
| | 65+ | 7 | 8 | 12 | 20 | 31 | 52 | 83 | 3,360 |
| | Total | 200 | 323 | 518 | 817 | 1,270 | 1,959 | 2,996 | 118,402 |
| *Rural* | 0-14 | 394 | 511 | 745 | 1,084 | 1,587 | 2,352 | 3,481 | 122,989 |
| | 15-64 | 378 | 534 | 731 | 1,042 | 1,531 | 2,252 | 3,313 | 117,276 |
| | 65+ | 29 | 29 | 38 | 58 | 84 | 116 | 181 | 5,926 |
| | Total | 800 | 1,073 | 1,514 | 2,184 | 3,202 | 4,721 | 6,974 | 246,191 |

*B. Fertility Reduced*

| | | Population (thousands) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Projection Ba* | *Year* | *0* | *10* | *20* | *30* | *40* | *50* | *60* | *150* |
| *Urban* | 0-14 | 89 | 127 | 151 | 185 | 235 | 285 | 339 | 1,432 |
| | 15-64 | 104 | 168 | 259 | 369 | 487 | 618 | 754 | 3,195 |
| | 65+ | 7 | 8 | 12 | 20 | 31 | 52 | 83 | 463 |
| | Total | 200 | 302 | 422 | 574 | 754 | 955 | 1,176 | 5,090 |
| *Rural* | 0-14 | 394 | 461 | 545 | 592 | 663 | 783 | 886 | 3,213 |
| | 15-64 | 378 | 534 | 718 | 940 | 1,188 | 1,419 | 1,662 | 6,014 |
| | 65+ | 29 | 29 | 38 | 58 | 84 | 116 | 181 | 821 |
| | Total | 800 | 1,023 | 1,302 | 1,590 | 1,934 | 2,318 | 2,729 | 10,048 |

[a]Column values do not always sum exactly to given totals because of independent rounding.

**Table 10-9. Alternative Projections of the Population of a Less Developed Country: Migration Increased**[a]

*A. Fertility Unchanged*

| | | *Population (thousands)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Projection Ab* | *Year* | *0* | *10* | *20* | *30* | *40* | *50* | *60* | *150* |
| *Urban* | 0-14 | 89 | 174 | 356 | 667 | 1,161 | 1,940 | 2,958 | 75,126 |
| | 15-64 | 104 | 193 | 375 | 710 | 1,270 | 2,128 | 3,293 | 85,388 |
| | 65+ | 7 | 9 | 14 | 24 | 44 | 84 | 157 | 5,146 |
| | Total | 200 | 376 | 745 | 1,402 | 2,475 | 4,152 | 6,408 | 165,661 |
| *Rural* | 0-14 | 394 | 482 | 617 | 751 | 886 | 1,034 | 1,331 | 46,645 |
| | 15-64 | 378 | 508 | 622 | 750 | 896 | 1,046 | 1,325 | 45,280 |
| | 65+ | 29 | 28 | 37 | 53 | 71 | 84 | 108 | 2,459 |
| | Total | 800 | 1,018 | 1,276 | 1,554 | 1,852 | 2,164 | 2,764 | 94,384 |

*B. Fertility Reduced*

| | | *Population (thousands)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Projection Bb* | *Year* | *0* | *10* | *20* | *30* | *40* | *50* | *60* | *150* |
| *Urban* | 0-14 | 89 | 150 | 226 | 334 | 475 | 625 | 738 | 1,982 |
| | 15-64 | 104 | 193 | 368 | 630 | 954 | 1,318 | 1,633 | 4,487 |
| | 65+ | 7 | 9 | 14 | 24 | 44 | 84 | 157 | 709 |
| | Total | 200 | 352 | 607 | 988 | 1,473 | 2,028 | 2,529 | 7,178 |
| *Rural* | 0-14 | 394 | 435 | 452 | 409 | 368 | 340 | 334 | 1,216 |
| | 15-64 | 378 | 508 | 610 | 675 | 694 | 664 | 668 | 2,330 |
| | 65+ | 29 | 28 | 37 | 53 | 71 | 84 | 108 | 338 |
| | Total | 800 | 971 | 1,099 | 1,138 | 1,133 | 1,088 | 1,109 | 3,884 |

[a]Column values do not always sum exactly to given totals because of independent rounding.

ing our assumptions about internal migration (*a*—Migration unchanged; and *b*—Migration increased). This gives the following four possible combinations:

| | *a.* Migration unchanged | *b.* Migration increased |
|---|---|---|
| *A.* Fertility unchanged | Projection *Aa* | Projection *Ab* |
| *B.* Fertility reduced | Projection *Ba* | Projection *Bb* |

Coale's assumptions about initial and future patterns of mortality and fertility were a crude birth rate of about 44 per 1,000 and a crude

death rate of 14 per 1,000, giving rise to a population growing at 3 percent per year. Starting with an expectation of life at birth of approximately 53 years, he assumes that during the next 30 years it will rise to about 70 years, at which point no further improvement will occur. In Coale's Projection *A*, current age-specific rates of childbearing are fixed for 150 years; in Projection *B* they are reduced by 2 percent each year for 25 years (reducing fertility to half of its initial level), at which point they too are fixed for the remainder of the projection period.

For our four urbanization scenarios we have spatially disaggregated Coale's data and assumptions in the following manner. Twenty percent of the initial population of a million persons is taken to be urban. The initial values for birth and death rates are assumed to be lower in urban areas than in rural areas (40 against 45 per thousand for the birth rate, and 11 against 15 per thousand for the death rate). Mortality and fertility are reduced as in the Coale projections, but the declines are accomplished ten years sooner in urban areas (25 instead of 35 years for the decline in mortality, and 20 instead of 30 years for the decline in fertility).

A multiregional population projection also requires a specification of the initial values and future course of internal migration (see Rogers, 1975). To generate the four scenarios, initial rates of outmigration were set equal to those prevailing in India in 1960 (Bose, 1973); that is, a crude outmigration rate from urban areas of 10 per thousand and a corresponding rate from rural areas of 7 per thousand. The age-specific rates of outmigration from urban areas are held fixed in all four projections, as are the corresponding rates from rural areas in the two *a* projections. Outmigration from rural areas in the two *b* projections, however, is assumed to increase sixfold over a period of 50 years, and then to drop to a half of its peak value over the following 30 years, after which it is held unchanged for the remaining 70 years of the projection period (Figure 10-14).

Table 10-10 lists the principal parametric assumptions that generated Coale's two illustrative projections and contrasts them with those that produced the four scenarios summarized in Tables 10-8 and 10-9. The assumptions appear to be reasonable in that the hypothetical urbanization paths charted by them are plausible. For example, the percentage-urban paths for the *b* projections in Figure 10-15 resemble the general shape of the observed urbanization paths set out earlier in Figure 10-11, and Figure 10-16 shows that the trajectories of urban and rural growth rates for these projections are in general similar to those exhibited by the U.S. data graphed in Figure 10-13.

As in Coale's scenarios, the initial population and the future regime of mortality are the same for all of the four population projections summarized in Tables 10-8 and 10-9. The major impact of the drop in

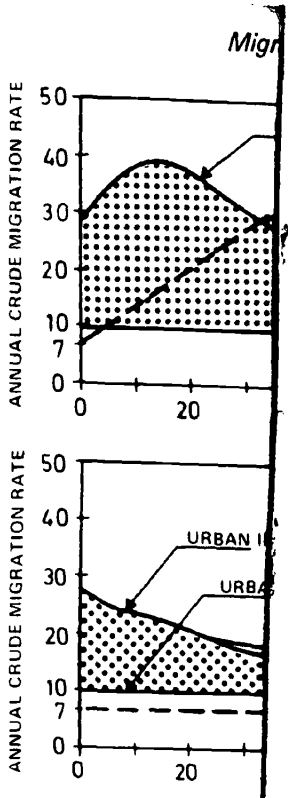


Figure 10-14

fertility appears i
about 24 times a
Migration's impa
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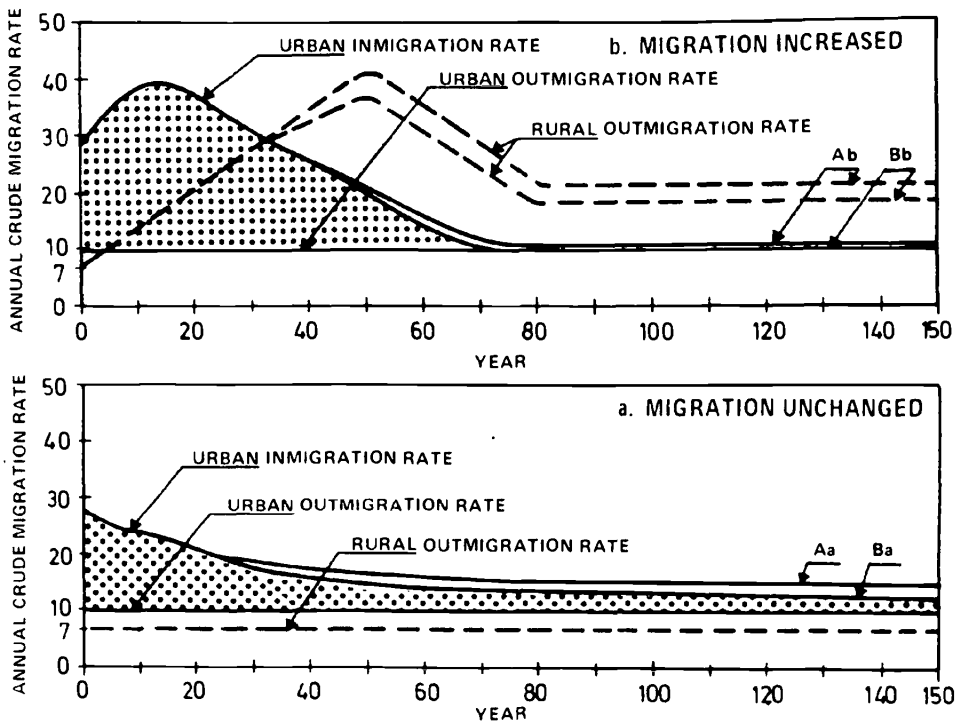


**Figure 10-14.** Migration Rates: Alternative Mobility Transitions

fertility appears in the projected totals: the *A* projection totals are about 24 times as large as the *B* projection totals after 150 years. Migration's impact, on the other hand, appears principally in the spatial distribution of these totals: the *a* projections allocate approximately a third of the national population to urban areas after 150 years, whereas the *b* projections double this share.

Recently published statistics show population declines in the larger metropolitan regions of many major industrialized nations (Vining and Kontuly, 1977). In the United States, for example, net migration into metropolitan areas has been negative since the early 1970s. Thus, whereas the average annual growth rate of metropolitan populations exceeded the nonmetropolitan rate by 1.6 percent to 0.4 percent in the 1960s, a reversal occurred between 1970 and 1973 which transformed these rates to 0.9 percent and 1.3 percent, respectively (Morrison, 1975, p. 10).

The dynamics leading to the decline of metropolitan rates of growth are reflected in Table 10-11, which describes the evolution of Projection *Bb* in greater detail. Note that the rural growth rate declines and

**Table 10-10. Assumptions in the Coale and in the Rogers Models**

| | *Coale* | *Rogers* | |
|---|---|---|---|
| | | *Urban* | *Rural* |
| *Initial Values* | | | |
| Population | 1,000,000 | 200,000 | 800,000 |
| Death Rate | 14/1,000 | 11/1,000 | 15/1,000 |
| Birth Rate | 44/1,000 | 40/1,000 | 45/1,000 |
| Outmigration Rate | – | 10/1,000 | 7/1,000 |
| *Future Paths* | | | |
| Mortality | Decline over 30 years to level with an expectation of life at birth of 70 years; unchanged thereafter | Decline as in Coale's model, but over 25 years; unchanged thereafter | Decline as in Coale's model, but over 35 years; unchanged thereafter |
| Fertility | *A*. Unchanged | *A*. Unchanged | *A*. Unchanged |
| | *B*. Reduction of 50 percent over 25 years; unchanged thereafter | *B*. Reduction as in Coale's model, but over 20 years; unchanged thereafter | *B*. Reduction as in Coale's model, but over 30 years; unchanged thereafter |
| Migration | | *a*. Unchanged | *a*. Unchanged |
| | | *b*. Unchanged | *b*. Increase of 500 percent over 50 years followed by a reduction to half of that peak level over 30 years; unchanged thereafter |

even takes on negative values for a 15-year period, then increases gradually and ultimately overtakes the urban growth rate. Observe that this does not occur at the intervals in which net migration to urban areas is negative.

### Demoeconomic Consequences of Growth and Urbanization

Figure 10-17 shows that the three population characteristics examined by Coale vary in their relative significance in the short, medium, and long runs, respectively. Changes in age compositions appear as changes in the dependency burden during the first 30 years and constitute the first principal impact of reduced fertility. After the first generation, however, the established difference in dependency burdens remains relatively fixed for the rest of the projection period. The varia-

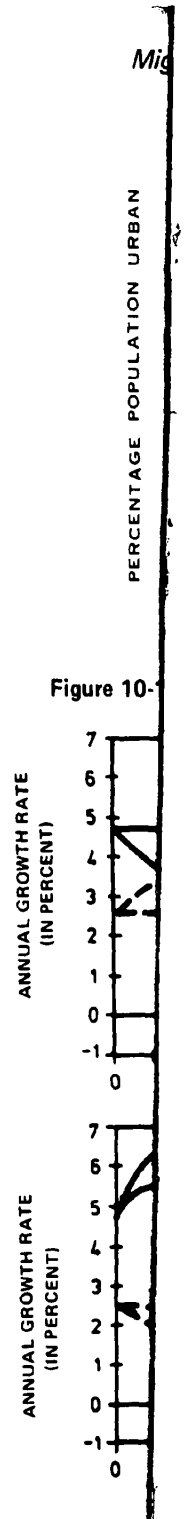


Figure 10-16.

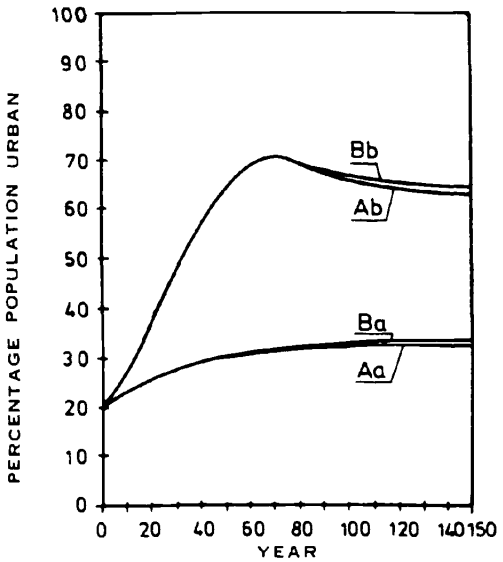


**Figure 10-15.** Alternative Urbanization Paths: Four Scenarios

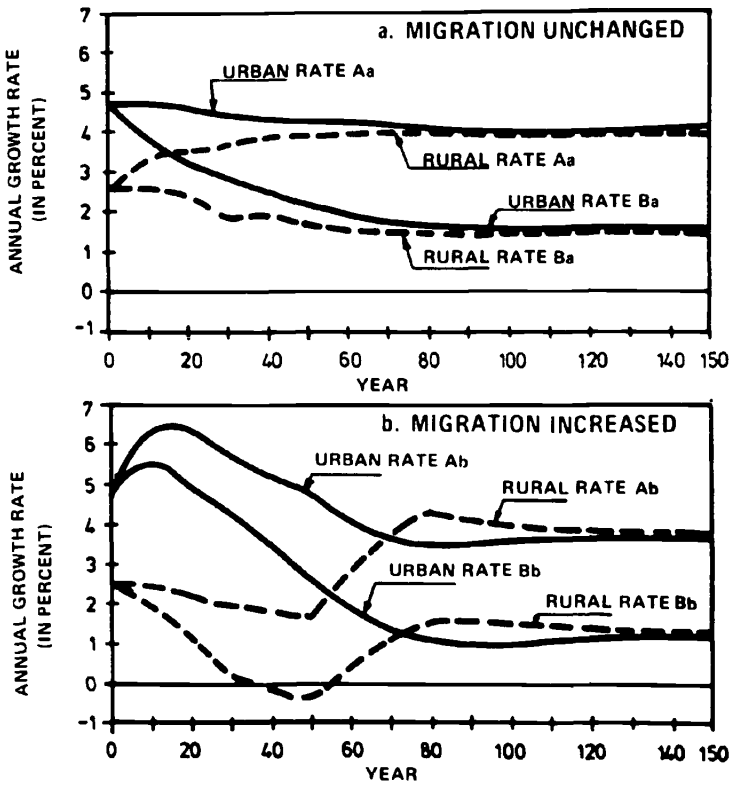


**Figure 10-16.** Urban and Rural Growth Rates: Four Alternate Scenarios

Models

ogers

| Rural |
|---|
| 800,000 |
| 15/1,000 |
| 45/1,000 |
| 7/1,000 |
| Decline as in Coale's model, but over 35 years; unchanged thereafter |
| *A.* Unchanged |
| *B.* Reduction as in Coale's model, but over 30 years; unchanged thereafter |
| *a.* Unchanged |
| *b.* Increase of 500 percent over 50 years followed by a reduction to half of that peak level over 30 years; unchanged thereafter |

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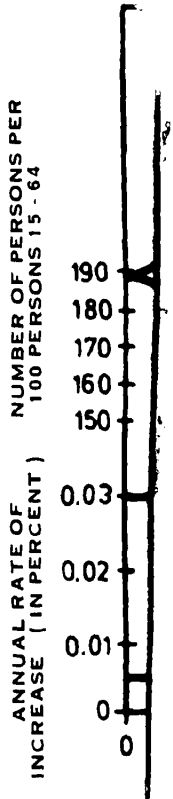
**Table 10-11. Annual Component Rates of Change and Urbanization Levels: Scenario Bb**

| Year | *Component Rates of Change (per thousand)* | | | | | | *Percentage Regional Share* | |
|---|---|---|---|---|---|---|---|---|
| | *Natural Growth* | | *Net Migration* | | *Growth Rate* | | | |
| | *Urban* | *Rural* | *Urban* | *Rural* | *Urban* | *Rural* | *Urban* | *Rural* |
| 0 | 29.00 | 30.00 | 18.00 | −4.50 | 47.00 | 25.50 | 20.00 | 80.00 |
| 5 | 28.47 | 29.76 | 24.81 | −7.36 | 53.28 | 22.40 | 22.89 | 77.11 |
| 10 | 26.52 | 29.56 | 28.47 | −10.32 | 54.99 | 19.24 | 26.61 | 73.39 |
| 15 | 23.86 | 28196 | 29.49 | −13.21 | 53.35 | 15.75 | 30.94 | 69.06 |
| 20 | 20.35 | 26.92 | 28.17 | −15.56 | 48.52 | 11.36 | 35.58 | 64.42 |
| 25 | 21.56 | 23.84 | 24.76 | −17.14 | 46.32 | 6.70 | 40.91 | 59.09 |
| 30 | 21.10 | 20.20 | 20.98 | −18.22 | 42.09 | 1.98 | 46.48 | 53.52 |
| 35 | 20.20 | 20.40 | 18.11 | −19.34 | 38.31 | 1.05 | 51.65 | 48.35 |
| 40 | 19.12 | 19.12 | 15.44 | −20.08 | 34.57 | −0.96 | 56.53 | 43.47 |
| 45 | 17.95 | 17.38 | 12.84 | −20.10 | 30.79 | −2.72 | 61.02 | 38.98 |
| 50 | 16.78 | 15.66 | 10.50 | −19.57 | 27.28 | −3.91 | 65.08 | 34.92 |
| 55 | 15.52 | 14.69 | 6.81 | −14.32 | 22.33 | 0.37 | 67.77 | 32.23 |
| 60 | 14.43 | 14.41 | 4.41 | −10.04 | 18.84 | 4.37 | 69.50 | 30.50 |
| 65 | 13.40 | 14.26 | 2.69 | −6.43 | 16.09 | 7.83 | 70.47 | 29.53 |
| 70 | 12.37 | 14.22 | 1.40 | −3.40 | 13.77 | 10.82 | 70.83 | 29.17 |
| 75 | 11.43 | 14.52 | 0.36 | −0.87 | 11.80 | 13.65 | 70.67 | 29.33 |
| 80 | 10.71 | 15.19 | −0.53 | 1.25 | 10.17 | 16.44 | 70.05 | 29.95 |
| 85 | 10.24 | 15.65 | −0.22 | 0.51 | 10.01 | 16.15 | 69.41 | 30.59 |
| 90 | 9.92 | 15.92 | 0.05 | −0.11 | 9.97 | 15.81 | 68.79 | 31.21 |
| 95 | 9.78 | 16.13 | 0.30 | −0.64 | 10.08 | 15.49 | 68.20 | 31.80 |
| 100 | 9.81 | 16.29 | 0.52 | −1.09 | 10.33 | 15.20 | 67.65 | 32.35 |
| 105 | 9.81 | 16.29 | 0.72 | −1.47 | 10.53 | 14.82 | 67.15 | 32.85 |
| 110 | 9.87 | 16.21 | 0.88 | −1.77 | 10.76 | 14.44 | 66.71 | 33.29 |
| 115 | 9.81 | 15.97 | 1.02 | −2.01 | 10.83 | 13.96 | 66.33 | 33.67 |
| 120 | 9.86 | 15.84 | 1.14 | −2.21 | 11.01 | 13.63 | 66.00 | 34.00 |
| 125 | 9.97 | 15.78 | 1.24 | −2.39 | 11.21 | 13.39 | 65.73 | 34.27 |
| 130 | 10.07 | 15.75 | 1.33 | −2.53 | 11.40 | 13.22 | 65.50 | 34.50 |
| 135 | 10.14 | 15.72 | 1.41 | −2.65 | 11.54 | 13.07 | 65.30 | 34.70 |
| 140 | 10.16 | 15.68 | 1.47 | −2.75 | 11.63 | 12.94 | 65.14 | 34.86 |
| 145 | 10.17 | 15.64 | 1.52 | −2.83 | 11.70 | 12.81 | 65.01 | 34.99 |
| 150 | 10.19 | 15.61 | 1.57 | −2.90 | 11.76 | 12.71 | 64.89 | 35.11 |

tion between the annual growth rates of labor-force agegroups begins to appear after 15 years, and widens to a maximum difference in about 70 years, that is, 45 years after fertility stabilizes at its reduced value. Once established, this difference continues essentially unchanged forever after in the two scenarios. Finally, the long-run effect of reduced fertility starts to become significant after 70 years; at this point




Source: Coale (1969)

**Figure 10-17.** Dep
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| | Percentage Regional Share | |
|---|---|---|
| al | *Urban* | *Rural* |
| 0 | 20.00 | 80.00 |
| 0 | 22.89 | 77.11 |
| 4 | 26.61 | 73.39 |
| 5 | 30.94 | 69.06 |
| 6 | 35.58 | 64.42 |
| 0 | 40.91 | 59.09 |
| 8 | 46.48 | 53.52 |
| 5 | 51.65 | 48.35 |
| 6 | 56.53 | 43.47 |
| 2 | 61.02 | 38.98 |
| 1 | 65.08 | 34.92 |
| 7 | 67.77 | 32.23 |
| 7 | 69.50 | 30.50 |
| 3 | 70.47 | 29.53 |
| 2 | 70.83 | 29.17 |
| 5 | 70.67 | 29.33 |
| 4 | 70.05 | 29.95 |
| 5 | 69.41 | 30.59 |
| 1 | 68.79 | 31.21 |
| 9 | 68.20 | 31.80 |
| 0 | 67.65 | 32.35 |
| 2 | 67.15 | 32.85 |
| 4 | 66.71 | 33.29 |
| 6 | 66.33 | 33.67 |
| 3 | 66.00 | 34.00 |
| 9 | 65.73 | 34.27 |
| 2 | 65.50 | 34.50 |
| 7 | 65.30 | 34.70 |
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| 1 | 65.01 | 34.99 |
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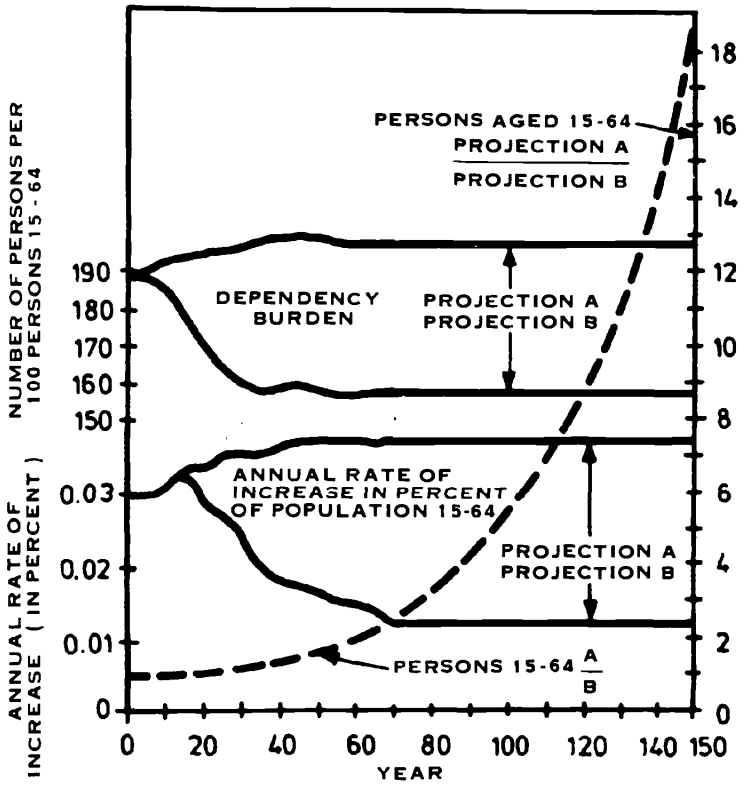



Source: Coale (1969), p. 66.

**Figure 10-17.** Dependency Burden, Annual Rate of Increase and Relative Size of Population Aged 15-64 Years: Two Alternative Projections.

the two alternative projections assume essentially fixed differences in age compositions and in rates of growth, and vary primarily in their relative sizes. This variation assumes enormous dimensions after 150 years, when the total size of the population in the 15 to 64 year age bracket in the population with constant fertility is about 18 times larger than the corresponding number in the population with reduced fertility.

The process of national modernization and development depends in a very direct way on the capacity of a national economy to increase its level of net investment. Recognizing that this is only a *necessary* and not a *sufficient* condition, Coale argues that the low fertility population is in a better position to divert resources away from production for current consumption to net investment aimed at the enhancement of future productivity.

The two projected populations in the labor-force agegroups in

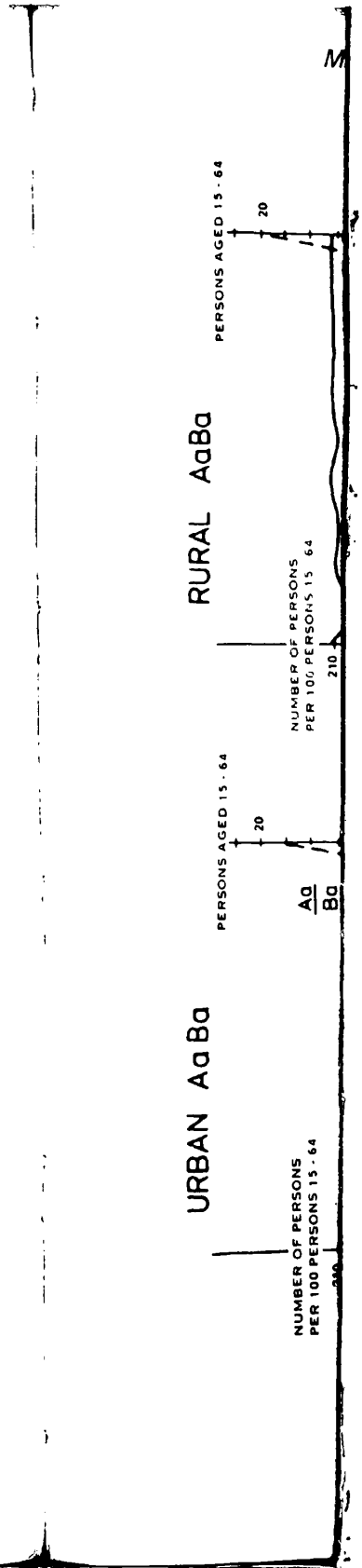
Figure 10-17 differ by only 4 percent after 25 years. It is not unreasonable, therefore, to assume that national income is at that point the same for the two scenarios. The pressure for allocating a much higher proportion of the national product for consumption then would be greater in the higher fertility population because of its higher dependency burden. Families with a large number of children, it is frequently argued, save less than those with fewer children, and the capacity of their governments and economies to raise the level of net investment, therefore, will be seriously impaired.

The short-run depressing influence of high dependency on savings and investment is exacerbated in the middle run by a high growth rate of the labor-force population. A larger labor force requires a larger capital stock to achieve the same productivity per capita. Adopting as a rule of thumb a capital-output ratio of 3, Coale concludes that with net investment growing at the respectable rate of 15 percent of national income, a "population with a rate of growth of three percent in its labor force can, with such a level of investment, add about two percent per year to the endowment of capital per worker" (Coale, 1969, pp. 70-71). It therefore will be able to add less to the productive capacity of the economy than a population experiencing a less rapid rate of labor-force growth. Thus, reduced fertility not only generates, in the short run, a population with fewer consumers among whom to divide a given output, it also helps, in the middle run, to generate a larger national output to divide.

Finally, the concern with excessive density of people to available resources—that is, with "overpopulation"—stems from the belief that per capita output declines above some ratio of workers to resources. It is argued that at some point an excessively large population produces a depressing effect on per capita output.

As Coale points out, however, the usefulness of the density concept in diagnosing population problems of less developed countries is limited. Politically feasible and realistic policies to influence the size of a national population are largely limited to fertility control, and such policies can affect the relative density of the labor force to resources only in the long run, that is, after changes in dependency and labor-force growth rates have already produced their major economic effects. Also, density is relevant primarily in economies that do not participate in international trade or that are principally organized around extractive activities such as mining, agriculture, and forestry.

The principal demographic impacts of reduced fertility described above are not altered substantially by the introduction of migration as a component of change and the concomitant spatial subdivision of the national population into urban and rural sectors. Figure 10-18 and



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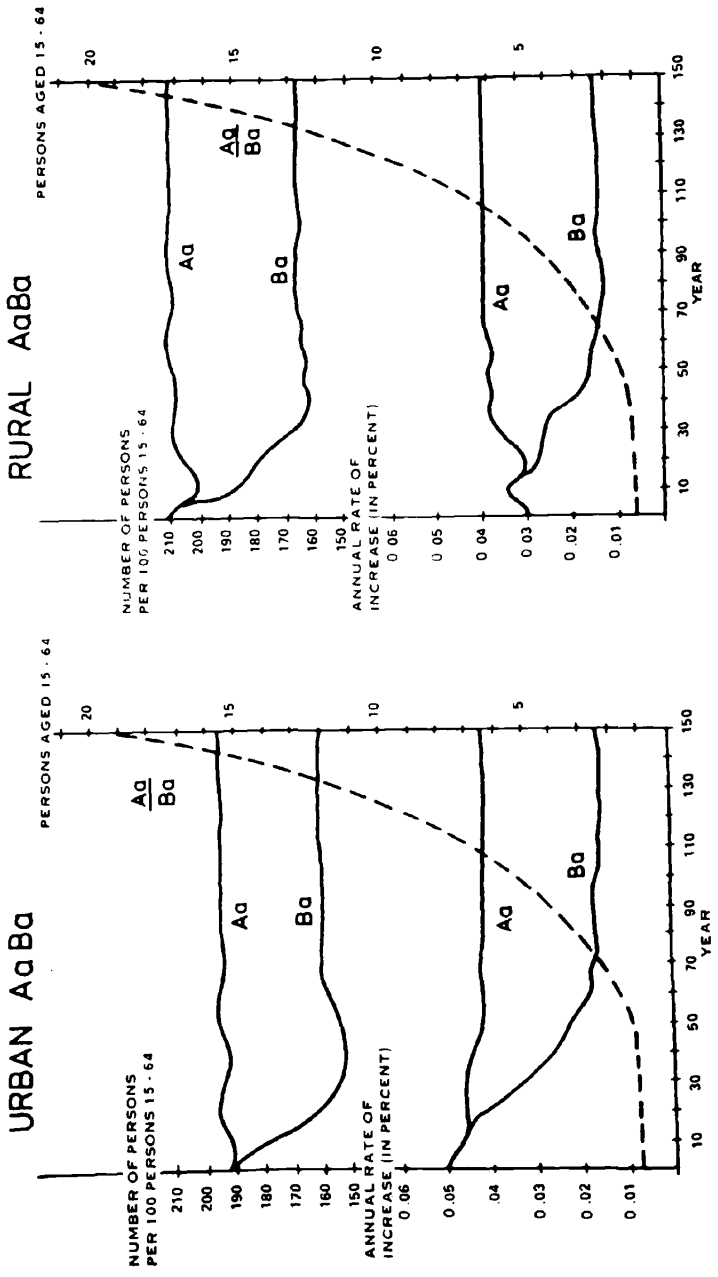



**Figure 10-18.** Dependency Burden, Annual Rate of Increase, and Relative Size of Population Aged 15-64 Years: Alternative Urban-Rural Projections

10-19 show that for a given regime of migration (*a* or *b*), the major impacts of reduced fertility are, as in the Coale model, a decline in the burden of dependency in the short run, a lowering of the growth rate of the labor-force population in the medium run, and a very much smaller density of people to resources in the long run. The spatial model does, however, bring into sharp focus urban-rural differentials: (1) differentials in dependency burdens and in the relative magnitudes of their decline following fertility reduction; and (2) differentials in initial growth rates of the labor-force population and the paths of their gradual convergence in the long run.

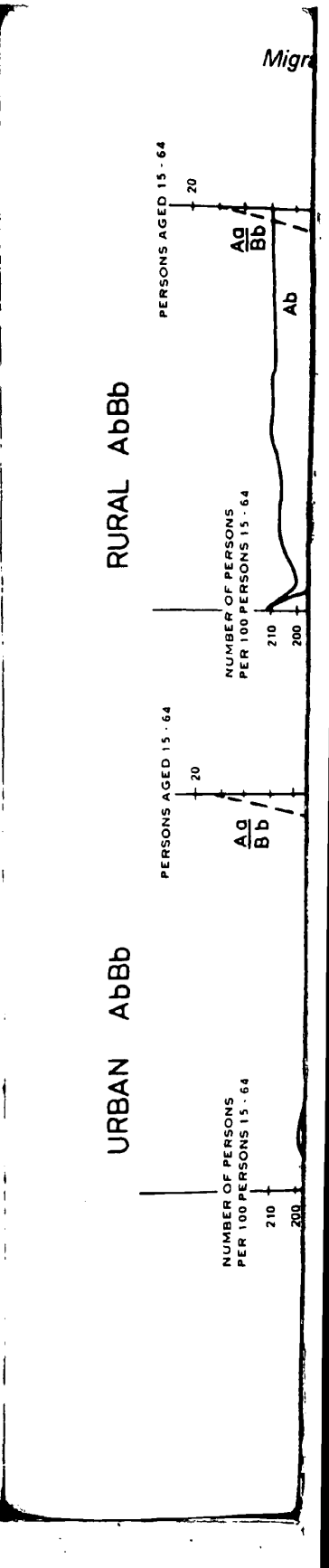
The dependency ratio in urban areas is 19 points lower than its rural counterpart at the start of the projection period. With constant fertility, the regional dependency burdens remain essentially unchanged. Declining fertility, however, narrows these differentials to almost a third of their original values, as the urban drop of 33 points is matched by a corresponding decline of 45 points in rural areas.

The annual growth rates of the labor-force population in urban and rural areas initially are 0.05 and 0.03, respectively. For both migration regimes, however, they converge to approximately the same values in the long run: 0.04 in the constant fertility scenario and slightly above 0.01 in the reduced fertility projection.

The major demographic impacts of increased rural-urban migration for a given regime of fertility are set out in Figures 10-20 and 10-21, in which are graphed the *a* and *b* projections for each of the two fertility regimes: fixed and reduced. These diagrams show that the influence of migration patterns in our particular scenarios is negligible with respect to dependency burdens, and is of paramount importance, in the short and medium runs, with regard to the growth rate of the population aged 15 to 64. In the long run, migration also has a moderately powerful impact on the density of workers to resources in rural areas.

Perhaps the most interesting observation suggested by Figures 10-20 and 10-21 is the transitory nature of high rates of urban growth. In the *b* projections, urban growth rates in excess of 6 percent per annum occur only in the short run, as the national population experiences its early phases of urbanization. This sudden spurt of growth of urban areas in the short run declines over the medium run, and in the long run it levels off at a rate below that generated by the fixed migration regime. The growth curve of rural areas, of course, assumes a path that reverses this trajectory, with the growth of the rural working population declining to relatively low—even negative—levels before increasing to stabilize at about the same level as that prevailing in the urban population.

Increased migration into cities reduces the size of rural populations



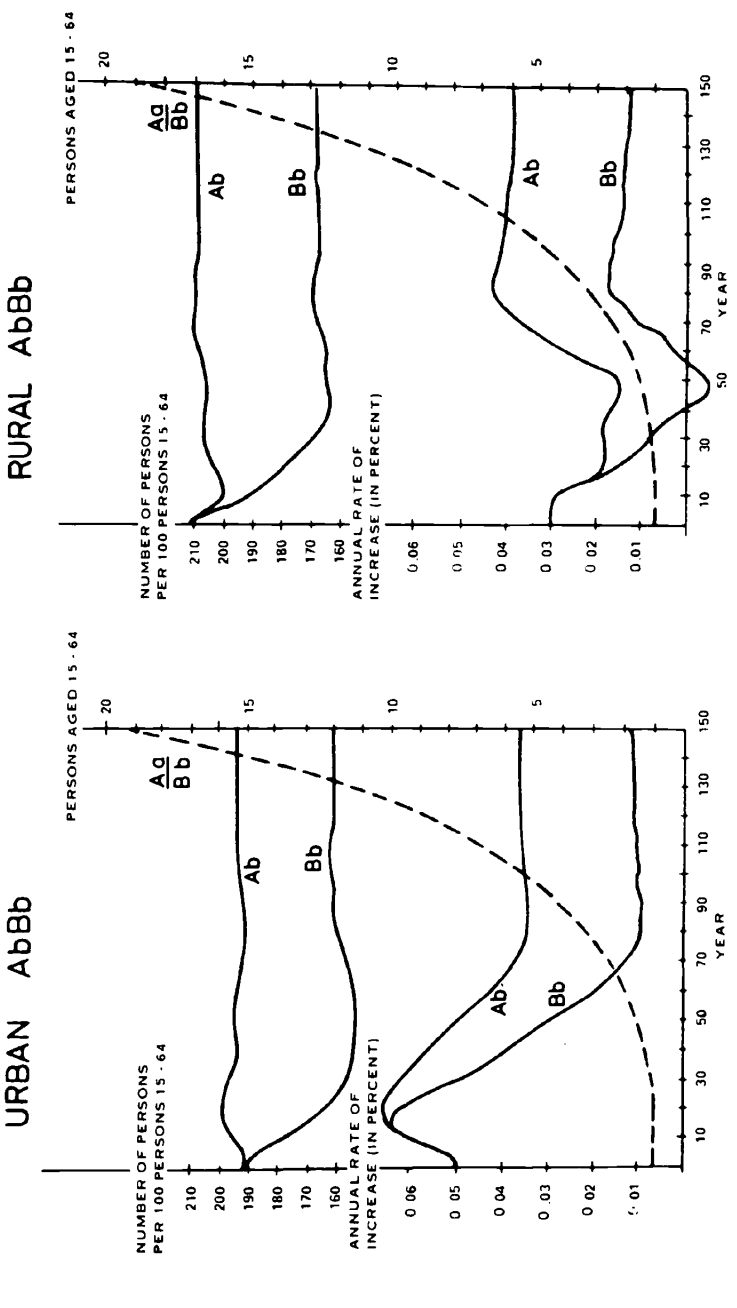



Figure 10-19. Dependency Burden; Annual Rate of Increase, and Relative Size of Population Aged 15-64 Years: Alternative Urban-Rural Projections

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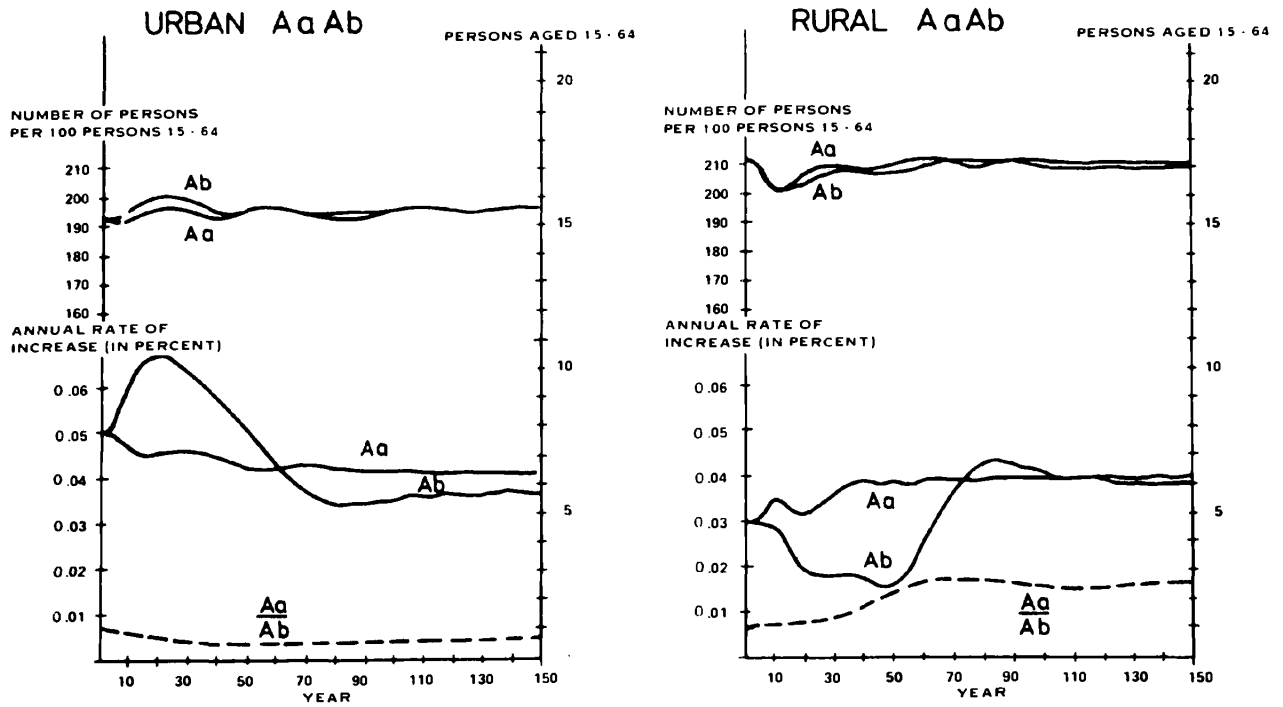
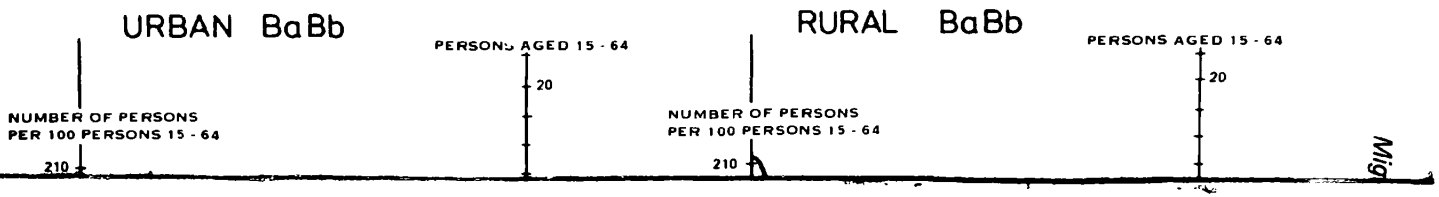



**Figure 10-20.** Dependency Burden; Annual Rate of Increase, and Relative Size of Population Aged 15-64 Years: Alternative Urban-Rural Projections



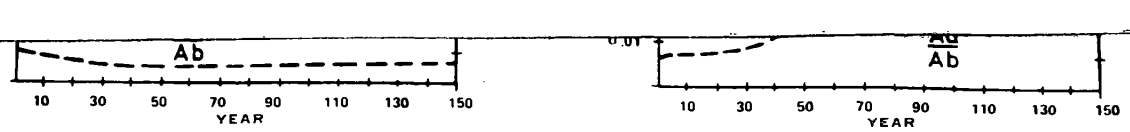



**Figure 10-20.** Dependency Burden; Annual Rate of Increase, and Relative Size of Population Aged 15-64 Years: Alternative Urban-Rural Projections

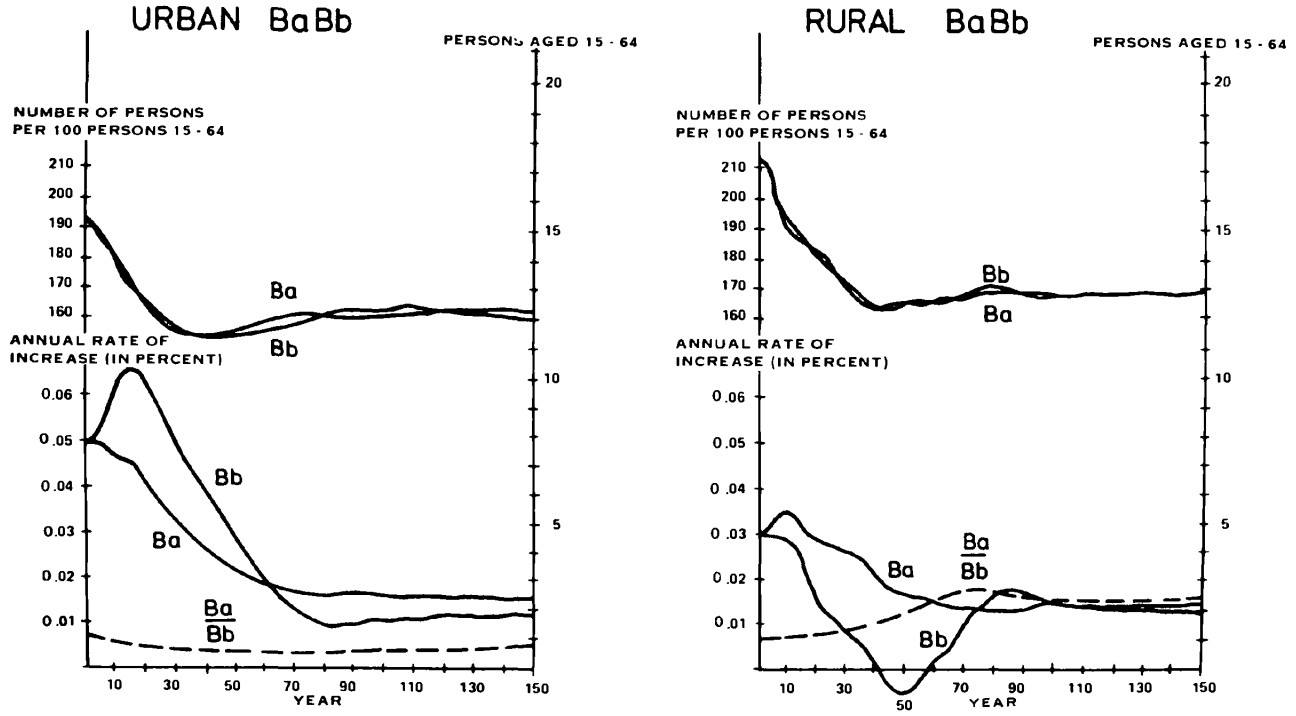



**Figure 10-21.** Dependency Burden, Annual Rate of Increase, and Relative Size of Population Aged 15-64 Years: Alternative Urban-Rural Projections

and hence their density with respect to rural resources such as agricultural land. Figures 10-20 and 10-21 show that the relative size of the rural population aged 15 to 64 is over 2.5 times larger under the fixed migration schedules of projections *a* than under the increased rural-urban migration rates of projections *b*. Thus the *b* scenarios create rapid urban growth and exacerbate human settlement problems, but at the same time reduce the density of rural populations to land and other rural resources. The *a* scenarios, on the other hand, give urban areas more time to cope with growth, but do so at the cost of increasing rural population densities. "Hyperurbanization" and "rural overpopulation," therefore, are the two sides of the fundamental policy question regarding development.

The economic implications of the spatio-temporal behavior of dependency, growth, and density in the urbanization scenarios are much the same as those described by Coale (1969), but they now include a spatial dimension. First, it is commonly believed that urban households save a larger fraction of their income than rural households. Thus the rapid urbanization arising out of increased rural-urban migration could have a positive impact on the national savings rate. But increased rural-urban migration creates rapid urban growth, thereby reducing the per capita endowment of capital and infrastructure in cities and contributing to high rates of unemployment in exploding urban centers. Finally, rapid urban growth in less developed countries tends to be concentrated in a few very large cities, and "city bigness" is viewed by many as a negative feature of development. The argument is that urban agglomerations become inefficient once they pass a certain size threshold, and thereafter the social costs of further growth begin to exceed the corresponding social benefits. However, several economists have maintained that large urban agglomerations generate more benefits than costs and that efforts to retard their growth, therefore, are likely to reduce national economic growth rates (for example, Gilbert, 1976).

Until recently, research on the economic influences of rural-urban migration in less developed countries has been largely ignored by national economic planners who have tended to emphasize "traditional economic variables such as output growth rates, terms of trade, savings and investment, and relative efficiency."

> The efficient allocation of human resources between sectors, if discussed at all, has been assumed to be a natural out-growth of a self-adjusting mechanism which functioned to equate sectoral marginal productivities. Rural-urban migration was portrayed as a manifestation of this self-adjusting mechanism (with its implicit full-employment assumptions)

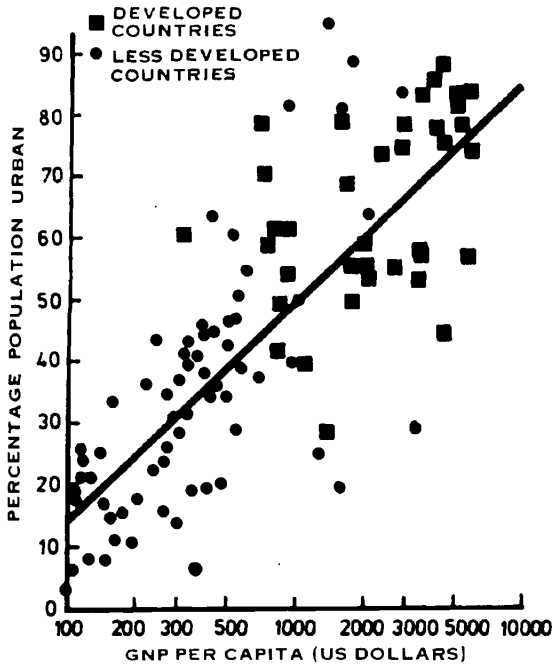
> and, as such, was not deemed to be of sufficient intrinsic importance to warrant detailed theoretical and empirical investigation. [Todaro, 1975, p. 367.]

Growing levels of urban unemployment and underemployment in less developed countries have sharply underlined the danger of ignoring the impacts of migration on development, and have exposed to question the applicability of the traditional economic models as descriptors of the practical socioeconomic realities of today's less developed world. The determinants and consequences of rural-urban migration and the relationships between such migration and the economic development of urban and rural areas are currently subjects of utmost importance and warrant careful scholarly examination. Agreement on this seems to be widely shared. What is less evident is the conceptual framework one could profitably adopt in such an endeavor. Can the Coale-Hoover (1958) paradigm and its successors, which have served as an economic framework for examining the probable consequnces of a drastic decline in the fertility rates of low-income countries such as India, be generalized and extended to serve as a framework for examining the probable consequences of significant increases in rural-urban migration levels and urbanization rates of such countries?

**Migration and Development**

In developed countries, high levels of urbanization and high rates of urban growth have historically been associated with high and increasing levels of per capita income. Figure 10-22, for example, indicates that the higher the percentage of a national population that is urban, the higher is the national per capita gross national product (GNP). This positive association is generally attributed to factors such as rapid industrialization, increases in productivity, widespread literacy, improved nutrition, and advances in health services.

Figure 10-23 illustrates that it is important to distinguish the effects of high levels of urbanization from those of high rates of urban population growth. The positive relationship between per capita GNP and urbanization level is difficult to discern in the plot of urban growth rates and per capita GNP growth rates that appear there. Indeed there seems to be a lack of any association whatsoever. We conclude, therefore, that although high proportions of national populations in urban areas are conditions that appear to be positively associated with high levels of per capita GNP, one cannot infer from this that rapid urban growth fosters rapid increases in a nation's wealth or productivity.



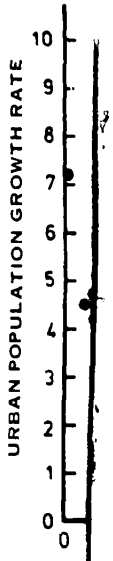

Source: United Nations (1976), p. 27.

**Figure 10-22.** Degree of urbanization compared with GNP per capita, 1973.

Most nations of the developing world are currently less urbanized than the developed countries, but are urbanizing more rapidly. With a few notable exceptions, their per capita income is growing slowly relative to their population increase, and their development is much too complex to be studied with the aid of simple plots such as those found in Figures 10-22 and 10-23. A fuller understanding of the important relationships that are hidden in these graphs requires the specification and estimation of a model that interconnects the principal contributing sectors of demoeconomic growth.

Figure 10-24 sets out the underlying structure of such a macrodemoeconomic model. Here changes in population are allowed to influence the level of output directly, and the contribution of natural resources (such as land) can be included in the same aggregate production function. Ideally the demoeconomic growth model should disaggregate population into urban and rural components and distinguish agricultural from nonagricultural production.






Source: United Nations

**Figure 10-23.** Compa
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**Dualistic Models**

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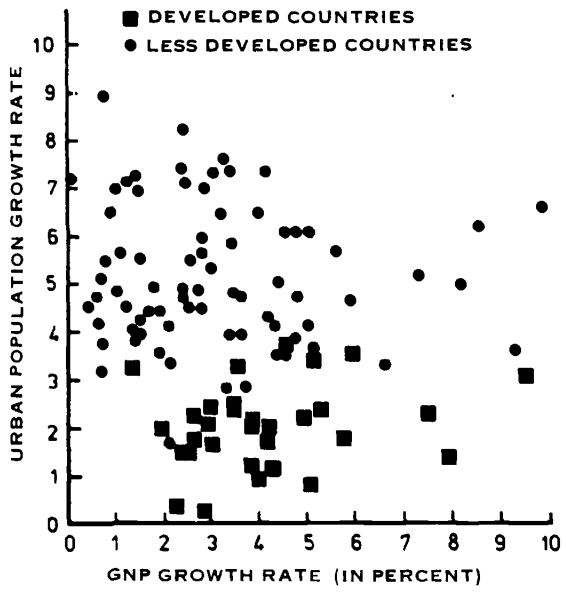


Source: United Nations (34) (1976), p. 28.

**Figure 10-23.** Comparison of Annual Average Percentage Rates of Growth of Urban Population and Annual Percentage Rates of Growth in GNP per Capita, 1965-1973.

### Dualistic Models of Demoeconomic Growth

A large number of studies have concluded that migration usually is a response to economic differentials and that the individual migrant generally improves his or her well-being by moving. The net benefits of this move to society, however, are much more difficult to determine. Since the relationships between migration and development are multidimensional and complex, evaluations of their interaction and their societal impacts call for a general equilibrium systems framework.

Migration between rural and urban areas changes population and labor-force growth in both regions. It also changes savings-investment behavior and the growth of capital stock. It alters labor-force productivity, and both affects and is affected by rural-urban income differentials. A focus on the behavior of only one of these aspects while holding the others unchanged can lead to erroneous policy conclusions.

A fuller set of social consequences of rural-urban migration can be

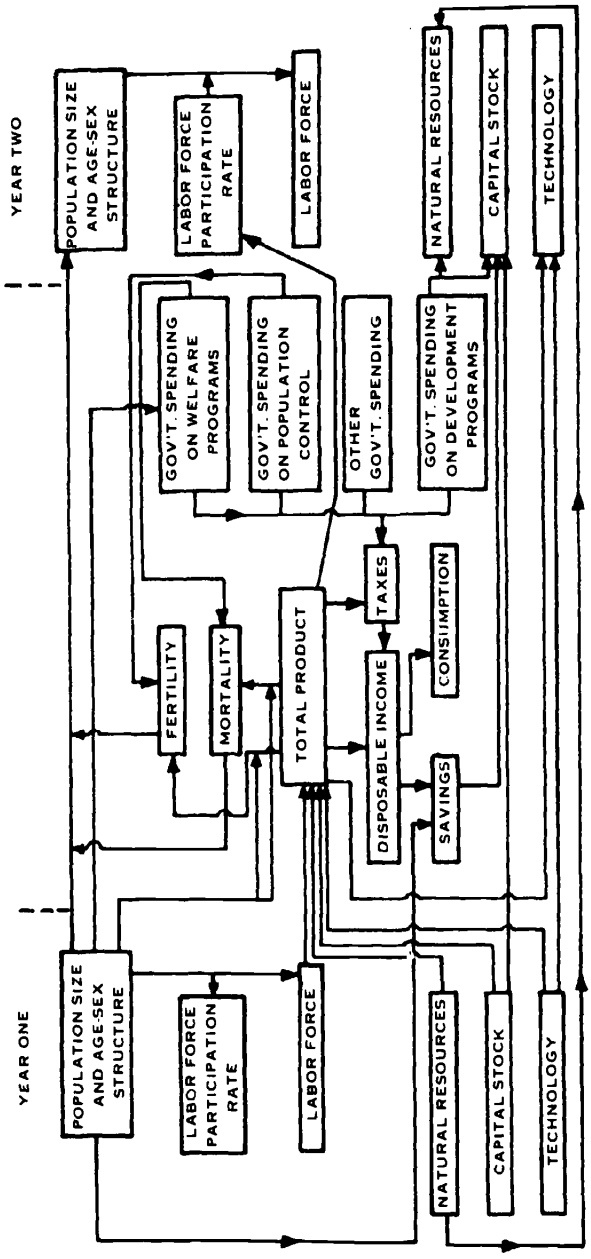


**Figure 10-24.** An Interactive Economic-Demographic Macro Model

Source: Robinson (28) (1975), p. 20.



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captured with a model framework that explicitly incorporates relationships between demographic and economic change. But progress in the development of such macroeconomic models has been slow, with the result that we have not advanced much beyond the pioneering framework provided by Coale and Hoover two decades ago. Nonetheless, the outlines of a profitable and robust paradigm are emerging out of the experiences of studies that have tried to exploit the natural intersection within economics of dualistic growth theory, general equilibrium analysis, and quantitative economic history. The utility of such dualistic models of modern economic growth can be defended with an argument based not solely on their usefulness "as abstract analytical constructs, but rather on their usefulness as quantitative tools for interpreting the historical experience of developing countries" (Kelley and Williamson, 1973, p. 450).

Dualistic models of modern economic growth typically divide a low-income economy into an agricultural-rural sector, which produces a single consumption good, and an industrial-urban sector whose output is divided between consumption and investment. Both sectors employ labor and capital to produce their outputs; the agricultural sector, in addition, utilizes land. Cobb-Douglas production functions are normally adopted for the agricultural sector, and CES production functions are often assumed for the industrial sector. Technological change is specified differentially to capture dualism in production, and urban and rural residents are assumed to differ in their consumption and savings behavior. Growth of the labor force is given exogenously, in most instances, whereas the growth of the capital stock is determined endogenously by means of a savings-investment equation.

Several future directions for dualistic model development were suggested by Kelley (1973) in a recent review of the role of population in models of modern economic growth. Heading the list of revisions of the "standard" model was the desirability of endogenizing population growth:

> Models in which population is endogenous are particularly relevant for two specific policy-oriented reasons. First, if population growth responds to economic conditions, then typical theoretical and empirical estimates of population's impact will be biased. For example, if population growth exerts a negative impact on the level and the pace of economic progress, and if family size varies inversely with economic conditions, then population growth will *decline* in response to its own hypothesized negative impact on the economy. Its *net* adverse impact on growth will therefore be quantitatively less than in the case where population growth is assumed to be exogenously given. . . . Second, if population growth is endogenous and sensitive to the variables used to


**Figure 10-24.** An Interactive Economic-Demographic Macro Model

Source: Robinson (28) (1975), p. 20.

> assess its impact—pollution, economic growth, social stability, employment—then policy recommendations should be formulated in a framework analyzing population's *net* impact. The relevant research issues include the speed of adjustment of population growth to policy objectives—and the extent to which the adjustment level is in some sense "appropriate." [Kelley, 1973, p. 40.]

We shall refer to such models as dualistic models of demoeconomic growth.

Kelley also emphasizes the importance of sectoral disaggregation. He argues that because the rate of economic development is associated with the rate of structural change, along such dimensions as degrees of industrialization and urbanization, models used for policy purposes should incorporate sectoral disaggregations. Such disaggregations should include, for example, the impact of population growth on the *composition* of demand as between urban and rural goods and the response of population growth to the rate of structural economic change when urban areas are assumed to foster a lower family size than is found in rural areas. The latter has already received some attention in the preceding section of this paper; the former will be examined in the next section. Here we shall return to our discussion of dualistic models of demoeconomic growth and closely examine a recent prototype of such a model in which the most important endogenous population variable is internal migration.

**A Prototype Model of Migration and Development**

Population's role in models of economic growth has been substantially enlarged in recent years. Most of the well-known models developed thus far have focused on impacts of population growth on per capita output (or income). Only a few models have also taken into account the influences of economic variables on population growth. Fewer yet have included internal migration as an endogenous variable affecting growth and development.

A prototype model of macrodemoeconomic growth should sketch out the main relationships determining the demographic and economic evolution of a nation experiencing modernization and development. It should contribute to the understanding of population's principal impacts on socioeconomic change and of the consequences of such change on demographic growth and distribution. In order to deal with questions of urbanization, such a model should distinguish between agricultural and nonagricultural production sectors and between rural and urban populations. Differential patterns of fertility, mortality, and internal migration should be incorporated explicitly, the government policy variables should constitute an important part of the model.

Instead of reviewing the several existing demoeconomic models that in general satisfy these criteria, we shall describe a single prototype model that resembles and draws on the others.[3] The model outlined below was developed by Lorene Yap as part of a doctoral dissertation and is described in greater detail in Yap (1976). It is representative of a growing class of dualistic demoeconomic models that could contribute to an improved understanding of the societal consequences of rural-urban migration in developing countries.

Yap presents a three-sector neoclassical model of rural-urban growth, with internal migration explicitly specified as an endogenous variable that both influences and is influenced by regional differentials in economic well-being. The model describes a disequilibrium process of growth in which firms maximize profits and individuals maximize utility. Migration between urban and rural sectors is viewed as a means of equalizing factor returns.

> . . . Rural-urban sectoral differences are emphasized in the model. In particular, there are higher capital and labor productivity and rates of technological change in the modern urban than in the rural and traditional urban sectors; higher rates of natural population growth for the rural than for the urban population; and higher marginal savings propensities for urban workers and businesses, and higher tax rates for urban workers, than for their rural counterparts. Urban population growth also generates pressures for more urban investment by the government, as well as for higher per capita public service expenditures in urban than in rural areas. With these sectoral differences a transfer of population from rural to urban areas will change the productivity of both labor and capital in the two areas, the growth of both factors, and therefore, the growth potential of the sectors. [Yap, 1976, p. 122.]

The Yap model was estimated using 1950-1965 data for Brazil, and simulation techniques were used to assess the impact of rural-urban migration on the growth of the Brazilian national product during that fifteen-year period. A historical growth path and two alternative paths of the Brazilian economy were simulated, each with different rates of internal migration. The differences between the historical simulation and simulations using a lower migration flow than the historical one were assumed to reflect the importance of migration in the determination of the growth rate of GNP during the period 1950 to 1965.

Table 10-12 sets out the principal results of Yap's three simulations. Run R1 is the historical simulation with observed migration levels. Runs R2 and R3 are the two "counterfactual" simulations: the first

[3]Several reviews and assessments of demoeconomic modeling have been published. Among the best are those of Robinson (1975), Robinson and Horlacher (1971), Arthur and McNicoll (1975).

**Table 10-12. Simulation Runs with Alternative Migration Levels**

| Variables | Run R1 (actual migration level) | | | Run R2 (migration parameters reduced by 0.5) | | Run R3 (migration parameters set to zero) | |
|---|---|---|---|---|---|---|---|
| | *Average Growth Rate (%)* | *Initial Year* | *Final Year* | *Average Growth Rate (%)* | *Final Year* | *Average Growth Rate (%)* | *Final Year* |
| 1. Migration as proportion of urban population | | 0.03 | 0.02 | | 0.02 | | 0 |
| 2. Urban population (mill.) | 5.1 | 17.5 | 37.3 | 4.1 | 32.0 | 2.4 | 25.0 |
| a. Proportion of total population | | 0.35 | 0.47 | | 0.39 | | 0.31 |
| 3.Income per capita ($) | *2.7* | *300* | *441* | *2.4* | *418* | *1.9* | *391* |
| a. Rural | 1.5 | 162 | 200 | 1.3 | 193 | 1.0 | 186 |
| b. Urban | 1.9 | 557 | 716 | 2.2 | 759 | 3.0 | 852 |
| 4. Income or value added ($bill.) | *5.9* | *15.0* | *35.2* | *5.6* | *33.6* | *5.2* | *31.7* |
| a. Agriculture | 3.3 | 5.3 | 8.4 | 3.9 | 9.3 | 4.7 | 10.4 |
| b. Modern | 7.1 | 9.2 | 25.6 | 6.5 | 23.4 | 5.7 | 20.9 |
| c. Traditional | 4.9 | 0.5 | 1.2 | 2.9 | 0.9 | −2.1 | 0.4 |
| 5. Capital stock ($bill.) | *5.4* | *37.0* | *79.5* | *5.2* | *77.5* | *4.9* | *75.1* |
| a. Agriculture | 3.3 | 13.1 | 21.1 | 3.4 | 21.5 | 3.6 | 22.0 |
| b. Modern sector | 6.3 | 23.9 | 58.4 | 6.0 | 56.0 | 5.6 | 53.1 |
| 6. Sectoral employment as proportion of total employment | | | | | | | |
| a. Agriculture | 1.8 | 0.65 | 0.53 | 2.7 | 0.60 | 3.7 | 0.69 |
| b. Modern | *5.2* | *0.26* | *0.35* | *4.5* | *0.31* | *3.5* | *0.27* |
| (1) skilled | 5.5 | 0.10 | 0.15 | 4.6 | 0.12 | 3.3 | 0.10 |
| (2) unskilled | 5.0 | 0.16 | 0.20 | 4.4 | 0.19 | 3.6 | 0.17 |
| c. Traditional | 4.9 | 0.09 | 0.12 | 2.9 | 0.09 | −2.1 | 0.04 |
| 7. Wage differentials | | | | | | | |
| a. Rural-urban | | 0.37 | 0.36 | | 0.33 | | 0.29 |
| b. Rural-urban: Unskilled only | | 0.59 | 0.57 | | 0.53 | | 0.47 |
| c. Urban unskilled-urban skilled | | 0.33 | 0.35 | | 0.34 | | 0.34 |
| 8. Sectoral wage inequality | | 3.43 | 4.34 | | 4.63 | | 6.93 |

Source: Yap (38) (1976), pp. 133-34.



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**igration Levels**

| *Run R2 migration arameters reduced by 0.5)* | | *Run R3 (migration parameters set to zero)* | |
|---|---|---|---|
| *rage wth te )* | *Final Year* | *Average Growth Rate (%)* | *Final Year* |
| | 0.02 | | 0 |
| 1 | 32.0 | 2.4 | 25.0 |
| | 0.39 | | 0.31 |
| | *418* | *1.9* | *391* |
| 3 | 193 | 1.0 | 186 |
| 2 | 759 | 3.0 | 852 |
| 5 | *33.6* | *5.2* | *31.7* |
| | 9.3 | 4.7 | 10.4 |
| | 23.4 | 5.7 | 20.9 |
| | 0.9 | −2.1 | 0.4 |
| | *77.5* | *4.9* | *75.1* |
| | 21.5 | 3.6 | 22.0 |
| | 56.0 | 5.6 | 53.1 |
| | 0.60 | 3.7 | 0.69 |
| | *0.31* | *3.5* | *0.27* |
| | 0.12 | 3.3 | 0.10 |
| | 0.19 | 3.6 | 0.17 |
| | 0.09 | −2.1 | 0.04 |
| | 0.33 | | 0.29 |
| | 0.53 | | 0.47 |
| | 0.34 | | 0.34 |
| | 4.63 | | 6.93 |

assumed that migration was half as sensitive to regional wage differentials as it actually was; the second assumed that migration did not occur at all.

An examination of the major economic consequences of the two counterfactual experiments reveals four significant impacts occasioned by the reduction in rural-urban migration:

1. Reducing migration reduces the growth rates of total and per capita GNP.
2. Reducing migration increases agriculture's share of total output.
3. Reducing migration reduces the accumulation of capacity for future growth.
4. Reducing migration increases sectoral inequalities.

Yap's simulations indicate that migration made a positive contribution to Brazil's postwar development. A 50 percent reduction in the values taken on by the parameters of the migration function lowers the average annual growth rate of GNP from 5.9 to 5.6 percent. A further drop to 5.2 percent follows from a complete prohibition of migration. A similar decline occurs in per capita terms, with the annual per capita GNP growth rate declining from 2.7 to 2.4 and 1.9 percent, respectively.

A reduction in rural-urban migration increases the growth of agricultural output from 3.3 to 3.9 percent annually, as migration's sensitivity to wage differentials is reduced to half of its previous level, and to 4.7 percent annually as migration drops to zero. At the same time the annual growth rate of the modern sector's output decreases from 7.1 to 6.5 to 5.7 percent, respectively. The output of the traditional sector also declines, and actually contracts at the rate of −2.1 percent per year in the run with zero migration.

A reduction in migration lowers the capacity for future growth, according to the counterfactual simulations reported in Table 10-12. Growth capacity, measured in terms of physical and human capital stocks, declines with reduced migration. Terminal stocks of physical and human capital (the latter measured by the fraction of skilled workers)—which are $79.5 billion and 15 percent, respectively, in the historical simulation—drop to $77.5 and $75.1 billion and to 12 and 10 percent, respectively, in the two counterfactual simulations with lowered migration levels.

Finally, the counterfactual simulations indicate that migration con-

tributes positively to a reduction in the growing inequality between the urban and rural sectors. Yap's model shows that the extent of wage inequality in the labor force and the differential in per capita income between sectors both increase when rural-urban migration is reduced below its historical level. More wage inequality and a larger differential in per capita income are reported in Table 10-12 for the final year of the two counterfactuals than for the historical simulation.

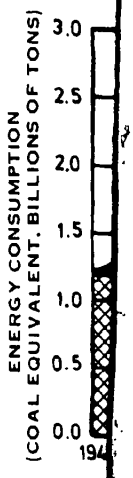
The principal results of the prototype model of migration and development described above add further weight to arguments directed against major efforts to curb rural-to-urban migration in the less developed world. The powerful private incentives and the apparently substantial social gains associated with such migration are apt to make policies to restrict rural-urban migration very costly. Urbanization policies in the less developed nations, therefore, are likely to be more socially beneficial if their focus is on managing rapid urban growth and reducing urban poverty rather than curtailing the flow of migrants to cities. Such a policy perspective leads naturally to an interest in the resource and service demands of rapid urbanization.

## RESOURCE AND SERVICE DEMANDS OF A RAPIDLY URBANIZING POPULATION

What are the resource and service demands of urbanization likely to be during the next 30 to 50 years in the less developed nations of the world? How important will urban *population* growth be relative to urban *economic* growth as a generator of increased levels of demand? To what extent would the management problems associated with meeting these demands be eased if urbanization rates were significantly reduced? These and related questions are receiving increasing attention as part of a general concern over whether population increase will ultimately outstrip the growth in food supplies and exhaust the world's stock of natural resources.

Resources and services are demanded by people; hence, if all else is fixed, the level of demand should be approximately proportional to population size. Demand above this level may be attributed to affluence. For example, Keyfitz (1976) calculates that U.S. energy consumption would have risen from its 1947 level of 1.21 billion tons of coal equivalent to 1.77 billion tons in 1973 if it merely kept pace with population increase. The fact that energy consumption rose beyond that total to 2.55 billion tons in 1973 was due to affluence, according to Keyfitz. Thus of the total increment of 1.34 billion tons, 0.56 billion was due to population growth and 0.78 billion to affluence (Figure 10-25).






Source: Keyfitz (20) (1976

Figure 10-2

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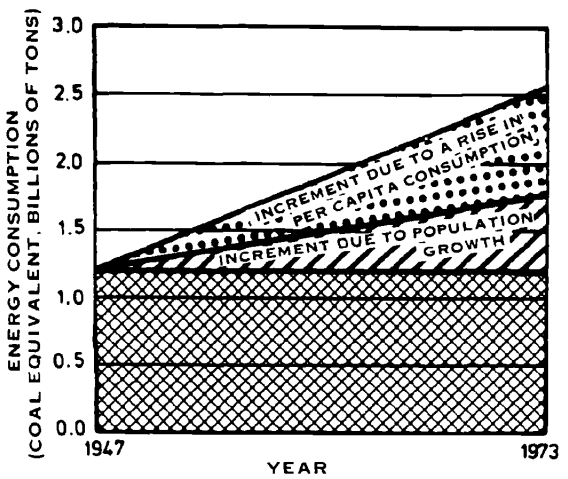



Source: Keyfitz (20) (1976), p. 32.

**Figure 10-25.** U.S. Energy Consumption, 1947-1973.

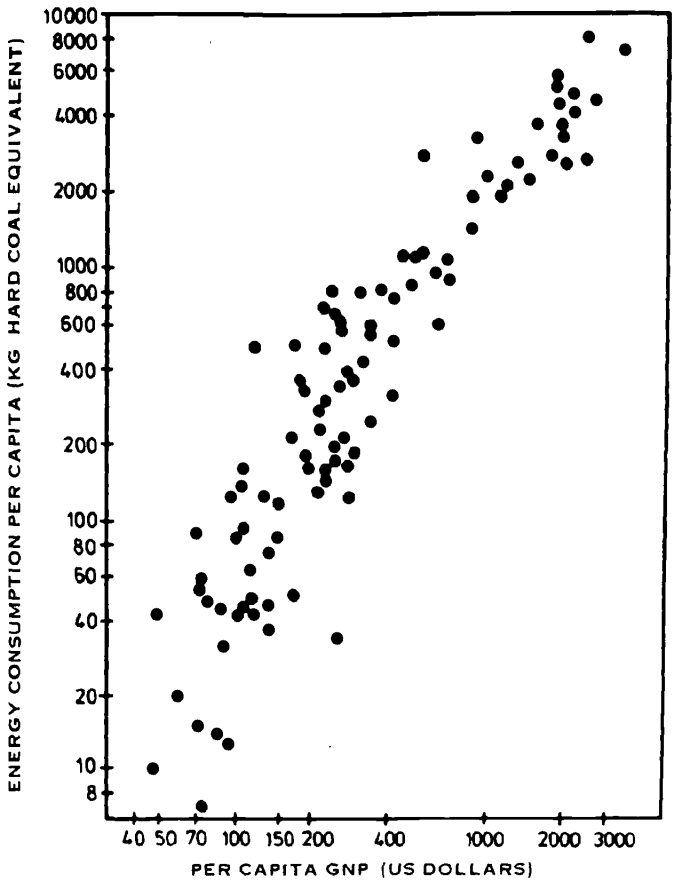
The association between energy consumption and affluence is more explicitly shown in Figure 10-26, which plots per capita energy consumption against per capita income for 96 nations of the world. The correlation is striking and it reflects the fact that as a poor country develops, it requires a larger throughput of energy resources to run its economy and supply the needs of its population.

The relationships between demoeconomic change and patterns of resource and service demand are imperfectly understood. The demographic and economic determinants of the level and composition of demand are several, but a satisfactory first approximation may be obtained by considering only the impacts of changes in the size of a given population and in the total income that is at its disposal.

If relative prices and tastes remain stable, then the demand for a given commodity or service may be shown to grow approximately at a rate equal to the sum of: (1) the income demand elasticity times the growth rate of per capita real income; and (2) the population demand elasticity times the rate of population growth (Kaneda, 1968, p. 6):

$$\frac{\dot{D}}{D} = \xi \frac{\dot{P}}{P} + \eta \frac{\dot{Y}}{Y} \qquad (10.11)$$

where $D$ denotes demand, $Y$ is real income, $P$ is population, $\sigma$ is the elasticity of demand with respect to income, $\xi$ is the elasticity of demand with respect to population, and where the dots indicate time




Source: Fisher and Potter (10) (1971), p. 237.

**Figure 10-26.** Per Capita-Energy Use and GNP, 1965

derivatives (that is, changes in the value of the variable over time).[5] If, in addition, the postulated demand function is homogeneous of degree one; that is, if there are no scale economies of demand, then $\xi = 1 - \sigma$ and (10.11) simplifies to:

$$\frac{\dot{D}}{D} = \frac{\dot{P}}{P} + \eta\left(\frac{\dot{Y}}{Y} - \frac{\dot{P}}{P}\right) \tag{10.12}$$

[5]Elasticities of demand measure the percentage change in demand generated by a unit percentage change in a variable thought to be influencing the level of that demand. For example, if an additional dollar of income raises the demand for food by 50 cents, we say that the income elasticity of demand for food is 0.5



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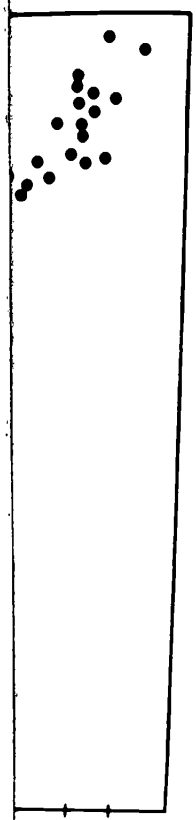


GNP, 1965

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Equation (10.12) may be used to infer the income elasticity of demand for food from data on income, population, and agricultural production. For example, taking as given a 1 percent annual population growth rate, a 3.8 percent rate of growth of per capita income per year, and a 1.6 percent annual growth rate of rice available for consumption, Kaneda used Equation (10.12) to infer that the income elasticity of demand for rice in Japan must have been $\sigma = 0.21$ (Kaneda, 1968, p. 7). Thus, approximately half of the observed percentage increase in the amount of rice demanded was due to growth in per capita income, and the other half was attributable to population increase.

**The Influence of Spatial Distribution: The Demand for Food**

Patterns of food consumption undergo considerable change during the process of a country's urbanization and development. Two fundamental shifts are: (1) a decline in the fraction of total per capita income that is spent on food (Engel's law); and (2) the change in the composition of the per capita food bundle. The share of food in private consumption expenditures (the so-called Engel ratio) declines from levels as high as 75 to 80 percent in traditional poor societies to levels less than half of that in modern developed societies. The composition of the per capita food bundle also changes, as consumers substitute "preferred" food products, such as animal protein foods, for "inferior" food products such as starchy staples.

Rapid urbanization has helped to shape new food consumption patterns in developing nations. Electric kitchen appliances have expanded the range and variety of methods for preparing food. Increasing affluence in urban centers has led to a growing importation of exotic foods and such essential food items as meat and dairy products.

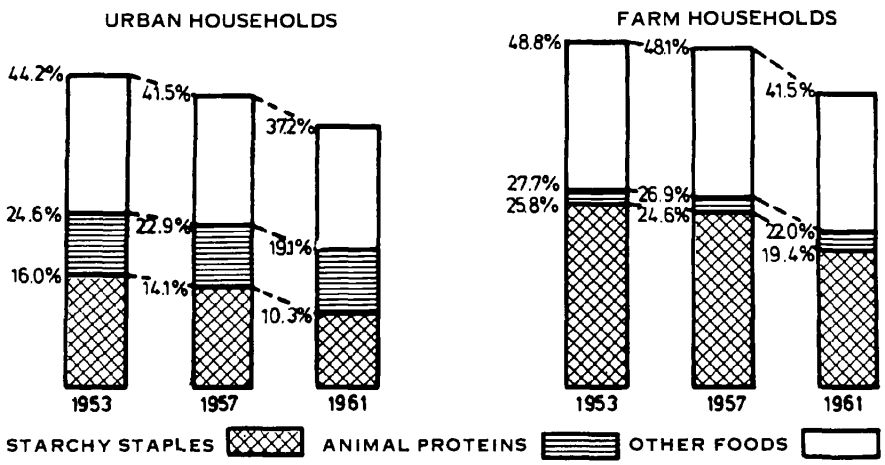
Urbanization influences the level and composition of food consumption in a number of related ways. First, urban and rural populations typically have different consumption patterns. Thus a rapid change in the geographic distribution of a national population is bound to alter the aggregate demand for food. Second, an important consequence of rural-urban migration is a change in the pattern of income distribution, as migrants gradually improve their income status. This change influences aggregate food consumption patterns; for example, an improvement in the income level of lower income groups would be expected to increase aggregate food demand more rapidly than otherwise. Finally, changes in tastes induced by urban development processes would be expected to further increase the aggregate elasticity of food demand.

Recently published data for Japan indicate very clearly the substan-

tial reduction in urban and rural Engel ratios that has followed the high growth rates of per capita income during the postwar years (Figure 10-27). For each of the three years included in Figure 10-27, the Engel ratio for urban households is lower than that for farm households. This in part reflects the higher per capita income of urban households. The fraction of total expenditure that is devoted to starchy staples (cereals, potatoes, and so on) is also lower for the urban population. As increasing income permits urban households to modify their dietary habits, they tend to consume ever larger quantities of animal protein foods such as meat, dairy products, eggs, and fish.

The differences in urban and rural food consumption patterns illustrated in Figure 10-27 also may be observed in the recent estimates of income elasticities developed by Kaneda (1968). These are set out in Table 10-13 and reveal that, as in the case of Engel ratios, the elasticities for all food, starchy staples, and animal proteins are smaller for the urban population than for the rural (farm) population. A possible explanation of this result is the greater variety and availability of alternative goods in urban centers. As a consequence, income expansion among farm households would increase aggregate food consumption more than a similar growth in income among urban households.

Sector-specific income elasticities such as those presented in Table 10-13 may be combined with urban and rural versions of Equation (10.12) to yield crude estimates of food demand over time and space.




Source: Kaneda (1970) (16), p. 423.

**Figure 10-27.** Percent of Total Household Expenditures Devoted to Specified Food Groups by Urban and Farm Households in Japan



**Table 10-13. Measur**
**Urban Workers' Hous**

| *Year* | *Total food* |
|---|---|
| 1953 | 0.481 (.015) |
| 1957 | .456 (.011) |
| 1961 | .472 (.004) |
| 1953 | 0.529 (.036) |
| 1957 | .531 (.044) |
| 1961 | .529 (.040) |

Source: Kaneda (16) (19
regressions; observations w
in each group.
[a]Cereals and starchy roots
[b]Meat, dairy products, egg
[c]Figures in parentheses are
[d]Not significantly differen

Assume, for exampl
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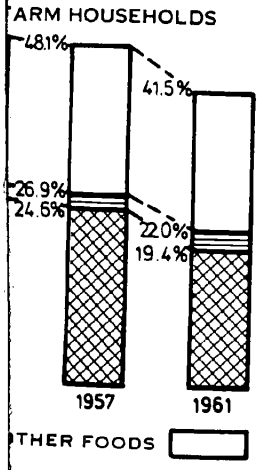


Devoted to Specified

**Table 10-13. Measured Income Elasticities Based on Household Budget Surveys, Urban Workers' Households, and Farm Households, 1953, 1957, and 1961**

| *Year* | *Total food* | *Starchy staples*[a] | *Animal proteins*[b] | *Other food* |
|---|---|---|---|---|
| | | *Urban Workers' Households*[c] | | |
| 1953 | 0.481 | 0.196 | 0.750 | 0.590 |
| | (.015) | (0.32) | (.012) | (.017) |
| 1957 | .456 | .062 | .773 | .602 |
| | (.011) | (.012) | (.032) | (.018) |
| 1961 | .472 | .075 | .700 | .585 |
| | (.004) | (.012) | (.008) | (.012) |
| | | *Farm Households*[c] | | |
| 1953 | 0.529 | 0.466 | 1.117 | 0.412 |
| | (.036) | (.080) | (.220) | (.084) |
| 1957 | .531 | .363 | 1.156 | .507 |
| | (.044) | (.089) | (.181) | (.069) |
| 1961 | .529 | .159[d] | 1.087 | .720 |
| | (.040) | (.091) | (.236) | (.072) |

Source: Kaneda (16) (1968), p. 22. Estimates were derived by weighted logarithmic regressions; observations were weighted according to the number of households represented in each group.

[a]Cereals and starchy roots (such as potatoes) for farm households represented in each group.

[b]Meat, dairy products, eggs, and fish.

[c]Figures in parentheses are standard errors of estimate.

[d]Not significantly different from zero at 5 percent.

Assume, for example, that the income elasticity for starchy staples is 0.1 in urban areas and 0.4 in rural areas. Let the annual growth rates of urban and rural incomes be 6.5 percent and 3.3 percent, respectively. (The latter are roughly the values presented for Brazil in Table 10-12.) Finally, assume that projection *Bb* in Table 10-11 describes the demographic evolution of the population under study. Then, during the initial years, demand for starchy staples in urban areas will be growing at an annual rate of about:

$$\frac{\dot{D}_u}{D_u} = 0.047 + 0.1(0.065 - 0.047) = 0.049$$

whereas the corresponding demand in rural areas will increase at the annual rate of:

$$\frac{\dot{D}_r}{D_r} = 0.025 + 0.4(0.033 - 0.025) = 0.028$$

If the only changes after fifty years are increases in the annual growth rates of urban income to 10 percent and of rural income to 4 percent, then the growth rate of demand for starchy staples should decline to 0.034 in urban areas and to 0.014 in rural areas. Since during this period the urban share of the total national population increased from 20 percent to 65 percent, the aggregate national demand for

starchy staples should decline from an initial annual growth rate of about 3.2 percent to one close to 2.7 percent. (If, as is likely, the income elasticities decline with increasing income, then this reduction should be, of course, even greater.)

Equations (10.11) and (10.12) provide crude approximations of demand changes stimulated by population and income growth in settings where the assumption of stable tastes and relative prices is not seriously violated. However, when food consumption patterns change rapidly, as they did in postwar Japan, for example, then the impacts of possible shifts in tastes and relative prices should be taken into account. Kaneda (1968) attempts to do this by adopting the following generalization of Equation (10.11):

$$\frac{\dot{D}}{D} = \frac{\dot{A}}{A} + \xi\left(\frac{\dot{P}}{P}\right) + \eta\left(\frac{\dot{Y}}{Y}\right) \qquad (10.13)$$

in which the intercept term is interpreted as a measure of *changes* in the structure of demand defined by the parameters $\xi$ and $\sigma$. Using household budget data for Japan and relaxing the assumption that $\xi$ must equal $1 - \sigma$, he obtains the partial elasticities of food demand for family income and also for *family size.* Table 10-14 presents his estimated elasticities, and reveals the following two important points:

1. Urban and rural partial *size* elasticities for total food expenditures do not differ nearly as much as partial *income* elasticities (0.405 against 0.455, for the former; and 0.462 against 0.555, for the latter). This suggests that differences in urban and rural household consumption behavior may be attributed much more to differences in income levels than to variations in family size.
2. The ranking of food groups in terms of partial *income* elasticities is, in descending order of magnitude: animal proteins, other foods, total food, and starchy staples. The corresponding ranking in terms of partial *size* elasticities is essentially the reverse. The first ordering reflects consumers' preferences; the second ranking reflects the effects of family size on food consumption. For example, animal proteins are preferred to starchy staples, but an increase in family size makes its members relatively poorer and increases the basic "need" for food energy. As family size for farm households increases, their consumption of animal proteins is reduced.

A widely observed regularity associated with urbanization, development, and modernization is the decline of agricultural production and



Table 10-14. Estimate
Expenditure, Postwar

| *Category of expenditure* | |
|---|---|
| Total food | |
| Cereals | |
| Animal proteins | |
| Other foods | |
| Total food | |
| Starchy staples | |
| Animal proteins | |
| Other foods | |

Source: Kaneda (16) (1968
[a]Figures in parentheses are s

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**Table 10-14. Estimated Elasticities with Respect to Family Size and Total Expenditure, Postwar Years**

| *Category of expenditure* | *Size elasticity* | *Income elasticity* |
|---|---|---|
| | *Urban Workers' Households*[a] | |
| Total food | 0.405 | 0.462 |
| | (.083) | (.024) |
| Cereals | .461 | .216 |
| | (.168) | (.050) |
| Animal proteins | .327 | .722 |
| | (.130) | (.038) |
| Other foods | .394 | .591 |
| | (.097) | (.029) |
| | *Farm Households*[a] | |
| Total food | 0.455 | 0.555 |
| | (.022) | (.016) |
| Starchy staples | .921 | .343 |
| | (.036) | (.026) |
| Animal proteins | −1.125 | 1.299 |
| | (.089) | (.065) |
| Other foods | .274 | .579 |
| | (.037) | (.027) |

Source: Kaneda (16) (1968), p. 24.
[a]Figures in parentheses are standard errors of estimate.

the corresponding rise in the importance of industrial production. The conventional explanation for this regularity points to the declining importance of food expenditures as income rises. But as Kelley (1969) observes, Engel curve analysis—with its primary focus on expenditure and income elasticities—can serve only as crude first approximation in any assessment of the influence of aggregate demand on industrial patterns: "Systematic changes in the rate of population growth, of ages, of average family size, and of urbanization (internal migration) are all part of economic development . . . each of these factors exerts an impact on the size and composition of demand . . ." (Kelley, 1969, p. 111).

### The Influence of Age Composition: Demand for Personal Health Services

In discussing the determinants of the demand for health care, we shall focus on personal health services only, that is, "those provided for individuals by doctors, nurses, and health technicians . . . to treat illness, prevent disease or disability, or facilitate such normal processes as human reproduction" (Corsa and Oakley, 1971, p. 372). Thus

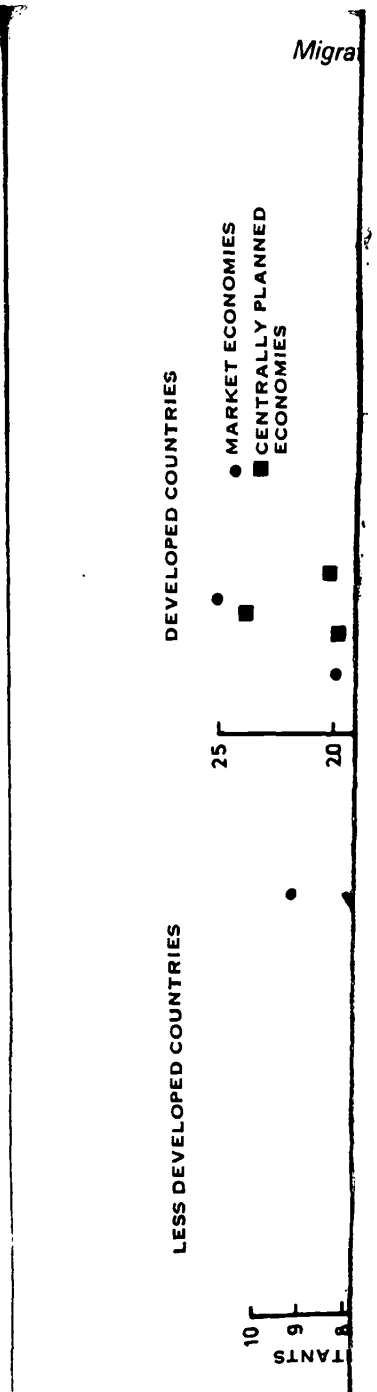
we shall exclude from consideration societal environmental health activities and such services as public information, education, vital registration, and health surveillance.

Crude estimates of personal health-care demands may be obtained by using appropriate service utilization ratios. Thus, for example, current ratios of health personnel and facilities to population may be applied to alternative population projections to develop estimates of the requirements for future health needs. However, as in the case of energy consumption in Figure 10-25, greater demands for health personnel and facilities arise not only from a growing population but also from an increasing level of income. Figure 10-28 indicates that this relationship, which is very evident in the less developed countries, may not persist in such a simple form once the countries reach a relatively high level of development.

The spatial distribution of a population also needs to be taken into account in studies of health-service requirements. Health-service ratios in less developed countries, for example, are generally much higher in the major cities than in the rest of the country (see, for example, Table 10-15). As a result, most developing countries are striving to narrow the gap that exists between urban and rural areas in the availability of health services, so current rural service ratios are inadequate norms with which to scale levels of future health-care needs for the rural population.

To obtain a more complete assessment of the impacts of different population trends on resource and service demands it is necessary to go beyond simple per capita ratios and examine the effect of changing population age composition on such demands. Figure 10-29 illustrates the relationships between age composition and demands for a number of services. These data show that demands for educational services, for example, occur largely between the ages of 5 and 20, with a peak at age 10. Housing requirements, on the other hand, increase during the later years of childbearing and hold steady until the age of retirement. Jobs are in demand during the labor-force participation ages of 15 to 65. Food requirements increase until the late teens, peaking at about age 18; after a slight decline they then level off and remain constant. Finally, health-service demands are relatively high for infants and older adults. These agegroups have the highest incidence of illness and require the most hospitalization.

Illness and hospitalization rates tend to be higher among adults at all ages above 50 than among children in the 0-5 agegroup. Nevertheless, because of their relatively large numbers in high fertility populations, young children generate a significant proportion of the total health-service demand. A decline in fertility does not reduce total



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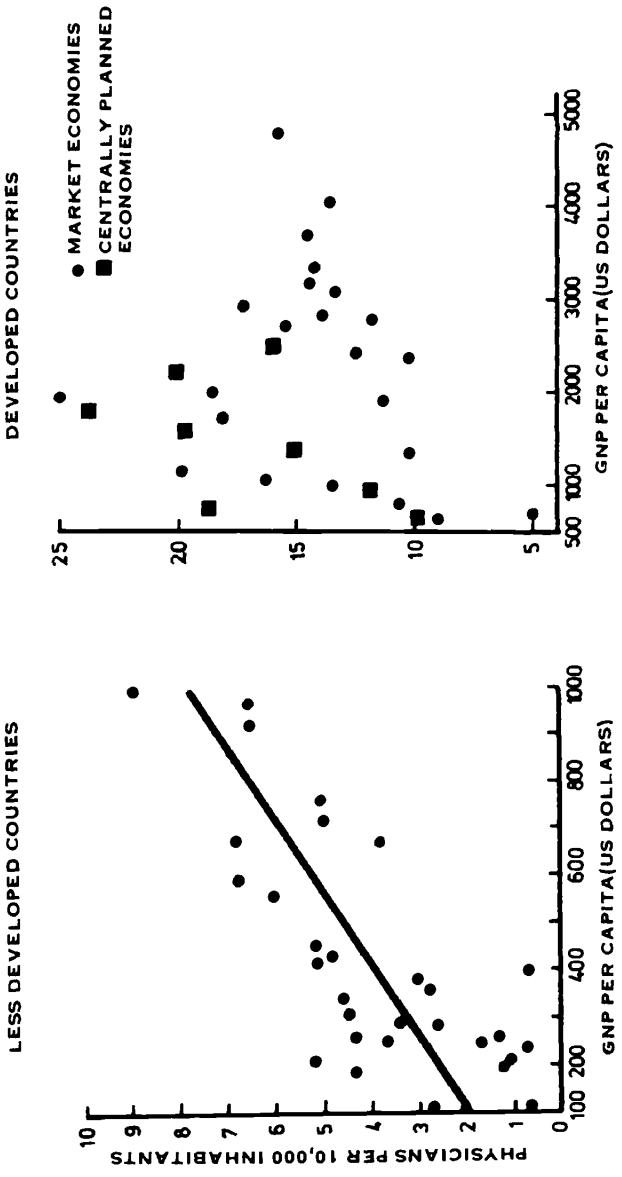
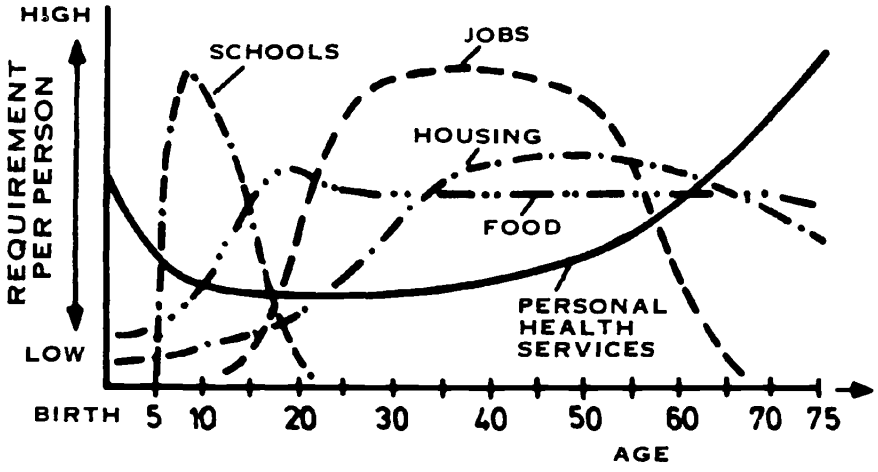



Source: United Nations (1976) (34), p. 129.

**Figure 10-28.** Gross National Product per Capita in Relation to the Number of Physicians per 10,000 Inhabitants, 1970




Source: Corsa and Oakley (6) (1971), p. 370.

**Figure 10-29.** Time Relationships between a Birth and Future Service Requirements

**Table 10-15. Projected Service Ratios per 10,000 Population, Thailand, 1970 (service ratios in Bangkok and rest of Thailand separately)**

| *Personnel and facilities* | *Service ratios in Thailand as a whole* | *Bangkok* | *Rest of Thailand* |
|---|---|---|---|
| Hospital beds | 9.14 | 41.55 | 5.86 |
| Physicians | .90 | 7.27 | .32 |
| Nurses | 2.03 | 14.24 | .92 |
| Practical nurses | 1.29 | 3.76 | 1.01 |
| Midwives | .88 | .57 | .91 |
| Sanitarians | .70 | .71 | .66 |
| Dentists | .098 | .71 | .043 |

Source: Jones (15) (1975), p. 119.



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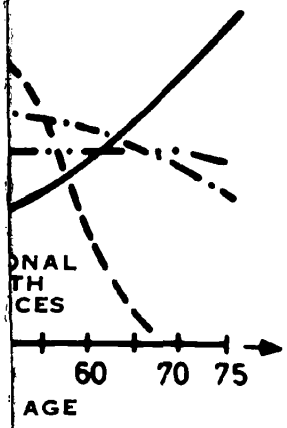
**Table 10-16. Expe
Various Ages: Unit**

| *Cause of Death* |
|---|
| Heart diseases |
| Neoplasms |
| Cerebrovascular disease |
| Cirrhosis of liver |
| Other accidents |
| Influenza and pneumonia |
| Motor accidents |
| Suicide |
| Homicide |
| All causes |

Source: Fuchs (11) (19




Future Service Require-

ulation, Thailand, 1970
ely)

| *Rest of Thailand* |
|---|
| 5.86 |
| .32 |
| .92 |
| 1.01 |
| .91 |
| .66 |
| .043 |

health-care requirements, however, because the corresponding decline in the proportion of young children is offset by the increase in the proportion of older adults.

Much of the variability in rates of illness (morbidity) and death (mortality) among different age and sex groups in a population can be attributed to differences in their underlying cause-of-illness or cause-of-death structure. By way of illustration, Table 10-16 presents death rates among U.S. and Swedish males, by cause of death, for three broad age groups. These data reveal a striking variation of mortality with age.

Teenagers and young adults in the United States are, on the average, very healthy, and their probabilities of dying of diseases are extremely small. Their probabilities of dying in accidents, however, are not that small, especially for males. Table 10-16 indicates that out of 100,000 U.S. males at age 15, over 1,100 will die in accidents before reaching age 25. More than half of these will lose their lives in automobile accidents. Combining these totals with deaths attributable to suicide and homicide, we find that deaths caused by violence in one form or another accounted for three out of every four male deaths in the 15-24 agegroup. This is in marked contrast to the corresponding aggregate rate for all U.S. males, which is one in every ten.

Heart diseases become the major cause of death from about age 35 on according to Table 16. Approximately one out of every hundred

**Table 10-16. Expected Number of Deaths, by Cause, per 100,000 Males at Various Ages: United States, 1968, and Sweden, 1967**

| | *United States (white males only)* | | | *Sweden* | | |
|---|---|---|---|---|---|---|
| *Cause of Death* | *15-24* | *35-44* | *55-64* | *15-24* | *35-44* | *55-64* |
| Heart diseases | 28 | 999 | 9,940 | 22 | 369 | 5,293 |
| Neoplasms | 103 | 507 | 4,697 | 110 | 343 | 3,159 |
| Cerebrovascular disease | – | – | 1,196 | 6 | 76 | 950 |
| Cirrhosis of liver | – | 188 | 645 | – | 50 | 204 |
| Other accidents | 310 | 321 | 508 | 228 | 287 | 426 |
| Influenza and pneumonia | 29 | 79 | 505 | 25 | 30 | 310 |
| Motor accidents | 807 | 351 | 382 | 335 | 197 | 285 |
| Suicide | 113 | 232 | 348 | 140 | 427 | 520 |
| Homicide | 75 | 98 | 62 | 9 | 4 | 9 |
| All causes | 1,690 | 3,458 | 21,902 | 1,045 | 2,286 | 13,410 |

Source: Fuchs (11) (1974), pp. 41-45.

white American males dies of a heart attack or related disease in the 35-44 age group. Neoplasms, especially lung cancer, and cirrhosis of the liver, both become important causes of death among American males starting at age 35. Thus the combined impact of smoking and drinking on health is considerable.

The probabilities of dying during the ten-year period between ages 55 and 64 are substantially higher than during the entire forty-year period between ages 15 and 55. The principal reason is the striking increase in the probabilities of dying from a heart attack. According to Table 10-16, the death rate of this cause is then times greater during late middle age than it is at ages 35-44, and over half of all deaths in the former agegroup are attributable to it. The chances of dying from lung cancer also increase to more than ten times the rate observed at ages 35-44.

A comparison of the U.S. and Swedish male death rates (Table 10-16) sheds some light on the character of health problems among American males. Largely because of the high rate of violent deaths, the U.S. rate at ages 15-24 is more than 60 percent higher than the corresponding rate in Sweden. The number of violent deaths per 100,000 individuals is 83 percent higher in the United States than in Sweden, whereas the corresponding differential in nonviolent deaths is only 16 percent.

The pattern changes in the 35-44 age group as the differential in deaths from violence declines and the differential in deaths from heart diseases increases substantially. Between ages 55 and 65 the U.S. death rate is 63 percent higher than the corresponding rate in Sweden, and the U.S. rate for heart diseases is approximately double the Swedish rate.

As better control over such diseases as typhoid fever, diphtheria, whooping cough, and measles leads to major declines in mortality levels, death rates provide an increasingly incomplete description of a national population's general health status. Illnesses and disabilities associated with arthritis, mental illness, and sight and hearing problems are not reflected in mortality statistics, yet much of a nation's requirements for health care are connected with such illnesses and disabilities. Moreover, as more people survive to older ages, chronic degenerative diseases, including heart disease, cancer, and stroke, become more common. Finally, it is important to recognize that future demands for health services also depend on the combined influences of a number of factors besides population. These include national decisions about the importance of health goals relative to other goals, national decisions regarding the health-service functions that should be carried out by various kinds of health personnel, world technological

developments, and levels of intenational technical assistance (Corsa and Oakley, 1971).

## POLICY ISSUES AND CONCLUSIONS

Scholars and policymakers often disagree when it comes to evaluating the desirability of current rates of rapid urbanization and massive rural-urban migration in the less developed world. Some see these trends as effectively speeding up national processes of socioeconomic development, while others believe their consequences to be largely undesirable and argue that both trends should be slowed down.

Those taking the negative view argue that most developing countries are "over-urbanized" in the sense that urban growth rates have greatly outdistanced rates of industrial development and economic growth. This has created an imbalance that finds cities in the less developed world perpetually struggling with crisis. Despite substantial gains in industrial production, new jobs do not appear at anywhere near the rates required to employ a significant portion of the growing urban labor force. Despite impressive improvements in urban housing, food availability, educational services, and transportation facilities, squatter settlements proliferate, hunger and illiteracy are in evidence everywhere, and traffic congestion is worse than before. And, most important, resources that could otherwise be applied to more directly and immediately productive uses instead must be diverted to satisfy the ever-growing demands for urban social services and infrastructure.

Supporters of current urbanization and migration patterns in developing countries point to the modernizing benefits of urbanization and to the improved well-being of most rural-urban migrants. They contend that urbanization transforms people's outlook and behavioral patterns, while broadening their skills and fostering in them the greater acceptability of innovations and rationality necessary for generating sustained wealth and power in a modern society. They also argue that concern on welfare grounds is probably misplaced, because despite job insecurity and squalid living conditions, most rural-urban migrants are better off than they were prior to their move. Their transfer from the farm to the city enables them to raise their personal income and to obtain social services of a much wider variety and superior quality than were available to them before.

The three population-related policies most frequently suggested for dealing with the urbanization problems of less developed nations are fertility reduction, economic development, and a redistribution of the urban population away from the largest cities. Countries that have achieved a high standard of living, it is pointed out, also have ex-

perienced significant declines in their birth rates. And sustained reductions in birth rates have not been accomplished without significant economic growth. Moreover, there is also some evidence that costs of services and environmental damages increase markedly with city size. Yet, although there is evidence to support all of these points, it is by no means irrefutable. Fertility declines have occurred without economic growth. Economic growth has occurred alongside population growth. And convincing arguments have been put forward against a narrow cost-minimization perspective in the debate on city size.

In this paper we have outlined what we believe to be three major components of any complete analysis of human settlement problems: (1) the demographics of rapid urbanization; (2) its demoeconomic development aspects; and (3) the resource-service demands that it generates. A great deal more needs to be learned about these three processes before convincing evidence can be marshaled for or against rapid rates of urbanization. This evidence could shed some light on the following three important policy questions:

1. Is it high fertility or high rural-urban migration that is the principal cause of current rapid rates of urbanization and urban growth in less developed countries, and which of these two components of population change should receive the major attention of national population policy?
2. Is a strategy of rapid industrialization, with its predominantly urban bias, the appropriate model for most developing countries, or should agricultural and rural development programs play a much larger role than they do today?
3. Are the major urban agglomerations in the less developed world too large and do they consume a disproportionately large share of national resources and services, or is the problem one not of urban size but of urban growth management?

The countries of the less developed world are currently faced with the problem of accommodating more people in urban areas within a shorter period of time than did the developed countries. The dimensions of the task confronting the cities of developing nations are, therefore, truly gargantuan. But there are grounds for optimism, since accelerating population increases in urban areas have been absorbed at rising income levels in a number of developing countries. What is sorely needed, however, is enlightened management of the urbanization process to remove systemic inefficiencies and inequalities, and simultaneous preparation of already growing cities for a very much larger increment of growth in the future.

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*Chapter Eleven*

# Discussion of "Migration, Urbanization, Resources, and Development," by Andrei Rogers

**Robert Louis Clark**

Professor Rogers has presented a detailed review of observed differences in urban and rural economic choices and status. He outlines potential problems associated with rapid rates of urban growth and urbanization. The principal focus of his examination is the direct and interactive effects of migration, urbanization, and resource utilization on the developmental process. The Rogers framework of analysis includes the influence of population growth on national and per capita income. In these comments, I will explicitly state the economic model of migration and examine it in light of Rogers's analysis. Next, the influence of population growth on the age structure and composition of the dependent population will be explored; and finally the use of dependency ratios to determine investment and economic growth is reviewed.

## MIGRATION AND NATIONAL INCOME

An individual's decision to leave a current job and community to migrate to a new geographic region can be treated as an investment decision. The worker recognizes the future earnings pattern available in an existing location and compares this value to alternative estimates of income opportunities in other areas minus the cost of relocation. The following model, whose origins are attributed to Sjaastad,[1] indicates the present value in discrete time associated with a move from area $j$ to area $k$:

$$PV = \sum_{t=0}^{T} \frac{Y_k(t) - Y_j(t)}{(1 + r)^t} - C$$

where $Y_k(t)$ is the expected earnings[2] in area $k$ at time $t$; $Y_j(t)$ is the anticipated earnings in area $j$ at time $t$; $T$ is the remaining years of work; $r$ is the discount rate the individual applies to the earnings streams; and $C$ represents the direct cost of moving assumed to occur entirely in the first period. Of course, the model can easily be expanded to include the value of nonpecuniary returns to both areas. In addition, demand for services such as education and health for one's children may influence location decisions.

The implication of this migration model is that individuals, as Rogers states, "migrate in search of improved social and economic opportunities." Workers make locational decisions in an attempt to maximize the present value of their lifetime earnings or utility. This model clearly states that the individual operating with full information will have improved his or her economic well-being following migration. At various points, Rogers wonders whether individuals, regions, or the nation as a whole gain from migration. For example, he states:

> The problems created by this transformation [urban growth and urbanization] are manifold and involve large *private and social costs.* But there are obvious benefits, too, and it is important to keep these in mind when considering policies for intervening in the urbanization process. [Emphasis added.]

Can the individual who moves be made worse off by a decision to relocate? While imperfect information can produce ex post suboptimal outcomes, migration is expected to increase the well-being of movers[3] with informational networks, that is, friends and relatives, newspapers, and so on, arising to generate the needed flow of knowledge. The improved status of migrants does not, however, insure a positive net benefit to either the region or the nation as a whole. The improved status of the migrant is not a sufficient condition to provide a net gain to the economy due to the possibilties of externalities and returns to scale in the production of goods. Differences between social costs and returns and private expenditures and receipts might provide a rationale for a public policy aimed at increasing or decreasing migratory flows.

Externalities produced by expansion of city size may be either positive or negative. Rogers focuses on the negative aspects of urban growth such as pollution or congestion. His analysis would seem to imply ihat if new migrants were forced to pay the of urban growth such as pollution or congestion. His analysis would seem to imply that if new migrants were forced to pay the full social costs of their relocation, fewer people would be drawn to urban areas. Thurow states the problem in the following manner:

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> Private incomes may increase enough to more than make up for the costs of moving, but the social costs of accommodating people in a crowded urban area may exceed the net private gain. More public services must be provided, and congestion may increase.[4]

The magnitude and nature of externalities can be expected to depend on urban characteristics, perhaps, to the extent that generalities cannot be made.

For society to be made worse off from migration, the full social costs of relocation, including these externalities, would have to be greater than the social gain from increased production attributable to workers finding employment with higher productivity than in their old residences. To the extent that higher levels of social services are provided in the urban areas—welfare benefits, subsidized housing, schooling—the difference between private and social gains may be widened, and it is possible that people will give up employment in rural areas to draw these benefits in cities. This, however, begs the question of why such differentials exist. Political and social hypotheses may be put forward to explain the existence of state-supported urban-rural differentials in social services, such as greater likelihood of revolution among disgruntled masses, urban poverty is more visible, and the like. But there may be economic rationales influencing these government decisions. Public policy may be explicitly directed toward increasing urbanization in the belief that there is a positive codecisions. Public policy may be explicitly directed toward increasing urbanization in the belief that there is a positive correlation between these migrational flows and economic development. The government may also recognize economies of scale in the production and supply of these services.

If social services are financed by the local area, the inflow of new migrants may increase the tax load on the existing inhabitants relative to the benefits that the newcomer provides. The possibility then exists that the individual and the nation may benefit by migration while the previous inhabitants of a particular city or region might suffer. In the case of social services, the increased tax burden on the long-term residents arise because of a pricing policy that provides them below costs and thus implies income transfers to the newcomers. In way of summary, Greenwood stated in his review of the migration literature that "little empirical work has attempted to measure the magnitudes of externalities associated with migration."[5]

Henderson argues that if the social and private costs of externalities are equated, cities will reorder their production priorities away from the goods that are producing the pollution or other externality. The adverse effect of the reduction in the production of the polluting commodity "will be more than offset by the increase in output of other

goods and the decline in pollution. Welfare of city residents will rise, and immigration to the city from the rest of the economy will then occur."[6] Thus, under certain conditions, an optimal taxing or pricing of an externality—pollution, congestion, and so on—may increase the well-being of the city dwellers at the existing urban population size, which will induce migration to the city, increasing its size.

Migration into large urban areas might also create additional burdens to a society if the production of social goods and services were characterized by decreasing returns to scale. In such a case the marginal and average costs of providing housing, education, and other services would increase as the population of the region rose. The inference is that it would have cost the society less to provide these services to new migrants in their old location. A recent study using U.S. data estimated that the production functions of urban services exhibited constant returns to scale across the entire sample.[7]

Arguing that urban production functions will exhibit increasing returns to scale, Goldstein and Moses conclude that the growth of urban areas "is intimately related to scale and agglomerative economies."[8] In his review of the internal migration literature, Greenwood concludes that "migration has historically been an important means by which these economies have been achieved in urban areas."[9] Kuznets, in his *Modern Economic Growth*, states that "urbanization is a necessary condition for industrialization and modern economic growth and essential to the economies of scale of modern industry."[10]

An additional concern stated by Rogers is that rural-to-urban migration increases city size, thus "reducing the per capita endowment of capital" in the urban area. Increases in the supply of labor in a particular region would be expected to generate downward pressure on wage rates; however, in the rural region wages should increase. Migratory flows that tend to equalize returns to capital and labor in the different areas within an economy are contributing to efficient allocation of resources. Therefore, reduced urban wages caused by the inflow of rural labor should not be considered an externality unless property rights on the existing capital stock and technology have been assigned to the initial urban workers.

These studies seem to indicate that the nation as a whole would tend to benefit from migration in the following manner: first, as workers move to areas where their productivity and earnings are greater, national and per capita income rise; second, the net negative values of externalities are typically not sufficient to offset these income gains, and if property taxed may contribute to increased city size; and finally, some evidence exists that indicates urban services are produced under constant or increasing returns to scale. This explanation is consistent

with results of Yap[11] that are cited in detail by Rogers. I might add that in any theoretical economic framework, unrestrained movement of resources is a necessary condition for efficient production and the achievement of maximum output. Thus, a government policy to restrict or retard the flow of labor within a country might significantly impair the economy's ability to respond to economic fluctuations.

## POPULATION GROWTH, AGE STRUCTURE CHANGES AND ECONOMIC WELL-BEING

Professor Rogers outlines a framework that links population growth, investment, and per capita income. His reasoning is that a nation with a rapidly increasing population "will be able to add less to the productive capacity of the economy than a population experiencing a less rapid rate of labor-force growth." This decline in investment occurs because "the pressure for allocating a much higher proportion of the national product for consumption then would be greater in the higher fertility population because of its higher dependency burden."

This is, of course, the traditional hypothesis of the interaction of population growth and economic well-being. It was stated forcefully by Spengler over two decades ago:

> Population growth is a major obstacle to economic betterment in most parts of the world. It is retarding capital formation, accelerating the rate of depletion of the world's limited store of nonreplaceable resources, augmenting the rise of costs in increasing cost industries, and decelerating the rate of increase of per capita income.[12]

The tenet that population growth retards and has slowed past economic growth is not, however, a uniformly accepted belief. Kuznets found that "no clear association appears to exist in the present sample of countries, or is likely in other developed countries, between rates of growth of population and product per capita."[13] In his examination of 76 less-developed countries over a period of ten years, Alfred Sauvy estimated no significant correlation between the rate of growth of population and national per capita income.[14]

Some researchers have outlined the economic advantages of population growth. These factors may include: existence of economies of scale in some industries; with fixed firm size, population growth may increase competition; higher proportion of capital stock is of a new vintage;[15] enhances vertical mobility of labor; and easier adaptability to economic change.[16]

While I do not wish to argue in favor of rapid population growth, I believe it would be useful in the framework of this conference to

analyze the implication of population increases on the ability of the economy to generate investment. My examination will focus on: (1) relating fertility decisions to a family choice model; (2) expenditures on children as a form of investment; and (3) the use of dependency ratios to determine savings capacity.

## HOUSEHOLD SAVINGS DECISIONS

Much of the analysis of the impact of children on aggregate saving concludes that increases in the number of children raises the number of consumers without increasing production; therefore, to maintain consumption standards, savings must be reduced.

Before continuing, we must reach agreement on the definition of investment. Expenditures that increase the ability of society to generate output in subsequent periods are described as investment, and these expenditures can be on either physical or human capital. Much of the public and private expenditures on children directly influence the income-generating capacity of the economy by increasing the stock of human capital. For example, educational expenditures provide children with the training and work skills that enable them to be more productive during their worklives. Thus, one must be cautious in describing the influence of children on household savings. The presence of children may induce the family to reduce its savings in the form of physical assets and bank accounts while it is increasing its investment in the human capital of the children.

Schultz estimated that the stock of education embodied in the labor force rose by 8.5 times from 1900 to 1956, compared to an increase of 4.5 times for reproducible capital.[17] Growth in national income is a function of physical capital accumulation and changes in its productivity, increases in per capita human capital, and changes in the aggregate stock of human capital due to population changes. Selowsky estimated that for the United States, improvements in the average level of educational attainment accounted for 0.52 percent of the annual growth rate between 1940-1965. Maintaining the same per capita educational levels with population growth contributed 0.33 percent to the rate of growth of national income.[18] Therefore, all public and private expenditures on children should not be allocated to consumption, but instead should include a definite investment component.

Kelley has argued that expenditures on children need not be substitutes for family savings, but may represent a reordering of the family consumption pattern. In addition, the presence of children may induce different patterns of market work (more or less) and might encourge the accumulation of assets, that is, add a bequest goal to the

family objective function. He concludes that "hard evidence on the relationship between family size and household savings is almost nonexistent."[19] Household decisions about the number and quality of children and the consumption of other commodities have been analyzed in a utility framework by Becker and Lewis. Their model shows the interactive nature of family decisions about family size and levels of consumption.[20] Thus, the influence of children on family savings in both human and physical assets is not certain.

## POPULATION AGE-STRUCTURE AND GOVERNMENT SPENDING ON DEPENDENTS

To examine the aggregate influence of alternative levels of population growth and the implied dependency burden, we employ age structure data developed by Coale and Demeny for a stable population of males exhibiting Western mortality rates. Five rates of population growth are shown in Table 11-1, along with the resulting age structure. Defining the labor force as 20-64, the proportion of the population in this agegroup is at its highest for a stable or slightly declining population. For a zero population growth rate, 57.43 percent of the population is in the working years while 15.95 percent would be retired and 26.63 percent were young dependents. By comparison, a nation growing at 2 percent per year has only 50 percent of its population in the labor force with 43 percent below age 20 and 7 percent age 65 and over.

Individuals outside the arbitrarily defined working ages are assigned to a dependent status presumably because they are adding to consumption but are not contributing to production. We must recognize that participation in the labor force is an individual decision, therefore not all those of working age will be in the labor force, while the entirety of those of dependent ages will not refrain from market participation. In addition, why should we call aged individuals dependents when they are living on the income from the assets that they have accumulated? Are those who have chosen to continue to invest in human capital formation dependents?

The conclusion of an increasing "dependency burden" with higher rates of population growth would seem obvious upon examination of Table 11-1. Two points, however, should be stressed: first, the reduction in the dependency ratio with decreased population growth is sensitive to the age of entry into the labor force and the retirement from it; and second, expenditures on young and old dependents might have a differential impact on the economy. Table 11-2 shows that if the age of entry into the labor force is lowered to 15, the difference between the proportion of the population in the labor force in the no-growth popula-

**Table 11-1. Rate of Population Growth and Age Structure**

| | *Rate of Growth in Stable Population (percent)* | | | | |
|---|---|---|---|---|---|
| *Percent in Age Group* | *−0.5* | *0* | *0.5* | *1* | *2* |
| 0-14 | 16.99 | 19.99 | 23.20 | 26.60 | 33.73 |
| 15-19 | 5.94 | 6.64 | 7.33 | 7.99 | 9.14 |
| 20-54 | 45.08 | 45.62 | 45.66 | 45.22 | 43.07 |
| 55-59 | 6.64 | 6.09 | 5.50 | 4.91 | 3.76 |
| 60-64 | 6.40 | 5.72 | 5.04 | 4.39 | 3.20 |
| 65-69 | 5.91 | 5.15 | 4.43 | 3.76 | 2.61 |
| 65 and over | 18.95 | 15.95 | 13.26 | 10.89 | 7.10 |
| 20-64 | 58.12 | 57.43 | 56.20 | 54.52 | 50.03 |
| 20-69 | 64.13 | 62.58 | 60.63 | 59.28 | 52.64 |
| 18-64 | 60.50 | 60.09 | 59.13 | 57.72 | 51.85 |

Source: A.J. Coale and Paul Demeny, *Regional Model Life Tables and Stable Populations* (Princeton, 1966), p. 168.

**Table 11-2. Age Structure and Population Growth**

| *Rate* | *Percent of Total Population Aged:* | | | | | | |
|---|---|---|---|---|---|---|---|
| *of Growth* | *20-64* | *20-59* | *20-54* | *20-69* | *15-64* | *15-59* | *15-54* |
| −0.5 | 58.12 | 51.72 | 45.08 | 64.13 | 64.06 | 57.66 | 51.02 |
| 0 | 57.43 | 51.71 | 45.62 | 62.58 | 64.07 | 58.35 | 52.26 |
| 0.5 | 56.20 | 51.16 | 45.66 | 60.63 | 63.53 | 58.49 | 52.99 |
| 1.0 | 54.52 | 49.48 | 44.57 | 59.28 | 62.51 | 57.47 | 52.56 |
| 2.0 | 50.03 | 48.83 | 43.07 | 52.64 | 59.17 | 55.97 | 52.21 |

Source: Table 11-1.

tion and one that is increasing is significantly narrowed. A decline in age of withdrawal from the labor force has a similar effect. For example, if the labor force is defined as the population 15-54, there is virtually no difference in the total dependency ratios for annual growth rates between 0 and 2 percent. This sensitivity of the relative size of the working-age population with changes in the ages of entry and retirement imply that generalizations about population growth and dependency ratios must be made with considerable caution. With economic development, two of the dominant labor-force participation trends are earlier retirement and later entry into the labor force. As previously stated, these patterns of labor supply exert conflicting pressures on the relative size of the dependent populations under alternative fertility assumptions.

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| *1* | *2* |
| 26.60 | 33.73 |
| 7.99 | 9.14 |
| 45.22 | 43.07 |
| 4.91 | 3.76 |
| 4.39 | 3.20 |
| 3.76 | 2.61 |
| 10.89 | 7.10 |
| 54.52 | 50.03 |
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| Aged: | | |
|---|---|---|
| *5-64* | *15-59* | *15-54* |
| 4.06 | 57.66 | 51.02 |
| 4.07 | 58.35 | 52.26 |
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The composition of the dependent population must also be examined if the impacts of changing age structures are to be related to national and per capita income. Let us once again define the labor force to be composed of individuals 20-64, with the remaining agegroups classified as dependents. The proportion of all dependents who are below the age of entry into labor varies directly with the population growth rate, as follows:

The changing composition of the dependent population raises the following two questions: (1) Is the cost of maintaining young dependents the same as that for older ones? (2) Are the public and private costs of supporting the two groups of the same nature? If the costs of supporting an older dependent is greater than that of maintaining children, the burden of dependency costs with increasing population growth rates may be reversed. Using U.S. data, Clark and Spengler have estimated that the annual public cost of supporting an older dependent is three times that of a youth; however, greater intrafamily transfers are usually made to children.[21] We can incorporate the higher costs of supporting the elderly to estimate an adjusted dependency burden in the following manner: let $X$ represent the cost of supporting a child, and $\alpha X$ the cost of maintaining an older dependent. Then the adjusted dependency burden is $X + \alpha X$. A higher support cost of as low as 50 percent is sufficient to reverse the pattern of increased dependency burden with population growth. Of course these ratios are also sensitive to the definition of the working age population:

In addition to the differences in the level of transfers to the two groups, the very nature of the spending may be different. We have previously argued that to a significant degree the expenditures on children represents investment in human capital formation, while transfers to the elderly are more likely to be for current consumption. Thus, in a rapidly growing population, more of the dependency costs will be for investment than in a no-growth society.

This analysis leads one to conclude that researchers should not look only at dependency ratios based on a single definition of the labor force to assess the impact of population growth on the ability of an economy to generate investment and thus influence the capital-labor ratio and per capita income. I have attempted to illustrate several critical variables that must be considered in examining population growth and economic development, including sensitivity to the age boundaries of the labor force, cost of young versus old dependents, and the investment component of expenditures for youths. Shifts in the population

age structure will also influence economic growth due to differential patterns of savings, productivity, and earnings over the life cycle.

* * *

I would like to contribute one final comment as it pertains to a statement about mobility of the dual career family. Rogers writes that "economic development stimulates the labor-force participation of wives, and working wives reduce the ease with which couples can relocate." While the few existing studies provide weak support of this hypothesis,[22] and my intuition is to concur, I remain unconvinced that this is necessarily the direction of causation, and certainly the theoretical result is ambiguous. For example, the typical unskilled worker who migrates quits his job in one city, and following relocation, searches for new employment in the new region. Presumably the worker was responding to wage differentials in the two locations. If the same family has two earners, the gain from such a move will be greater upon the reemployment of both workers. Of course, costs have also risen with higher family opportunity costs due to foregone earnings.

Professional workers more frequently already have new jobs prior to relocation. Thus, if both earners are professionals, mobility may be hindered by the need to secure two jobs. However, upward mobility in a corporate society is dependent on willingness of individuals to move to various locations as they progress up the business hierarchy. Therefore, the existence of two such workers in a single family may increase the frequency of opportunities for the family to transfer while one member receives a promotion in the same firm and the other searches for new employment. The most significant result of the increasing incidence of dual career families as it relates to Roger's paper may be the tendency of such families to locate in major metropolitan areas where job opportunities are more diverse and more suitable to accommodate two workers from the same family.

## NOTES

1. Larry Sjaastad, "The Costs and Returns of Human Migration." *Journal of Political Economy Supplement* (October 1962).

2. Expected earnings are a function not only of the prevailing wage rate but also the probability of obtaining employment. See, for example, M.P. Todaro, "A Model of Labor Migration and Urban Unemployment in Less Developed Countries," *American Economic Review* (March 1969), pp. 139-48.

3. For developing countries, see Gian Sahota, "An Economic Analysis of Internal Migration in Brazil," *Journal of Political Economy* (March/April

1968); T. Paul Schultz, "Rural-Urban Migration in Colombia," *Review of Economics and Statistics* (May 1971); Ralph Beals, Mildred Levy, and Leon Moses, "Rationality and Migration in Ghana," *Review of Economics and Statistics* (November 1967); and Michael Greenwood, "A Regression Analysis of Migration to Urban Areas of a Less-Developed Country: The Case of India," *Journal of Regional Science* (August 1971).

4. L.C. Thurow, *Investment in Human Capital* (Belmont, Calif.: Wadsworth, 1970), p. 33.

5. Michael Greenwood, "Research on Internal Migration in the United States: A Survey," *Journal of Economic Literature* (June 1975), p. 421.

6. J.V. Henderson, "Optimum City Size: The External Diseconomy Question," *Journal of Political Economy* (March/April 1974).

7. David Segal, "Are There Returns to Scale in City Size?" *Review of Economics and Statistics* (August 1976).

8. Gerald Goldstein and Leon Moses, "A Survey of Urban Economics," *Journal of Economic Literature* (June 1973), p. 471.

9. Greenwood, op. cit., p. 417.

10. Simon Kuznets, *Modern Economic Growth* (New Haven: Yale University Press, 1966), p. 60.

11. L. Yap, "Internal Migration and Economic Development in Brazil," *Quarterly Journal of Economics* (February 1976).

12. Joseph Spengler, "The Population Obstacle to Economic Betterment," *American Economic Review* (May 1951), p. 354.

13. Kuznets, op. cit., p. 67.

14. Discussion of paper by Goran Ohlin, "Economic Theory Confronts Population Growth," in Ansley Coale, ed., *Economic Factors in Population Growth* (New York: Wiley, 1976), p. 22.

15. Alfred Sauvy, "The Optimal Change of a Population," in ibid., pp. 68-69.

16. Joseph Spengler, "Economic Implications of Low Fertility," presented to the Conference on Social, Economic and Health Aspects of Low Fertility, sponsored by the World Health Organization and National Institutes for Health, March 1977.

17. T.W. Schultz, "Investment in Human Capital," *American Economic Review* (March 1961), p. 11.

18. Marcelo Selowsky, "On the Measurement of Education's Contribution to Growth," *Quarterly Journal of Economics* (1969), pp. 449-63.

19. Allen Kelley, "The Role of Population in Models of Economic Growth," *American Economic Review* (May 1974), p. 41.

20. Gary Becker and Gregg Lewis, "On the Interaction between Quantity and Quality of Children," *Journal of Political Economy* (March-April, 1973), Part II, pp. S279-88.

21. Robert Clark and Joseph Spengler, "Changing Demography and Dependency Costs: The Implications of New Dependency Ratios and Their Composition," presented to *Support for the Aged: Policy Options and Research Needs*, a conference sponsored by the Gerontological Society, April 1976; and Robert Clark, "The Influence of Low Fertility Rates and Retirement Policy on Dependency Costs," prepared for the American Institutes for Research in the Behavioral Sciences, July 1976.

22. Larry Long, "Women's Labor Force Participation and the Residential Mobility of Families," *Social Forces* (March 1974). In examining data from the United States, Long finds increased intracounty mobility but decreased interstate mobility when the wife works. However, he finds that "a working wife thus appears to have little effect on her husband's long-distance migration in the early years of his career—the years when long-distance migration is most likely to occur." (p. 346).

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*Chapter Twelve*

# Discussion of "Migration, Urbanization, Resources, and Development," by Andrei Rogers

William J. Serow

As a discussant, one is usually faced with the choice of carefully reviewing the major paper for one of two primary reasons: (1) to unearth relatively minor details for purposes of not necessarily constructive criticism; or (2) to find points that permit further elaboration or extension of the major paper. This paper reflects the second approach, and may be viewed as an extension of Dr. Rogers's fine paper in that it focuses on issues relating to rural development and some of the policy implications for this sort of development.

As the title indicates, the paper initially views issues of rural development from a demographic perspective, treating separately the questions of fertility and migration. The aim in doing so is to preserve the notion of demographic transition, with its separate natural increase and mobility components, as outlined previously by Dr. Rogers.

## FERTILITY

It is a demographic axiom that fertility in rural areas will, as a rule, exceed that of urban areas. Because of a paucity of reliable fertility data in most portions of the Third World, one is forced to seek confirmation of this assertation by examination of relatively crude measures such as the child-woman ratio. While this is a far from perfect measure,[1] it is about the only tool available for our purposes. It is certainly clear from the imperfect and far from complete data in Table 12-1 that fertility among both the rural and urban residents of developed countries is substantially lower than that in developing countries. Continuing high

fertility in the rural portions of developing countries will only continue to add, as Dr. Rogers has suggested, to continued population growth in urban areas through inmigration from rural areas in search of employment opportunities. These rural dwellers swell the urban population both directly (through their inmigration) and indirectly[2] (through reproduction).

As a consequence, declines in rural fertility will enhance development by reducing population pressure in both the rural and urban portions of a country. The mere fact of population growth, it might be argued, aids as a deterrent to economic and technological advance, simply because it requires a larger share of investible resources to be devoted to equipping the new entrants to the labor force (that is, maintaining a constant capital-labor ratio), rather than increasing the amount and quality of capital available per worker.[3] Additionally, a high rate of population growth necessarily implies a very large share of young dependents in the population. Not only do these persons consume but not produce (thus decreasing the share of total income that can be saved), but given current levels of infant mortality, many of them will die prior to reaching labor-force age.

Perhaps the major question that has confounded persons interested in the roll of population growth in the development process is whether reduced population growth is a precondition to economic development, or vice versa. This latter concept is perhaps best stated by Kingsley Davis,[4] who forcefully argues that family planning programs per se (that is, programs aimed at reducing population growth on the assumption that this will enhance development) ignore entirely the motives of individuals regarding their own reproductive behavior. Thus, a successful family planning program will allow the individual to attain desired family size but, according to Davis, this size may well be consistent with fairly high rates of population growth.

Economic development, therefore, might be supposed to reduce fertility, by affecting the motivations of individuals to reproduce. Consider some of the possible motivations for desiring a fairly large family in a developing society: the additional social pressure to insure a male heir; the need for old-age security; and the supply of relatively inexpensive labor to assist in cultivating the family holding. The process of economic development is likely to mitigate all of these pressures to some extent. Along with economic development is likely to come a sharp decline in infant mortality; as this ensues (given time for recognition of this change), fertility will decline, simply because fewer children will be required to ensure the survival of a male child to adulthood. This factor, along with the growth and development of some sort of social welfare system, should also mitigate the old-age security issue. Finally, if improvements in agricultural technology are

sufficiently diffused, the need for additional farm labor becomes proportionally less.

As the situation stands at present, it is frequently argued that the marginal productivity of farm labor in many developing countries approximates zero, and this fact alone contributes substantially to rural-urban migration in these nations. This might make the rural sector better off in the sense that their own output might be shared by fewer persons (or, at least, that per capita income or consumption would rise), but—as Todaro has demonstrated—not have much effect on the well-being of the migrant, given the possibility of a low probability of finding employment. Indeed, Todaro suggests that it is difficult to reduce substantially "the size of the urban traditional sector without a concentrated effort at making rural life more attractive."[5] One means of doing this is to allocate capital funds for improving rural amenities, thus increasing the real income of rural residents relative to urban residents, and reducing the relative strength of the rural push or urban pull.

The role that improvements in income or other measures of well-being actually have on reproductive ideals and performance is another topic that has been the subject of considerable debate among scholars over the past decade. While time and space do not permit an analysis of the differences between the so-called Becker and Easterlin "schools" of the economic determinants of fertility, a recent study by Sanderson concludes that agreement on two major points (role of bequests or expenditures per child as fertility determinants, and the role of intergenerational perceptions of income as a determinant of fertility) has been reached.[6] In other words, according to Sanderson, "It is possible to entertain both the hypothesis that parents' aspirations for their own standard of living and bequests for their children depend, in part, on their background and the hypothesis that the parents' aspirations for their children's standard of living as well as their own depend, in part, on their current income."[7]

Through what might be termed a critical minimum effort thesis, it may be alleged that fertility will decline as development progresses. The United Nations describes this hypothesis as follows: "In a developing country where fertility is initially high, improving economic and social conditions are likely to have little if any effect until a certain economic and social level is reached; but once that level is achieved, fertility is likely to enter a decided decline and to continue downward until it is again stabilized in a much lower plane."[8]

This hypothesis suggests that a minimum threshold of development must be attained as a precondition to fertility diminution and the subsequent reduction of population growth rates, in the manner of the natural increase component of the demographic transition described previously by Dr. Rogers.

An important addendum to this hypothesis has recently been advanced by Kocher,[9] who suggests that a wide diffusion of rural development and equality in the distribution of the development process and its benefits will lead to more rapid modernization among a relatively larger share of the rural population, which will lead to a more widespread desire for smaller families and earlier, more rapid, and sustained declines in fertility. The overall framework is outlined by Kocher as follows:[10]

1. Population growth, whatever the level, is not an obstacle to growth of per capita agricultural output.
2. In most developing countries, new agricultural technology is a precondition for agricultural growth and development.
3. The degree to which diffusion of technology and other developmental processes will be widespread depends on government policies and domestic institutions.
4. If these diffusions are widely diffused so that the distribution of the benefits of development is fairly widespread, the standard of living will rise and a more modern life-style will be adopted by a majority of the rural population. Based on the reasoning of the economics of fertility outlined above, this will cause an increase in parents' aspirations for themselves and their children, which should lower desired family size. It is at this point that an effective family program can hasten and facilitate a spontaneous decline in fertility.
5. Finally, if the diffusion of innovation is limited by institutions, policies, or both, then a dualistic pattern of rural development will ensue, with the bulk of developmental efforts being shared by a privileged few, while the majority of rural dwellers will continue their traditional mode of life.

If the diffusion of rural development is not widespread, then there is no incentive for the disenchanted rural resident to remain at home. Hence, nondiffused rural development only adds to the rural-urban migration movement.

## MIGRATION

As noted above, rural-to-urban migration customarily occurs because of some combination of what demographers call push and pull forces. As Everett Lee has described it: "In every area there are countless factors which act to hold people within the area or attract people to it, and there are others which tend to repel them."[11] These factors vary with

individuals, but each weighs the positive and negative factors of the current place of residence vis-á-vis those of competing places of residence and, theoretically, decides: (1) whether to move; and if so (2) to which competing area.

For the case of developing countries the rural resident will be faced with a substantial (and probably growing) differential in urban-rural income (pull), and the prospect of little advance in economic status within the rural community (push). Even given the low probability of employment in the urban area, the individual might decide that, from a private perspective, the benefits of migration outweigh the costs. From the viewpoint of society, however, the public costs of this migration might well outweigh the public benefits.[12] A substantial portion of the cost was alleviated in the past through emigration,[13] but for presently developing countries such a mechanism has effectively ceased to operate.

It has proved somewhat difficult to measure private and public costs and benefits of internal rural-urban migration in developing countries. Yap, in her review of the literature on the subject, finds that "though there is a wide variation in the quality of the jobs obtained, migrants seem to receive higher incomes in their destination than in their place of origin."[14] On the other hand, a summary report by the National Academy of Sciences notes that studies usually indicate that the costs of providing jobs for rural-urban migrants in developing countries are so high that it is better (from a cost-benefit point of view) to reduce drastically the volume of rural-urban migration and make all possible efforts to keep prospective migrants in their (rural) place of origin. However, the Academy notes that while "it is difficult to argue with the arithmetic of these studies . . . it can be asked if they are attuned to the reality of the situation. A similar study in the period of intense urbanization of now developed countries would probably have yielded the same conclusions."[15]

Rural-urban migration, then, might be a phenomenon which is an integral part of the development process.[16] As such, the question that might appropriately be asked is not whether steps should be taken to curb this flow, but rather, Should it (and how should it) be rechannelled? It should be noted that some claim that developing countries are presently "overurbanized." Abu-Lughod summarizes the argument:

> Many students of urbanization have suggested that countries in the early stages of industrialization suffer an imbalance in both the size and distribution of their urban populations, implying primarily that they have a higher percentage of people living in cities and towns than is "warranted" at their state of economic development.[17]

Although this thesis, at least that portion dealing with the size of the urban population, has been refuted by Sovani,[18] Kamerschen,[19] and others, there remains the question of the maldistribution of the urban population and the possible need to rechannel its growth.

## RESOURCES AND RURAL DEVELOPMENT

The urban pattern of most developing nations can be best characterized as that of the "primate city," that is, one which is overwhelmingly large in comparison with all other cities in the country "Commonly, within developing countries there is no hierarchy of cities of various sizes such as that found in developed nations, and primate cities most frequently occur in countries with relatively low overall levels of urbanization."[20] Hoselitz notes that such a system may be all that most developing countries are capable of supporting, but that the system of the primate city has harmful overall effects for several reasons: (1) the depletion of valuable personnel from rural areas; (2) the consumption of nearly all investment monies; (3) the subsequent prevention of the development of other urban areas; and (4) a tendency toward relatively high consumption and relatively low production.[21] While in the course of urbanization the development of an urban hierarchy in developing countries is probably inevitable, much can be done to shape the mode of this new urban development.

The logical means for this planned pattern of urban development is to concentrate resource allocation in the presently rural sector, on the theory that economic change in the rural sector will eventually create a demand for urban-type development through specialization of labor and increased demand for services. As Dr. Rogers notes in his paper, this state of urban development customarily comes at a relatively late stage in economic development—indeed, as he notes, it seems to be presently occurring in the United States.

In order for such a program to succeed, it would seem that rural development efforts, while based on agriculture, must go beyond this into rural multisectional development. An example of this approach is that presently taken by the World Bank, in what they term integrated rural development projects. The ultimate aim is to improve the standard of living of rural residents by improving their productivity, usually by introduction and expansion of technological change at the micro level. In order to accomplish this, the World Bank believes that three basic conditions must be met:[22] (1) producers must know how to increase their output; (2) they must have access to the means of increasing their output; and (3) they must have the incentive to make the effort and accept the risk associated with increasing their output. In

order to facilitate this process, bank projects are concentrated on effective means of delivering to farmers all necessary goods and services. This includes not only capital inputs, but also such infrastructural items as irrigation and transportation. While such a venture may prove relatively costly in the short run, the long-run effects are likely to see a balanced growth and development of rural and urban areas, with a true urban hierarchy developed to service the needs of all residents. This is a requirement in many developed, as well as developing, countries.[23] The latter, however, have the opportunity of coping with, and shaping their future, in a manner that will reflect and avoid the mistakes made by now developed countries at similar stages of their development.

## NOTES

1. "The Child-woman ratio is an imperfect tool for the study of fertility differentials, as it is affected by differential infant and child mortality as well as by differential completeness of enumeration of the child population. More particularly, when used to study differences between urban and rural fertility, the ratio may also distort the rural-urban fertility differential because of age-selective migration from rural to urban areas." United Nations, *The Determinants and Consequences of Population Trends* (New York, 1973), p. 97.

2. This twofold contribution is made clear in William J. Serow, "The Potential Demographic Impact of Migration, *Review of Regional Studies* (Fall 1974), pp. 16-28; and Campbell Gibson, "The Contribution of Immigration to the United States Population Growth: 1790-1970," *International Migration Review* (Summer 1975), pp. 157-77.

3. See Joseph J. Spengler, "Agricultural Development Is Not Enough," in *World Population—The View Ahead*, ed. R. N. Farmer, J. D. Long, and G. J. Stolnitz (Bloomington: Indiana University, 1968), pp. 104-26.

4. Kingsley Davis, "Population Policy: Will Current Programs Succeed?" *Science*, November 10, 1967, pp. 730-39.

5. Michael P. Todaro, "A Model of Labor Migration and Urban Unemployment in Less Developed Countries," *American Economic Review* (March 1969), p. 147.

6. Gary Becker and Nigel Tomes, "Child Endowments and the Quantity and Quality of Children," *Journal of Political Economy* (August 1976), pp. S143-62; and Richard A. Easterlin, "Population Change and Farm Settlement in the Northern United States," *Journal of Economic History* (March 1976), pp. 45-75.

7. Warren C. Sanderson, "On the Two Schools of the Economics of Fertility," *Population and Development Review* (Sept.-Dec. 1976), p. 474.

8. United Nations, "Conditions and Trends of Fertility in the World," Population Bulletin No. 7 (1963), p. 143.

9. James E. Kocher, *Rural Development, Income Distribution and Fertility Decline* (New York: The Population Council, 1973), p. 143.

10. Ibid., pp. 56-57.

11. Everett S. Lee, "A Theory of Migration," *Demography* (1966), p. 50.

12. This distinction stems from Larry A. Sjaastad, "The Costs and Returns of Human Migration," *Journal of Political Economy* (October 1962) (Supplement), pp. 80-93.

13. The particularly interesting case of emigration from Ireland as an alternative to rural-urban internal migration is analyzed in Robert E. Kennedy, Jr., *The Irish: Emigration, Marriage, and Fertility* (Berkeley: University of California Press, 1973).

14. Lorene Y. L. Yap, *Internal Migration in Less Developed Countries: A Survey of the Literature*, International Bank for Reconstruction and Development Staff Working Paper No. 215 (Washington, 1975), p. 25.

15. National Academy of Sciences, *Rapid Population Growth*, Vol. 1: *Conclusions and Policy Implications* (Baltimore: Johns Hopkins Press, 1971), p. 46.

16. This is probably true not only for nations as a whole (witness the Industrial Revolution), but also for segments of national populations that are relatively disadvantaged. For a discussion of this phenomenon among an economically disadvantaged group in the United States, see Calvin L. Beale, "Rural-Urban Migration of Blacks: Past and Future," *American Journal of Agricultural Economics* (May 1971), pp. 302-307.

17. Janet L. Abu-Lughod, "Urbanization in Egypt: Present State and Future Prospects," *Economic Development and Cultural Change* (April 1965), p. 313.

18. N. V. Sovani, "The Analysis of Over-urbanization," *Economic Development and Cultural Change* (January 1964), pp. 113-22.

19. David R. Kamerschen, "Further Analysis of Over-urbanization," *Economic Development and Cultural Change* (January 1969), pp. 235-53.

20. J. John Palen, *The Urban World* (New York: McGraw-Hill, 1975), p. 328.

21. Bert F. Hoselitz,"The City, the Factory, and Economic Growth," *American Economic Review* (May 1955), pp. 166-84, cited in ibid., p. 331.

22. Montague Yudelman, "Integrated Rural Development Projects: The Bank's Experience," *Finance and Development* (March 1977), pp. 16-17.

23. The need for such rural development in the United States is spelled out in Luther Tweeten and George L. Brinkman, *Micropolitan Development: Theory and Practice of Greater-Rural Economic Development* (Ames: Iowa State University Press, 1976).

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