Consequences of Rapid Population Growth: An Overview and Assessment

Geoffrey McNicoll

Population and Development Review, Volume 10, Issue 2 (Jun., 1984), 177-240.

Consequences of Rapid Population Growth: An Overview and Assessment

Geoffrey McNicoll

In the continuing spate of attention to population issues in social science research, the subject of the consequences of population growth, the main reason for that attention in the first place, receives much less than its due. As global drama, the modern scale and pace of demographic expansion may not equal the short-run spectacle of political or technological change, but their significance for the future of human society both within and among nations is at least as great and a good deal more calculable.

Why then the neglect? Several answers suggest themselves. First, the subject is not quite part of demography proper, but falls into a diverse array of neighboring fields concerned with understanding social, economic, and environmental change. Population specialists have no comparative advantage in these matters. Added to this is a lingering taint to the subject in intellectual circles, traceable perhaps to the earlier eugenics literature and reinforced by reactions to "population bomb" writers of the 1960s. Once a rationale was established for efforts to moderate the pace of population growth, the less said about consequences, it may have seemed, the better.

Second, modern theoretical developments in both demography and economic growth theory paid little heed to considerations of absolute size of population and product. Stable population theory and much of mainline neoclassical growth theory are effectively scale-neutral. There was little systematic theoretical substructure to support consequences studies.

Third, despite this theoretical weakness, there was a casual assumption by many that early efforts to model economic-demographic relationships had wrapped up the subject, demonstrating to general satisfaction the net adverse results of rapid population growth for the development effort, and more broadly for social welfare, in most poor countries. Institutionalized support for national antinatalist policies, established on this basis, thereupon directed research at-

tention and funding to the determinants side of population growth and in particular to the operational problems of birth control programs.

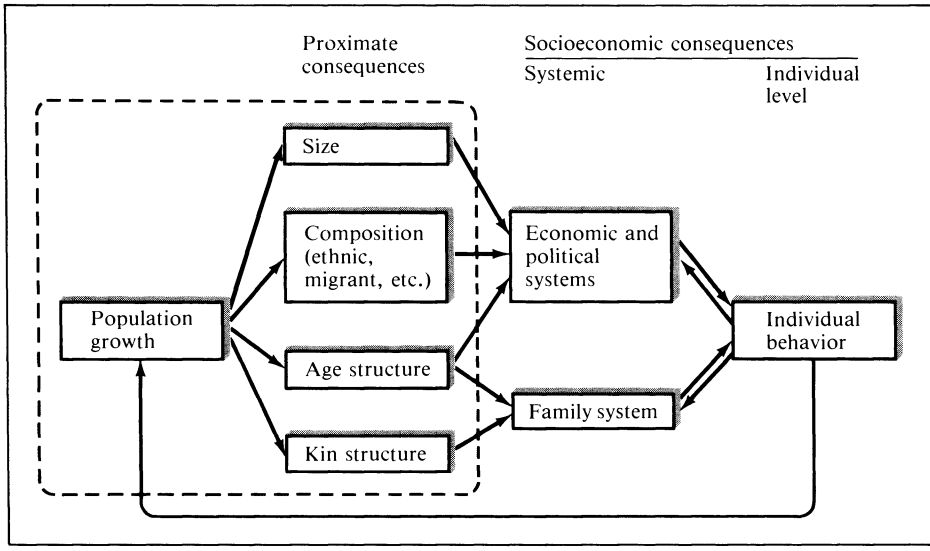
The assumption that the various studies of the consequences problem have cumulatively settled the matter might be plausible were there a reasonable consensus on where the balance of growth consequences lies. Such a consensus probably did exist in the 1960s, but is much less evident today. In the last decade a revisionist stream of thought has emerged that seems to cast doubt on the previous orthodoxy: rapid population growth, according to scholars of this persuasion, is often a neutral and can even be a positive factor in development. Hence the odd current situation of fundamental disagreement about the net impact of one of the most profound changes in social circumstances in the modern world—a disagreement founded, moreover, not in variant political or philosophical premises but in economic modeling and in readings of the empirical record.

It might be argued that little now hinges on resolution of this argument. The declining fertility trends evident through large parts of the Third World give apparent grounds for belief that the issue is retreating in practical significance. But these grounds are anything but solid. United Nations medium variant projections that foresee the world population growth rate falling steadily by nearly one-half over the next four decades (with birth rates in the Middle East and Africa, for instance, dropping by a third) are based on little more than heroic extrapolation and hope. Even these projections, moreover, show world population increments of between 80 and 90 million each year until after 2020 and a total population above 10 billion, more than double the present size, a century hence (United Nations, 1981, 1983). Clearly, understanding the consequences of such growth is of more than academic interest.

The present article seeks to provide both a review of the subject in terms of conventionally identified population growth effects (on savings, technology, employment, and so on) and a sense of perspective that can permit overall judgments to be made. The latter calls for an attempt to distinguish first-order effects from the remainder and for tying the analysis closely to salient differences among societies in resource endowments and institutional arrangements and capacities. The paper has five main parts: (1) a survey of the demography of rapid population growth in terms of the proximate (demographic) factors through which effects on the wider economy and society make themselves felt; a discussion of how these factors impinge on (2) the economy and (3) social and political organization, at various levels of the social system; (4) an examination of the resulting impact on individual economic and demographic behavior and assessment of its distributional consequences; and (5) a discussion of the normative dimensions of these changes—what can be said about their desirability or otherwise under given welfare premises.

The simple analytical scheme loosely underlying the paper is set out in Figure 1. Population growth effects at the individual level are contingent on existing institutional forms and dynamics—the variety of which, as Kuznets

FIGURE 1 Analysis of population growth consequences



(1966a: 308) notes, bars "any invariant and significant direct effects of population increase on the rate of economic growth." Some of these institutions are comparatively stable over time; others are themselves modified by population growth and by the technological change that typically accompanies it. Over time, induced changes in individual behavior can in turn give rise to new institutional arrangements in the socioeconomic and family systems. Attempts to isolate a simple analytical economics of population growth are a valid way to seek insights on specific economic-demographic relationships, but are likely to be seriously misleading if aspiring to comprehensiveness.

The demography of rapid population growth

By rough analogy with recent work on the proximate determinants of fertility, mortality, and family composition (Bongaarts and Potter, 1983; Mosley and Chen, in press; Bongaarts, 1983), it is possible to define "proximate consequences" of population growth: that is, factors within the demographic domain through changes in which, and only through changes in which, population growth can affect the broader socioeconomic system. The analogy, of course, is by no means complete; in particular, the neat factorization into conceptually independent proximate components that has proven so valuable in the fertility case does not have a simple consequences analogue.

The two most obvious and significant proximate factors are of course aggregate population size and age structure. A third, more subtle factor is kin structure—the relative frequencies of particular kinship relations (by birth or

marriage) in the population. In each of these cases we are interested in the absolute change in the factor, the pace of change, and departures from uniformity of change in the population. The same categories should be able to be applied to growth resulting from net migration as to growth from net reproduction, and to comparisons across populations (or with a hypothetical standard such as a stationary population) as well as to growth over time in a given population.

To reach closure in defining proximate consequences of population growth, we need similar closure on the admissible characteristics of an individual that are to enter the description of the population. A strict construction of demography would limit these characteristics to age, sex, and marital status. In that case, the three factors noted above, together with the sex ratio, can be considered a full set of proximate consequences. If a native/immigrant or ethnic origin tag is included, this would make a fifth. While others could perhaps be added, these five are adequate for our purposes.

Size effects are the subject of the classical literature on the economics of population growth and also figure in more recent interests in environmental degradation and forms of social organization. Age structure effects have been the focus of "neoclassical" economic demography, under the influence both of neoclassical growth theory, with its emphasis on steady-state growth, and of stable population theory, with its interest in age distribution properties net of the intrinsic exponential growth component. They have major practical implications through their influence on dependency burdens and intergenerational transfers. Kin structure effects, most of them comparatively much less studied, are crucial in defining the family-level context of economic-demographic behavior, in influencing household size and composition, and in determining generational overlap. Sex ratio effects, in contrast to these first three, are probably of little importance in the normal course of demographic transition. They would mainly arise in situations of growth by migration, where sex selectivity is usual. For the most part the discussion below will ignore them, as does (for simplicity) Figure 1. Finally, both migrant effects (here referring to movement across national frontiers) and effects of changes in ethnic makeup of the population (or in relative sizes of groups defined by other cultural or linguistic attributes) should obviously figure heavily in any discussion of growth consequences. Although conceptually distinct, there are enough similarities between ethnic and migrant effects for the two to be treated together.

This loose classification of proximate consequences can be used to organize a brief account of the demography of rapid population growth, looking both at actual demographic experience and at theoretical relationships using simple simulation models.

Population size

Among nations in the contemporary world, "rapid" population growth connotes annual increases in the neighborhood of 2 percent or more.The highest

growth rate (Kenya's) was just over 4 percent per year around 1980. India and Indonesia, with growth rates close to 2 percent, would still be classed as rapid; China, with a rate of 1.3 percent (1981), would not.

The size implications of geometric growth are most simply captured by the familiar translation into doubling times: 2 percent per year doubles in 35 years, 3 percent in 23 years, 4 percent in 17 years. The rapid-growth countries thus are increasing at rates that roughly double their populations in a generation. Constant geometric growth is of course not characteristic of any biological population. Trends and fluctuations are introduced both by exogenous forces acting on the three components of growth—fertility, mortality, migration—and by feedback responses to particular growth consequences. In addition, the time lag between birth and the ages of reproduction can accentuate any departures from uniform growth by giving rise to generational echoes of one-time shifts in vital rates.

Particular interest in the present study attaches to the growth consequences of the demographic transition from high to low birth and death rates. In the course of this transition mortality improvements have typically outpaced declines in fertility, resulting for a time in substantially higher rates of natural increase than historical average levels. In Sweden, for example, the rate of natural increase averaged 0.6 percent per year in 1750–1800; as mortality began a slow secular decline in the nineteenth century it edged up to 0.8 percent in 1800–1850 and 1.2 percent in 1850–1900; then, with fertility rapidly falling in the present century but mortality leveling out, natural increase diminished to 0.7 percent in 1900–1950 and 0.4 percent in 1950–80 (Hofsten and Lundstrom, 1976; United Nations, 1981). Most other now-developed countries have demographic histories, aside from migration, that are variants of this pattern. However, with few exceptions (the chief one being the United States), natural increase at its most rapid was below 1.5 percent per year. Over a lengthy transition the aggregate growth of population could still of course be substantial—for example, a 2.2-fold increase in Sweden between 1820 and 1930, the period of the main decline in vital rates (and appreciably more if emigrants were included)—but the growth per generation was modest.

The contrast with contemporary developing countries is striking. If the transition there, beginning, say, around 1930, were to extend for a century (a plausible expectation in many cases), it is not a two- or threefold increase in population that would be witnessed, but rather a six- to tenfold. (Table 1 shows the projected scale of expansion for the eight largest developing countries.) Some modern transitions may of course turn out to be much shorter than this, with the rapid fall in mortality quickly followed by a similarly rapid fall in fertility, but there is as yet limited evidence that such shortening will be a widespread phenomenon. The current UN medium variant projections used in Table 1 embody the assumption of steady progress in fertility reduction over the next few decades until net reproduction reaches replacement level. Even if this assumption is borne out, India's growth rate is not projected to drop

below 1.5 percent until after 1995, Brazil's not until after 2005; Nigeria's projected population in 2025, over four times the 1980 size, would still be growing at 2.3 percent per year.

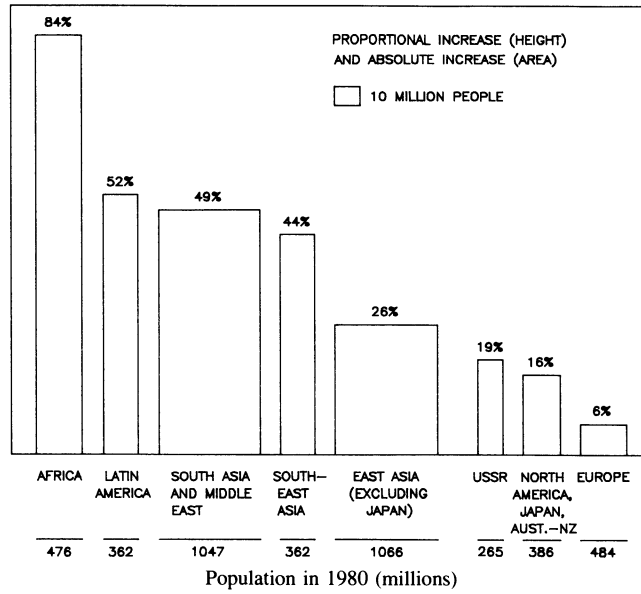
For broad regions of the world the forecast population growth in the period 1980–2000 is shown in Figure 2. The widths of the rectangles in this figure, updated from McNicoll and Nag (1982: 123), give the 1980 populations,

TABLE 1 Projected population increase over the period 1925–2025 and maximum rate of increase for the eight largest developing countries as of 1980

Country	Population (millions) 1925 (1)	Population (millions) 2025 (2)	Growth multiple (2)/(1) (3)	Maximum annual growth rate (percent) (4)
China	530	1460	3	2.6 (1965–70)
India	260	1189	5	2.5 (1960–65)
Indonesia	54	255	5	2.4 (1970–75)
Brazil	30	246	8	3.2 (1950–55)
Bangladesh	34	219	6	2.8 (1975–80)
Pakistan	22	213	10	3.1 (1980–85)
Nigeria	20	338	17	3.6 (1995–2000)
Mexico	15	154	10	3.3 (1965–70)

SOURCE: col. (1): McEvedy and Jones (1978); cols. (2), (4): United Nations (1983), medium variant projections.

FIGURE 2 World population in 1980 and expected increase, 1980–2000, by major region



SOURCE: United Nations (1983).

the heights the projected proportional increases. The areas, therefore, represent the projected absolute increases over these two decades. Africa and Europe both have 1980 populations slightly below half a billion. Africa, however, is projected to add 14 persons for each one added in Europe. Less striking but numerically more significant is the comparison between South Asia (here including the Middle East) and East Asia (excluding Japan), each with about a billion people in 1980. South Asia is still clearly a high-growth-rate region (a projected average annual increase of 2.0 percent over 1980–2000), while East Asia is not far from the growth rate of North America and the Soviet Union.

TABLE 2 Relative shares of selected countries and regions in the world population, 1950 and 1975, and projected shares to 2025 (percent)

Country/region	1950	1975	2000	2025
China	26.8	22.9	20.5	17.9
India	14.0	15.2	15.7	14.6
Africa	8.9	10.1	14.3	20.1
Latin America	6.6	7.9	9.0	9.6
Europe	15.6	11.6	8.4	6.4
USSR	7.2	6.2	5.1	4.5
USA	6.1	5.3	4.4	3.8
Rest of world	14.8	20.8	22.6	23.1
Total	100.0	100.0	100.0	100.0

SOURCE: Estimates and medium variant projections from UN 1982 assessment (United Nations, 1983).

What are the implications of these contrasting growth patterns for the relative demographic weights of major world regions? Taking the projections to 2025 (using the UN 1982 assessment), the shifting picture is set out in Table 2. The changing balance between East and South Asia, and between Europe and Africa, is very evident. These trends appear more dramatic in Figure 3 based on the World Bank's projections, which extend from 1980 to 2100 (see Demeny, 1984): here the percentage shares of world population at the endpoints are as follows:

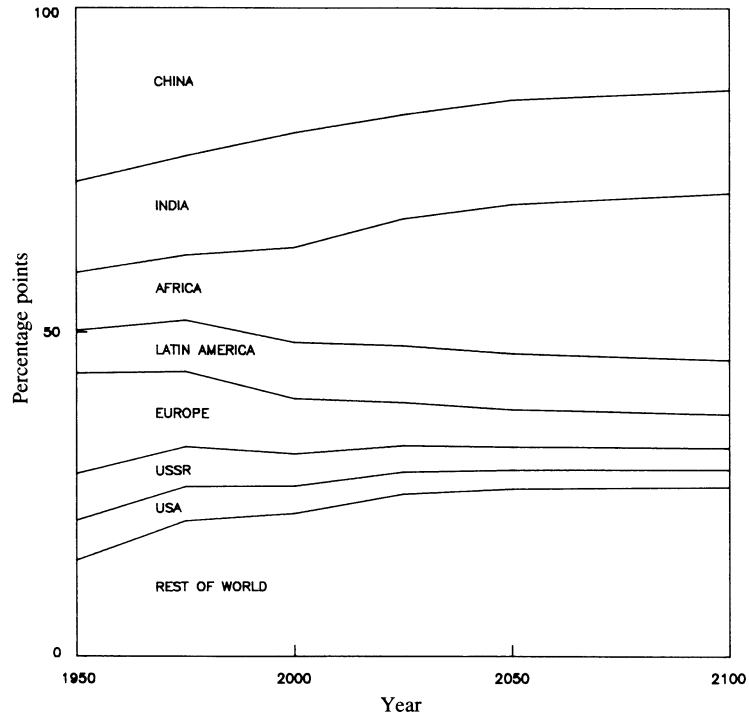
	1980	2100
East Asia	27	15
South Asia	28	33

	1980	2100
Europe	11	5
Africa	11	26

(The highly tentative nature of both sets of projections as forecasts should be emphasized. Their assumptions on the smoothness and rapidity of decline in fertility and mortality are open to considerable skepticism.)

Two important departures from uniformity in population growth are differential growth by age group and by urban or rural location. The first of

FIGURE 3 Relative shares of selected countries and regions in the world population, 1950–80, and projected shares to 2100



SOURCE: 1950–75, United Nations (1983); 2000–2100, World Bank projections (Demeny, 1984: Tables 1 and 2).

these is appropriately treated in a discussion of the labor force–aged population. The future labor force growth implicit in the birth and death rates and base populations of recent decades can be represented near enough by contrasting the projected population at critical labor force ages with the situation in the 1960s and 1970s. Demeny (1981, 1983) has assembled UN data in this format for the age groups 0–19 and 20–39. Table 3 shows the resulting estimates of proportional and absolute increases in the developed and Third World countries. In the latter, the young labor force–aged population (20–39 years) will grow at about the same average rate over 1980–2000 as in the 1960–1980 period, with the absolute increase 80 percent larger than in the earlier period. In contrast, this age group in the developed countries will increase in 1980–2000 by only one-third the amount it grew by in 1960–1980. The estimates for the age group 0–19 in Table 3 suggest that the developing country situation will be somewhat improved in the period 2000–2020, but that potentially serious labor absorption difficulties will remain. (The sensitivity of pressure on the labor market to variations in fertility and mortality is made very clear in the

estimates of the ratios of labor force entrants to retirees for stable populations, reproduced in Table 4.)

The other important departure from uniformity of population growth is by urban/rural location. Within a single country an overall growth rate of 2–3 percent per year typically coincides with growth rates for major cities of 4–5 percent. The regional picture is set out in Table 5, giving both the recent pace of urban growth and the projected pace for the rest of the century according to UN estimates. While population redistribution is essentially an economic (and occasionally a political) phenomenon, rapid urban growth clearly has significant consequences in turn for both economy and society. The rapid-growth regions of the world are doubling in population in a generation, but their cities are quadrupling. (Only Latin America is a partial exception to this

TABLE 3 Population growth rate and absolute increase in two age groups, developed and less developed countries, 1960–2000

Age group (years)	Growth rate (percent per year)		Absolute increase (millions)	
	1960–80	1980–2000	1960–80	1980–2000
	Developed countries			
0–19	0.3	−0.1	19	−5
20–39	1.0	0.3	60	20
	Less developed countries			
0–19	2.3	1.0	623	380
20–39	2.4	2.6	355	635

SOURCE: Demeny (1983: Table 2); underlying data from UN 1982 assessment.

TABLE 4 Labor force replacement ratios[a] in model stable populations with fixed age-specific participation rates[b] (population growth rates in parentheses)

Total fertility rate	Life expectancy (years)	
	50	70
6	2.9 (.025)	5.4 (.035)
4	1.7 (.012)	2.9 (.020)
2	0.6 (−.011)	0.9 (−.002)

[a] Number of entrants per withdrawal through retirement or death.
[b] Average patterns for industrialized countries.
SOURCE: United Nations (1973: 320).

situation, chiefly because its urban sector is now so dominant that the rural-urban migrant contribution to urban growth necessarily appears modest in comparison to urban natural increase.)

TABLE 5 Proportion urban in 1980 and average annual rate of increase of total and urban population, by region, 1960–80 and projections for 1980–2000

Region	Proportion urban, 1980 (percent)	Population growth rate (percent per year)			
		1960–80		1980–2000	
		Total	Urban	Total	Urban
Africa	29	2.6	4.9	2.8	4.8
South Asia	24	2.6	4.0	2.3	4.4
East Asia	28	2.0	2.5	1.2	2.7
Latin America	65	2.7	4.1	2.6	3.3
North America	74	1.1	1.6	0.9	1.3
USSR	65	1.1	2.5	0.8	2.2
Europe	69	0.8	1.6	0.7	1.3

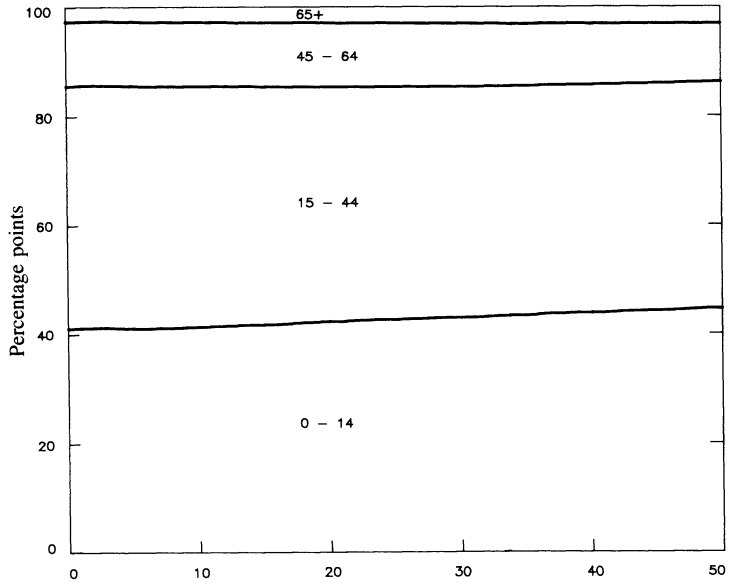
SOURCE: United Nations (1980a: Tables 48, 49, 50); East Asia estimates revised based on data for China in Banister (1984).

Age structure

The broad age-distribution characteristics of populations experiencing rapid growth are familiar: a large proportion, often 40 percent or more, below age 15, and a correspondingly small proportion at old ages. Less well known, however, is that this pattern closely resembles the pretransition, high-mortality population from which it developed. Declines in mortality usually affect both ends of the age distribution, hence can leave the median age of the population relatively unchanged. The situation is illustrated in Figure 4, which shows the effect of substantial improvement in mortality over 50 years on an initially stable, high-mortality population. Fertility is assumed to remain constant in order to isolate the mortality effect. Despite the more than 50 percent increase in the rate of growth over the period, the relative proportions at different ages are only minimally affected. In particular, the dependency burden—defined roughly, say, by the ratio of the population outside the age range 15–65 years to the population within this range—is slightly raised, although this effect would likely be overshadowed in practice by a countervailing reduction in the actual dependency burden as a result of the lessened morbidity that accompanies the fall in mortality.

No similar constancy of age structure is associated with the transition out of rapid population growth as fertility declines. The effect necessarily is concentrated at young ages and thus quickly unbalances the distribution. Figure 5 shows the result for the case of South Asia over the period 1970–2020 as projected in the UN's 1982 assessment. The age distribution at the end of this period, with fertility optimistically reduced to replacement level, is nearing

FIGURE 4 Age-structure and growth rate effects of a 50-year mortality decline on a stable, high-mortality population, assuming constant high fertility[a]



TFR	6.0	6.0	6.0	6.0	6.0	6.0
$\mathring{e}_0$ (yrs.)	35	40	45	50	55	60
r (%/yr.)	1.7	2.0	2.3	2.6	2.9	3.1

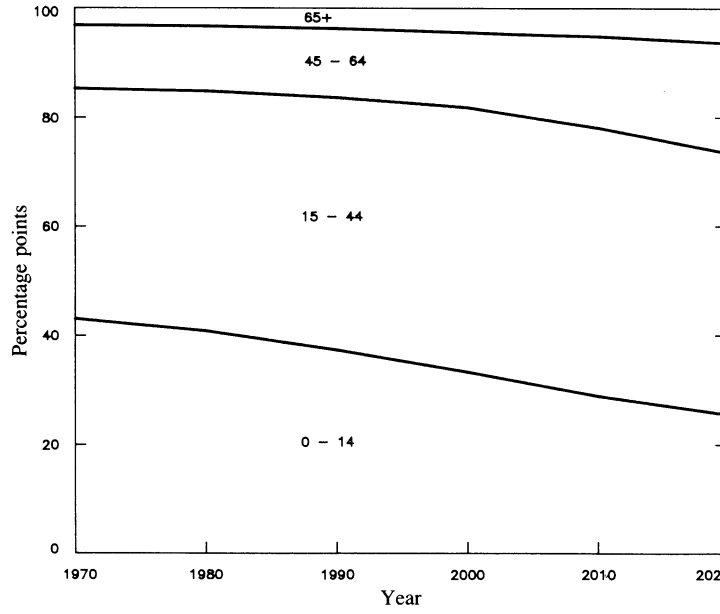
[a]Total fertility rate (TFR) and expectation of life at birth ($\mathring{e}_0$) assumptions and implied annual growth rate (r) are given below the chart.

that in the contemporary developed countries. The proportion of the population at old ages is still quite small but is steadily increasing. The current contrast between the age structures in the more and less developed countries is set out in Table 6.

A given population growth rate, it should be noted, can be associated with a range of age structures, since the latter are reflections of many decades of fertility and mortality experience. The differences tend to be not very large, however. Two "West" model stable populations, both with a growth rate of 2.5 percent but with birth and death rates per thousand given by (45, 20) in the one case, (30, 5) in the other, show the following age distributions (in percent):

	0–14	15–44	45–64	65+	All ages
(45, 20)	43	43	11	3	100
(30, 5)	37	43	14	6	100

FIGURE 5 Age-structure effect of declining fertility: estimates and United Nations medium variant projections of age structure and vital rates[a] for South Asia, 1970–2020



TFR	5.9	4.8	3.7	2.8	2.4	2.1
$\mathring{e}_0$ (yrs.)	48	52	56	60	63	67
r (%/yr.)	2.4	2.2	1.9	1.4	1.2	0.9

[a]Total fertility rate (TFR), expectation of life at birth ($\mathring{e}_0$), and annual rate of population growth (r). Rates refer to 5-year period following designated year.

SOURCE: United Nations (1983).

Migration effects on age structure are potentially more variable than fertility and mortality effects, but tend to share with mortality the spread over a range of ages and hence the lack of a very distinct impact. For example, the stabilizing (ergodic) properties of population age structure are preserved under quite broad immigration assumptions (see Espenshade et al., 1982).

The smooth transition of age structure that results from regional aggregation and conventional projection assumptions, as in Figure 5, may correspond poorly to the experience of individual countries. China provides a case in point, where sudden shifts in economic conditions and population policy over the

TABLE 6 Comparison of age structures in more and less developed regions, 1980

Region	Population growth rate	Age distribution (percent)				
		0–14	15–44	45–64	65+	All ages
More developed regions	.006	23.1	44.8	20.8	11.3	100.0
Less developed regions	.021	39.1	44.3	12.6	4.0	100.0

SOURCE: United Nations (1982: 60–63).

past three decades are clearly imprinted in the age distribution. High mortality and a sharp drop in the birth rate were experienced in the period of the Great Leap Forward policy (1958–61), followed by a recovery to prior high fertility levels and low, falling mortality in the 1960s. Then, with the adoption of strong antinatalist measures in the 1970s, a drastic decline in fertility took place (from a birth rate of above 35 per thousand to below 20). Most recently, a relaxation in pressures for late marriage, the entry of 1960s birth cohorts into reproductive ages, and a shift away from collectivized agriculture show signs of leading to a partial resurgence of fertility at least in rural areas, notwithstanding efforts to institutionalize one-child families. Among the age-distribution consequences of this record is the striking bulge of the 1960s and early 1970s birth cohorts that are posing imminent problems of labor absorption and in another 50 years are likely to make serious old-age security demands on the economy (see Coale, 1981: 94; Banister, 1984).

Kin structure

Much of demographic analysis proceeds as if population could be represented by a density function over the age-time plane, with corresponding functions specifying the birth probability and the force of mortality at each point. In essence, a population element is identified by age and birth cohort, with all other characteristics suppressed. Some important implications of population growth, however, can be traced out only if further characteristics are introduced—in particular, those relating to household and family structure. Analytical models here very quickly become highly intricate, losing their heuristic value; in their place we must have recourse to simulation techniques and, of course, to immersion in demographic household data. This subject is an active frontier of current demographic research (see Bongaarts, 1983).

In a pioneering analysis of the kin structure implications of the demographic transition, Ryder (1975) computes various measures of family structure under stylized pretransitional, transitional, and post-transitional demographic regimes. The birth and death rates per thousand of the three populations are set at (42, 42), (42, 10), and (14, 14), respectively, the transitional population being the high-growth-rate case (3.2 percent per year). Nuclear families in the three regimes, not surprisingly, differ greatly in size and duration. Mean family size is 3.2 in the first, 4.7 in the second, and 3.4 in the third; mean durations from marriage to death of one spouse (usually the husband) are 19, 36, and 45 years. Ryder's most important result for the present study concerns the family dependency burden implied by these regimes. Although the conventionally defined child dependency burden in the population as a whole is substantially higher in the transitional regime than in the other two cases, there is a much smaller contrast among regimes in the average ratio of consumers to producers (distinguishing them by age) within any given family over the duration of its life. Two quite separate phenomena account for this. One, evident enough, is the mortality effect on person-years available for production in the family. In the transitional regime, comparing it with the pretransitional,

although more children survive, families have much longer to reap productive contributions from both parents and children. The second is that, because nuclear families are being created at a faster rate in the rapid growth case, proportionately more are in the early, high-dependency years of family-building. The average dependency burden over the family's life does not therefore reflect the cross-sectional dependency burden of the society.

The preceding argument helps to explain the fairly muted association between changing population growth rates and average household size. (Another part of the explanation is the likelihood that most remnants of families disrupted by mortality attach themselves to other households, resulting in a greater discrepancy between family and household in the high mortality regime.) In India, for example, household size appears to have stayed almost constant at five persons since recordkeeping began in 1901, despite a more than doubling of the rate of population growth. Secular declines in household size are seen only after fertility itself starts to fall, although then they are often striking (United Nations, 1973: 341–347).

It should be emphasized that as an empirical matter rapid population growth is a comparatively new phenomenon in the world; it is high fertility not high natural increase that is "traditional." Hence the average family composition implied by rapid population growth is also fairly new. A person on average grows up with more siblings and expects his parents to survive into his adulthood; the demographic base of the family economy and the demographic contingencies to be provided against are thus altered.

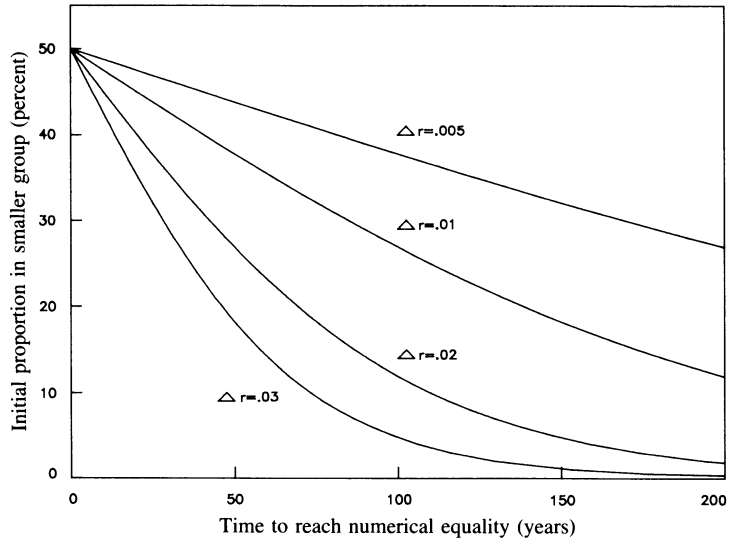
Such averages, however, may conceal more than they reveal. In the overwhelming demographic attention paid to the average fertility of populations, for example, the extent of natural variation in fertility and family composition is often neglected. Moreover, the variance in the marital and fertility experience of individuals is not simply a consequence of biological randomness. Cross-cultural differences in variance can often be traced to contrasting social institutions. Marriage is a notable case in point: the so-called European marriage pattern, in which societally enforced property restrictions on marriage led to generally late marriage and substantial proportions of the population never marrying in much of preindustrial Europe, contrasts sharply with the early and virtually universal marriage characteristic of most Asian societies. Socioeconomic stratification is another major source of variance—child survival, for instance, is strongly linked to parental education and economic status. And overlapping these is the contribution of technology: differences in medical and contraceptive knowledge are reflected in varying individual-level uncertainties entailed in mortality and fertility processes. Combining natural variation with economic, technological, and institutional variation, it would not be surprising if the average pattern of family composition in a given demographic regime gave little clue to the economic and demographic strategies of the majority of families. The more complex simulation models that will allow due weight to be given to the higher distributional moments of family composition are still in their early stages of development.

Social group composition

An enduring distinction found in the villages of many traditional societies is between descendants of the original settlers or founders of the village and all other inhabitants—whether recent settlers or members of families resident there for generations—who lack this ancestral link. Transposed to the national level, analogous distinctions are also frequently made, although here generational memories when not reinforced by communal tensions are much shorter. Citizenship, bureaucratically conferred on certain immigrants under prescribed conditions, may not, however, be sufficient to override communal differences when it comes to economic opportunity or exercise of political power. As proximate consequences of population growth, therefore, changes in the relative sizes of communal groups, whether resulting from migration or from differential natural increase, warrant attention. (Changes in the relative sizes of nations—the same phenomenon writ large—were discussed above under the rubric of population size. International communal conflict of course exists but is typically dominated by conflict over more tangibly defined national interests.)

The simple arithmetic of differential group increase is illustrated in Figure 6. Where natural increase is the basis of the growth rate gap, a .02 difference would be near the upper limit of empirical experience. With migration, higher differentials are readily conceivable. Of course, strong economic pressures cutting across group boundaries generally exist, tending to erode cultural dis-

FIGURE 6 Time period required to reach numerical equality of two population groups differing in initial size and growth rate for selected growth rate differences (Δr)



tinctiveness in demographic behavior. There may, moreover, be considerable minority group loss through assimilation into the dominant group. For this reason high fertility communities such as the Amish in the United States do not rapidly expand across the country.

Instances of shifting relative sizes of communal groups with potentially far-reaching societal-level consequences are not uncommon. Rapid relative growth of the Hispanic population of the United States, of the Central Asian republics of the Soviet Union, of the black majority population of South Africa, of the Muslim population of Lebanon, and of the Arab population of Israel are well-known cases.

Population growth effects on the economy

The proximate effects of rapid population growth constitute new demographic realities that have to be coped with by societies and ultimately by families and individuals. "Coping" can take place at different organizational levels and may or may not involve deliberate decision-making—or, for that matter, explicit recognition of the changed demographic situation. What determines the organizational level and to some extent the nature of any response is the institutional design of the society: its family and community structure, its arrangement of property rights, its system of government and economic administration, and the culturally specific meanings that attach to these elements. Hence a study of the consequences of population growth, if it is not to be narrowly contingent on a given setting and thus confined by drastic ceteris paribus assumptions, must carefully assess the influences of these institutional arrangements—both as mediating structures that channel population growth effects in characteristic ways on to individuals in the society and as potentially dynamic components of the societal response itself. Taking account of the latter—institutional change induced by population growth—is the problem addressed in this and the following section of the paper. The familiar array of population growth effects on local and national economies is discussed from this standpoint below; the more elusive effects on social organization and political arrangements outside the narrowly economic sphere, and effects at the international level where the economic and the political cannot be separated, are dealt with in the next section.

On the economic side the discussion of the effects of population growth is complicated by the fact that the proximate growth consequences not only can directly modify institutional configurations (in turn altering the incentive structure in which individual decisions are made) but also can do so indirectly as an outcome of changed individual circumstances. In the face of such intricacies it is tempting to seek methods of analysis that cut through the institutional detail in the hope of reaching a hard substructure of economic reality. The neoclassical theory of economic growth, especially the canonical one-sector model of Solow (1956) and its many offshoots and elaborations, has particular

appeal for such a purpose: population (or labor force) growth is related to capital investment and consumption in a simple and mathematically tractable set of equations, amenable to sensitivity analysis and counterfactual experiment and free of institutional flummery. It seems, at least in the long run, that this radical reductionism can still leave models with appreciable explanatory power. The discussion below starts by exploring the scope and limitations of such modeling, then considers the main areas of population impact on the economy (technological change, capital formation, and labor absorption) where greater institutional content arguably undermines or substantially qualifies the simpler analytical results.

"Institution-free" modeling

Economic growth models cannot of course escape making institutional assumptions, either open or tacit. Often, however, there are good reasons for suppressing most of this detail in model formulation. For example, if capital, labor, and product markets generally clear, the introduction of specific clearance mechanisms is likely to be a needless modeling complication in tracing out long-run growth. A model better exhibits its workings when stripped down to essentials.

The basic one-sector neoclassical growth model, an extreme example of a stripped-down model, can be used to demonstrate a number of important population growth consequences. Most obviously, with an economywide production function recognizing capital and labor as factors and allowing some degree of substitutability between them, an increasing labor supply associated with population growth yields an increasing total product. Demographic factors can also influence product growth through effects on the rate of capital formation, the rate of technological change, and the scale of production. In the conventional case of a constant savings rate and constant returns to scale, rapid population growth has a detrimental effect on economic welfare since more investment must be devoted to maintaining the level of capital per head at the expense of either immediate consumption or investment in capital deepening (hence future consumption). Under steady-state growth—that is, with constant proportions of income saved and consumed, a constant population growth rate, and all production over and above capital-widening needs devoted to consumption—the steady-state level of consumption is inversely related to the rate of population growth. In Solow's (1970: 29) words, "An economy that must in a steady state support a more rapidly growing population will support it at a lower standard of consumption, given the savings rate."

The constant returns to scale assumption of much modern growth theory, while it owes something to the algebraic simplification thereby introduced, follows from the constancy of functional income shares implicit in the "stylized facts" that modern theorists such as Kaldor took as their starting point. Ricardian effects are assumed away. Equilibrium growth paths, with uniform exponential increase of people and product, might pose problems of stability (Harrod's knife-edge) but not of maintenance. Classical growth theory, in

contrast, preferred to assume an initial regime of increasing returns when the economy was small, giving way under growth to an eventual situation of diminishing returns. Steady-state growth at any positive rate could not of course exist in such an economy.

Technological change in its simplest analytical form can be introduced into the neoclassical model by specifying multipliers that inflate (''augment'') one or both of the factors in the production function. Biased change occurs if one factor is augmented at a faster rate than the other. Most model properties can be preserved by rescaling capital and labor in these augmented units. Steady-state growth thus redefined, for example, is consistent with constant exponential improvement in labor productivity. Observations such as that population growth in some circumstances appears to stimulate technological change or that technological bias can sometimes be related to population-influenced wage–rent ratios are then readily translated into formal model terms. The critical issue of pinning down just what those circumstances are or how often ''sometimes'' occurs is pursued below.

If technological change and returns to scale are cases where the empirical grounding of particular modeling assumptions is often cloudy, the same cannot be said of the elaboration of the neoclassical model into a dual-economy form. From Preobrazhensky in the 1920s and W. A. Lewis in the 1950s onward, the contrasting production relations in agriculture and industry and the nature of the links between these sectors have been major emphases of development studies. In the labor-surplus formulation of Fei and Ranis (1964), population growth directly retards the rate at which this surplus diminishes and hence postpones the economy's ''turning point''—the time at which dualism is eliminated and neoclassical growth and wage determination processes extend throughout the economy. For Fei and Ranis, a basic policy aim is to shift what they call the center of gravity of the economy—the balance between the labor force in industry and agriculture—toward industry. The criterion of successful development is quite simply for production conditions in the industrial sector to be such that this sectoral labor reallocation can take place despite population growth (Fei and Ranis, 1964: 120–122).

If the Lewis and Fei–Ranis assumption of a labor surplus is dropped, even in the weak sense of an industrial wage rate greater than the agricultural product foregone in hiring an additional person in industry, then the role of population growth is diminished. This is illustrated in the analytical study of the economic history of Meiji Japan by Kelley and Williamson (1974), who adapt the general dual economy theory they earlier developed (Kelley, Williamson, and Cheetham, 1972) to the specific case of Japan's industrialization. They argue, with persuasive empirical support, that the model captures the broad features of Meiji growth and, when calibrated on the initial conditions, successfully retraces the observed course of change. Hence it can be used, among other things, for counterfactual experiment: to ask what would have been the outcome had particular preconditions, functional relationships, or

parameter values differed in specified ways. Moreover, given the general equilibrium form of the model, the potential bias entailed in simple sensitivity analysis of ignoring general equilibrium effects can be avoided.

The specific demographic counterfactual that Kelley and Williamson (1974: 132) pose is the following: "What would have been the speed of Japanese economic growth had she sustained the high population growth rates prevailing in the contemporary developing world?" Population growth in the Meiji period is estimated to have averaged 0.9 percent per year. What happens to the growth path traced out by the model if this rate is trebled? Their answer turns out to be: not much. Over the period of the simulation (1887–1915), per capita output increases by 111 rather than 129 percent, and virtually no difference is found in the pace of urbanization or rate of increase of industrial output. This result cannot be attributed to age-distribution effects, since the Kelley–Williamson model has none. Rather, the result follows from the stimulus that population growth gives in this model to capital formation. More rapid population growth increases the share of nonlabor income and hence raises the economywide savings rate (by assumption, all profits are reinvested), and it slows the rise in the capital–output ratio—also contributing to faster capital growth. (Partly offsetting this is a slightly smaller decline in the relative price of industrial goods, since rapid population growth puts more of a downward pressure on output prices in the labor-intensive agricultural sector.) The combination of these effects supports Kelley and Williamson's strong conclusion: "If we hold other factors constant, considerably higher rates of population growth in Meiji Japan would have made very little difference to her development performance" (p. 137).

In most of these models the proximate population growth factor is merely aggregate size. Population and labor force are not distinguished from each other, and typically their growth rate is constant. (A minor subfield has developed in which this growth rate is made to depend on economic conditions, such as per capita consumption or the capital–labor ratio, as already foreshadowed in Solow's 1956 paper.) Adding age structure permits a new class of population effects to be explored. In the long run, the ergodic properties of age distributions under constant vital rate schedules yield steady-state results that are generalizations of the scalar-population case (see Arthur and McNicoll, 1977, 1978b; Lee, 1980; Willis, 1982). One significant result is to qualify the basic antinatalist conclusion of the Solow model: the capital-widening demands of population growth still represent a detraction from welfare, but in addition there are age-dependent transfers from producers to consumers that can offset or reinforce the capital-widening effect depending on the age schedules of consumption and labor force participation. Emphasis is thus put on the "chain letter" aspects of population growth: fertility can be seen as sustained by the net transfers each generation receives from the succeeding generation. This direction of modeling leads also into analysis of the situation where private and social gains differ—where, for example, parents reap the intergenerational

transfers directly (their children providing them with labor contributions and old-age support) while the capital-widening effects are passed on to society at large in the form of depressed wages or overextended infrastructure.

The comparison of steady-state growth paths leaves out of the analysis the process of economic adjustment to new demographic conditions, where age-distribution effects also play an important role. A different modeling tradition, originating with the pioneering work of Coale and Hoover (1958), is concerned with simulation of this adjustment. As Figures 4 and 5 demonstrated, the shift to rapid population growth associated with mortality decline typically has very little effect on population age structure, while a fertility decline has a very marked effect. A one-time drop in the birth rate is reflected immediately in reduced child dependents but not for 15–20 years in reduced labor force entrants; hence if children are costly there is a consumption or investment gain to be reaped for this period. With a 50 percent fertility reduction over a generation, the various models of this sort show fairly consistent results: "a per capita income advantage of approximately 3–5 percent after 10 years, 15–25 percent after 20 years, and 25–50 percent after 30 years" (Ruprecht and Wahren, 1970). Contrasting rapid population growth with the simple counterfactual of slow growth (provided this refers to a putative situation of lowered fertility that follows the rapid growth phase rather than to the higher mortality that preceded it), the former is seen to be an economic disadvantage.

The preceding quick sketch of a few parts of the large literature modeling economic consequences of population growth should be enough to support one clear conclusion. There is an ample supply of hypothetical mechanisms that link demographic to economic variables, and selection among them can yield widely varying net effects. The modeling enterprise is valuable chiefly in shedding light on these mechanisms separately and in small combinations, and to some extent in suggesting their quantitative significance under specified conditions. Beyond this, we come sharply up against the general problem of counterfactual explanation, in which findings are valid insofar as the relevant relationships and ceteris paribus assumptions of the model hold—but those conditions and assumptions become the proper center of debate. The particular difficulty in the population case is that population growth cannot simply be adjusted as an independent variable in counterfactual experiments—as might, for example, the foreign terms of trade or sectoral investment allocation—since the demographic regime that gives rise to that growth is supported by so much else of economic significance in the society's institutional arrangements. The ease of algebraic manipulation of a population growth rate in a simple general equilibrium model bears no relation to the intricacy of the socioeconomic changes that would likely have been needed to induce any particular growth rate response.

Technological change and productivity

For the most part, hypothetical population growth effects on technological change, and more broadly on total productivity, are those of size rather than

of other proximate consequences. Population size, it is argued, in part governs market demand and scale economies in production and can yield similar economies in the provision of infrastructure. Some analysts suggest the existence of scale diseconomies: populousness conducing to the "soft state," in turn giving rise to a "soft economy," or population growth generating giant cities that consume disproportionate resources in maintenance far offsetting the locational economies that once justified them. On the technological side, there is strong evidence of population-induced innovation in some agricultural settings; but there are cases too where rapid population growth has been accompanied by stagnant productivity or by labor-saving rather than labor-using technical progress. To make sense of these conflicting forces and contradictory arguments calls for examining the conditions under which particular relationships appear to hold.

Scale economies The findings of the 1957 International Economic Association (IEA) conference on the economic consequences of the size of nations (E. A. G. Robinson, 1960) were notably inconclusive on the magnitude of scale economies at the national level, although tending to support their existence for smaller countries (below 10–15 million). Robinson (1960: xxii) did, however, assert the absence of upside risks: "There are no possibilities of diseconomies of scale arising from the excessive size of the market. There are no penalties for being bigger than the minimum size, if such there be, that exhausts the economies of scale, provided that a centralized economic policy is not collectively more protectionist against the outside world or slower at making the adjustments of economic policy that will keep the parts of the large integrated unit continuously operating at a high level of production."

The well-known cross-national study by Chenery (1960) includes a quantitative discussion of scale economies in manufacturing. For the manufacturing sector as a whole, Chenery found the partial elasticity of output with respect to population, controlling for per capita income, to be 0.20. Maizels (1963), with a different classification of industries, found somewhat less of an effect. The series of analyses of the sources of postwar economic growth in the United States, Europe, and Japan by Edward F. Denison shows substantial effects of economic scale, to which demographic expansion contributes a part. Simon (1977: 69) estimates the population elasticities implied by Denison's data for 1950–62 to be .10 for the United States and .18 for Northwest Europe; the same calculation applied to Japanese data for 1953–71 in Denison and Chung (1976) gives an elasticity of .17. These numbers suggest distinct but modest positive population size effects. For a particular country, output per capita is relatively insensitive to population except over a broad size- (and thus time-) range.

Transport, communications, and other components of economic infrastructure are areas where economies of scale are likely to be prominent. The case of roads is examined by Glover and Simon (1975), who compute a strongly positive elasticity of roads per unit area with respect to population density

(cross-nationally, controlling for per capita income). In Simon's (1977: 275) summary, "an increase in population has a very positive effect on a country's infrastructure, on the reasonable assumption that increased congestion does not negate all the benefits of the additional facilities." The latter assumption is less reasonable in the case of very large cities (22 cities above 4 million existed in the developing countries in 1980; in 2000 there are projected to be 61). While calculations of optimal city size for efficiency of infrastructure are usually suspect, there is little doubt that serious scale diseconomies eventually set in.

The provisos noted by Robinson in the passage quoted above merit some attention. Economic ambition in a small country—keeping to the IEA's conception of smallness—compels an export-oriented policy and the consequent disciplines but also uncertainties of the international marketplace. The manufacturing sector is necessarily import-dependent, given the high concentration of capital goods production in the large industrial economies (Maizels, 1963). Even when industrialized, small countries turn out to have a high import content of investment in producers' equipment—as documented, for example, by Kuznets (1964) and Adams (1967). Agricultural or natural resource exports may provide the shelter for high-cost domestic manufacturing (or even entire financing of a service economy) without calling for substantial marketing skills, but these cases are few and typically vulnerable. In contrast, at larger population sizes the opportunities for sustaining domestic economic inefficiencies behind protective barriers are much greater. Moreover, even where domestic economic policies would permit manufacturing exports, significant levels of such exports in per capita terms would likely soon confront demand-side obstacles in the form of trade barriers, which rarely are set with any consideration of per capita equity. (To give a sense of magnitudes, in 1980 South Korea's manufactured exports per capita came to around $400; China's, India's, and Indonesia's were each below $10.)

The other proviso concerns the possible disadvantages of scale in the sphere of economic policy and organization. Centralized planning and economic administration apparently are subject to such effects, but not necessarily other institutional regimes. A large domestic market size is a prerequisite for effective competition in many industries. An increased population may thus argue for adaptations in economic management, but does not threaten on this score to introduce appreciable scale diseconomies. Economic sclerosis in Olson's (1982) sense is not a disease tied to size.

A strong criticism that can be leveled at most cross-sectional studies of scale economies (made, for example, by Hagen [1975: 319–322] in reference to the IEA conference) is their inattention to the likelihood that these effects are markedly dependent on the level of technology. Technological change may radically alter economies of scale both within a single industry and conceivably in the economy as a whole. The direction of such alterations in the past has been mostly to raise the efficient size of plant—notable examples being steel, automobiles, and fertilizer. On the other hand, technological change, by raising incomes, expands domestic market size without population growth. Moreover,

recent advances in technology (computer control) and economic organization (component industries) may work strongly against demographic scale economies.

Induced innovation The idea that population growth stimulates innovation in technology or economic organization has been supported by a number of economists, including Boserup (1965, 1981), Clark (1967), and Hirschman (1958). Empirical instances are fairly common of societies that adopt new labor-intensive agricultural techniques only when persistence of earlier land-intensive methods is threatened by increasing population density. Gourou (1965: 103–107), for example, cites various African cases where the change from shifting cultivation to settled agriculture can be clearly associated with density increases—even to the extent of reversing itself when it happened that low-density methods again became feasible. The argument, developed at length by Boserup, is that technological change needed to expand agricultural production often entails initially a greater labor input per worker and therefore will not be adopted voluntarily until necessity requires it. (Note that the argument refers to adoption rather than invention of technology; demographic effects on innovation intensity in the strict sense are discussed below.)

That choice of technique is influenced by factor proportions is of course a commonplace. The empirically more interesting part of the Boserup thesis is the assertion that rising density induces productivity increases per worker or per man-hour. The evidence here is considerably less clear-cut. Radical changes in productive technique such as the shift from swidden to settled agriculture may indeed confront an economy with new innovation possibilities. Exploitation of them, however, will presumably depend on the specifics of the local incentive structure—in particular, the degree to which the returns can be appropriated by households or firms. There is a sense in which credit for subsequent routinized technological change (resulting, say, from individual economic aspirations) can be imputed back to the original shift and thence to its demographic antecedents, but it is at best a weak one.

It should be pointed out that counter-examples of population growth leading to an economic impasse and welfare decline rather than to technological transformation are not hard to find. Africa can provide many more of these than of the situations that Gourou depicted. While ad hoc explanations for failure can be adduced in each particular case, there is no less need to consider ad hoc explanations of success. In either case the more theoretically productive route would be to explore how the constraints on and opportunities for technological change are related to characteristics of the cultural and institutional context without positing an underlying model of economic growth or stasis.

The economic theory of induced technological change, now backed by considerable though scattered evidence, ties the rate and factor-bias of innovation variously to investments in research and education and to factor prices. (See Binswanger, 1978, for a convenient survey.) Research strategies, while likely to be influenced by existing factor proportions, are essentially policy variables at the national or firm level rather than endogenously determined. Hence, there is no necessary link with population growth. Factor prices in

theory reflect underlying factor availabilities: more rapid population growth, other things equal, will be associated with a lower wage-rent ratio, in turn shifting production in a labor-using direction. The reality, of course, may be rather different: countervailing government policy in a variety of fields (minimum wage laws and currency valuation, for instance) can make capital and labor prices diverge from their scarcity values. Although over the long run these values are likely to assert themselves, the population growth link is weakened.

A more profound effect on productivity originating in factor prices and factor proportions would be one that worked through a shift in basic institutional arrangements in the economy. A theory of institutional change induced by changing wage–rent ratios is the conceptual apparatus for the influential studies by Davis and North (1970) and North and Thomas (1973), exploring the institutional origins of industrialization. In the North–Thomas study, for example, changes in preindustrial Europe as varied as the breakdown of feudalism, the expansion of trade, and the formalization of contracts and property rights are traced to increasing population growth in the fifteenth century—setting up a new incentive structure for capitalist development. (Grand theorizing of this sort has made less progress on the question of why, if population growth pushed Europe toward industrialization, it had no comparable effect on China.)

On a less ambitious scale, the so-called new institutional economics provides often-persuasive explanations for shifts in agrarian institutions in the contemporary developing countries as outcomes of demographic pressures mediated by risk and transaction costs. To Hayami and Kikuchi (1982: 216), for instance, "the basic force inducing agrarian change in Asia [is] the decline in the return to land resulting from the strong population pressure that tends to outpace efforts to augment land by means of improvements in agricultural technology and land infrastructure." They argue that this force, in interaction with personalized economic and political markets at the village level, yields distinctive institutional adjustments in the direction either of polarization along *kulak*-proletariat lines or of (preferred) stratification—"increasing class differentiation in a continuous spectrum ranging from landless laborers to noncultivating landlords, while the social mode of traditional village communities is maintained" (Hayami and Kikuchi, 1982: 60). Productivity in both cases may be raised but with substantially different social costs in labor displacement.

The technological and institutional changes discussed thus far have been disembodied processes, either wholly autonomous or induced by demographic growth. An important source of productivity gains, however, is the improved quality of the work force over time as education expands, a change embodied in new entrants. The faster turnover of labor force associated with rapid population growth (see Table 4) might then be regarded as a benefit—this is argued, for example, by Leibenstein (1967). While the arithmetic is unassailable, the case hinges on an implausible absence of resource constraints on educational expenditures and disregards options for upgrading work skills in place.

For completeness we should take note of the argument made by Simon (1981), and earlier by Kuznets (1965: 128), tying the pace of innovation not to population growth but to population size: "because improvements—their invention and their adoption—come from people, it seems reasonable to assume that the amount of improvement depends on the number of people available to use their minds. . . . A larger population implies a larger amount of knowledge being created, all else being equal" (Simon, 1981: 197, 210). The ceteris paribus assumption here is massive, encompassing as it does the economic, organizational, and cultural determinants of research productivity. Even conceding a residue of scale effects, moreover, the economic value of technological innovation in many industrial spheres may appear only late in the development process. Countries such as South Korea, Taiwan, and Hong Kong, even Japan until the 1960s, have flourished as adapters and licensees of foreign technology. The major role of multinational companies in the international transfer of technology is largely independent of domestic research capacities. (Agricultural research might be considered an exception, since it is in important respects location-specific; however, the institutional designs and techniques for such research are transferable even if resultant crop varieties, for instance, are not.)

A more damaging line of attack on the thesis derives from the evident fact that dominant roles in entrepreneurship and innovation are frequently played by numerically small cultural or ethnic minorities in the population—Parsis, Gujaratis, and Marwaris in India; Chinese in Indonesia and the Philippines; Shanghainese in China; and so on. Noting P. T. Bauer's (1981) emphasis on the phenomenon, Demeny (1982b: 193) remarks that "Bauer's demonstration of this point utterly demolishes the newly fashionable idea that sheer population size is an automatic generator of entrepreneurial talent and technological innovation."

Productivity limits and ceilings The preceding discussion argues for skepticism toward the idea that population growth pays for itself by generating scale economies or technological advances. Productivity gains occurring independently of demographic change, or influenced by it only to the extent of the demographic component of demand, may of course keep pace with or exceed the rate of population growth. Underestimating the scope for such gains has been a common error in economic-demographic predictions from Malthus on.

Yet the opposite view, that technological rescue is always at hand (though perhaps needing some rearrangement of institutional scaffolding in order to have effect), is no less subject to doubt. Take, for example, the popular question of the course of per capita food supply under population growth. With any given technology, geographic limits on cultivable area and diminishing returns on the intensive margin will eventually constrain output. Views differ substantially on where those limits are—in particular, on how much of tropical forests and grasslands are potentially cultivable—and on appropriate calorie and protein levels of per capita food intake in calculating "carrying capacity."

Gilland (1983), with assumptions he characterizes as "technological realism" (little expansion in land under food crops; average crop yields increased from the present 2 tons per hectare to about 5 tons, through improved varieties and more fertilizer use; conservative estimates of rangeland and marine production; and per capita food consumption, converted to grain equivalent, set at some 50 percent above the current world average), estimates global carrying capacity at around 7.5 billion people, a number likely to be reached fairly early in the next century. Radical land-saving technological advances, especially deriving from genetic engineering, may yet transform this outlook, although there are also downside risks to be faced (new crop diseases, soil erosion, climate change). Technological relationships of this sort, of course, do not by themselves determine actual outcomes. In the case of food, the organization and pricing of agricultural production, the capacity of transport and storage facilities, and the economic and political factors governing the level of effective demand are at least as important in setting consumption levels and patterns. Exercises such as Gilland's nevertheless demonstrate the foreshortened scale of needed technological advance under rapid population growth and the resulting heavier reliance on a widow's cruse of innovation.

Savings and investment

In a number of studies of the implications of alternative paths of population growth, starting with Coale and Hoover (1958), rapid growth has a retarding effect on savings and investment. In others, such as the Kelley and Williamson (1974) model discussed earlier, rapid growth contributes to capital formation. What explains such discrepant viewpoints, what is the scale of the putative effects, and what can be done to achieve a reconciliation?

We note first the obvious fact that development in the modern world is a self-conscious process in which governments have both a central strategic role and considerable control over investment levels and allocation. Although the apparatus for revenue collection from individual employees, households, or firms requires a level of administrative capacity that may only come fairly late in the development process, taxes on foreign trade, royalties from extractive resource production, and profits from government monopolies present few such collection difficulties. There may still be narrow constraints on net resources available for investment, particularly when government consumption expenditures are not fully controllable—for instance, when governments are locked into price subsidy programs by political considerations—but for the most part the level of austerity (and its distribution in the population) to be imposed in the interests of capital formation and economic growth is a government policy decision. If through no other instrument, the dominance of public over private savings behavior is demonstrated by currency inflation. To the extent this dominance is the case, private savings (corporate and household) are defined residually and the nice behavioral calculations of the determinants of private savings are of little ultimate consequence.

Conceptually, there may nonetheless be a purpose in working through the demographic determinants of savings and investment under the premise of government neutrality toward economic growth. In a few cases something approaching neutrality may indeed exist, although probably as an outcome of incompetence rather than of adherence to libertarian economic principle. More generally, the reasoning that can account for household and corporate behavior may in effect explain aggregate investment levels, public and private, with the government acting "as if" at the behest of the private economy.

Household savings The dominant forces making for savings at the household level are the need for consumption averaging over time, given anticipated changes in family dependency burdens; the desire to provide against downside risks to living standards; and aspirations to improve those standards. Population growth is intimately connected with each, though as a consequence as well as a determinant of savings behavior.

Within a particular family, dating it from the time of marriage, high fertility imposes an evident early consumption burden that is met, if indeed it is met, in one of three ways: first, by drawing down prior savings (this was the standard practice in much of preindustrial Europe, in which there was an informal property requirement for marriage); second, by sheltering those consumption needs in a larger family setting (in essence, redefining the family's starting date to be later on in the life cycle: this is in effect the common situation in many contemporary high-fertility societies); or third, by going into debt, borrowing against anticipated income. Whatever the precise institutional arrangements, the net effect in the population is of transfers from producers to consumers, from low-dependency families to high-dependency families. The necessary scale of such transfers is induced by the market-determined interest rate, which in turn sets the terms of the extrafamilial obligations thereby entailed. (This is the so-called biological interest rate of Samuelson, 1958. Corresponding intrafamilial obligations are of course also established—see Caldwell, 1976.) Under stable demographic conditions, the average age of consumption is typically below that of production, but there are evident circumstances, particularly those of rapid fertility decline, when the difference is likely to be reversed. The consumption-smoothing component of household savings may then vanish or be negative in the population as a whole.

Family-level provision against misfortune is an obvious reason for saving. The impact of high fertility here, however, is likely to be the opposite of the transfer effect just considered. It is highly plausible, in fact, that high fertility is itself a manifestation of risk aversion in the absence of alternative means of risk insurance (see Cain, 1981). The net consumption costs of children may be incurred precisely because other forms of risk management under the prevailing conditions are less reliable.

The aspiration to improve one's relative or absolute economic standing is the main behavioral assumption behind the investment function in a gov-

ernment-free economy. For the economy as a whole, the basic Solow formulation holds that capital deepening can proceed at a faster pace if population growth is slower. For individual families, it is often similarly argued on the basis of savings behavior that upward economic mobility is eased by having fewer children (Dumont's "social capillarity" notion). More directly, female labor force participation is enabled to be higher in low-fertility families. Counterarguments flourish here, however: the anticipated economic demands of children might make parents work harder and save more, and the children themselves may contribute to net family savings while still fairly young. Some empirical evidence, indeed, supports this positive demographic effect at least on the total amount of household savings; the *rate* of savings out of income most studies find to be reduced (Simon 1977: 50–51, 218–219).

The overall impact of a high dependency burden on household savings remains empirically cloudy. In a recent study of the relationship, Bilsborrow (1979: 34–35) finds that the effect on the savings rate of a rise in average dependents per family is small: it is likely, he argues, that "only a small fraction of the families in LDCs has sufficient income and incentive to account for much net savings . . . [the others] have no alternative but to reduce per capita consumption by nondependents." Any substantial fertility decline in the population must, by the arithmetic of weighted averages, be located among the (previously, at least) nonsaving majority of households. (Propensity to save is also, of course, a culturally influenced characteristic; shifts in relative numbers of households in cultural groups of varying savings propensity, taking place as a result of migration or differential natural increase, would have some impact on overall net household savings.)

Finally, we should remark that simply to categorize households as nonsavers may in many circumstances be too positive. Particularly in agriculture it is possible to sustain net dissaving over a substantial period, eroding, perhaps literally, the productive base of the household's economic existence. This can occur either through poor agricultural practices that degrade the landholding of the household concerned or, more commonly, through unilateral or reciprocal negative externalities within a collection of households—with whatever private household savings that are achieved in a narrow accounting sense being accompanied by a wasting of real assets. Provision for land maintenance cannot be taken for granted. The most spectacular case of such dissaving is probably the hillside erosion of the Himalayas in Nepal and Uttar Pradesh (see Ashish, 1979), but serious problems of erosion and desertification in agriculture are widespread in India, China, and the African Sahel (Agarwal, Chopra, and Sharma, 1982; Smil, 1984; Club du Sahel, 1980). While there is no necessary demographic cause and effect relationship behind these processes, there is a highly plausible indirect effect of population growth on the incapacity of the societies concerned to halt them.

Corporate investment Whether consisting of retained earnings or household savings, a large part of private investment in most countries is

channeled through the corporate sector, with investment decisions concentrated among a relatively small managerial and entrepreneurial elite. (The chief exceptions are the few remaining economies still dominated by peasant agriculture.) Population growth affects the level and composition of such investment through its influence on market size and structure, factor prices, and the actual or anticipated business environment.

The first two of these need little elaboration. Aggregate consumer demand and the age structure of that demand have obvious demographic determinants. Relative factor prices, as discussed above with respect to induced innovation, are probably affected also, although in some institutional settings the effects on shadow prices may be slow to show up in actual price changes. The business environment, a complex amalgam of the objective legal and administrative context of corporate behavior and subjective perceptions of how that context may change, has clearly a major influence on investment decisions. The relationship of business environment to population size and growth, however, is more elusive and difficult to explicate. Administrative scale diseconomies may make for corporate inefficiencies and insecurities that detract from anticipated profitability. More plausibly, such effects would stem from population growth rather than sheer size—the need to cope with changing scale of administration, especially in urban areas where demographic growth of 4–6 percent per year is typical. Overriding such technical issues of administrative performance, moreover, is any demographic influence on political stability.

Public investment Rapid population growth imposes greater demands than slower growth on government investment in economic and social infrastructure that is keyed to young ages—principally, child health services and schools and vocational training—if per capita standards are to be maintained. Investment in capital deepening is thereby lessened. This was a major theme of Coale and Hoover's (1958) India study. Cassen (1978: 225–226), in criticizing the argument, notes that "the real question [is] that of whether such educated and healthy people make a greater contribution to the economy than would be achieved by using the capital to raise the output of a smaller population," and asserts that the answer could well be affirmative in many situations. Rather than emphasize dubious effects on net "welfare" investment in education and health, Cassen argues that the more significant investment impact of rapid population growth is in impelling an earlier shift in the composition of productive investment toward more capital- and foreign exchange–intensive forms, as the production-raising possibilities for labor-intensive public works get used up. Food production in particular may have to be put on a more capital-intensive basis, through public investment, as also may efforts to halt or reverse processes of environmental degradation that harm the productive capacity of the rural economy as a whole.

Public investment in infrastructure cannot thus be summarily dismissed, however, if only because of the large place it occupies in national budgets. The arithmetic of assessing the budgetary implications of alternative population

growth scenarios for these expenditures is set out in studies such as those in W. C. Robinson (1975). Awareness of these budgetary effects is a major reason for government concern with rapid population growth. Poorly maintained or decaying infrastructure, the public-sector parallel to the problem of private dissaving noted earlier, extends this awareness to all.

The influence that governments have on private rates of saving and investment is also appropriately considered here. Many of the incentive structures in the economy that promote or impede private savings are themselves potentially instruments of policy. The design of old-age security programs is an important case in point: under a pay-as-you-go scheme, the transfers from earners to retirees through the scheme subtract from what otherwise could be larger provisions toward the earners' future retirement. "Because there is no accumulated social security fund, the decrease in private savings that is caused by social security entails an equal decrease in national saving"—and thence a decrease in capital stock (Feldstein, 1976: 85; there are, however, demurrers to this conclusion—see Aaron, 1982). Sustained population growth can keep such a scheme solvent; fertility and (adult) mortality decline present evident threats to it. Few poor countries, of course, endeavor to establish social security programs, funded or otherwise. Even in China, where socialism dictates a government concern, that concern is manifested by a constitutional requirement for families themselves to support their aged members. (Competing claims of workers and retirees to national product can be, and often are, resolved without formal settlement, by means of inflation—eroding the value of claims that are expressed in nominal terms or are less than fully indexed.)

A final note should be entered here on the possible stimulus that an "unfavorable" age distribution could have on government investment policy. Just as a larger number of children is sometimes held to induce greater parental savings efforts, so at the national level a youthful age distribution has been proffered as a "challenge to development" (see Keyfitz, 1965). Governments may well view with trepidation the advance of successive cohorts, each substantially larger than the one before, to the ages where they demand access to the economy. Given a pattern of declining mortality, the numbers of labor force entrants may be rising much faster than the population as a whole (doubling in five years in the Indonesian case discussed by Keyfitz), and the arguments adduced, for example, by Hirschman (1958: 177) that the struggle to accommodate more people enhances the "ability to invest" are made the more plausible.

What then can be said about the net savings or investment impact of rapid population growth? The answer appears to be: in general, rather little. The broad generalizations of neoclassical growth theory and intergenerational transfer analysis and the neo-Ricardian argument of Cassen point to an expected negative impact. However, interactions among the different categories of private and public sector decision-makers and variations among societies in the institutional settings of economic behavior make results contingent upon the

details of specific empirical situations. Leibenstein's (1976: 618) conclusion of a decade ago, that the relationship between population growth and the savings rate "is, at present, non-determinable," should perhaps be rephrased to avoid intimating that further research may remedy the situation. Yet something has changed over this period to make indeterminacy on the issue less serious than it earlier appeared. Development theory no longer accords the same degree of salience to capital formation as the engine of economic growth. The famous Lewis (1954) dictum ("The central problem in the theory of economic development is to understand the process by which a community which was previously saving and investing 4 or 5 percent of its national income or less, converts itself into an economy where voluntary saving is running at about 12 to 15 percent") is less an article of faith. Mounting evidence on the sources of economic growth has shifted the focus of development theorizing toward the qualitative dimensions of factor inputs, to the determinants of innovation, and to issues of organization and efficiency.

Labor absorption

The labor absorption issue has been touched on above in two contexts: in discussing the projected increases in labor force entrants and in describing the "turning-point" notion in dualistic growth theory. In both cases the realities were considerably simplified. Entry to the labor force as conventionally defined depends not only on age but also on the demand and opportunity for education and training, on institutional and cultural constraints on labor force participation (especially for women), and on the factors making for "discouragement" (in the technical sense of ceasing to look for work, thereby dropping out of the labor force, because of low expectations of success). Moreover, labor absorption refers not just to labor force entry but to employment, which has obvious additional demand-side determinants. The turning point, supposedly marking the end of an economy's labor surplus condition, remains a striking theoretical metaphor but its empirical referent is at best a fuzzy and perhaps lengthy interval over which labor markets tighten, base-level real wages edge upwards, and the low-productivity, subsistence-wage labor supply (in Lewis's still apposite example, household servants) dries up. Nevertheless, for all the qualifications that are needed to fill out the labor absorption picture, the essence of the contemporary situation is well enough captured by this elementary demographic arithmetic and dual-economy framework.

UN estimates show the absolute increases of the urban and rural populations of the less developed countries, for the past three and next two decades, as follows (in millions; United Nations, 1980a: 125, 155):

	1950–60	1960–70	1970–80	1980–90	1990–2000
Urban	164	212	321	481	662
Rural	200	301	340	320	219

Currently, the population numbers are increasing about equally in the urban and the rural sectors of these countries; in the past, the predominant growth was in rural areas, in the future it will be in urban areas. Even under the assumption of steady fertility decline and continued rapid urbanization made in these projections, rural populations will not start to dwindle for several more decades.

How are these increases being absorbed? As was the case with savings, there is a large measure of indeterminacy in the answer, introduced by variations in resource endowments and institutional arrangements and by the fact that policy decisions on choice of technique and wage levels are not bound to follow the logic of factor proportions. We have noted that population growth has some impact on the pace and direction of technological change and on the level and composition of investment. It is theoretically possible for these effects to be such as to generate the employment demand needed to cope with even a rapidly rising labor force–aged population. In reality, however, this demand generation is palpably insufficient in many instances. Instead, population backs up in tenuous, low-productivity activities and to a limited extent in open unemployment. Rather than moving toward a turning point, the economy may in fact be retreating further from it.

Aggregate and sectoral employment data might be thought to give a statistical picture of the situation, but it is not hard to see why such data in practice fail to do so. Familiar patterns of "occupational multiplicity" emerge as workers scramble for subsistence among a diverse array of activities—making statistical description based on primary occupation diverge increasingly from reality. (Addition of secondary and tertiary occupations is a partial improvement, achieved by sacrifice of complete ordering.) In addition, particularly for women, recorded labor force participation outside the formal wage sector can change radically with minor shifts in definition, giving a false impression of volatility to this significant part of labor input (see Dixon, 1982).

Despite this statistical elusiveness, there is a fairly clear productivity ladder down which marginal labor force entrants find themselves pressed as their numbers increase in the absence of either an open land frontier or an otherwise expanding economy. Exclusion from access to the social product is generally a matter of degree. Any economy offers a wide range of open-entry, low-productivity occupations, for the most part entailing self-employment but with a minimal requirement for working capital. Handicraft production, microscale trading and arbitrage, and personal services of all sorts are the main areas of this activity, highly visible in most poor countries. Such occupations are not indefinitely extensible, and even before private returns are pushed below subsistence it is likely that social returns have become negligible. Extortion and theft, of course, are direct means of access to product, and clearly open-entry occupations. In turn, security threats to property and physical safety generate a large amount of service employment. Growth of the "threat economy" (in Boulding's term) is tied more to poverty and social disorder than

directly to population increase but the indirect connection is significant, as argued in the following section.

There does not appear to be a statistical association between population growth and unemployment (as usually defined) in developing countries. This is not a demonstration of a demographic stimulus to job creation but a result of the fact that unemployment is not a feasible option for most of the population. Open unemployment is usually highest among educated urban youth who are presumably able to draw on family support while seeking work commensurate with their qualifications or expectations (see Turnham, 1971: 54). Selective government concern for this group, however, is also typically found—seen in an extreme form in policies such as Egypt's that guarantee employment to all university graduates.

It would be expected that the scale of the labor absorption problem faced by many developing country economies would compel governments to move strongly to favor labor-using technologies. In reality, such policies have been sporadic at best. The litany of measures that tend to the contrary to make capital cheaper than its scarcity value is familiar. Labor-using policies are seen most in the growth of public employment itself, with extensive featherbedding in both civil (and military) service and public enterprise, and in regulations aimed at stopping private employers from reducing their work force.

Programmatic responses that seem appropriate to true factor scarcities can of course be found, particularly in the rural sector. Food-for-work schemes of various kinds can be counted here, and the relatively few attempts to organize landless agricultural workers (see Krishna, 1979). Government-sponsored guaranteed-employment programs, mobilizing labor for public works projects (for example, the ambitious Employment Guarantee Scheme of Maharashtra state in India), are perhaps the most important current endeavors on these lines.

Government responses to labor force growth, although constrained by political and social realities, are policy variables. Of more concern in this paper are the underlying societal responses to that growth, where emergence of political support for government intervention is merely one among many possibilities. The rural sector again provides the best illustrations. The most significant contrast between societies in terms of employment effects of population growth is between those in which local economic organization is maintained more or less intact under growth and those in which it is not. In the former—systems of peasant proprietorship, for example, or larger scale capitalist agriculture—institutions exist that regulate population increase that might otherwise undermine the system's stability. Primogeniture, property restrictions on marriage, and estate-specific labor markets are such institutions; lowered natural increase or raised outmigration are the demographic alternatives. In the latter, in contrast, social structures are more flaccid in accommodating population growth even at the cost of steady dilution of per capita assets (for illustrations in India and Indonesia, see Marriott, 1953, and Geertz, 1963). Institutional arrangements in this case serve to spread claims to the social

product, for example by assuring open access to harvesting or by strengthening lines of affiliation (tribes, factions, etc.) not tied to fixed territorial boundaries.

Setting out this contrast immediately raises deep questions. Why did the former kind of society emerge in preindustrial Europe, parts of East Asia, and in the areas of European settlement, the latter kind in much of the rest of the world? What are the cultural and administrative conditions for institutional rigidity in the extrusion case (and were they fortuitous in an evolutionary sense, since rapid population growth is such a new phenomenon)? Were there comparable institutions elsewhere that eroded under particular historical exigencies (colonialism, for example) or is it more the European/Japanese experience that has to be explained as a curious exception to the normal pattern?

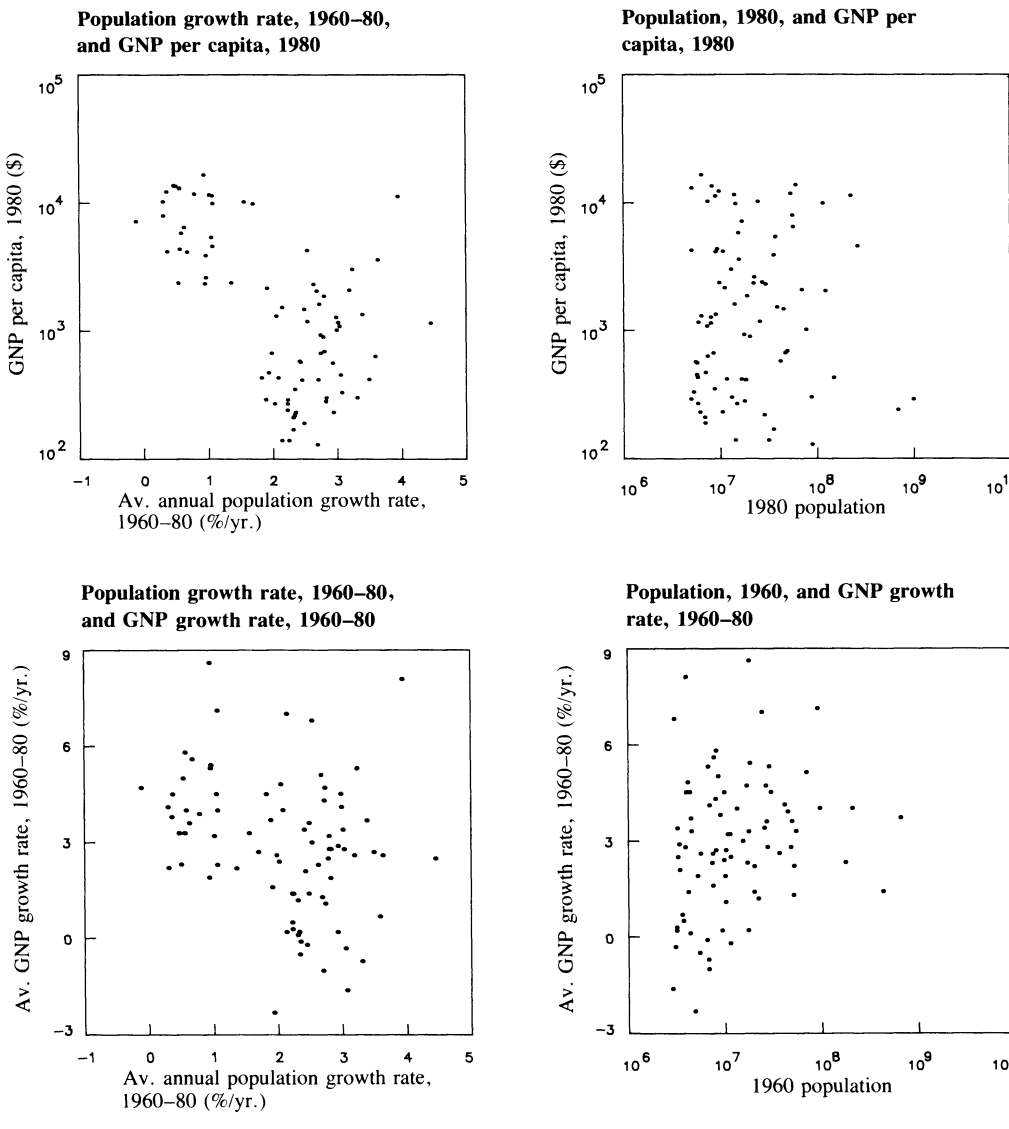
Such questions, perhaps fortunately, lead beyond the scope of this paper; one other, however, does not: what are the limits of labor absorption in the accommodationist case, and what happens as those limits are approached? We earlier noted Hayami and Kikuchi's (1982) observations concerning the effects of rural population pressure on access to the agricultural economy and on class stratification in rural Southeast Asia: these were end-effects, albeit in economies experiencing appreciable growth and technological change. In Indonesia, for example, the practice of contracting out the task of harvesting, instead of letting anyone participate and receive a share, is spreading, cutting back on total labor use and substituting men for women; however, overall employment in the economy has been growing, so far taking up much of the slack. In Bangladesh, accommodation of continuing rapid rural population increase is permitted by modest technological change and government-financed agricultural investment (levees and tubewells), and by a social system in which growing numbers of landless workers survive through loose attachment to clan and factional groupings surrounding prominent families. If agricultural output keeps up with population growth (a not too difficult achievement) a tenuous stability can be maintained notwithstanding the extraordinarily high rural densities already reached. A substantial class differential in mortality rates provides a nearly invisible fine-tuning of the system. (See Arthur and McNicoll, 1978a.)

We cannot flatly conclude that labor absorption in such societies can proceed indefinitely given pari passu gains in production, or that end-effects will always show this gradualism. On the economic side, however, there seem not to be clear-cut limits. Yet once we refocus on development goals rather than on simple accommodation of an ever larger work force, the opportunities foregone in that low-level expansion may be all too evident.

Discussion

The various effects of population growth on the economy that we have described above, together with those in the opposite direction, combine to form a notably confused aggregate cross-national picture (Figure 7: data are World Bank gross national product estimates and UN population estimates). A few general statements about growth consequences can of course be elicited. The most evident is that in most poor countries rapid population growth slows, sometimes dras-

FIGURE 7 Scatter diagrams of gross national product level and growth rate against population size and growth rate, 1960–80, for countries with 1980 populations of 5 million and above



tically, the rate of increase in the proportion of the labor force in the modern, high-productivity sectors of the economy. Countervailing productivity effects appear at best to be slight: while families individually may be induced by high fertility to raise productivity, any per capita gains are at least partially offset by negative external effects of others' fertility. A positive net productivity impact of rapid population growth is unsubstantiated as a general proposition. Similarly, the evidence suggests that economies of scale in production and

infrastructure yielded by population size are modest and only garnered in the long term. On balance there is little doubt that rapid population growth is a serious burden on efforts to generate sustained increase in per capita product. (This is also Cassen's [1976] conclusion, in his classic survey of the population and development literature.) What prevents this showing up in correlations such as those of Figure 7, aside from large intercountry variation in the institutional settings of economic-demographic change, is the fact that strong economic performance in turn will often raise the rate of population growth through natural increase or migration. Rapid population growth, as an immediate by-product of success in combating mortality, does signal a certain measure of collective organizational capacity or economic prowess.

To reduce the consequences of rapid population growth principally to a problem of labor absorption—even a serious problem, calling for politically laden realignments of factor prices and elaborate public-sector employment-generating programs—would be to downplay them. Accommodationist policy measures are available off the shelf, routinely packaged for individual country use by international agency missions. The more significant implications of alternative population growth trajectories lie in the design and performance of development institutions and in the kind of social arrangements they support, and perhaps also in the changes that are generated in the international system. These gray areas, largely inaccessible to formal economic analysis, are touched on in later parts of this study.

The underlying difficulty in reaching determinate conclusions about economic consequences, remarked on earlier, lies in dealing with inherently unverifiable, contrary-to-fact conditionals. McClelland (1975), who discusses the problem lucidly, points out the "enormous difference between (a) attempting to identify some of the causal factors that actually contributed to an observed effect, and (b) attempting to specify what the world would have been like minus one of the causes that actually did occur" (1975: 163). The first is the traditional task of historians, who often amass so much detail as seemingly to present sufficient conditions for the given outcome. The second is more familiar to economists and new economic historians and is what is chiefly of interest for the problem at hand. The difficulty, however, is that counterfactual speculation "requires knowledge about likely substitution processes in the world minus a given cause, and specifying the nature of such a world may be judged to be next to impossible, if not blatantly impossible" (1975: 165).

The Kelley–Williamson counterfactual of rapid population growth in Meiji Japan can probably pass muster on this score. A modern mortality regime anachronistically imposed on late nineteenth century Japan could plausibly leave the structure and behavioral assumptions of the Kelley–Williamson model relatively intact. If so, the conclusion that rapid population growth would not have impeded Meiji economic performance would still hold. Contrast this, however, with Simon's (1977: ch.13) finding of the relative insensitivity of output per worker to variations in fertility in a model simulation over nearly two centuries. The model itself is not at issue here (although see the criticisms

of it by Sanderson, 1980) nor is its calibration (using parameter values representing contemporary low-income countries). The problem rather is that the alternative fertility trajectories assumed in the experiments on it would indeed entail major "substitution processes" that cannot be ignored. The trajectories lead to population sizes at the end of the period that differ by a factor of 20—necessarily reflecting quite different socioeconomic institutions and hence calling for quite different modeling assumptions. A statement such as that "over quite a wide range of moderate to high birth rates, the effect of fertility upon income is *not* spectacularly large—seldom as much as 25% even after 180 years" (Simon, 1977: 295), assuming some meaning can be assigned to it beyond the confines of these particular analytics, is simply not supportable by a structurally invariant growth model.

Is the answer then to elaborate the models to encompass more institutional reality? This has indeed been a popular route, leading to a number of very large simulation models of economic-demographic systems. The inherent weaknesses of such efforts even for short-run sensitivity analysis, let alone long-run policy experiment, are discussed in Arthur and McNicoll (1975). Yet the ambition that has driven these enterprises, deriving from the recognition that the evolution of economic-demographic systems involves complex interactions and yields sometimes counterintuitive trends, is surely justified. To draw conclusions on the differences among alternative economic-demographic scenarios requires admitting that complexity. Unfortunately, further knowledge of social and economic change will probably do little to smooth the difficulties facing formal systems modeling in population and development—especially if, as seems likely, it ties demographic processes more closely to social structures, administrative organization, and the political system. And the intractability of any modeling over the long time spans needed in this area will remain.

Population growth effects on social and political organization

Interconnecting with population growth effects on economic characteristics such as productivity, investment allocation, and labor absorption are effects on social, administrative, and political arrangements. Although empirical evidence here is hard to come by, these latter effects likely outweigh more narrowly construed impacts on the economy. Rapid population growth may impel changes in the nature and role of the family and local community and in forms of government administration; it may generate new political responses far beyond the demographic sphere; and over the long term its differential impact seems likely to induce large shifts in international relations.

Family and community organization

One of the proximate consequences of an increase in the rate of population growth deriving from mortality decline is a shift in kinship frequencies. Despite

little overall change in the population age distribution, families on average have more surviving children and last longer. Structural adjustments to the new demographic circumstances are to be expected. For example, as early parental mortality becomes rarer and children routinely survive into their parents' old age, some of the informal security arrangements that would have favored laterally extended family ties may no longer be needed (see Burch, 1970: 65). Such reasoning supports the commonly held notion of a transition from extended to nuclear families as an accompaniment of modern economic growth, "from the joint, large family, with its patriarchal or matriarchal and nepotistic tendencies that stifle individual initiative, to the small, individualistic family that is the appropriate unit for modern societies" (Kuznets, 1965: 94–95). A growing body of empirical evidence, however, belies this stereotype. Nuclear family prevalence can be traced far back in European history. Even in South and East Asia, where patriarchy has been normatively dominant, the realities appear to suggest a long-continuing high rate of occurrence of nuclear units. "The joint family as described and discussed in the literature of family sociology and cultural anthropology appears to be more a sociological tradition than a statistical reality" (United Nations, 1973: 340).

The onset of rapid population growth does have one significant family-level effect: an increasing pace of new family formation. (This was referred to in the earlier discussion of kin structure.) The effect is not an inevitable one: a traditional European- or Japanese-style restriction on marriage or establishment of a new household would eliminate it—in turn, as in those settings, curtailing population growth. But such social controls are seen as wholly infeasible in most contemporary societies (China being a partial exception); governments endeavor instead, if often with little success, to promote birth control *within* marriage. The main effects of a high rate of increase of households are located in the larger community and economy rather than in the family itself, although feedback effects from these suprafamily spheres may be felt.

Comparison of the rapid-growth, midtransition demographic regime with the low-fertility, post-transition regime offers greater contrasts in family structure. In accounting for these, however, the accompanying processes of urbanization and industrialization and increases in geographic mobility, which together help to strip away traditional family roles, probably are more important: at any rate their presence makes it difficult to isolate independent growth rate effects on the family. A variety of more subtle influences on family organization may result from change in the variance or skewness of kinship distributions over demographic transition. Until the demography of these changes is better known, speculation on the social consequences is unprofitable.

Less demanding of technical demography is the question of population growth consequences at the community level. These are for the most part simple size effects. Consider first the case of rural areas. Villages have historically expanded by fission in most peasant societies, with establishment of "daughter villages" as population grows. The resulting pattern of hamlet

clusters, each hamlet having typically a few hundred households at most, is widely found across Asia and the Middle East. Administrative "villages" that have populations of 5–10,000 as in Indonesia or 20–30,000 as in Egypt turn out to be clusters of that type. (Settlement patterns at variance with this can of course be found: where topography or agrarian conditions dictate less clustering or a more fluid territorial base, or where tribal or similar ties override those of neighborhood. Note also that the fission process does not require propinquity. Where an open land frontier exists, settlers can and do create new hamlets in distant areas.)

What happens as population continues to grow and the land frontier closes? The earlier discussion of labor absorption treated one side of the answer: a build-up of agricultural labor, in some places precipitating fairly abrupt institutional change to limit numbers of claimants to the harvest, in others giving rise to serious environmental degradation; the multiplication of non-agricultural activities; and extrusion of people from the rural sector. The welfare consequences of these processes can differ greatly depending on the overall rate of expansion of the economy, urban as well as rural. Changes in the village community qua community, however, seem less dependent on economic performance. Chief among such changes is the weakening of village authority structures and erosion of local solidarity built on face-to-face contact (however cross-cut by class and faction). The village, in effect, is slowly converted to suburb. Rapid population growth is of course only one among several forces at work. New technologies, improvements in transport (facilitating short-term migration and commuting), fuller monetization of labor markets, and the spread of consumerist values are important independent factors in the outcome.

Local effects of population growth in urban areas should also be mentioned. Urban growth rates in the developing world were noted in Table 5. Continued expansion at rates above 4 percent per year for several more decades is in prospect for many countries. Rural-urban migration remains a large contributor, currently accounting for some 40 percent of urban growth (United Nations, 1980a: 23). This sustained rapid increase and the migration that helps to fuel it might well be expected to be highly disruptive of social relationships, giving rise to the individual anomie and social disorder that are common stereotypes of urban life. In reality, substantial parts of even large cities in the developing countries have a distinctive community structure. In squatter settlements particularly, there is abundant evidence of retained or recreated solidarities under these new conditions. Disorder, it seems, is partly in the eye of the beholder: the apparently chaotic street scenes of, say, Lagos or Calcutta disguise an appreciable underlying structure of collective action. (See Tilly [1981] on this issue.) Moreover, the system appears to be able to survive rapid population growth: there is no direct analogue of the fissioning process that once operated in the countryside, but new local community identities somehow continue to emerge.

Sociologists and anthropologists tend to romanticize this urban community structure (as they once did village life), probably in reaction to the flat

condemnation of the often-grim physical settings by city planners and government officials. In certain quantifiable respects—real income, health, educational opportunities, access to amenities of certain sorts—even slum dwellers can usually be shown to be better off than most rural villagers. For the assessment of population growth, however, this contrast is immaterial. What matters is whether urban conditions would have been better had city growth been slower. The answer is hardly in question.

Administrative systems

As organizations, families and (to a lesser and more varying extent) communities are exclusionary, potentially able to use their control of membership to protect themselves against dilution of per capita assets. Many larger social groupings—in particular, national states—have little membership control. Migration into them may be regulated, but natural increase for the most part must simply be accommodated. (Government efforts to promote low fertility would rarely call for more than minor qualification of this statement.) Economic response through technological and institutional adjustments has been treated above in some detail. We consider now responses in the administrative and political spheres.

Rapid population growth, especially as manifested in fast-expanding cities and ever-larger numbers of labor force entrants, is clearly seen by most governments as a threat to social stability and orderly change. The perception is probably accurate. The "structures of collective action" that were just pointed to as showing the resilience of community life in Third World cities provide the means to channel new political demands on government and to mobilize support for them (see, for example, the Mexican case study by Cornelius, 1975). Demands come too from the rural population, where erosion of traditional village and patron–client ties allows clearer expression of communal and class-based interests. In these cases the perceived political threat is likely to elicit a strengthening of government administrative control of the population, whether in response to an actual challenge or preemptively to an anticipated challenge. (By its nature, such a relationship is difficult to support with direct evidence. See, however, the study by Moller [1968] of youth cohort effects in different political regimes.) Quite apart from any deliberate efforts to achieve political change or protect existing privilege, some shifts in the direction of tighter or more pervasive government control can be simply seen as attempts to maintain elementary physical security in the face of increasing crime and violence. Here too it is not implausible to trace a contributory role of rapid population growth, although a direct crowding/social pathology link is unsupported (see Freedman, 1975: ch.5).

Compositional changes in a population, notably differential growth by ethnic or cultural group, also have major consequences in the political–administrative sphere. Weiner (1971: 595–600) discusses a number of cases in point. Communal tensions rooted in expectations of adjustment in political representation as demographic change occurs—even extending, as in Nigeria,

to disputes over the facts of population size, politicizing the task of census-taking—are at the base of many civil conflicts around the world. Authoritarian responses by governments in these situations are all too familiar.

The organizational demands imposed on government by rapid population growth beyond those concerned with domestic security are a second large area of impact on administrative systems. A growth rate that doubles population size in a generation, and city size in sometimes a decade, keeps a country's political and administrative apparatus perpetually overextended and off balance. Organizations no less than organisms are subject to principles of allometry (see Boulding, 1978: 214). Administrative systems cannot simply be scaled up as needed with their competence intact. Indeed, managing any such expansion itself is likely to occupy a significant part of bureaucratic attention. In a laissez-faire economy, working within a well-established institutional setting, a degree of administrative incapacity may have little consequence; in developing country situations, where governments typically have assumed a major role in economic management, the damage can be severe. An important instance is the inability of many Third World governments to take effective action to halt environmental degradation, such as that resulting from uncontrolled deforestation. (The demographic impact, it should be emphasized, is not primarily a direct result of "population pressure" on the landscape, but an effect on societal arrangements that formerly managed—and elsewhere continue to manage—to maintain renewable resources in the face of rising demand.) Administrative overextension may also be felt in a diminished capacity to cope with external shocks such as sudden shifts in international economic conditions. It is possible to imagine circumstances in which efforts to meet the administrative demands of responding to demographic challenges would prove a bracing rather than debilitating experience for government—a kind of "Hirschman effect" similar to that noted in the earlier discussion of public investment; actual examples (Hong Kong, perhaps?) are probably very few.

We have been concerned thus far with political and administrative responses to rapid demographic change. The absolute size of a country's population also has important implications for administrative design. The largest of the now developed countries at the beginning of their industrialization were France, with a population of some 30 million around 1800, and Japan, about the same size in 1850. Britain in 1800 had fewer than 10 million people; the United States in 1850 about 24 million. Their legacy of administrative technology may have little to offer today's much more populous developing countries. Kuznets (1973) remarks on the implications of size disparity for contemporary transfers of "material and social tools." Third World countries face "a long period of experimentation and struggle toward a viable political framework," with economic advance contingent not only on modifying to their own needs the available stock of material technology but also, and even more, on "innovations in political and social structure" (1973: 256–257). The benign image of nations self-consciously developing political cultures as if pottering

in a laboratory of course bears slight resemblance to the real processes (and neglects the likelihood in many cases of totalitarianism being an absorbing boundary). The fact remains that the political formats emerging from contemporary efforts to mobilize national populations have long-range implications for the course of economic growth and for the kinds of societies that result.

International consequences

"International relations continue to be a recurring struggle for wealth and power among independent actors in a state of anarchy" (Gilpin, 1981: 7). Equilibrium in the international system is attained when the expected costs to any state of seeking to change the system through territorial, political, or economic expansion outweigh the benefits (1981: 10–11). Thus expressed in terms of realpolitik, these premises are simply the Coasian view of the firm (Coase, 1937) transposed to a global scale. Differential growth among nations in economy or in political or military capacity is likely to alter the balance of benefits and costs of change, and thus lead to small or large attempts to adjust the system. Demographic change clearly is a factor influencing these differential growth patterns—how important a factor is explored below—and hence has repercussions on international relations. Population also, however, has some tendency to seek its own level: national borders, except in relatively few cases of conjunction between strong state interests and high administrative capacities, are to some degree permeable to human migration. Thus population may impinge on the international order directly, so to speak, as well as through the agency of national states.

Population and power Political scientists trace the dynamics of international relations to the differential growth of power among nations. Though variously defined, power refers most simply to economic and military capabilities.

How population size is related to a nation's power is an intricate question. At a gross level there is no doubt about the association: scale counts demographically as well as economically. More populous nations, other things (chiefly, per capita product) equal, tend to have more authority in world affairs than less populous ones. The relationship is not a fixed one, however. Quincy Wright (1958: 265), for example, emphasized its dependency on technology and organization. Where these were fairly comparable, as in the European state system from its early days until well into the present century, "military power depended in large measure upon the size of the national population which supplied army recruits and paid the taxes to equip them." Where countries differ markedly in technology and organization, the link is broken—as illustrated by the success of European imperialism over several centuries. Wright went on to note, however, that the future may more resemble the premodern European past: "As states become more alike in technology and organization—as they will in the shrinking world—population may increase in importance as a measure of military power" (1958: 266). Achievement of

technological equality is a more distant prospect for many nations today than it appeared to be in the 1950s; but provided the expectation of eventual achievement remains, then, as Davis (1958: 205) remarks, "a policy of limiting population growth jettisons an important source of national power—namely the military and industrial value of a greater population when other things are improved."

It can be argued that strategic nuclear weapons have decisively altered the significance of these demographic factors, attenuating or even eliminating the "defense in depth" once offered by large territory and population. The economic and demographic clustering displayed by urban industrial societies makes for extreme vulnerability irrespective of those characteristics. Probably a stronger case can be made, however, that the situation of mutual deterrence created by second-strike weaponry at the nuclear level has left the routine exercise of power among states still largely determined by economic and conventional military capacities—thus leaving population still a significant factor.

Whatever the conclusion of this debate, it remains the case that national governments rarely have time horizons exceeding a few decades, and even at the rapid pace of population growth in the contemporary world the time it takes for a country to move from the minor to the major demographic leagues is measured in generations. Hence, while vague ambitions of demographic grandeur may play a certain part in governing the direction of a nation's population policy, the larger roles are likely to be played by considerations of shorter run population effects on relative power. These latter effects are overwhelmingly mediated through the economy.

Encouragement of immigration can of course speed a nation's population increase or compensate for fertility decline when the nation is seeking demographic aggrandizement or simply additional labor. Culture and economics introduce conflicting considerations here. One direction of argument would sharply limit immigration to a level set by the processes of acculturation: national identity for most countries entails some commonality of values and historical memory, and preservation of that identity is usually a tacit axiom of demographic policy. Even in culturally or linguistically pluralistic societies where identity is necessarily defined more broadly, rough preservation of an existing group balance is likely to be a policy assumption. In typical conflict with such thinking is the straightforward economic argument that would admit migrants on the basis of more or less explicit benefit–cost calculations, social or private. Short-term migration organized through guest-worker programs, recently widespread in Western Europe and now characteristic of the oil-rich states of the Middle East, is an effort to resolve this conflict between cultural identity and economic growth.

Although most governments experiencing high rates of population growth are in fact pursuing policies to reduce that growth, the prospects, as seen earlier, are for at least several decades of continued rapid expansion. Over this period the demographic configuration of the world will shift markedly, as

shown, for example, in Table 2 and Figure 3. What are the implications of these shifts for international relations? Any answer must be speculative, but the following points can be made.

— For each generation it is the current demographic weighting that is seen as the starting point for national assertions of population-based rights. Nations do not acknowledge "responsibility" for past population growth. (Blame is another matter. In some formulations of dependency theory, demographic expansion, like economic backwardness, is seen as a manifestation of "peripheral" status in the world system. Responsibility is imputed to the core countries.)

— So dominant is the doctrine of national sovereignty in the modern world, however, that there are few such rights be be claimed. To a limited extent, population size is a factor in allocational decisions by international agencies; less so in national foreign assistance programs, preferential trade policies, and so on. In the division of potentially rich ocean resources recently decided upon by the Law of the Sea Conference, and in the lengthy deliberations leading up to it, population weights played virtually no part.

— Prospective shifts in absolute and relative demographic weight must be superimposed on prospective changes in resource availability and the environment. The depletion and eventual exhaustion of fossil fuels is one such change, likely trends in climate another. In the latter case, for example, while the time scale of climatic change is not yet fully clear and the international distributional impact still a matter of speculation (see Kellogg and Schware, 1982), there is little doubt that climatic effects will require substantial adaptations in agriculture in coming decades. In the longer term, a retrenchment in coastal settlement may be needed to accommodate a higher sea level. Demographic effects on international relations cannot be set against a constant environmental backdrop.

— As developing countries become technologically more proficient, population weights may well become more salient, as Quincy Wright suggested. Pressure for realignment of international relations to accord with these new realities would be expected—for example, some substitutions among countries recognized as major powers and a shift from a bipolar toward a multipolar world system.

— While any such process of realignment can potentially be violent, it is not particularly helpful to debate the issue of whether population growth is thus a "cause of war." Demographic factors, together with economic, technological, and environmental change, are underlying forces making for shifts in power relations; whether or not these shifts are accomplished peacefully depends on less fundamental characteristics of national polities. In particular, the rhetoric of "Lebensraum" or its equivalent is better seen as an attempted rationalization of power and a device for

mobilizing domestic support for aggression rather than a description of actual motivation. (See Kleinman [1980: ch.3] for a vigorously argued case against population growth as a cause of conflict. Kleinman strongly criticizes the empirical study by Choucri [1974] that claims to demonstrate such a link in many recent conflicts in developing countries.)

Remnants of liberalism in international migration In a liberal world order, labor, like other factors of production, would move freely in response to price signals indicating demand. Most countries with free-market economies approximate a national labor market within their borders; few now have a labor market extending across national borders, and these only in cases of attempted economic integration such as the European Economic Community or its looser equivalents in other regions. The same situation applies with respect to other kinds of migration, including refugee movement. Key features of national sovereignty are controls over entry, right to work, and acquisition of citizenship.

Enacted controls are not easily implemented, however: they call for substantial organizational and administrative capacities and impose political costs elsewhere in the society that may be deemed excessive. For either reason, a good deal of international migration occurs illicitly, at least according to the laws of the recipient country.

Immigration beyond legally sanctioned levels is in some sense not in the national interest of the receiving country, although different interests of particular groups in the society and the enforcement costs just mentioned blur this statement. For countries of origin the migratory flow (aside from its "brain drain" component, a numerically small part of the picture) is often thought to represent an easing of unemployment or other social problems and increasingly is seen as a source of foreign exchange from migrant remittances. Efforts to stanch it may appear an unfriendly political act. Bangladeshis moving to India, Mexicans to the United States, or Moroccans to France are cases in point. It is clear that such migration, numerically transferring population growth from one nation to another beyond one of those nations' legislatively declared interests, is appropriately seen as a proximate consequence of population growth; the economic and communal strains experienced in the regions of destination, the governmental responses that are elicited, and the tensions generated between sending and receiving nations are systemic consequences. (For an analysis of these consequences in one particularly violent contemporary case—that of Bangladeshi migrants in Assam—see Weiner, 1983.)

Illegal migration from poorer to richer nations seems bound to continue and probably to increase in scale, although its level is not immune to advances in the technology of administrative control. In some countries of destination, resulting compositional effects and their political ramifications are likely to be marked. In addition to this routine migration there is perhaps increasing likelihood in a number of regions of seeing massive short-run population movements across national frontiers of the kind that occurred in 1971 during the Pakistan civil war when an estimated 10 million people, more than a tenth of

the population of what was to become Bangladesh, sought refuge in India's northeastern states (Franda, 1982). It is not difficult to envisage situations elsewhere that might give rise to migration of a similar relative magnitude but with permanent and pervasive rather than (as in this case) temporary and contained effects on the demography of the recipient country. Short of demographic imperialism on a vast scale—even compared, say, with the European occupation of the Americas—that could only be the outcome of a radical shift in the world order, the numerical impact on the demography of any but the smallest countries of origin would be slight.

Discussion

The political and social organizational consequences of rapid population growth are even less clear-cut than the economic consequences. Evidence for the most part is qualitative; assertions backed merely by argument and casual illustration abound. In part this situation reflects narrowness of the research base. The subject, for example, typically is seen in terms of the effects on social organization of population size rather than rate of growth. The population/power relationship then can be dismissed as faded mercantilist dogma, undeserving of further study. Smaller scale anthropological research on consequences for social and political systems tends to bog down in parochial disciplinary disputes (see, for example, Stevenson, 1968) or remain mired in societal minutiae (for example, Barth, 1978).

Unfashionability of subject and disciplinary aversion to generalization do not fully explain the thinness of empirical findings. There are underlying difficulties, deriving from the intrinsic nature of the variables and the hierarchy of levels at which they operate. The influence of population growth on social organization is that of an oceanic force for change, evident in distant perspective (recall, for instance, the North–Thomas study of the impacts of population growth on European feudalism) but crowded out by a host of proximate determinants at close range. Tolstoyan interpretations of "the forces that move nations" may not demand a Tolstoy, but they do not readily emerge from mainstream social science analysis.

The hierarchy of levels poses a more straightforward analytical problem. There can be no doubt, for example, that the continued rapid expansion of the young labor force–aged population in the Third World over the rest of this century, with absolute increases much larger than in prior decades (Table 3), will have profound effects on local government, national polities, and the international system. At each level the scale of these effects is governed in part by lower level responses: the degree to which political instabilities are contained, economic growth is generated, and social institutions adapt. Moreover, spillovers to higher systemic levels are as often as not intentional. The picture of institutional change drawn by Ruttan (1978), as an outcome of efforts by economic units such as households or firms to capture the gains from economic activity and avoid the costs, set against efforts by the broader society to force economic units to bear the costs and yield up the gains, appears to

apply quite generally—even, albeit with minimal countervailing capacity by the "broader society," to nations in the world system. A satisfactory analysis cannot be confined to a single level.

Individual-level and distributional consequences

It has been convenient as a matter of presentation to separate the discussion of population growth consequences for the economic system from that of family-level and broader social organizational consequences, but the two interpenetrate at many places. In particular, both contribute to changes in the setting of the economic and demographic behavior of individuals, and both thus come into play in determining net individual-level and distributional consequences of population growth.

Individual experience of rapid population growth

The behavioral setting that supports a regime of rapid population growth is one in which parents and potential parents do not find it in their interest to limit fertility at a relatively low level. (Such a statement, of course, requires qualification to allow for different distributions of completed fertility in different high-growth-rate societies, for recognition that men and women may differ in their fertility interests and in their power to act on them, and for acknowledgement that in some societies the cost of effective birth control may be a significant deterrent to practice.) A simple classification of the reasons such a setting may persist can be framed in terms of (1) the (ex ante) perceived net benefits children yield to one or both parents, (2) the groups in the society on which net external costs of the resulting population growth fall (or to which net external benefits accrue), and (3) the relative capacity of those groups to organize themselves to assert or protect their interests in specific demographic outcomes.

In the classic stylized illustration, entrenched rapid population growth is seen as a "prisoner's dilemma": each family transfers some of its fertility costs on to the rest of society and reciprocally bears part of others' costs itself, but the extreme diffusion of costs inhibits remedial action through the establishment of a social compact that could elicit the first-best solution of mutually lowered fertility (see Demeny, 1971: 214–216). Fertility costs, in other words, to a possibly large extent are borne by the society as a whole, through mechanisms such as depressed wages, physical insecurity, or a degraded environment. Probably more common in reality is the situation of unilateral rather than reciprocal transfers: the costs of fertility are borne, for example, by children, who may face bleak employment prospects; by the poor, whose opportunity for upward mobility may be weakened; or by women, if social pressures compel very early marriage and childbearing. Gainers from the high-fertility regime, aside from (presumably) the parental decision-makers, can

similarly be identified: in particular, those at the center of kin-based groupings, whose economic strength may be enhanced by the greater size and more youthful age structure of the group; and larger clans, factions, or ethnic groups with a political stake in raising their relative demographic weight. The difference in organizing capacities between gainers and losers, apparent in these examples, provides a kind of stability to the demographic regime; changes in those capacities are a major source of destabilization.

Analogous transfers can be delineated in the case of rapid population growth resulting from migration, internal or international. The existing populations of communities where migrants settle may indeed benefit from the resulting growth, but even if they feel harmed they are typically precluded by law from taking exclusionary action. Within that population there are also likely to be clear-cut gainers from the migration, such as employers who can draw on a cheaper, more pliable work force or profit from expanded local consumer demand.

Tracing out demographic transfers in a given institutional setting is an intricate task. As an illustration of the complexity involved, a recent study of rural Bangladesh (Cain, 1978) finds that, although high fertility entails an involuntary transfer of costs on to the next generation (i.e., on to the children who inherit assets diluted by population growth), within any family high fertility helps ensure that land holdings will at least be preserved to be inherited and not lost for want of family labor. Children individually would not be benefited by having fewer siblings. The situation in which families essentially act as corporate units, or in which family heads internalize the interests of their children, eliminates the generational transfer problem only by adding to the prisoner's dilemma.

Once such a transfer analysis has been carried out, necessarily somewhat roughly since many of the transfers are not readily quantifiable and involve time delays and other kinds of incommensurabilities, the systemic consequences of rapid population growth can be recast into consequences experienced by individuals. Any person is simultaneously a member of various cross-cutting categories in the population—say, a nuclear family head, a member of a larger corporate kin group, a wage laborer, and so on—each associated with its own benefit–cost balance with respect to population growth. In theory at least, then, the effects can be aggregated for each individual. (Interpersonal differences in what is counted a benefit of course influence subjective judgments on the outcome of the aggregation.)

Whatever the complexity of these overlapping external effects in the larger institutional context, it might be thought that at least the *direct* consequences of its own high fertility for the family concerned are unproblematic. Two obstacles prevent simplicity from thus being achieved, however. First, the family is itself in some respects a miniature society, with its own interest groups (by gender and generation) and conflicting preferences. Second, cause and effect are thoroughly entangled: high fertility is a response to family circumstances as well as a contributor to them. Wray (1971: 455–456), at the end of a major review of the many studies that show positive correlations of

large family size with child mortality and morbidity and with impaired physical and mental development, was unable to find evidence one way or the other to answer the question: "would the parents of large families have provided better for their children if they had fewer of them?" Short of this bottom-line counterfactual, he does however conclude that there is a causal connection from family size (and close childspacing) to those various adverse outcomes: "family size is not the only cause of these effects, but it is clearly implicated as an important element in the interacting network of causal factors" (1971: 454). Birdsall (1977: 74–77) cites a number of subsequent studies supporting this latter conclusion and takes note also of the negative effects of high fertility on maternal health, especially for poor women.

Behavioral outcomes

The individual experience of rapid population growth generates behavioral responses. Some of these we have earlier discussed: changes in savings behavior, in some situations enhanced productivity through technological or organizational innovation or simply greater effort, and political demands on government. These are represented in Figure 1 by the reverse arrows from "individual behavior" to economic, political, and family systems. Additionally, there are important demographic responses feeding back into population growth itself.

Most thinking about behavioral responses to rapid population growth makes two tacit assumptions. First, the family is seen as a system with certain homeostatic qualities, its members seeking to preserve or enhance its relative status in a larger community or reference group. Second, the stimulus generated by population growth is assumed to be contained within the family itself—for example, consisting of the expected consequences for the parents of the number of children so far born and surviving—or transmitted as object lessons from one's family of origin (as in the "Easterlin hypothesis") or from other observed family situations. To the extent that the costs and benefits of population growth are deflected away from those directly responsible, or are mutually diffused throughout the population, it is likely that any resulting behavioral effects will not be perceived as being linked to population growth.

The simple model of the homeostatic family does not yield unambiguous response predictions, since there may be substitutability among responses. In his well-known version of demographic transition theory, Kingsley Davis (1963) argues that fertility decline and outmigration have historically been alternative responses to improved child survival rates, with the latter in fact preferred. Only when migration opportunities are foreclosed is a fertility response predicted. Moreover, economic or political responses may also be chosen: an increase in family labor supply, innovation, or improvements in efficiency; and mobilization of others to assert collective influence on political allocative decisions or on the rules governing those decisions.

A still more serious source of underdetermination in this model is the homeostasis assumption itself. Families can and do "fail"—passively tolerating welfare decline and, in extreme cases, in effect disintegrating as economic

and social entities. Explanation for such failure may be located in the social structure (more precisely, in the network of transfers generated by and sustaining rapid population growth) or in the cultural system that gives meaning to people's experience and that may limit their view of the possible. More important than predictive determinacy on the direction of response is an understanding of the socioeconomic and cultural factors that make for *any* purposive response.

The second tacit assumption—that demographic costs are contained within families—is obviously unreal in many cases, as discussed in the preceding section. Situations where something approaching full cost internalization may indeed have existed—for example, in preindustrial European systems of peasant proprietorship and in the analogous agrarian regime in Tokugawa Japan—have been maintained by elaborate superstructures of political, administrative, and ideological controls exercised over households and local communities. Explanation again must spread far beyond the family itself.

Discarding these two assumptions does not mean that nothing can be predicted about behavioral responses to rapid population growth. It does, however, mean that predictions cannot be casually made or readily transferred from one empirical setting to another. Rather, they must be constructed in situ on the basis of a close analysis of a particular set of socioeconomic circumstances and cultural patterns. It is there one can hope to uncover why, for example, a country like Bangladesh, with a precarious subsistence economy, can be doubling its population in a generation; and there too locate the kinds of structural change needed to redirect individual responses toward more socially desired ends. (See Arthur and McNicoll, 1978a: 46–59, and Cain and Lieberman, 1982.)

Distributional effects

Three distributional dimensions are primarily of interest in the present discussion. The first is the conventionally defined distribution of household income, with each family taken as a single recipient unit irrespective of its composition. The second is the analogous distribution of per capita income, with each family's income counted as if divided equally among its members. And third is the distribution of income shares by region or social group, contrasting rural and urban areas or assessing differentials among provincial units or ethnic groups, in per capita terms. The first two of these bear directly on the issue of inequality and indirectly on current concerns with absolute (as compared to relative) poverty; the third is of broad strategic interest for development planning and policy.

Some other dimensions of distribution with potential theoretical and practical interest confront inordinate conceptual and measurement problems likely to defeat most empirical research. Notable here is the concern with intrahousehold allocation of consumption, as between husband and wife or between parent and child. Exchanges within the family have an intensity and complexity that are poorly depicted in simple consumption terms except in

fairly extreme cases. Analysis of them must draw on conceptualizations well beyond economics. Empirical evidence on intrahousehold allocation of specific commodities is nevertheless of interest, although difficult to acquire: the study of food and health care allocation in rural Bangladeshi families by Chen et al. (1981) is one of the few examples of such research.

"Income" in these distributional considerations should ideally include an imputed share of public goods, which in some cases, such as publicly funded educational and health services, are themselves unequally distributed among families. To the degree that family size influences access to these goods, ignoring them (as is done in most empirical work based on family budget survey data) will introduce a bias into the results. If large families suffer a per-child disadvantage in that respect, any adverse distributional effect of population growth would be understated.

Rapid population growth can be attained with low or high family size variance—and by migration as well as by net reproduction. It can be sustained by many different combinations of transfers of fertility or migration costs. And it can elicit a diverse array of individual economic and demographic responses. It is not surprising therefore to find varying assessments of the direction and scale of distributional impact.

In terms of simple correlation, international cross-sectional studies consistently show positive associations between the rate of population growth and the level of income inequality. The relationship persists when economic factors such as the level and growth rate of gross national product are controlled. Under such controls, Chenery et al. (1974: 28), for example, record a distinct adverse effect of population growth on the income share of the lowest 40 percent of households: a one percentage point addition to the rate of growth of population was associated with a 1.6 percentage point drop in that share. Ahluwalia (1976: 326) shows a similar link and in addition a positive association with the income share of the top 20 percent. Since there is ample evidence that larger families on average have higher family incomes but lower per capita incomes than smaller families (Kuznets, 1976: 88), if we convert the income distribution index into per capita terms the population growth/inequality connection is even stronger.

But what underlies it? There are plausible causal arguments in both directions. Rapid population growth may lower the wage–rent ratio, reducing labor's share of output, as discussed earlier; increasing inequality in income distribution is a likely result. Differential growth of families by economic status may dilute the assets and income of the poor more than the rich (see Potter, 1979). In turn, a given overall gain in income is often argued to reduce fertility more if the benefits accrue to poorer families. Statistical analysis to pin down the net balance and strength of these relationships has not proved conclusive—see, for example, Boulier's (1982) criticisms of the study by Repetto (1979). Rodgers (1983), in perhaps the most persuasive of the cross-sectional studies, estimates a recursive model in which both population growth and inequality are endogenous: current inequality is a substantially lagged

function of the growth of income and of population; current population growth is a short-lagged function of income level and income distribution. Little effect of population growth on inequality (income share of the bottom 40 percent of households) was found. Rodgers' conclusion from his own and others' studies is that "there does not emerge from the literature, national or international, a convincing demonstration that the effects of population growth on inequality are *important*" (1983: 31).

A little more can, however, be said. In a given country setting, population growth may be concentrated in ways that have manifest distributional consequences whether or not they show up in the fairly short term in conventional measures. The case of differential population growth by income class was noted above. Here, the most significant effects may be those that operate through parental investments (both in money and in time) in "child quality" at the early ages, a process with a generational lag. Jones and Potter (1978: 22) cite data from Colombia: "when the birth rate was above 45 in 1964 about half of each cohort was born into the poorest 50 percent of all households. In 1973, when the birth rate had declined to the low thirties, the share of children born into these households increased to about two thirds." (The annual growth rate over this period decreased from about 3.1 to 2.2 percent.) Similar experience of concentration of births among the poor as population growth declines can be found elsewhere. It underlies current eugenic concerns in Singapore, for example. Further striking evidence of the phenomenon is provided by Birdsall's (1980: 39) adjustments of income distribution data in a number of countries to reveal "relative income per child" for households classified by income per capita. "From one generation to the next, an unequal distribution of income is caused by and contributes to an unequal distribution of skills, as large family size and low investments in children go hand in hand" (1980: 41).

Concentration of population growth along other dimensions may have more immediate distributional consequences, but ones that happen not to be picked up in measures of household or per capita income distribution. Differential growth by ethnic group, discussed in the previous section, is an obvious example. Regional differences in the natural increase of population provide a less clear-cut illustration since, if tending to generate significant economic disparities, they are likely to be offset by migration.

The ethnic group case just mentioned serves to introduce a further consideration. The distributional issue arises there because individuals can be tagged with an ethnic affiliation. Taken further, other such tags can be envisaged—ultimately leading to each family or each individual being separately distinguished. An unchanged aggregate income distribution in a population in which such identifications are suppressed may in fact coexist with large shifts, up and down, in the fortunes of most individuals in it. Conversely, a marked shift in Gini coefficient may coexist with minimal changes in economic status. Many of the supposed advantages for economic development that theorists now see in egalitarian income distribution (that is, aside from any value it has

as a development *goal*) are probably more closely tied in fact to opportunities for upward economic mobility, on the assumption that such opportunities are more widespread in egalitarian settings. That assumption may well be quite tenuous.

A recurrent theme of this paper is the significance of institutional arrangements in a society for governing interactions between population growth and economic variables—arrangements, moreover, that have their own dynamics to be explicated. From this standpoint, the distribution of income (or of economic opportunity) can be seen as a manifestation of deep-seated power relations and property rights in a society. To explain a particular distributional pattern calls for exploring these factors; to modify it calls for changing them or tolerating their change. Much the same thing can be said about the determinants of population growth and its components. A fertility regime in particular is not casually changeable, as the policy experience of the last two decades amply demonstrates. For the present discussion the corollary is that the distributional consequences of population growth, like the individual behavioral responses to that growth, are institutionally contingent. This is not to say that they are indeterminate, still less unimportant, but that generalizations as to net effects will not adequately capture specific realities.

Valuation of growth consequences

Even where there is reasonable accord on the factual implications of rapid growth for the economy and society in a particular setting, there can be, and often is, wide disagreement on the valuation of these consequences. Differences in value assumptions can concern anything from details of individual preferences to fundamental ethical premises. We start with the latter.

The most important premise in terms of its effect on valuation is the specification of whose welfare is to be of interest. As a practical matter, since most of the consequences of rapid population growth (and virtually all the costs of policies to slow it) appear to be contained within national boundaries, it makes sense to address this problem at the national level. Here, the widely accepted index for valuing population growth is some summary measure of the ensuing time path of the average welfare of citizens—both those presently alive and those who become citizens in the future through birth or immigration. Mounting uncertainty about the future and diminished empathy with those distanced in time (as in space and culture) are usually brought into the valuation through a positive rate of time preference, giving progressively less weight to welfare over time. More restrictive variants of such an index—for example, a focus on the "basic needs" of those at the bottom end of the income distribution—retain the same ethical spirit.

Not everyone accepts this per capita welfare criterion. In contradistinction to it, the classical utilitarian position calls for the maximization of "total welfare"—that is, average welfare at each time summed over the population experiencing that average. As a population grows, the weight accorded its

average welfare in the maximand thus grows also. Clearly, in this case much larger populations would be approved of. The total welfare criterion was put forward by Bentham and Paley and later supported by Sidgwick and Edgeworth. These writers admittedly were concerned with how the base population should be defined (a country? the world? "all beings capable of pleasure and pain"?) rather than with valuing marginal changes in population size. Sidgwick (1907: 415–416), however, notes in passing the implication of the criterion for population growth:

> [I]f the additional population enjoy on the whole positive happiness, we ought to weigh the amount of happiness gained by the extra number against the amount lost by the remainder. So that, strictly conceived, the point up to which, on Utilitarian principles, population ought to be encouraged to increase, is not that at which average happiness is the greatest possible,—as appears to be often assumed by political economists of the school of Malthus—but that at which the product formed by multiplying the number of persons living into the amount of average happiness reaches its maximum.

Among modern economists, Meade (1955) is the best-known advocate of a total welfare criterion. The alternative, per capita form, he argues, implies that society would be better off if any relatively less advantaged subgroup that was fairly independent of the rest of the population were "blotted out." "Just as a change in the rate of savings necessarily involves some conflict of interests between the born of one generation and the unborn of the next, so a change in the size of the population may at least involve a conflict of interests between the born and the unborn of the same generation" (1955: 82). Less tortuously, but amounting to the same thing, the Benthamite view can be defended on the grounds that, since future generations are not responsible for their size, an impartial judge of equity should not discriminate among individuals on the basis of when they happened to be born. (The criterion is more readily defensible in immigration policy, where those whose welfare is or is not to be counted are presently living people; a Benthamite position is here humanitarian rather than simply populationist.)

How then does one justify the intuitive preference most people have for a per capita criterion? In this instance utilitarian theorizing may be an obstacle to clear thought. Nozick (1974: 41) remarks that "[u]tiliarianism is notoriously inept with decisions where the *number* of persons is at issue." A plausible means of assessing the relative merits of these two criteria, getting away from the fine points of utilitarian disputation, is Rawls's device of the rational observer having to choose membership in one or the other society from behind a "veil of ignorance" as to where in each society he would find himself placed. Such a choice, with a moderate degree of self-interest, would likely favor the society adhering to the per capita rule. (See Rawls [1971: 161–166 and 183–189] for a detailed treatment of the argument.)

Acceptance of the time path of average welfare as the objective criterion still leaves the valuation problem substantially underdetermined. Most notably,

the ingredients of welfare at each time have to be specified. To planners, the level of material consumption is typically seen as the main component of welfare. Nonmaterial consumption utilities that attach to security, health, a clean environment, and so on should be added. In fact, a full accounting of the values linked to population growth would have to consider all of the proximate, systemic, and behavioral consequences previously identified. Tradeoffs among these outcomes then arise, just as they do among alternative consumption goods. Thus, for instance, in any ethical scrutiny of an antinatalist population policy the abstract valuations that people place on such demographic characteristics as population size or age structure—probably seen as impinging on their well-being only through fairly indirect congestion or price effects—must be set against valuations of the direct personal sacrifice they are called on to make as parties to an implicit social compact. In this tradeoff, these personal considerations, represented most obviously by social pressures to reduce fertility, may well dominate up to extremes in population density. To take a contemporary example, it could well be imagined that the radical kin structure implications of success in the current one-child family campaign in China are anathema to most families in a society in which kinship ties play such a major role. Privately favored tradeoffs, were they to be determined, would probably argue for continued higher levels of fertility despite the projected adverse economic consequences.

Underlying calculations such as these are the assumptions that individual preferences are consistent, comparatively stable over time, and sovereign. Each is open to doubt. March (1978) persuasively demolishes the first two: "we manage our preferences, . . . we construct our preferences, . . . we treat our preferences strategically, . . . we confound our preferences, . . . we avoid our preferences, . . . we expect change in our preferences, . . . we suppress our preferences" (1978: 596–597). Preferences to some degree track and are modified by the range of available options. Value distinctions among alternative population trajectories drawn on the basis of current preferences as they evolve in each case have no common standard of comparison. Spengler (1972: 282) refers to this in his remark that "adverse effects of population growth upon per capita welfare are hidden, since choices available when numbers were smaller have been eliminated by population growth, whilst knowledge of the former existence of these choices tends gradually to disappear." The less benign corollary is pointed out by Iklé (1968: 122) in reference to anti-utopias such as *Brave New World:* "In these stories the people are made happy; it is only the predictors and decision-makers of today who do not like these futures. If we let our choice of action be guided entirely by the predicted future tastes of society, we would want to move into these worlds of tranquilized happiness."

Flexible preferences could still of course be considered sovereign, although the case for respecting them would be weakened. Few governments in practice see themselves as instruments to reflect and give effect to their citizens' preferences. Even the most democratically constituted routinely attempt to manipulate them. Popular choice is anyway highly constrained in substance

and only able to be exercised at wide intervals. In the more common situation where democratic institutions are weak or absent, the connection between government policy and individual preferences is highly attenuated, being simply surmised or asserted. The chief principled ground for overriding individual preferences in this area is that population growth, like other long-run national issues, can legitimately be dealt with by governments in their capacity as societal custodians. This is the so-called Pigou rationale (see Marglin, 1963, who criticizes it). Most people would probably agree that governments, particularly those engaged in the development effort, should have longer time horizons and lower time discount rates than their individual constituents, and should be expected to take some responsibility for weighing the interests of future generations against the present.

To attempt to reach a determinate conclusion, we can again have recourse to the Rawlsian veil of ignorance. Since alternative time paths of population growth in a particular country cannot be separated from the economic and institutional settings that give rise to them, comparisons must be made among whole settings as they evolve from a given initial condition. Moreover, since the pace of economic growth will differ in the different demographic cases, comparisons are of interest not only among "final states" (defined, say, by some high level of real consumption) but also among interim conditions along the way. An elaborate thought experiment is required.

What values should the rational observer behind the veil bring to bear in his judgments? At some point an image of the good life must be invoked as a criterion. Although many details of any such criteria would be culturally relative, it is not unlikely that rough agreement on the broad terms needed to impose an ordering of sorts on gross demographic alternatives would be fairly easily arrived at. Consider some examples:

— Most of the "human rights" declared in UN instruments are accepted across a wide range of societies in the modern world as valued social objectives, even if their status as rights is often rhetorical. (There is, of course, a good deal less accord on the forms of the countervailing constraints on individual autonomy that social life requires and that rapid population growth, we have argued, intensifies.)

— Judgment of distributional equity is at first glance an irremediably thorny valuation problem. Contrast, for instance, a Nozick-style entitlement stance, which may passively accept diminished equality of opportunity or transmission of poverty across generations, if that is what population growth brings, with a distributional principle seeking equality of outcome (the radical demographic exemplar of which is China's proclaimed one-child family). Yet even here a narrowing of disagreement may be feasible, not by bridging this gulf but by circumvention, based on a more subtle, multidimensional concept of distributional equity. (Walzer's [1983] discussion of "complex equality" points a possible way toward such a consensus.)

— In valuing the diverse aesthetic consequences of alternative demographic scenarios it is hard to be detached from distributional considerations. Submergence of local cultural forms and traditions in a homogeneous culture of mass consumption, which seems an inescapable part of the development process, leaves a society poorer in many aesthetic respects even though in real consumption terms it is much richer. Development-induced changes in the physical environment, both city and countryside, may similarly impose a large aesthetic price in return for tangible economic gain. Such tradeoffs, familiar subjects of political debate, have probably to be accepted as a byproduct of broad-based participation in economic growth; with accumulating wealth, moreover, some repair of damage is possible. In the demographic case, however, rapid population growth exacts an aesthetic price for no gain save the deferral of collective action to slow it, and its effective irreversibility (barring catastrophe) limits and may sometimes preclude eventual repair. The valuation problem here is not choice between urbanity and rusticity but among population densities consistent with alternative urban hierarchies (and associated natural environments) and among aesthetic values preserved in the course of reaching these alternative cultural-cum-settlement patterns. In rough magnitude, it is quite likely that the preferred population trajectory in such an exercise would find fairly wide acceptance.

— A value asserted often in ecological writings is that of keeping options open in an uncertain environment. The world's modern demographic expansion in one sense reflects highly successful adaptation to environmental conditions: that India and China, for example, currently support 1.8 billion people whereas 50 years ago they could barely support 800 million can be seen as a signal achievement. But just as in biological evolution successful adaptation is often linked to diminished adaptability (see Boulding, 1978: 111), this expansion has sharply constrained the development options that remain. A number of specific foreclosed options are discussed by Demeny (1982a), including the option of sustaining population growth for a longer period at a low rate. For any society it makes sense to assign a positive value to maintaining a comfortable distance from the margins of social necessity, whether such margins refer to technological vulnerability, political regulation, or environmental stress.

In the foregoing we have been concerned with valuation of population growth in terms of some concept of national welfare. There is also, of course, an international dimension to the valuation problem. Looking over the planet as a whole, a Rawlsian observer could do little more than express regret at what might have been. No global order exists or is likely to with ameliorative capacity in the demographic sphere. International opinion is not to be dismissed as a force in many areas, but its capriciousness and politicization make improbable any strong influence for it on national population policies. Far from

a diminishing role for national boundaries that would be part of a mutual liberalizing trend in national polities, the future seems likely to see further entrenchment of national sovereignty as the dominant principle of world affairs. Rapid population growth helps to assure that outcome.

Note

This paper was prepared as a Background Paper for the World Bank's *World Development Report 1984*. Comments by John Bongaarts, Jonathan Lieberson, and Joseph E. Potter are acknowledged.

References

Aaron, Henry J. 1982. *Economic Effects of Social Security*. Washington, D. C.: Brookings Institution.

Adams, Nassau A. 1967. "Import structure and economic growth: A comparison of cross-section and time-series data." *Economic Development and Cultural Change* 15: 143–162.

Agarwal, Anil, Ravi Chopra, and Kalpana Sharma (eds.) 1982. *The State of India's Environment, 1982: A Citizen's Report*. New Delhi: Centre for Science and Environment.

Ahluwalia, M. S. 1976. "Inequality, poverty and development." *Journal of Development Economics* 3: 307–342.

Arthur, W. Brian, and Geoffrey McNicoll. 1975. "Large-scale simulation models in population and development: What use to planners?" *Population and Development Review* 1: 251–265.

———, and Geoffrey McNicoll. 1977. "Optimal time paths with age dependence: A theory of population policy." *Review of Economic Studies* 44: 111–123.

———, and Geoffrey McNicoll. 1978a. "An analytical survey of population and development in Bangladesh." *Population and Development Review* 4: 23–80.

———, and Geoffrey McNicoll. 1978b. "Samuelson, population and intergenerational transfers." *International Economic Review* 19: 241–246.

Ashish, Sri Madhava. 1979. "Agricultural economy of the Kumaon hills." *Economic and Political Weekly* 14, no. 25: 1058–1064.

Banister, Judith. 1984. "An analysis of recent data on the population of China," in this issue.

Barth, Fredrik (ed.) 1978. *Scale and Social Organization*. Oslo: Universitetsforlaget.

Bauer, P. T. 1981. *Equality, the Third World, and Economic Delusion*. Cambridge, Mass.: Harvard University Press.

Bilsborrow, Richard E. 1979. "Age distribution and savings rates in less developed countries." *Economic Development and Cultural Change* 28: 23–45.

Binswanger, Hans P. 1978. "Induced technical change: Evolution of thought," in *Induced Innovation: Technology, Institutions, and Development*, ed. Hans P. Binswanger and Vernon W. Ruttan. Baltimore: Johns Hopkins University Press.

Birdsall, Nancy. 1977. "Analytical approaches to the relationship of population growth and development." *Population and Development Review* 3: 63–102.

———. 1980. "Population and poverty in the developing world." Staff Working Paper No. 404. Washington, D. C.: World Bank.

Bongaarts, John. 1983. "The formal demography of families and households: An overview." *Newsletter* (International Union for the Scientific Study of Population), no. 17.

———, and Robert G. Potter. 1983. *Fertility, Biology, and Behavior: An Analysis of the Proximate Determinants*. New York: Academic Press.

Boserup, Ester. 1965. *The Conditions of Agricultural Growth*. London: Allen and Unwin.

———. 1981. *Population and Technological Change: A Study of Long-Term Trends*. Chicago: University of Chicago Press.

Boulding, Kenneth E. 1978. *Ecodynamics: A New Theory of Societal Evolution*. Beverly Hills: Sage Publications.

Boulier, Bryan L. 1982. "Income redistribution and fertility decline: A skeptical view," in *Income Distribution and the Family*, ed. Yoram Ben-Porath, Supplement to *Population and Development Review* 8.

Burch, Thomas K. 1970. "Some demographic determinants of average household size: An analytic approach." *Demography* 7: 61–69.

Cain, Mead. 1978. "The household life cycle and economic mobility in rural Bangladesh." *Population and Development Review* 4: 421–438.

———. 1981. "Risk and insurance: Perspectives on fertility and agrarian change in India and Bangladesh." *Population and Development Review* 7: 435–474.

———, and Samuel S. Lieberman. 1982. "Development policy and the prospects for fertility decline in Bangladesh." Center for Policy Studies, Working Paper No. 91. New York: The Population Council.

Caldwell, John C. 1976. "Toward a restatement of demographic transition theory." *Population and Development Review* 2: 321–366.

Cassen, R. H. 1976. "Population and development: A survey." *World Development* 4: 785–830.

———. 1978. *India: Population, Economy, Society*. New York: Holmes and Meier.

Chen, Lincoln C., Emdadul Huq, and Stan D'Souza. 1981. "Sex bias in the family allocation of food and health care in rural Bangladesh." *Population and Development Review* 7: 55–70.

Chenery, Hollis B. 1960. "Patterns of industrial growth." *American Economic Review* 50: 624–654.

———, et al. 1974. *Redistribution with Growth*. London: Oxford University Press for the World Bank and the Institute of Development Studies, University of Sussex.

Choucri, Nazli. 1974. *Population Dynamics and International Violence*. Lexington, Mass.: Heath.

Clark, Colin. 1967. *Population Growth and Land Use*. New York: St. Martin's Press.

Club du Sahel. 1980. *The Sahel Drought Control and Development Programme 1975–1979: A Review and Analysis*. Paris.

Coale, Ansley J. 1981. "Population trends, population policy, and population studies in China." *Population and Development Review* 7: 85–97.

———, and Edgar M. Hoover. 1958. *Population Growth and Economic Development in Low-Income Countries*. Princeton: Princeton University Press.

Coase, Ronald H. 1937. "The nature of the firm." *Economica* (N. S.) 4: 386–405.

Cornelius, Wayne A. 1975. *Politics and the Migrant Poor in Mexico City*. Stanford: Stanford University Press.

Davis, Kingsley. 1958. "Population and power in the Free World," in *Population and World Politics*, ed. Philip M. Hauser. Glencoe: Free Press.

———. 1963. "The theory of change and response in modern demographic history." *Population Index* 29: 345–366.

Davis, Lance, and Douglass C. North. 1970. "Institutional change and American economic growth: A first step toward a theory of institutional innovation." *Journal of Economic History* 30: 131–149.

Demeny, Paul. 1971. "The economics of population control," in *Rapid Population Growth: Consequences and Policy Implications*. Baltimore: Johns Hopkins Press for the National Academy of Sciences. Volume 2.

———. 1981. "The North-South income gap: A demographic perspective." *Population and Development Review* 7: 297–310.

———. 1982a. "Population policies," in *Population and the World Economy in the 21st Century*, ed. Just Faaland. New York: St. Martin's Press.

———. 1982b. Review of P. T. Bauer, *Equality, The Third World, and Economic Delusion*. *Population and Development Review* 8: 191–193.

———. 1983. "International development and population policy." Paper prepared for the Harvard-Draeger Conference on Population Interactions between Poor and Rich Countries, Cambridge, Massachusetts, 6–8 October.

———. 1984. "A perspective on long-term population growth." *Population and Development Review* 10: 103–126.

Denison, Edward F., and William K. Chung. 1976. *How Japan's Economy Grew So Fast: The Sources of Postwar Expansion*. Washington, D.C.: Brookings Institution.

Dixon, Ruth. 1982. "Women in agriculture: Counting the labor force in developing countries." *Population and Development Review* 8: 539–566.

Espenshade, Thomas J., Leon F. Bouvier, and W. Brian Arthur. 1982. "Immigration and the stable population model." *Demography* 19: 125–133.

Fei, John C. H., and Gustav Ranis. 1964. *Development of the Labor Surplus Economy: Theory and Policy*. Homewood, Ill.: Irwin.

Feldstein, Martin. 1976. "Social security and saving: The extended life cycle theory." *American Economic Review* 66 (Papers and Proceedings): 77–86.

Franda, Marcus. 1982. *Bangladesh: The First Decade*. New Delhi: South Asian Publishers.

Freedman, Jonathan L. 1975. *Crowding and Behavior*. New York: Viking Press.

Geertz, Clifford. 1963. *Agricultural Involution: The Processes of Ecological Change in Indonesia*. Berkeley: University of California Press.

Gilland, Bernard. 1983. "Considerations on world population and food supply." *Population and Development Review* 9: 203–211.

Gilpin, Robert. 1981. *War and Change in World Politics*. Cambridge: Cambridge University Press.

Glover, Donald, and Julian L. Simon. 1975. "The effects of population density upon infra-structure: The case of road building." *Economic Development and Cultural Change* 23: 453–468.

Gourou, Pierre. 1965. *The Tropical World: Its Social and Economic Conditions and Its Future Status*. 4th ed. London.

Hagen, Everett E. 1975. *The Economics of Development*. Revised ed. Homewood, Ill.: Irwin.

Hayami, Yujiro, and Masao Kikuchi. 1982. *Asian Village Economy at the Crossroads: An Economic Approach to Institutional Change*. Tokyo and Baltimore: University of Tokyo Press and Johns Hopkins University Press.

Hirschman, Albert O. 1958. *The Strategy of Economic Development*. New Haven: Yale University Press.

Hofsten, Erland, and Hans Lundstrom. 1976. *Swedish Population History: Main Trends from 1750 to 1970*. Stockholm: Statisticka Centralbyrn.

Iklé, Fred C. 1968. "Can social predictions be evaluated?" in *Toward the Year 2000: Work in Progress*. Boston: Houghton Mifflin.

Jones, Gavin W., and Joseph E. Potter. 1978. "The economic consequences of population change." Paper presented at the First IRG Workshop on Research Priorities for Population Policy, Colombo, Sri Lanka, April.

Kelley, Allen C., and Jeffrey G. Williamson. 1974. *Lessons from Japanese Development: An Analytical Economic History*. Chicago: University of Chicago Press.

———, Jeffrey G. Williamson, and Russell J. Cheetham. 1972. *Dualistic Economic Development: Theory and History*. Chicago: University of Chicago Press.

Kellogg, William W., and Robert Schware. 1982. "Society, science and climate change." *Foreign Affairs* 60: 1076–1109.

Keyfitz, Nathan. 1965. "Age distribution as a challenge to development." *American Journal of Sociology* 70: 659–668.

Kleinman, David S. 1980. *Human Adaptation and Population Growth: A Non-Malthusian Perspective*. Montclair, N. J.: Allanheld, Osmun.

Krishna, Raj. 1979. "Small farmer development." *Economic and Political Weekly* 14, no. 21: 913–920.

Kuznets, Simon. 1964. "Quantitative aspects of the economic growth of nations: IX. Level and structure of foreign trade: Comparisons for recent years." *Economic Development and Cultural Change* 13, no. 1, part 2.

———. 1965. *Economic Growth and Structure: Selected Essays*. New York: Norton.

———. 1966a. "Demographic aspects of economic growth," in *Proceedings of the World Population Conference, Belgrade, 1965*. New York: United Nations. Volume 1, pp. 305–314.

———. 1966b. *Modern Economic Growth: Rate, Structure and Spread*. New Haven: Yale University Press.

———. 1973. "Modern economic growth: Findings and reflections." *American Economic Review* 63: 247–258.

———. 1976. "Demographic aspects of the size distribution of income: An exploratory essay." *Economic Development and Cultural Change* 25: 1–94.

Lee, Ronald. 1980. "Age structure, intergenerational transfers and economic growth: An overview." *Revue Economique* 31: 1129–1156.

Leibenstein, Harvey. 1967. "The impact of population growth on 'non-economic' determinants of economic growth," in *Proceedings of the World Population Conference, Belgrade, 1965*. New York: United Nations. Volume 4, pp. 8–11.

———. 1976. "Population growth and savings," in *Population Growth and Economic Development in the Third World*, ed. Léon Tabah. Dolhain, Belgium: Ordina Editions, Volume 2.

Lewis, W.Arthur. 1954. "Economic development with unlimited supplies of labour." *Manchester School* 22: 139–191.

Maizels, Alfred. 1963. *Industrial Growth and World Trade*. Cambridge: Cambridge University Press.

March, James G. 1978. "Bounded rationality, ambiguity, and the engineering of choice." *Bell Journal of Economics* 9: 587–608.

Marglin, S. A. 1963. "The social rate of discount and the optimal rate of investment." *Quarterly Journal of Economics* 77: 95–111.

Marriott, McKim. 1953. "Technological change in overdeveloped rural areas." *Economic Development and Cultural Change* 1: 261–272.

McClelland, Peter D. 1975. *Causal Explanation and Model Building in History, Economics, and the New Economic History*. Ithaca: Cornell University Press.

McEvedy, Colin, and Richard Jones. 1978. *Atlas of World Population History*. New York: Penguin Books.

McNicoll, Geoffrey, and Moni Nag. 1982. "Population growth: Current issues and strategies." *Population and Development Review* 8: 121–139.

Meade, J. E. 1955. *Trade and Welfare*. London: Oxford University Press.

Moller, Herbert. 1968. "Youth as a force in the modern world." *Comparative Studies in Society and History* 10: 237–260.

Mosley, W. Henry, and Lincoln C. Chen. (in press). "An analytical framework for the study of child survival in developing countries," in *Child Survival: Strategies for Research,* ed. W. Henry Mosley and Lincoln C. Chen, Supplement to *Population and Development Review* 10.

North, Douglass C., and Robert Paul Thomas. 1973. *The Rise of the Western World: A New Economic History*. Cambridge: Cambridge University Press.

Nozick, Robert. 1974. *Anarchy, State, and Utopia*. New York: Basic Books.

Olson, Mancur. 1982. *The Rise and Decline of Nations: Economic Growth, Stagflation and Social Rigidities*. New Haven: Yale University Press.

Potter, Joseph E. 1979. "Demographic factors and income distribution in Latin America," in *Proceedings of the Conference on Economic and Demographic Change: Issues for the 1980's, Helsinki 1978*. Liège: International Union for the Scientific Study of Population. Volume 1.

Rawls, John. 1971. *A Theory of Justice*. Cambridge, Mass.: Harvard University Press.

Repetto, Robert. 1979. *Economic Equality and the Birth Rate in Developing Countries*. Baltimore: Johns Hopkins University Press, for Resources for the Future.

Robinson, E. A. G. (ed.) 1960. *Economic Consequences of the Size of Nations*. New York: St. Martin's Press.

Robinson, Warren C. (ed.) 1975. *Population and Development Planning*. New York: The Population Council.

Rodgers, Gerry. 1983. "Population growth, inequality and poverty." Paper prepared for the UN Expert Group on Population, Resources, Environment and Development, Geneva, April. (IESA/P/ICP.1984/EG.III/17).

Ruprecht, Theodore K., and Carl Wahren. 1970. *Population Programmes and Economic and Social Development*. Paris: Organization for Economic Cooperation and Development.

Ruttan, Vernon W. 1978. "Induced institutional change," in *Induced Innovation: Technology, Institutions, and Development,* ed. Hans P. Binswanger and Vernon W. Ruttan. Baltimore: Johns Hopkins University Press.

Ryder, Norman B. 1975. "Reproductive behavior and the family life cycle," in *The Population Debate: Dimensions and Perspectives*. New York: United Nations. Volume 2.

Samuelson, P. A. 1958. "An exact consumption-loan model of interest with or without the social contrivance of money." *Journal of Political Economy* 66: 467–482.

Sanderson, Warren C. 1980. *Economic-Demographic Simulation Models: A Review of their Usefulness for Policy Analysis*. Laxenburg: International Institute for Applied Systems Analysis.

Sidgwick, H. 1907. *Methods of Ethics*. 7th ed. London: Macmillan.

Simon, Julian L. 1977. *The Economics of Population Growth*. Princeton: Princeton University Press.

———. 1981. *The Ultimate Resource*. Princeton: Princeton University Press.

Smil, Vaclav. 1984. *The Bad Earth: Environmental Degradation in China*. Armonk, N.Y.: Sharpe.

Solow, Robert M. 1956. "A contribution to the theory of economic growth." *Quarterly Journal of Economics* 70: 65–94.

——. 1970. *Growth Theory: An Exposition*. New York: Oxford University Press.

Spengler, Joseph J. 1972. *Population Economics: Selected Essays*. Durham, N.C.: Duke University Press.

Stevenson, Robert F. 1968. *Population and Political Systems in Tropical Africa*. New York: Columbia University Press.

Tilly, Charles. 1981. "Useless Durkheim," in *As Sociology Meets History*. New York: Academic Press.

Turnham, David. 1971. *The Employment Problem in Less Developed Countries: A Review of Evidence*. Paris: Organization for Economic Cooperation and Development. (Development Centre Studies, Employment Series No. 1)

United Nations. 1973. *Determinants and Consequences of Population Trends*. New York. (UN Department of Economic and Social Affairs, Population Studies No. 50), Volume 1.

———. 1980a. *Patterns of Urban and Rural Population Growth*. New York. (UN Department of International Economic and Social Affairs, Population Studies No. 68).

———. 1980b. *World Population and Its Age-Sex Composition by Country, 1950-2000: Demographic Estimation and Projection as Assessed in 1978*. New York.

———. 1981. *World Population Prospects as Assessed in 1980*. New York. (UN Department of International Economic and Social Affairs, Population Studies No. 78).

———. 1982. *Demographic Indicators of Countries: Estimates and Projections as Assessed in 1980*. New York: United Nations.

———. 1983. *World Population Prospects as Assessed in 1982*. New York: United Nations.

Walzer, Michael. 1983. *Spheres of Justice: A Defense of Pluralism and Equality*. New York: Basic Books.

Weiner, Myron. 1971. "Political demography: An inquiry into the political consequences of population change," in *Rapid Population Growth: Consequences and Policy Implications*. Baltimore: Johns Hopkins Press for the National Academy of Sciences. Volume 2.

———. 1983. "The political demography of Assam's anti-immigrant movement." *Population and Development Review* 9: 279–292.

Willis, Robert J. 1982. "The direction of intergenerational transfers and demographic transition: The Caldwell hypothesis reexamined," in *Income Distribution and the Family*, ed. Yoram Ben-Porath, Supplement to *Population and Development Review* 8.

Wray, Joe D. 1971. "Population pressure on families: Family size and child spacing," in *Rapid Population Growth: Consequences and Policy Implications*. Baltimore: Johns Hopkins Press for the National Academy of Sciences. Volume 2.

Wright, Quincy. 1958. "Population and United States foreign policy," in *Population and World Politics*, ed. Philip M. Hauser. Glencoe: Free Press.