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URBANIZATION AND DEVELOPMENT IN THE THIRD WORLD

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FOREWORD

An increased awareness of global economic interdependence and competition for diminishing stocks of resources, coupled with widening disparities in material welfare, has made future population growth a central issue in international affairs. Indeed Robert McNamara, former President of the World Bank, has ranked today's rapid population growth in Third World countries second only to nuclear proliferation in significance.

Urban population growth rates in the Third World have been even more explosive. Roughly 1.8 billion people, 42 percent of the world's population, live in urban areas today, and this total is growing by almost 3 percent per year. Even more dramatic are the growth rates of large cities in developing countries. Rates of 5–8 percent are not uncommon, and the urban growth multipliers that they imply are truly awesome – a doubling time of 8–15 years.

Scholars and policy makers are divided on the issue of rapid urbanization and urban growth in the Third World. Some see these trends as effectively speeding up national processes of socioeconomic development; others believe their impacts to be largely undesirable and argue that they should be slowed down. Yet many of the determinants and consequences of urban and rural demoeconomic patterns of change are poorly understood, and there is an urgent need for improved methods for analyzing the fundamental issues and options that they bring about.

During the past several years, the Human Settlements and Services Area of the International Institute for Applied Systems Analysis has focused much of its research on population growth, structural change, and settlement dynamics. The five papers in this collection, written by current or past scholars in the Area, are a representative sample of this research. Together with three papers by other authors (not included here), they form the proceedings of a symposium on urbanization in the Third World published by the journal *Economic Development and Cultural Change*.

A list of related papers from the Human Settlements and Services Area appears at the end of this publication.

ANDREI ROGERS
Chairman
Human Settlements and Services Area

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Migration, Urbanization, and Third World Development: An Overview*

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I. The Urban Explosion

Recent urban population growth has been explosive. Roughly 1.8 billion people live in urban areas today, and this total is growing by just under 3% per year. At the beginning of the last century the urban population of the world totaled only 25 million. The United Nations estimates that about 3.2 billion people, nearly twice the size of today's urban population, will be living in urban areas by the year 2000—a multiple of 128 in just 2 centuries.[1]

Rapid rates of urban growth initially occurred among the nineteenth-century leaders in the industrial revolution. In less developed parts of the world these rates did not reach significant levels until recently, generally after World War II. Consequently, a relatively small fraction of Third World population, only about one-fourth, is urban. The corresponding fraction for the developed world is close to seven-tenths. Because of their considerably larger share of the world's population, however, less developed countries today have as large an urban population as the developed countries: just under four-fifths of a billion people each. Yet, the LDC share is expected to increase substantially, reaching two-thirds by the end of the century and including some 264 of the world's 414 million-plus cities.

This urban transformation is occurring so fast that LDC institutions are having difficulty coping. Are the explosive urban growth rates in

* In writing this paper, we have received helpful comments from Nathan Keyfitz, Piotr Korcelli, Warren Sanderson, and Leon Tabah. We are grateful to them all but absolve them of any errors remaining.

[1] UN, *Patterns of Urban and Rural Population Growth* (New York: United Nations Department of International Economic and Social Affairs, 1980).

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today's developing countries likely to continue for long? Are there "limits to urban growth"? If rapid urban growth is a transitory phase of Third World development, what then are probable future levels of urban resource, job, housing, and service demands?

Demographers interpret today's accelerated rates of urban growth in the less developed countries as the direct consequence of a rise in rates of natural increase and of net urban in-migration. Their explanations of temporal and spatial variations in these two rates have followed conventional descriptive generalizations that appeal to historical regularities described as "transitions" or "revolutions." Population growth is attributable to the *vital revolution,* the process whereby societies with high birth and death rates move to a situation of low birth and death rates. Urbanization is attributed to the *mobility revolution,* the transformation experienced by societies with low migration rates as they advance to a condition of high migration rates. These two revolutions occur simultaneously and jointly constitute the *demographic transition:* the demographer's classic tale of population and development.

In the demographer's story, urbanization evolves from a spatial interaction of the vital and mobility revolutions. It is characterized by distinct urban-rural differentials in fertility-mortality levels and patterns of decline, and by a massive net transfer of population from rural to urban areas through internal migration. Simple multiregional cohort-survival models that reflect these characteristics indicate that urban growth is partly self-limiting. Urban growth rates tend to decline as urban proportions increase and as rural populations first stabilize and then decline. However, the time horizon for such limits is a long one. To illustrate such patterns of evolution, one may extend Coale's now-classic analysis of fertility reduction to include rural-urban migration.[2]

Following the Coale style of analysis, one may examine the evolution of a hypothetical population with the age composition and fertility-mortality rates typical of Latin America. Coale's two alternative projections—(*A*) fertility unchanged and (*B*) fertility reduced—may be increased to four by introducing two assumptions regarding internal migration—(*a*) migration unchanged and (*b*) migration increased. A multiregional projection model then may be adopted to translate assumptions about future trends in urban and rural mortality, fertility, and migration patterns into estimates of the future size, age composition, and spatial distribution of a population. This gives rise to four projections which in table 1 are labeled *Aa, Ab, Ba,* and *Bb.*

[2] A. J. Coale, "Population and Economic Development," in *The Population Dilemma,* ed. P. M. Hauser, 2d ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969), pp. 59–84.

Table 1 describes these four urbanization scenarios: 20% of the initial population is taken to be urban, and the initial birth and death rates are assumed to be lower in urban areas than in rural areas (40 against 45 per 1,000 for the birth rate, and 11 against 15 per 1,000 for the death rate). Mortality and fertility are reduced as in the Coale projections, but the declines are assumed to take place 10 years sooner in urban areas (25 instead of 35 years for the decline in mortality, and 20 instead of 30 years for the decline in fertility). Finally, the starting rates of out-migration are set equal to those prevailing in India in 1960: that is, a crude out-migration rate from urban areas of 10 per 1,000 and

TABLE 1

ALTERNATIVE PROJECTIONS OF URBAN AND RURAL POPULATION AND "LABOR FORCE" OVER A 50-YEAR PERIOD
(Millions)

	INITIAL YEAR		20 YEARS LATER		50 YEARS LATER	
THE FOUR SCENARIOS	Population	Labor Force	Population	Labor Force	Population	Labor Force
Aa Fertility and migration unchanged:						
Urban	.2	.1	.5	.3	2.0	1.0
Rural	.8	.4	1.5	.7	4.7	2.3
Total	1.0	.5	2.0	1.0	6.7	3.3
Bb Fertility reduced, migration unchanged:						
Urban	.2	.1	.4	.3	1.0	.6
Rural	.8	.4	1.3	.7	2.3	1.4
Total	1.0	.5	1.7	1.0	3.3	2.0
Ab Fertility unchanged, migration increased:						
Urban	.2	.1	.7	.4	4.2	2.1
Rural	.8	.4	1.3	.6	2.2	1.0
Total	1.0	.5	2.0	1.0	6.4	3.1
Bb Fertility reduced, migration increased:						
Urban	.2	.1	.6	.4	2.0	1.3
Rural	.8	.4	1.1	.6	1.1	.7
Total	1.0	.5	1.7	1.0	3.1	2.0

SOURCE.—A. Rogers, "Migration, Urbanization, Resources and Development," in *Alternatives for Growth: The Engineering and Economics of Natural Resources Development*, ed. H. J. McMains and L. Wilcox (Cambridge, Mass.: Ballinger Publishing Co., 1978), pp. 176–77.

NOTE.—The "labor force" is simply the population of working age—15 through 64. The initial rates are discussed in the text.

Future paths of these rates are: Mortality—decline over 25 years (urban) and 35 years (rural) to a level with an expectation of life at birth of 70 years; unchanged thereafter; Fertility—in *Ba* and *Bb* a reduction of 50% over 20 years (urban) and 30 years (rural); unchanged thereafter; Migration—in *Ab* and *Bb* an increase of 500% over 50 years.

a corresponding rate from rural areas of 7 per 1,000.[3] The age-specific rates of out-migration from urban areas are held fixed in all four projections, as are the corresponding rates from rural areas in the two *a* projections. Out-migration rates from rural areas, however, are assumed to increase sixfold over a period of 50 years in the two *b* projections.

The four scenarios point out the apparently inescapable conclusion that most of today's less developed countries will enter the twenty-first century as predominantly rural societies. Even with rising rural out-migration rates, it seems very probable that rural populations will triple before beginning to decline. In consequence the growth rates of their future demands for sustenance, employment, and services are likely to be unprecedented.

The two scenarios with "unchanged fertility" exhibit natural increase rates that begin at 3% per annum and then increase gradually as mortality declines. The initial national population of 1.0 million is projected to be 6.7 and 6.4 million, respectively, by the end of 50 years. The somewhat lower total in the *Ab* scenario (fertility unchanged, migration increased) is the combined consequence of higher assumed rural-to-urban migration rates and of the assumption that rates of natural increase are lower in urban than in rural areas. Yet the differences are not great, implying that the reduction in national population size attributable to urbanization is minimal. The reduction in growth rates in the two scenarios is also trivial: from 3.99% to 3.74% per annum after 50 years. The reduction is even smaller in the two scenarios with reduced fertility. In short, urbanization is unlikely to offer a significant reduction in Third World population growth rates.

The scenarios with "increased migration" raise sharply the end-period level of urbanization. The impact of rising migration on the spatial distribution of population in labor force ages is dramatic: the end-period fraction accounted for by the urban population in the unchanged fertility regimes rises from one-third in case *Aa* to two-thirds in case *Ab*. The "fertility reduced" scenarios show a similar increase in urbanization between case *Ba* and *Bb*. Clearly, migration matters to future urbanization experience. In the words of Johnston and Clark, the "investment and other requirements that would be required even to permit the 13-fold increase of urban employment of . . . Scenario [*Bb*] are staggering."[4]

[3] A. Bose, *Studies in India's Urbanization 1901–1971* (Bombay: McGraw-Hill Book Co., 1973).

[4] B. F. Johnston and W. C. Clark, "Food, Health, and Population: Policy Analysis and Development Priorities in Low Income Countries," Working Paper WP-79-92 (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1979).

The scenarios summarized in table 1 also suggest that rates of urban growth above 4% per annum are transitory. Even in the increased migration projections, urban growth rates in excess of 4% occur only in the short run during early phases of urbanization. This sudden spurt of urban growth declines over the medium term, and ultimately levels off at a growth rate below that generated by the fixed migration regime.

Increased migration into cities reduces the size of rural populations and hence their density with respect to rural resources such as agricultural land. The projections show that the relative size of the rural population aged 15–64 is over 2.5 times larger under the "unchanged migration" projections than under the increased migration projections. Thus scenarios *Ab* and *Bb* create rapid urban growth and exacerbate human-settlement problems but at the same time reduce the density of rural populations with respect to land and other rural resources. Scenarios *Aa* and *Ba,* on the other hand, give urban areas more time to cope with growth but do so at the cost of increasing rural population densities. "Hyperurbanization" and "rural overpopulation," therefore, are two sides of the same fundamental policy question regarding development.

These demographic projections indicate that the forces of demographic transition will reduce urban growth rates—through the braking influence of lower fertility among city populations—only in the very long run. Kelley and Williamson argue, however, that economic forces are likely to act much earlier.[5] Rising urban costs of various kinds should reduce rural-urban migration rates. Growing requirements for "unproductive" urban investment to augment public infrastructure, levels of service provision, and housing, will increasingly take priority over those investments that create capacity for future urban employment. This should also curtail urban growth. Assessments concerning timing and impacts, however, require a demographic-economic (demoeconomic) modeling perspective of the kind illustrated in this collection of essays. And this, in turn, requires a marriage of the largely independent macroperspectives of demographers and economists.

It is not surprising that the demographer, with roots in sociology and the actuarial sciences, relies principally on decomposition as a research method. Macrodemographic events are typically accounted for by shifting weights between groups which exhibit different demographic behavior. Demographic accounting tends, therefore, to stress between group variance and then focuses on the macro impact of shifting group weights. The economist's perspective focuses instead on explanations of individual choice behavior. That is, the economist tends

[5] Allen C. Kelley and Jeffrey G. Williamson, "The Limits to Urban Growth: Some Suggestions for Macromodeling Third World Economies," in this issue.

to explain macro events by accounting for changing behavior within groups, regions, and firms.

Related to these two different perspectives are different styles of modeling: large versus small, and disequilibrium versus equilibrium. Those striving to offer prescriptions regarding complex systems will often adopt a relatively large and complex model. Others will frequently use a model only to illustrate a parable and, therefore, will often be content with a small, transparent model if it makes a point. Economists are likely to criticize the designer of large demoeconomic models as wanting to build in complexity where simplicity best exposes behavior. Demographers are likely to find this view extraordinarily naive, exhibiting a failure to appreciate between group variance and problems of aggregation.

Finally, some analysts—demographers among them—tend to focus on quantities and see their limited availability as setting ceilings to society's growth. In this view, economies often seem to be in disequilibrium and headed for disaster if left uncontrolled. Economists tend to focus on prices and believe that substitution will push any economy back toward equilibrium since scarcity implies high cost, reduced use, and diminished shortage.

The urban explosion in today's Third World is nothing less than the evolution of a society during its structural transformation from an agrarian to an industrial-service economy. In order to be effective, projects and programs designed to modify any single aspect of this evolution must take into account the broad system-wide interdependencies that characterize such processes. Recognizing this, the World Bank, the United Nations, and other international agencies have gradually moved away from a particularistic focus on specific problems and projects toward a much broader concern with understanding the developmental process itself. The essays in this symposium seek to advance that understanding by combining the insights of demographers and economists studying the interdependent processes of migration, urbanization, and development.

II. The Demographer's View of Urbanization: Migration Exogenous

Is urbanization experience explained by migration, or by natural increase? This question is at the heart of the papers by Andrei Rogers and Jacques Ledent,[6] but the answers clearly depend on one's definition of "urbanization experience." Urban growth refers to the expansion of the numbers living in urban settlements. Obviously, the rate of natural increase matters a great deal to this growth, although even here there

[6] Andrei Rogers, "Sources of Urban Population Growth and Urbanization, 1950–2000: A Demographic Accounting"; and Jacques Ledent, "Rural-Urban Migration, Urbanization, and Economic Development," both in this issue.

is debate, as we shall see below. Urbanization refers to the proportion living in urban settlements, and here the role of natural increase is not so clear.

Rogers presents data indicating that the fertility of urban women is lower than that of rural women virtually everywhere in the Third World. Furthermore, rural mortality exceeds urban mortality. While the differences between rates of natural increase are never very great, they do tend to be *higher* among rural populations in most of the Third World. Clearly, urbanization cannot be explained by natural increase differentials at all; on the contrary, all of the measured urbanization in the Third World must be accounted for by in-migration to the cities. This inevitable conclusion justifies the attention that both demographers and economists have devoted to migration in the Third World.

The demographer's view, tracing the link between urbanization and migration, is seen very clearly in Ledent's paper. Taking economic variables as exogenous, he explores the relation between rural-urban migration and development. Exploiting the evidence that rural-urban differences in natural increase are negligible, Ledent derives an expression that links the rate of net rural out-migration to the level of urbanization.[7] He then uses this expression to derive, for a number of countries, the evolution of the rural net out-migration rate that is consistent with the past and anticipated future evolution of the degree of urbanization. This allows him to contrast, for example, the expected future rural net out-migration rates of Mexico and India and to conclude that they are likely to decrease in the former country and increase in the latter.

By estimating the relationship between urbanization and GNP per capita, Ledent is then able to project migration experience over time, given GNP per capita experience and given stability in the parameters linking GNP per capita and urbanization. A test of his estimated relationship suggests a bell-shaped evolution of the rural net out-migration rate over the course of a nation's economic development. Stressing the experience of India, Egypt, Honduras, and Mexico to the year 2000 and beyond, Ledent concludes that for most of the developing countries—those with a per capita GNP below 500 1964 U.S. dollars—the peak rates of rural out-migration are yet to come.

What about urban growth? What portion of the spectacular rates of city growth in the Third World is to be explained by migration and what portion by natural increase? One school of demographic thought is led by Kingsley Davis and the United Nations, who argue, that, contrary to popular opinion, the rapid expansion of city populations

[7] See also N. Keyfitz, "Do Cities Grow by Natural Increase or by Migration?" *Geographical Analysis* 12, no. 2 (1978): 142–56.

in the Third World is primarily due to natural increase, rather than to rural-urban migration.[8] A second school of thought, led by Michael Todaro and others, argues that this view "fails to recognize that the age selectivity of migrants . . . is such that the recorded high natural increase is, in fact, largely the direct result of the locational choice and high fertility of migrants . . . the unprecedented volume and rate of internal rural-urban migration is the principal factor."[9] Which view is correct?

Rogers begins with a simple aggregative projection model focusing on India and the USSR for empirical motivation. The exercise is useful in illustrating the relative importance of migration and urban natural increase, especially since these two countries illustrate the contrasts raised by a recent United Nations study:[10] in Europe, roughly two-thirds of recent urban growth can be attributed to migration, while in the Third World the figure is only 40%. The difference appears to be due to the generally higher rates of urban natural increase in the Third World. Rogers replicates these results, as well as the so-called cross-over point where a country switches from "migration-driven" to "urban-natural-increase-driven" urban growth and illustrates a demographic theorem for Third World urban growth: "the principal effect of migration is to determine the level of urbanization, whereas that of natural increase is to establish the urban growth rate."[11] Yet the aggregate projection model fails to confront Todaro's view. Rather it simply estimates the proportion of current urban growth that would be eliminated if rates of either migration or natural increase were set at zero. As Todaro points out, urban in-migrants as a group are predominantly of childbearing ages and the urban natural rate should reflect that fact. Rogers considers this thesis by applying a disaggregated projection model with age-specific rates. The results support Todaro since the introduction of age composition alters the projections in favor of migration as a contributor to urban growth. While searching for the explanation for this reversal of results, Rogers offers another demographic theorem: "although a sharp increase in the rate of rural-to-urban migration temporarily raises the urban population growth rate, its ultimate effect is to urbanize the population more rapidly and thereby to depress the urban growth rate to a lower level than it would have reached in the absence of the increase."

[8] UN; and K. Davis, "The Urbanization of the Human Population," *Scientific American* 213, no. 3 (1965): 18.

[9] M. Todaro, "Urbanization in Developing Nations: Trends, Prospects, and Policies," Working Paper no. 50 (New York: Population Council, Center for Policy Studies, 1979), p. 11.

[10] See n. 1 above.

[11] Rogers, all quotations are from the article in this issue.

Why do we care about the demographic sources of contemporary urban growth? Why does the debate over migration versus urban natural increase matter to policy? Rogers's citation of the 1978 UN survey of national population policies offers at least one clear defense. The survey showed that Third World authorities felt that in-migration was indeed the principal contributor to urban population growth, and the vast majority of those responding to the UN inquiry expressed that belief that urban growth was too high and indicated that they had adopted policies to slow down and even to reverse this migration. Although the papers by Rogers and Ledent cast some doubt on this view, the controversy certainly justifies the efforts by economists to understand more about the determinants and consequences of migration.

III. The Economist's View of Urbanization: Endogenous Migration in Partial Equilibrium

An enormous body of empirical literature on migration behavior in the Third World accumulated during the 1960s. These studies attempted to explain migration in general, and rural-urban migration in particular, by the application of partial equilibrium, single-equation models. That is, wage, income, or earnings variables were taken as exogenous, and migration itself was rarely allowed to influence these or any other economic variable. Furthermore, the central issue in that stream of early migration research—led by the human-capital approach embodied in Sjaastad's classic contribution—was a test of economic rationality.[12] Do Third World households respond to economic incentives in selecting employment locations? The answer has been a resounding yes, and this result is confirmed by the more sophisticated models presented in the contributions to this symposium by Gary Fields and T. Paul Schultz.

Both papers deal with place-to-place lifetime migration in Latin America, Fields appealing to the 1973 Colombian Census and Schultz to the 1961 Venezuelan Census. Both studies confirm the economic model of migration. In Fields's words: ". . . the results sustain the empirical validity of the economic model of migration. . . . These patterns are consistent with the view that past migration may have been caused by large rural-urban income differentials, just as the economic model of migration would predict."[13] Similar findings are offered by Schultz. Indeed, migration was surprisingly responsive to economic incentives in Venezuela in the early 1960s: "Average wage rates at destination are associated with migration within all four education

[12] L. A. Sjaastad, "The Costs and Returns to Human Migration," *Journal of Political Economy* 70, suppl. (October 1962): 80–93.

[13] Gary Fields, "Place-to-Place Migration in Colombia," in this issue.

groups; the elasticity of the migration rate with respect to destination wages ranges between 1.4 and 2.9."[14]

These two studies also reveal interesting differentials among demographic groups. The average propensity to migrate rises with education, but the *marginal* propensity to migrate also rises with education and, in the case of Venezuelan out-migration, is greatest where school enrollment is highest.

In 1969, Michael Todaro raised an issue that influenced much of the research of the 1970s. If migrants were rational, how was it that (i) "wage gaps" between urban and rural areas persisted (and perhaps even widened), and that (ii) migration to the city continued in the face of urban unemployment, where the latter was defined to include low-productivity underemployment? To explain these apparent anomalies, Todaro offered a simple thesis: Migrants did not respond solely to actual earnings differentials between farm and city but rather to *expected* earnings differentials. Expected earnings were conditioned by migrants' expectations of securing favored urban formal sector jobs. Debate ensued over the form of the expectations function as well as its empirical relevance, but the Todaro model quickly became a key premise in Third World models of urban labor markets.[15]

Although Todaro and subsequent analysts were dealing with migration in general equilibrium—a topic to be described below in Section IV—the underlying motive driving migration behavior in their models has become conventional wisdom in partial equilibrium analysis as well.[16] The Todaro adherents view urban unemployment as a market-clearing price between sectors where urban wages are institutionally fixed. In this case rural-urban migration proceeds until urban unemployment equates discounted expected earnings. The response of migration to unemployment is a crucial dimension in the Todaro model. Yet Fields finds little support for the importance of the employment rate on Colombian migration. Schultz's results, while consistent with Fields's, are even more revealing: "The essential feature of the Harris-Todaro model . . . is that inflexibilities in wage rates across labor markets induce compensating variation in employment rates . . . compensating variation between wages and employment levels is not evident in Venezuela among male migrants with less than a secondary education. For these less educated groups in the labor force the traditional

[14] T. Paul Schultz, "Lifetime Migration within Educational Strata in Venezuela: Estimates of a Logistic Model," in this issue.

[15] M. Todaro, "A Model of Labor Migration and Urban Unemployment in Less Developed Countries," *American Economic Review* 60 (March 1969): 138–48.

[16] See, e.g., J. R. Harris and M. Todaro, "Migration, Unemployment and Development: A Two-Sector Analysis," *American Economic Review* 60 (March 1970): 126–42; and W. Corden and R. Findlay, "Urban Unemployment, Intersectoral Capital Mobility and Development Policy," *Economica* 42 (1975): 59–78.

wage gap appears to be the predominant determinant of urban labor force growth and interregional migration." This is not true of the more educated in Venezuela: ". . . for men with some secondary or higher education the elasticity of migration with respect to employment is greater than that with respect to wages. For these better-educated men the Harris-Todaro (1970) framework may be applicable."[17] Obviously, unemployment among better-educated Venezuelan migrants may represent idle resources or simply job-search costs incurred by young inexperienced workers. To inform policy properly, we must discriminate between these two interpretations in future research. But both Schultz and Fields suggest that there is no Latin American trade-off on migration between unemployment and wage rates among the less educated.

Another premise of the new conventional wisdom has been that the in-migrant accepts informal service sector employment (or, indeed, unemployment) at a wage below that prevailing in the rural area so that he may remain in the labor queue, hopeful for employment in the formal high-wage sector. Accumulating "revisionist" research has cast much doubt on this premise. For example, Fishlow's work on Brazil and Bellante's work on the American South suggests that observed nominal wage gaps are in large part a reflection of skill, age, sex, and occupational differentials, rather than regional wage gaps per se.[18] Furthermore, Yap has shown that recent in-migrants to Brazilian cities did *not* have lower income than they would have received in the rural areas they vacated; they did *not* appear in informal sector employment with much greater frequency; and furthermore, they improved their relative income position very quickly after arriving in the city.[19] Even more recently, Mohan has shown for Bogotá that underemployment is *not* extensive and in any case not specific to recent in-migrants, that migrants are *not* poorer, and that the so-called informal sector is extremely hard to distinguish from alternative employment in the city.[20] The Todaro-generated conventional wisdom simply does not hold up to empirical scrutiny.

The papers by Fields and Schultz advance our understanding of the determinants of urban in-migration in the Third World, but they

[17] Schultz, in this issue.

[18] A. Fishlow, "Brazilian Size Distribution of Income," *American Economic Review* 62 (May 1972): 391–402; and D. Bellante, "The North-South Differential and the Migration of Heterogenous Labor," *American Economic Review* 69 (March 1979): 166–75.

[19] L. Yap, "Internal Migration and Economic Development in Brazil," *Quarterly Journal of Economics* 90 (February 1976): 119–37; "Rural-Urban Migration and Urban Underemployment in Brazil," *Journal of Development Economics* 3, no. 3 (1976): 227–43; and "The Attraction of the Cities: A Review of the Migration Literature," *Journal of Development Economics* 4, no. 4 (1977): 239–64.

[20] R. Mohan, "The People of Bogotá: Who They Are, What They Earn, Where They Live," World Bank Staff Working Paper no. 390 (Washington, D.C.: World Bank, May 1980).

leave unanswered some questions that might well be central to future urban policy. Rarely do empirical studies of migration take adequate account of cost-of-living differentials. When they do, the cost-of-living indices almost always exclude rents, which are difficult to measure, especially in squatter housing. The exclusion is troublesome since rents rise with density and crowding, and thus cities, especially large ones, tend to have high rents. Furthermore, as the cities grow, rents usually climb at a steep rate. Nominal wage differentials obviously overstate the advantage of city life. When cost-of-living differentials are included, much of the nominal gap disappears.[21] In addition, nowhere in these studies is serious attention given to urban disamenities, an issue that has been examined lately both for developed economies as well as for important historical cases like the British industrial revolution.[22] But little work has been done on Third World societies along these lines, which is certainly surprising given the general concern with the quality of life among the Third World urban poor. As Section IV indicates, such evidence is very important to modeling the potential limits to urban growth and thus to informing policy.

A number of labor market studies of Third World economies have indicated that urban unemployment is more a consequence of segmented urban labor markets than of deficient aggregate urban demand or technological rigidities. If correct, these studies would suggest that urban jobs may not be as scarce as the conventional wisdom implies. These studies would also suggest that the problem is limited intraurban occupational migration, especially between urban employments requiring different levels of skills. This view argues for a shift in focus from the determinants of "aggregate pull" in urban areas to (i) the composition of that urban pull across employment of various types and to (ii) the rural determinants of migration.

The Third World rural exodus is thought to be "pushed" by growing population pressures in relatively stagnant agrarian regions. Certainly Schultz's findings on Venezuelan data confirm the importance of this Malthusian push, although population growth appears to have

[21] See Fishlow, cited above, and the recent work on Peru by V. Thomas, "The Measurement of Spatial Differences in Poverty: The Case of Peru," World Bank Staff Working Paper no. 273 (Washington, D.C.: World Bank, January 1978).

[22] For the more contemporary applications, see the following: W. Nordhaus and J. Tobin, "Is Growth Obsolete?" in *Economic Growth*, General Series, no. 96, vol. 5 (New York: Columbia University Press, for the National Bureau of Economic Research, 1972); I. Hoch, "Climate, Wages, and the Quality of Life," in *Public Economics and the Quality of Life*, ed. L. Wingo and A. Evans (Baltimore: Johns Hopkins University Press, 1977); and S. Rosen, "Wage-based Indexes of Urban Quality of Life," in *Current Issues in Urban Economics*, ed. P. Mieszkowski and M. Straszheim (Baltimore: Johns Hopkins University Press, 1979). For an application in economic history, see J. G. Williamson, "Urban Disamenities, Dark Satanic Mills and the British Standard of Living Debate," *Journal of Economic History* 41 (March 1981): 75–84.

a more potent impact on destination choice. A key issue in the urbanization literature is whether rural modernization can stem the agrarian Malthusian tide. Obviously, the answer depends critically on whether the rural modernization effort is labor saving; whether it is small-farm oriented; and whether on balance it raises the potential income of landless labor and subsistence peasant households.

IV. The Economist's View of Urbanization: Endogenous Migration in General Equilibrium

If economic factors play a critical role in determining rural-urban migration, then urbanization and city growth are clearly determined by those same factors. It follows that urbanization and city growth cannot be analyzed without giving explicit attention to the interaction between rural and urban labor markets. Furthermore, those labor markets cannot be fully understood without explicit modeling of labor supply and demand forces in both the sending and receiving regions. In short, urbanization and city growth can be understood only by embedding the process in a complete general equilibrium model. This conclusion has slowly emerged over the past decade or so as economists and demographers have become increasingly sophisticated in their study of the sources of urbanization.

The economist usually views the urbanization problem from the perspective of comparative statics. Three simple comparative static views of the equilibrium level of urbanization are commonly put forward. One invokes wage equalization and full employment; another assumes full employment but introduces "market segmentation"; a third combines market segmentation with underemployment. While each of these models is capable of telling a different tale, they have one point in common. They all ignore potential dynamics linking urbanization levels to growth performance, and growth performance to future urbanization experience. On the supply side of these labor markets, for example, there is no theory of demographic transition that links urbanization patterns to fertility and mortality trends. On the demand side, there is no theory of accumulation and technical change that links urbanization to shifts in the derived demand for labor. In short, none of these comparative static models offers an explanation of the sources of urbanization over time. We need dynamic models for that purpose.

Dynamic demoeconomic models have already passed through two generations and now are entering a third. The first generation surely can be dated by the appearance of Coale and Hoover's classic work.[23]

[23] A. J. Coale and E. M. Hoover, *Population Growth and Economic Development in Low-Income Countries: A Case Study of India's Prospects* (Princeton, N.J.: Princeton University Press, 1958).

The second generation made an effort to formalize some of the issues raised there. Five second-generation demoeconomic models which have taken the effort seriously enough to simulate, among other things, urbanization experience, are: Tempo-II, Bachue, Simon, FAO, and KWC.[24] As Warren Sanderson has recently pointed out, these five hardly exhaust the list that has accumulated since 1970, but they are representative and perhaps the dominant contributions.[25]

What do these second-generation models have to say about migration, urbanization, and city growth in the Third World? Since urbanization and city growth are endogenous in such models, each is capable of describing the time path of the urbanization experience. The KWC model, for example, was able to replicate urbanization levels over a cross section of countries as well as the urbanization histories of nine countries which could be documented from the 1860s onward. Having established the validity of the model, KWC then went on to explore the sources of that urbanization experience by posing counterfactuals. That is, they isolated the impact of population growth, technical change, demand, saving, and other influences on urbanization.

The contribution by Allen Kelley and Jeffrey Williamson to the symposium appears to be part of a "third generation" of demoeconomic urbanization models.[26] The authors are motivated by a search for the limits of urban growth, not just those induced by policy but also those that may be the inevitable result of rapid development. What forces tend to inhibit the rate of urbanization in a developing economy undergoing structural change? No doubt there are many, but Kelley and Williamson stress two.

Most models of Third World growth and urbanization have little to say about limits to urban growth since they fail to introduce adequately potential sources of such limits into their frameworks. In particular, the authors argue that nowhere are competing, urban unproductive investment demands on the national saving pool considered. The label "unproductive" is taken directly from Coale and Hoover who stress population-sensitive investment needs and their negative influence on the rate of accumulation of directly "productive" capital stocks. Kelley and Williamson apply this notion to urban investment requirements in general, but they focus on housing requirements in particular. In their account, two urban housing sectors are considered—

[24] A. C. Kelley, J. G. Williamson, and R. J. Cheetham, *Dualistic Economic Development: Theory and History* (Chicago: University of Chicago Press, 1972).

[25] W. C. Sanderson, "Economic-Demographic Simulation Models: A Review of Their Usefulness for Policy Analysis," Working Paper RR-80-14 (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1980).

[26] See also I. Adelman and S. Robinson, *Income Distribution Policy in Developing Countries: A Case Study of Korea* (Stanford, Calif.: Stanford University Press, 1978).

informal squatter settlements (the major source of residential housing expansion in Third World cities), and conventional higher-cost housing. Rapid in-migration to the cities can have two effects, either of which may place natural limits to urban growth: first, urban rents may rise due to lags in housing construction; second, a rise in unproductive housing investment will tend to diminish the residual savings pool available for productive urban capital stock accumulation. The retardation in the rate of productive urban capacity creation clearly means fewer new jobs in the future, less attraction to the cities, and therefore slower future urban growth.

In addition, Kelley and Williamson point out the importance of augmenting our models to include inelastic urban land supplies. In traditional approaches to Third World urbanization and economic growth, high and rising city rents—a critical component of a potential rural migrant's city budget—never play a role through cost-of-living differentials. Nor do increasing urban disamenities (and the declining quality of life associated with overurbanization) ever play a role in such models. As Kelley and Williamson argue: "Urban land constraints serve to raise (market or shadow price) rents, augment urban relative to rural living costs, and inhibit in-migration to the city. The importance of these urban land constraints on city rents can only be evaluated in a general equilibrium model which admits housing service activities and confronts issues of equilibrium land use." While any urban land-use characterization should allow for a variety of city land-use requirements, Kelley and Williamson develop a simpler model that stresses land use for public social overhead, for residential squatter settlements, and for "luxury" housing sites.

There is, of course, no way of knowing exactly how important these and other potential limits to urban growth in the Third World may be. But Kelley and Williamson propose a multisectoral general equilibrium model which can be validated on Third World evidence. If they are successful in replicating the economic development, urbanization, and city growth experience that have been typical of the Third World since the early 1960s, then they will be in a position to project the year 2000. Having done so, they will then be in the enviable position of decomposing the underlying sources of that urbanization experience, past, present, and future. They should also be able to trace through the influence of demographic transition, energy scarcity, technological slowdown, austerity in advanced economies, *and* sharp policy change.

V. The Political Economy of "Overurbanization"

Kelley and Williamson focus on the limits to urban growth by stressing high urban capital intensities, as well as public social overhead and population-sensitive private investment requirements in cities. Could

these investment requirements be diminished by more appropriate use of less capital-intensive technologies? One way to achieve such technologies, of course, is to pursue policies that retard the rate of urbanization. Another is to invoke the notion of "optimal city size" which, so it is alleged by some critics, implies eroding the bias that favors large cities and fostering instead the development of smaller cities and towns. Central to these issues are the costs of urbanization, and central to these costs is efficiency (and equity) in the supply of public goods.

Many governments in developed and less developed countries believe that their largest cities are too big and seek policies that deflect growth to medium-sized centers. The sizes held to be optimal vary from country to country, but the recommended totals often lie in the 250,000–500,000 range. How are such numbers calculated?

Most studies of optimal city size assume diseconomies of urban scale and seek to identify that population at which per capita public costs are minimized. But since such studies have been unable to measure public-sector outputs, it is difficult to match expenditures with the public services actually purchased. Moreover, the costs are money costs, not economic costs. Lacking a theoretical basis for measuring the latter gives rise to tough questions: Are expenditures on land costs or wealth transfers? Are public employees' salaries true costs, or are they partly transfer payments? Furthermore, since per capita output appears to increase with city size, it would seem more appropriate to maximize the difference between outputs (incomes) and inputs (costs) than merely to minimize costs.[27] And how are we to measure quality-adjusted public sector outputs anyway?

Although there is little hard evidence that large cities are too big, there may well be circumstances under which large additions to currently underserviced populations may be impossible to accommodate in the shortrun. A higher city growth rate means greater pressure on the quality of the local environment, less time for overcoming social, institutional, and political barriers, and the postponement of the resolution of existing problems created by past growth. A slower growth rate buys time to explore alternatives and to catch up with past needs. Urban populations that double in size every decade would strain the absorptive capacity of cities in most developed countries; in the less developed nations such doublings are frequent and occur in a setting of inadequate human, physical, and financial resources.

[27] W. Alonso, "Problems, Purposes, and Implicit Policies for a National Strategy of Urbanization," in *Population, Distribution, and Policy*, ed. S. M. Mazie (Washington, D.C.: Government Printing Office, 1978), pp. 635–47; and H. W. Richardson, "The Costs and Benefits of Alternative Dimensions and Perspectives," in *The Population Debate: Dimensions and Perspectives*, Papers of the World Population Conference, Bucharest, 1974 (New York: United Nations, 1978), 2:131–78.

Johannes Linn's contribution to this symposium responds to these issues—issues that became especially visible among academic economists after W. Arthur Lewis's Janeway Lectures in 1977.[28] As Lewis reminded us, "Urbanization is decisive because it is so expensive."[29] Why the concern over the costs of urbanization? Linn offers four reasons: (1) urbanization places a high financial burden on urban governments—a financial problem made especially acute in the Third World due to imperfect capital markets there; (2) because of the high capital requirements of city building, and given the rapid growth of cities, some believe that today's Third World urbanization is responsible for growing international indebtedness; (3) the costs associated with congestion and pollution are thought to be higher in larger cities than in small, and higher in urban than in rural areas; and (4) there is the equity concern: rural areas should not subsidize urban areas.

Based on Colombian data, it is true that public expenditures per capita are higher in larger cities and urban areas, a conclusion supported by Asian data as well.[30] What is not clear, however, is how many of these expenditure patterns can be explained by per capita income. Obviously, public expenditures are determined both by unit costs on the supply side and income plus price effects on the demand side. Linn's conclusion on these income effects is well worth repeating: "To the extent that urbanization costs are dependent on incomes, they are not avoidable by accelerated rural development or by favoring the development of smaller towns and cities." Unit costs aside, the user price charged may also be critical to urban demand for public services. Subsidized public services are common in the Third World, and they do tend to be higher in urban areas since there are more services provided there.[31]

What about the unit costs of supplying public goods? The issue of scale economies in the provision of public goods is an old topic, and it underlies the optimal-city-size problem. Are unit costs higher in cities and especially higher in large cities? If so, then an argument could be made that the Third World is overurbanized. Linn summarizes the evidence on water supply, sewerage, electricity, solid-waste disposal, transportation, education, health, and other social-overhead services. He can find no evidence to support the view that cities are inefficient

[28] J. Linn, "The Costs of Urbanization in Developing Countries," in this issue. All quotations are from this article.

[29] W. A. Lewis, "The Evolution of the International Economic Order," Discussion Paper no. 74 (Princeton, N.J.: Princeton University, Woodrow Wilson School, Research Program in Development Studies, 1977), p. 39.

[30] See J. Meerman, *Public Expenditure in Malaysia: Who Benefits and Why* (London: Oxford University Press, 1979); and M. Selowsky, *Who Benefits from Government Expenditures: A Case Study of Colombia* (London: Oxford University Press, 1979).

[31] See Selowsky.

relative to rural areas or smaller towns. What about congestion, pollution, and other urban disamenities? While we need much more research on the question, Linn emphasizes that "the main lesson to draw for purposes of policy is that controlling city size is rarely, if ever, the appropriate policy instrument to deal with . . . congestion, pollution, public service subsidies. . . . The appropriate policy intervention should instead focus directly on the sources of the inefficiency, which would include the pricing of externalities through pollution and congestion charges and the pricing of urban services at cost rather than at subsidized rates."

What about the distributive impact of public expenditures in developing countries? Michael Lipton has been in the forefront of the critics alleging overurbanization.[32] For Lipton, an urban bias in public policy leads to excessive rates of urbanization and worsens the distribution of income. Furthermore, Lipton feels that these effects have been large. While these allegations have provoked useful debate, they have not yet generated much hard fact. But even if we accept the allegations, what do they imply for urbanization policies? Linn suggests: "To the extent that urban areas are subsidized by the public sector, one may indeed want to correct the balance . . . on equity grounds. But this corrective action should not involve policies geared primarily to slow down the urbanization process; rather, the subsidies provided to urban dwellers should be reduced or eliminated by appropriate changes in taxation, user charges, and public expenditures policies. Indirectly, these policies may also affect relative rural-urban population growth rates, but judging from the empirical evidence on the determinants of rural-urban migration in developing countries this impact is not likely to be strong."

Nathan Keyfitz would find this view naive. In the final contribution to this symposium, Keyfitz raises four big questions: Why does inequality in poor countries still persist? Why so great an expansion of government? Why such rapid urbanization? And why the neglect of agriculture in countries where many people are hungry? The answer, according to Keyfitz, lies in large part with the rise in urban-based, middle-class elites who reinforce and accelerate the urban bias. That is, once in power, urban elites are unlikely to pursue the corrective policies that erode their power. ". . . even in democracies the levers of power are in the hands of the middle class, which determines the policies that make the cities grow and the countryside wilt."[33]

[32] M. Lipton, *Why Poor People Stay Poor: Urban Bias in World Development* (Cambridge, Mass.: Harvard University Press, 1977).

[33] Nathan Keyfitz, "Development and the Elimination of Poverty," in this issue. All quotations are from this article.

While economists have stressed the urban-industrial bias for some time, and have dwelt at length on the menu of policies that tend to implement that bias, in Keyfitz's hands these policies come alive as a comprehensive political economy of overurbanization.

> Such are the policies that improve the lot of city people and so incidentally increase city sizes. They help explain the perversity of urbanization. . . . Those who have already attained such jobs and are in power may not be directly trying to expand their numbers, but it is hard for them to avoid doing so. For one thing the urban amenities that they introduce—roads, local transport, and schools—are available in some degree to the poor. The elite cannot make the city better for themselves without . . . making it better for the newcomers, and so encouraging further newcomers. . . . The masses in the capital city are physically close enough to the government to communicate their wishes. . . .

If true, it is obviously important to learn much more about the social mechanism that causes overurbanization through the urban bias. Yet, the quantitative importance of the urban bias has never been estimated nor have the sources of Third World urbanization been established. Perhaps the general equilibrium models of the type described by Kelley and Williamson will offer that accounting. Until then, overurbanization remains a force of unknown magnitude.

VI. Demoeconomic Models as Tools for Urban Management

As with rapid population growth in general, rapid urban growth increases the difficulties of providing a population with the necessary sustenance, employment, services, and infrastructure. Income per capita growth adds to these demands and complicates urban problems. Growth in urban population and incomes strains health and educational budgets, complicates the reduction of unemployment levels, and exacerbates problems connected with provision of adequate housing, food, energy supplies, transport, water, and sanitary facilities. The "demographic investment" needed just to maintain present standards in many rapidly urbanizing areas means a doubling or tripling of institutional plant within the next 25 years. The overwhelming challenge to urban planners and managers in LDC cities, therefore, is how to absorb large numbers of newcomers in an effective and equitable manner. Demoeconomic simulation models have an important role to play in these planning efforts, since they can be used to trace out the likely consequences of alternative policies.

It is not enough to examine the impact of aggregate population and income growth on urban resource demands, since changing age composition introduces an additional influence. Peak demands for education services, for example, occur largely between the ages of 5 and 20. Housing requirements, on the other hand, increase during the later

years of childbearing and hold steady until the ages of retirement. Jobs are in demand during the labor force participation ages of 15 to 65. Food requirements increase until the late teens, peaking at about age 18; after a slight decline they then level off and remain constant. Health service demands are relatively high for infants and older adults. These age groups have the highest incidence of illness and require the most hospitalization.

Finally, urban infrastructure and services are demanded not only by urban residents but also by industrial and commercial users. This is especially true of public utilities such as water supply, electricity, and sewerage. Thus industrialization generates its own increased demands for urban infrastructure.

Policymakers concerned with increasing the stock of urban infrastructure may well be interested in the indirect effects that this investment might have on rural out-migration and on rural population growth. On the other hand, policymakers designing strategies for agricultural development may be equally concerned with their impact on the growth of the informal urban service sector. It is precisely in this connection that demoeconomic models make an important contribution. Their usefulness derives from their systems-wide character, an attribute that allows the policymaker to explore the indirect effects, on different economic sectors and regional populations, of one set of policies against another. Such models, therefore, further the process of informed policymaking.

Sources of Urban Population Growth and Urbanization, 1950–2000: A Demographic Accounting*

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Cities in the less developed world are growing at historically unprecedented rates. Since 1975, for the first time in history, the majority of the global urban population is located in the less developed countries. The United Nations estimates that cities in the LDCs will have to cope with over a billion more people in the year 2000 than they have today. In 1950, 11 of the world's 15 largest cities were in the more developed countries. By 1975, this share declined to eight, and only three (Tokyo, Los Angeles, and New York) are expected to be members of this set at the turn of the century. About 264 of the world's 414 "million-plus cities" are expected to be in the LDCs by the year 2000.[1]

What has caused this phenomenal growth? The immediate demographic sources are unprecedented rates of natural increase, large migratory flows from rural to urban areas, and the increasing reclassification of previously rural localities to urban status. Urban growth rates are roughly double the growth rates of national populations in the developing world, and most estimates attribute at least half of this growth to natural increase.

But the demographics of urban population growth and urbanization are only manifestations of more fundamental structural changes in national economies undergoing their transformation from agrarian to industrial societies. Thus the demographics cannot be logically separated from the associated economics. Nevertheless, considerable insights

* I am grateful to Julie DaVanzo, Nathan Keyfitz, Young Kim, Jacques Ledent, and Jeffrey Williamson for their helpful comments on an earlier draft, and to Walter Kogler and Dimiter Philipov for programming and carrying out the numerical calculations used in this paper.

[1] UN Population Division, *Patterns of Urban and Rural Growth* (New York: Department of International Economic and Social Affairs, 1980).

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regarding the evolution of urbanization trends can be gained by rather simple mechanical decompositions of current patterns of urban growth and distribution. Such decompositions will serve as the frame of reference for the examination of the sources of urban population growth and urbanization set out in this paper.

This paper begins with a brief presentation of new UN estimates of urban population growth and urbanization since 1950, with projections to the year 2000. This review is followed by an examination of the contributions of natural increase and rural-to-urban migration to urban population growth and urbanization for a number of nations with adequate data for making such estimates. Variants of a simple demographic projection model are then used to analyze the demographic sources of urban population growth rates and urbanization levels.

I. Global Patterns of Urban Population Growth and Urbanization

Global comparisons of urban and rural population growth are beset by problems of data and definition. Unlike studies of mortality and fertility, for which vital registration systems provide a continuous supply of data, studies of urbanization generally must rely on information supplied by widely spaced population censuses. Moreover, the definition of urban localities varies from nation to nation and over time.

All settlements that are not rural are urban, and traditionally, rural residence has been associated with a predominantly agricultural local economy. More commonly, however, urban settlements are distinguished from rural ones on the basis of their number of inhabitants. In many countries the threshold defining urban localities lies between 2,000 and 5,000 inhabitants; in others, density and administrative designations play a central role.

In this paper we present urbanization data published by the United Nations, which continues its practice of developing estimates based on national designations of urban areas instead of imposing a uniform set of criteria.[2] Table 1 sets out the estimated and projected urban and rural populations for the world by more developed and less developed regions, and by major geographic regions.[3] It shows that although world population growth is still a dramatic phenomenon—with nearly 200,000 individuals added each day to its total—the growth rate apparently has peaked and is decelerating. The UN projections show a decline in the annual growth rate from 2.3% to 2.0% per year between the years 1970 and 2000 in the LDCs and from 1.0% to .6% in the MDCs, giving an aggregated decline from 1.9% to 1.7%.

About 90% of expected world population growth by the end of this

[2] Ibid.

[3] Any regions other than North America, Europe, Japan, Australia, New Zealand, and the USSR are defined to be less developed regions.

TABLE 1—Population Estimates and Projections and Average Annual Rate of Growth: World Total, Regions, Countries, or Areas, Urban and Rural, 1950–2000

Regions, Countries, or Areas	Total Population (Thousands) and Annual Rate of Growth (%)										
	1950	Rate	1960	Rate	1970	Rate	1980	Rate	1990	Rate	2000
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
World total:											
U	724,147	3.4	1,012,084	2.9	1,354,357	2.9	1,806,809	2.9	2,422,293	2.8	3,208,028
R	1,776,924	1.1	1,973,733	1.3	2,255,816	1.3	2,567,042	1.1	2,857,409	.6	3,045,956
More developed regions:											
U	448,929	2.4	572,730	2.1	702,876	1.7	834,401	1.5	969,226	1.2	1,092,470
R	405,502	−.1	402,396	−.5	383,894	−.8	355,013	−.9	325,258	−1.0	294,700
Less developed regions:											
U	275,218	4.7	439,354	3.9	651,481	4.0	972,408	4.0	1,453,067	3.8	2,115,558
R	1,371,422	1.4	1,571,337	1.8	1,871,922	1.7	2,212,029	1.4	2,532,151	.8	2,751,256
Africa:											
U	31,818	4.4	49,506	4.9	80,373	5.0	132,951	5.0	219,202	4.6	345,757
R	186,986	1.8	223,290	2.0	271,355	1.9	327,963	1.9	394,881	1.7	467,923
Latin America:											
U	67,511	4.6	106,599	4.2	162,355	3.9	240,592	3.6	343,304	3.1	466,234
R	96,411	1.2	108,982	1.0	120,670	.8	131,042	.8	142,283	.8	153,695
Northern America:											
U	106,019	2.3	133,281	1.8	159,493	1.4	183,281	1.5	212,393	1.2	239,199
R	60,054	.9	65,381	.2	66,896	−.2	65,552	−.4	62,743	−1.0	57,000
East Asia:											
U	112,812	5.5	194,734	3.1	265,153	3.0	359,457	2.8	476,462	2.7	622,441
R	562,008	.5	593,246	1.1	661,713	.9	728,292	.4	757,036	−.1	747,621
South Asia:											
U	104,883	3.4	146,902	3.9	217,290	4.2	329,760	4.5	515,685	4.3	790,685
R	565,336	1.8	678,453	2.2	844,886	2.1	1,046,859	1.8	1,256,031	1.1	1,397,199
Europe:											
U	222,603	1.8	266,032	1.8	318,374	1.5	369,286	1.4	423,291	1.2	476,953
R	191,926	−.1	189,318	−.5	179,534	−.7	167,229	−.8	154,551	−.9	141,548
Oceania:											
U	7,736	3.0	10,443	2.7	13,675	2.6	17,829	2.4	22,590	1.8	27,145
R	4,893	.8	5,321	.6	5,638	.0	5,643	−.2	5,508	.1	5,557
USSR:											
U	70,765	3.9	104,587	2.8	137,644	2.3	173,653	1.9	209,366	1.4	239,614
R	109,310	.0	109,742	−.4	105,124	−1.1	94,462	−1.1	84,376	−1.1	75,413

Source.—UN Population Division, *Patterns of Urban and Rural Growth* (New York: Department of International Economic and Social Affairs, 1980).
Note.—U = urban, R = rural.

century will thus take place in the less developed countries, with the result that two countries (China and India) will have populations in excess of 1 billion each; nine countries are projected to show totals between 100 and 300 million, and 13 between 50 and 100 million. The global total is expected to reach 6.2 billion.[4]

Urban populations are growing much more rapidly than the total populations of which they are a part. Between 1950 and 1970 the total population of the more developed countries increased by 27% and that of the less developed countries by 53%; during the same period the urban population of the more developed countries grew by 57%, while that of the less developed countries increased by over 137%. By the year 2000, urban areas in LDCs will have gained about 1.5 billion people since 1970—double the MDC urban population in 1970. Even so, the current 86% LDC share of the world's *rural* population is expected to increase to 90% by that date.

Historically, urban population growth and urbanization have occurred together, but they do not measure the same attribute of national population. Urban growth refers to an increase in the number of people living in urban settlements. Urbanization, on the other hand, refers to a rise in the proportion of a total population that is concentrated in urban settlements. The latter measure, therefore, is a function not only of urban growth but also of rural growth.

Urbanization—the transition from a dispersed pattern of human settlement to one concentrated around cities and towns—is a process that has a beginning and an end. Urban growth, on the other hand, has no such inherent limit inasmuch as cities can continue to grow as a pure consequence of an excess of births over deaths. Thus urban growth can occur without any urbanization if the rural population increases at a rate equal to or greater than that of the urban population.

Table 2 traces the urbanization process in the world's developed and less developed regions and in eight of its major geographical areas. More than half of the world's population is projected to be urban by the year 2000. About three-fourths and just over two-fifths of the national populations of the more and the less developed countries, respectively, are expected to be living in urban areas at that time.

Rates of urban growth are even more dramatic at the level of the individual urban settlement. Table 3 sets out recent UN projections of the growth of some of the less developed world's largest urban centers, indicating that the size of the population growth multiplier for some cities is truly awesome. For example, during the 25 years between 1975 and 2000, Lagos and Jakarta are expected to triple their populations; Lima, Mexico City, São Paulo, and Teheran are projected to grow by

[4] UN Population Division.

a factor of 2.5; and Addis Ababa, Nairobi, and Kinshasa are to increase fourfold or more. The largest city in the world by the year 2000 is expected to be Mexico City with 31 million inhabitants. Not far behind will be São Paulo with about 26 million.

Rapid urban population growth and increased consumption arising out of a growing per capita income, both continuing to grow at annual

TABLE 2

ESTIMATED AND PROJECTED PERCENTAGE OF POPULATION IN URBAN AREAS: WORLD TOTAL, MACRO REGIONS, AND REGIONS, 1950–2000

MACRO REGIONS AND REGIONS (1)	PERCENTAGE OF ESTIMATED AND PROJECTED POPULATION IN URBAN AREAS					
	1950 (2)	1960 (3)	1970 (4)	1980 (5)	1990 (6)	2000 (7)
World total:	28.95	33.89	37.51	41.31	45.88	51.29
More developed regions	52.54	58.73	64.68	70.15	74.87	78.75
Less developed regions	16.71	21.85	25.82	30.53	36.46	43.46
Africa	14.54	18.15	22.85	28.85	35.70	42.49
Latin America	41.18	49.45	57.37	64.74	70.70	75.21
Northern America	63.84	67.09	70.45	73.66	77.20	80.76
East Asia	16.72	24.71	28.61	33.05	38.63	45.43
South Asia	15.65	17.80	20.45	23.95	29.10	36.13
Europe	53.70	58.42	63.94	68.83	73.25	77.11
Oceania	61.24	66.22	70.77	75.93	80.37	82.97
USSR	39.30	48.80	56.70	64.77	71.28	76.06

SOURCE.—UN Population Division, *Patterns of Urban and Rural Growth* (New York: Department of International Economic and Social Affairs, 1980).

TABLE 3

POPULATION ESTIMATES AND PROJECTIONS FOR 15 LARGE CITIES

CITY	POPULATION (Millions)			MULTIPLE INCREASE OVER BASE YEAR	
	1950	1975	2000	1950–75	1975–2000
Cairo, Egypt	2.5	6.4	13.1	2.6	2.0
Addis Ababa, Ethiopia	.2	1.2	5.6	5.8	4.8
Nairobi, Kenya	.1	.9	4.9	6.2	5.6
Lagos, Nigeria	.4	2.0	6.9	5.2	3.6
Kinshasa, Zaire	.2	2.2	8.4	10.9	3.9
Mexico City, Mexico	3.0	11.9	31.0	4.0	2.6
São Paulo, Brazil	2.5	10.7	25.8	4.3	2.4
Bogota, Colombia	.6	4.0	11.7	6.3	2.9
Guayaquil, Ecuador	.3	.9	2.4	3.5	2.7
Lima, Peru	1.1	3.8	8.9	3.5	2.4
Jakarta, Indonesia	1.7	5.7	16.6	3.3	2.9
Teheran, Iran	1.1	4.3	11.3	3.8	2.7
Seoul, Korea	1.1	6.8	14.2	6.1	2.1
Karachi, Pakistan	1.1	4.0	11.8	3.5	3.0
Bangkok, Thailand	1.4	4.0	11.9	2.8	3.0

SOURCE.—UN Population Division, *Patterns of Urban and Rural Growth* (New York: Department of International Economic and Social Affairs, 1980).

rates of 4%–5%, means an annual growth rate of total urban income and demand for goods and services of about 9%, a doubling every 7–8 years.

An examination of future prospects for world population growth and urbanization reveals very forcefully that the twin historical developments that have combined to create the problems of human settlements today will continue for the rest of this century and beyond in most parts of the world. The rate of world population growth, though apparently declining, will still be considerable for some time to come, and rural-urban migration shows no signs of abating in much of the less developed world. Therefore the number of people in the world will continue to increase in the near future, as will the proportion living in urban settlements. Populations in urban centers will continue to grow at an alarming rate, particularly in the larger urban agglomerations of the less developed world. The problems created by this transformation are manifold and will continue to involve large private and social costs. These costs have led a number of governments in less developed countries to express a growing concern over issues of population distribution. For example, a 1978 UN survey of national population policies revealed that only six out of 116 less developed countries responding to the inquiry viewed the spatial distribution of their population as "acceptable," whereas 68 declared it "highly unacceptable," and 42 considered theirs "unacceptable to some extent."[5] Most believed that rural-to-urban migration was the principal contributor to urban population growth, and 90 out of the 116 indicated that they had adopted policies to slow down or reverse this migration.

In light of the apparently widespread dissatisfaction with rapid urban population growth and urbanization in less developed countries, an important issue is the degree to which internal migration contributes to such growth. Is rural-to-urban migration or natural increase primarily responsible for the growth of cities in LDCs today?

Some scholars, such as Kingsley Davis, have placed natural increase above migration: "It is the population boom that is overwhelmingly responsible for the rapid inflation of city populations in such countries. Contrary to popular opinion both inside and outside those countries, the main factor is not rural-urban migration."[6] Others, such as Michael Todaro, argue that ". . . this interpretation fails to recognize that the age selectivity of migrants . . . is such that the recorded high

[5] UN Economic and Social Council, *Concise Report on Monitoring of Population Policies* (E/CN.9/338) Population Commission, Twentieth Session (New York, 1978), pp. 27–28.

[6] Kingsley Davis, "The Urbanization of the Human Population," *Scientific American* 213, no. 3 (March 1965): 41–53, esp. 48.

natural increase is, in fact, largely a direct result of the locational choice and high fertility of migrants. . . . The unprecedented volume and rate of internal rural-urban migration is the principal factor. . . .''[7]

Which point of view is correct? Confronting the data with a model is the only way to unconfound the contribution of each component of change.

II. The Demographics of Urban Population Growth and Urbanization

The evolution of a human population in a territorial unit with fixed boundaries is governed by the interaction of births to residents, deaths of residents, and migration across those boundaries. When boundaries change over time, as they do with populations classified as urban and rural, territorial reclassification also becomes a contributor to change. In this paper we shall follow the UN practice of including the effects of reclassification together with those of internal migration, distinguishing them from those of natural increase. The latter component of change will be assumed, as in the UN study, to also include the effects of international migration.[8]

Table 4 presents 1960 component rates of urban and rural population growth for the world and for its major regions. These data indicate that the fertility of urban women is lower than that of rural women virtually everywhere, and that rural mortality exceeds urban mortality, particularly in the less developed countries. The difference between the birthrate and the death rate is natural increase, and the natural increase of rural populations exceeds that of urban populations in most parts of the world. Yet populations in urban areas have been growing much more rapidly than in rural areas. Clearly the component of change fostering this differential growth is rural-to-urban migration. Assessing its relative importance over time as a source of urban growth requires a projection model.

Aggregated Projection Models

The growth of urban and rural populations may be represented by simple projection models that follow groups of individuals just born into a population, as they age with the passage of time, reproduce, and ultimately leave the population because of death or outmigration. These events and flows enter into an accounting relationship in which the growth of a regional population is determined by the combined effects of natural increase and net migration. The fundamental mechanics of

[7] Michael Todaro, ''Urbanization in Developing Nations: Trends, Prospects, and Policies,'' Working Paper no. 50 (New York: Population Council, Center for Policy Studies, 1979), p. 11.

[8] UN Population Division.

such models may be illustrated with a simple numerical example based on data for India. For ease of exposition, fixed rates of fertility, mortality, and migration will be assumed throughout.

The urban population of India was increasing by about 3.7% a year during the late 1960s and early 1970s. The urban growth rate, r_u, was the outcome of a birthrate of 30 per 1,000, a death rate of 10 per 1,000,

TABLE 4

COMPONENT ANNUAL RATES OF URBAN AND RURAL POPULATION GROWTH: WORLD TOTAL AND REGIONS, 1960

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

SOURCE.—United Nations, *Global Review of Human Settlements: A Support Paper for Habitat, 1 and 2* (Oxford: Pergamon Press, 1976), pp. 51–52.

an inmigration rate of 27 per 1,000, and an outmigration rate of 10 per 1,000.[9] Expressing these rates on a per capita basis leads to the fundamental identity

$$\begin{aligned} r_u &= b_u - d_u + i_u - o_u \\ &= .030 - .010 + .027 - .010 \\ &= .037 . \end{aligned}$$

The corresponding identity for the rural population was

$$\begin{aligned} r_r &= b_r - d_r + i_r - o_r \\ &= .039 - .017 + .002 - .007 \\ &= .017 . \end{aligned}$$

The total national population of India in 1970 was about 548 million, of which roughly 109 million (20%) was classified as urban. Multiplying this latter total by the urban growth rate gives 109 (.037) = 4.03 million as the projected *increase* for 1971. An analogous calculation for the rural population gives 7.46 million for the corresponding projected increase in the rural population. These changes imply, for 1971, an urban population of 113 million, a rural population of 446 million, and a rate of national population increase of

$$r = .20r_u + .80r_r = .021 . \qquad (1)$$

Alternatively, urban population growth may be described by the equation

$$P_u(t + 1) = (1 + b_u - d_u - o_u)P_u(t) + o_rP_r(t) . \qquad (2)$$

Equation (2) states that next year's urban population total may be calculated by adding to this year's urban population (i) the increment due to urban natural increase, (ii) the decrement due to urban outmigration to rural areas, and (iii) the increment due to rural to urban migration. Substituting in the rates for India gives the accounting identity

[9] Andrei Rogers, "Migration, Urbanization, Resources, and Development," in *Alternatives for Growth: The Engineering and Economics of Natural Resources Development*, ed. H. J. McMains and L. Wilcox (Cambridge, Mass.: Ballinger Publishing Co., for the National Bureau of Economic Research, 1978), pp. 149–217.

$$P_u(1971) = (1 + .030 - .010 - .010)P_u(1970) + .007P_r(1970)$$
$$= 1.010(109) + .007(439)$$
$$= 113.2 \text{ million} .$$

An analogous equation for the rural population yields

$$P_r(1971) = .010P_u(1970) + (1 + .039 - .017 - .007)P_r(1970)$$
$$= .010(109) + 1.015(439)$$
$$= 446.7 \text{ million} .$$

Projecting India's population forward with fixed rates gives the evolution of the urban and rural populations presented in table 5. Also included, for purposes of comparison, is the analogous projection of the urban and rural populations of the Soviet Union.

Starting with a growth rate of 3.7% a year and a share of the total of 19.9%, India's urban population gradually increases its urban proportion to 27% by the year 2000, as it slowly approaches an ultimate asymptotic share of 37.7%, at which point its ultimate, or *intrinsic*, annual urban growth rate is 2.1%. The Soviet Union, on the other hand, starting with an urban growth rate of 2.5% per year and an urban proportion of 56.3%, stabilizes its urban population's share of the total

TABLE 5

AGGREGATED PROJECTIONS OF OBSERVED POPULATIONS: INDIA AND THE SOVIET UNION

Year (T)	Urban (%) ($100U$)	Urban Growth Rate (r_u)	Net Urban Inmigration Rate ($m_u = r_u - n_u$)	Growth Due to Migration (%) ($m_u/r_u \times 100$)
		A. India		
1970	19.9	.037	.017	47.1
1975	21.4	.034	.015	43.5
1980	22.7	.033	.013	40.2
2000	27.1	.028	.008	29.8
2020	30.2	.025	.006	22.7
Stability	37.7	.021	.001	6.0
		B. Soviet Union		
1970	56.3	.025	.016	63.8
1975	60.2	.021	.012	56.7
1980	63.3	.018	.009	49.8
2000	70.6	.012	.003	26.7
2020	73.4	.010	.001	13.0
Stability	75.3	.009	.000	1.7

NOTE.—(A) Natural increase: $n_u = 20 \times 10^{-3}$, $n_r = 22 \times 10^{-3}$; migration: $o_u = 10 \times 10^{-3}$, $o_r = 7 \times 10^{-3}$. (B) Natural increase: $n_u = 9 \times 10^{-3}$, $n_r = 10 \times 10^{-3}$; migration: $o_u = 11 \times 10^{-3}$, $o_r = 35 \times 10^{-3}$.

at 75.3% and at that point exhibits an intrinsic annual urban growth rate of 0.9%. The contributions of urban natural increase and urban net migration vary significantly in each of the two projections. India's urban population in 1970 was growing more from natural increase, whereas that of the Soviet Union was growing more from migration. Decompositions such as these for identifying the demographic sources of urban population growth and urbanization are dealt with in greater detail in Section III of this paper.

Disaggregated Projection Models

Population projections have both a retrospective and a prospective aspect. For example, given our earlier projections to the year 2000 of the urban and rural populations of India, we may wish to identify retrospectively how many of the projected urban residents were living in rural areas at the start of the projection period. Or we may be interested in determining what fraction of the projected urban dwellers were *born* in rural areas (i.e., are "alien" residents) and what proportion are urban "natives."[10]

Prospectively, we may ask, What proportion of the 1970 Indian rural population will be living in urban areas in the year 2000? Or we may wish to calculate, on 1970 rates, the fraction of an average lifetime that a baby just born in a rural village in India can expect to live in the urban settlements of that nation.

To answer these and related questions, we may begin by dividing the resident urban population of a nation into natives and aliens: $P_u(t) = {}_uP_u(t) + {}_rP_u(t)$, where the additional subscript on the left of the population variable, P, denotes the region of birth and the right subscript denotes the region of residence, as before.[11]

The accounting relationship for calculating urban residents given earlier as equation (2) may be used to obtain urban natives simply by introducing the place of birth subscript and allocating the new births during the year to the "native" population:[12]

$$ {}_uP_u(t) = (1 + b_u - d_u - o_u){}_uP_u(t-1) + o_r\,{}_uP_r(t-1) + b_u\,{}_rP_u(t-1)\,. \quad (3) $$

[10] Andrei Rogers and Dimiter Philipov, "Multiregional Methods for Subnational Population Projections," Working Paper WP-79-40 (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1979).

[11] Although we speak of "region of birth," it should be clear that we could instead consider "region of residence in 1970" (or at some other past moment in time).

[12] In the age-disaggregated model described later, a fraction of the births to alien migrants is added to the native population in the destination region (Dimiter Philipov and Andrei Rogers, "Multistate Population Projections," Working Paper WP-80-57 [Laxenburg, Austria: International Institute for Applied Systems Analysis, 1980]).

Analogous relationships may be defined for ${}_{r}P_{u}(t)$, ${}_{u}P_{r}(t)$, and ${}_{r}P_{r}(t)$. It is assumed that natives and aliens experience the same fertility, mortality, and migration rates, that is, those prevailing at their region of residence, and all births to alien migrants are added to the alien population stock.

For illustrative purposes, assume that all of India's 1970 urban population was born in urban areas and that all of its rural population was born in rural areas. Projecting these stocks forward with fixed rates until stability, one obtains the evolution of the urban and rural populations presented in table 6. Again, the analogous projection for the Soviet Union is included for purposes of comparison.

This fixed-rate projection shows that the fraction of rural-born aliens in India's urban population ultimately stabilizes at about the level of one-fourth, whereas the corresponding fraction in the Soviet Union is roughly one-fifth. Thus the ultimate contribution of migrants to the urban population *stock* in India is higher than it is in the Soviet Union. Recall that the corresponding contributions to annual net additions (i.e., the *flows*), set out earlier in table 5, showed the reverse ordering. We shall return to this apparent paradox in Section III.

Crude rates are weighted combinations of age-specific rates; changes in age composition alter the weights and produce changes in crude rates. The aggregation of age groups, therefore, creates a projection bias. A standard biregional cohort-survival projection of the 1970 Indian population to the year 2000—on the assumption of un-

TABLE 6

AGGREGATED PLACE-OF-RESIDENCE-BY-BIRTH PROJECTIONS OF OBSERVED POPULATIONS: INDIA AND THE SOVIET UNION (%)

Year (T)	Urban ($100U$)	Urban Natives ($100U_N$)	Urban Aliens ($100U_A$)
	A. India		
1970	19.9	19.9	0
1975	21.4	19.0	2.4
1980	22.7	18.4	4.3
2000	27.1	18.5	8.6
2020	30.2	20.2	10.0
Stability	37.7	28.4	9.3
	B. Soviet Union		
1970	56.3	56.3	0
1975	60.2	53.6	6.6
1980	63.3	51.9	11.4
2000	70.6	50.6	20.0
2020	73.4	52.4	21.1
Stability	75.3	60.6	14.7

NOTE.—(A) Natural increase: $n_u = 20 \times 10^{-3}$, $n_r = 22 \times 10^{-3}$; migration: $o_u = 10 \times 10^{-3}$, $o_r = 7 \times 10^{-3}$. (B) Natural increase: $n_u = 9 \times 10^{-3}$, $n_r = 10 \times 10^{-3}$; migration: $o_u = 11 \times 10^{-3}$, $o_r = 35 \times 10^{-3}$.

changing age-specific rates of fertility, mortality, and internal migration—gives a total population of 1.051 billion, with 27.7% of that total residing in urban areas, and exhibiting an annual growth rate of 2.5%. The national population at that moment in time is projected to be increasing at the rate of 2.0% per year.

How does the fixed-rate projection compare with one produced by the aggregate biregional model of the preceding section? For the projection summarized in table 5 the corresponding figures are a total population of 1.023 billion, growing at a rate of 2.1% per year, with 27.1% located in urban areas and growing at a rate of 2.8% per annum.

The slight differences between the two sets of projections are a consequence of aggregation bias, which in this illustration results from an aggregation across age groups.

III. The Sources of Urban Population Growth and Urbanization

Do cities grow mostly by their own natural increase or do they grow mostly as a consequence of net inmigration from rural areas? A recent study by the United Nations concluded that urban growth in the less developed world results primarily from the natural increase of its urban population.[13] Table 7 presents a selection of the more detailed results. These results were generated by an intercensal comparison of age-specific populations in which exceptional changes in age structure were ascribed to internal migration and reclassification. The residual between the observed population growth and the estimated migration totals were attributed to natural increase.

The UN calculations show that the highest relative contribution of migration (and reclassification) to urban growth occurred in Europe, in particular, and in the more developed countries, in general. An average of two-thirds of recent urban growth in Europe and in the USSR is attributable to migration. In the less developed countries, on the other hand, the bulk of urban growth (about 60%) comes from natural increase. Much of this difference between the two groups of countries is due to the much higher rates of urban natural increase in the LDCs.

The UN decomposition strives to disentangle the instantaneous contributions of migration and natural increase to urban population growth. It estimates the fraction of today's growth that would be eliminated if rates either of migration or of natural increase suddenly were set equal to zero. But as Todaro points out, migrants will bear children, and that contribution to urban growth perhaps should not be fully attributed to natural increase.[14] The long-run impacts of current pat-

[13] UN Population Division.
[14] Todaro.

TABLE 7

SOURCES OF INTERCENSAL URBAN GROWTH

Country or Region	Dates	Intercensal Annual Urban Population Growth Rate (r_u)	Annual Rate of Urban Natural Increase ($n_u = b_u - d_u$)	Annual Rate of Net Urban Inmigration* ($m_u = r_u - n_u$)	Growth Due to Migration ($m_u/r_u \times 100$)
Africa:					
Ghana	1960–70	.04685	.02697	.01988	42.4
Morocco	1960–71	.04100	.02581	.01519	37.0
Mean	...	...	...	...	36.9
North America:					
Canada	1961–71	.02563	.01644	.00919	35.9
Mexico	1960–70	.04904	.03349	.01555	31.7
Mean	...	...	...	...	35.9
South America:					
Argentina	1947–60	.02906	.01431	.01475	50.8
Peru	1961–72	.04923	.02875	.02048	41.6
Mean	...	...	...	...	36.3
Asia:					
India	1961–71	.03211	.02173	.01038	32.3
Turkey	1960–70	.05552	.02117	.03435	61.9
Mean	...	...	...	...	46.6
Europe:					
Austria	1961–71	.00884	.00053	.00830	94.0
Sweden	1960–70	.01870	.00944	.00925	49.5
Mean	...	...	...	...	66.6
Oceania:					
Australia	1961–71	.02370	.01889	.00481	20.3
New Zealand	1951–61	.03620	.01833	.01788	49.4
Mean	...	...	...	...	34.8
USSR	1959–70	.02788	.01083	.01705	61.1
Mean:					
Sample ($N = 65$)	...	...	...	...	45.9
Developing countries ($N = 40$)	...	...	...	...	39.6
Developed countries ($N = 25$)	...	...	...	...	57.4

SOURCE.—UN Population Division, *Patterns of Urban and Rural Growth* (New York: Department of International Economic and Social Affairs, 1980).

* Including reclassification of rural areas to urban status

terns of migration and natural increase on urban population growth and urbanization levels can be assessed only by population projection.

Decompositions with Crude Fixed Rates

With no city population there can be no urban natural increase; and some time after the establishment of a city it is likely that the contribution of urban net inmigration will begin to exceed that of the surplus of urban births over urban deaths, that is, urban natural increase. At the other extreme, when a nation is mostly urbanized, rural population can contribute little to urban increase. Between these two extremes, there is a time at which the contribution of natural increase to urban growth should begin to exceed that of net inmigration. Keyfitz and Ledent call this moment the "crossover point" and develop analytical expressions that express it as a function of the components of urban population growth.[15] Their argument may be illustrated with the Indian and Soviet Union examples previously set out in table 5.

Imagine a hypothetical population, initially entirely rural, that is subjected to the regime of growth exhibited, for example, by India in 1970. Table 8A1 shows that after 30 years the urban population is 15.5% of the national total and growing at 4.7% per annum. The rate of urban net inmigration at that moment is 2.7%, and its contribution as a source of urban growth is (2.7/4.7)100 = 58.1%. Twenty years later the urban fraction increases to 22.0% and migration's contribution falls to 41.9%. The crossover point is passed after 39 years, when the urban fraction is 18.7%. Note that this hypothetical population, starting its evolution as an entirely rural population, ultimately stabilizes at exactly the same equilibrium state as did its empirical counterpart in table 5A. This is simply a consequence of what is known in demography as "strong ergodicity," the tendency of an observed population to eventually "forget its past" as it is projected for a long period into the future under fixed rates of natural increase and migration.[16] Such "horizon-year" projections allow one to contrast two regimes of growth without confounding their impacts with different starting conditions, such as India's initial 19.9% urban to the Soviet Union's 56.3%.

Table 8 suggests that India's urban population in 1970 was growing more from natural increase than from net migration because it passed

[15] Nathan Keyfitz, "Do Cities Grow by Natural Increase or by Migration?" *Geographical Analysis* 12, no. 2 (April 1980): 142–56; Jacques Ledent, "The Dynamics of Two Demographic Models of Urbanization," Research Memorandum RM-78-56 (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1978), and "The Factors and Magnitude of Urbanization under Unchanged Natural Increase and Migration Patterns," Research Memorandum RM-78-57 (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1978).

[16] Andrei Rogers, *Introduction to Multiregional Mathematical Demography* (New York: John Wiley & Sons, 1975).

TABLE 8

AGGREGATED PROJECTIONS OF HYPOTHETICAL POPULATIONS INITIALLY ENTIRELY RURAL AND EXPOSED TO DIFFERENT REGIMES OF GROWTH

A. HYPOTHETICAL POPULATION: INDIA

1. India's Growth Regime					2. India's Natural Increase Rates with Soviet Union's Migration Rates			
$n_u = 20 \times 10^{-3}$ $100U$	$n_r = 22 \times 10^{-3}$ r_u	$o_u = 10 \times 10^{-3}$ m_u	$o_r = 7_t \times 10^{-3}$ $m_u/r_u \times 100$	T	$n_u = 20 \times 30^{-3}$ $100U$	$n_r = 22 \times 20^{-3}$ r_u	$o_u = 11 \times 10^{-3}$ m_u	$o_r = 35 + 10^{-3}$ $m_u/r_u \times 100$
0	0	0	0	0	0	0	0	0
3.2	.215	.195	90.9	5	15.5	.198	.178	90.1
6.1	.114	.094	82.8	10	27.7	.099	.079	80.3
15.5	.047	.027	58.1	30	55.9	.036	.016	45.3
22.0	.034	.014	41.9	50	67.1	.025	.006	22.8
37.7	.021	.001	6.0	Stability	74.7	.020	.001	2.5

B. HYPOTHETICAL POPULATION: SOVIET UNION

1. Soviet Union's Growth Regime					2. Soviet Union's Natural Increase Rates with India's Migration Rates			
$n_u = 9 \times 10^{-3}$ $100U$	$n_r = 10 \times 10^{-3}$ r_u	$o_u = 11 \times 10^{-3}$ m_u	$o_r = 35 \times 10^{-3}$ $m_u/r_u \times 100$	T	$n_u = 9 \times 10^{-3}$ $100U$	$n_r = 10 \times 10^{-3}$ r_u	$o_u = 10 \times 10^{-3}$ m_u	$o_r = 7 \times 10^{-3}$ $m_u/r_u \times 100$
0	0	0	0	0	0	0	0	0
15.7	.184	.175	95.1	5	3.3	.201	.192	95.6
28.1	.087	.078	89.7	10	6.2	.101	.092	91.2
56.7	.024	.015	63.1	30	15.9	.035	.026	74.4
67.9	.014	.005	36.6	50	22.7	.022	.013	59.5
75.3	.009	.000	1.7	Stability	39.6	.009	.000	4.1

its crossover point when it was 18.7% urban some time ago. The urban population in the Soviet Union, on the other hand, in 1970 was growing more from net migration than from natural increase because it still was about 9–10 years short (on 1970 rates) of reaching the 63.2% urban level associated with its crossover point.

The crossover point with the Soviet Union's growth regime occurs at about the same time as with India's, that is, after 39½ years, but it is experienced by a national population that is much more urban. Tables 8A2 and 8B2 show why. Lowering rates of natural increase delays the crossover point, but raising net rates of urban inmigration hastens its occurrence. Combining India's natural increase with the Soviet Union's higher rates of rural to urban migration reduces the time to the crossover from 39 to 27 years. Replacing these migration rates with India's in the Soviet Union's growth regime delays the crossover by over 20 years.[17]

Table 8 indicates that the principal effect of migration is to determine the level of urbanization, whereas that of natural increase is to establish the urban growth rate. Despite differences in migration rates (tables 8A1 and 8A2), India's natural increase ultimately produces an urban population growing at 2% per year; the Soviet Union's gives rise to urban growth at roughly half that rate (tables 8B1 and 8B2). Despite differences in rates of natural increase, the Soviet Union's migration rates generate a national population that ultimately is three-fourths urban (tables 8A2 and 8B1), whereas those of India produce an urban fraction that is just under 40% (tables 8A1 and 8B2).

That increasing rural-to-urban migration should speed up the time to crossover is perhaps intuitively understandable; that it should also reduce the urban population growth rate, however, is not. Yet table 8 suggests this conclusion. For example, introducing the Soviet Union's migration rates into India's growth regime results in a lower rate of urban population growth. A similar reduction occurs when the urban growth effects of the growth regime in table 8B2 are contrasted with those of table 8B1. What is the cause of this counterintuitive pattern of evolution?

The fixed-rate projection model used to generate the results set out in tables 5, 6, and 8 defines the urban population growth rate $r_u(t)$ to be the sum of a fixed rate of natural increase, n_u, and a changing rate of net urban inmigration, $m_u(t)$. Since net urban inmigration is the

[17] Ledent, working with the continuous-time formulation of the projection model, derives an expression for the urban fraction that also illuminates these interdependencies: $U(T_1) = o_r/(n_u + o_u + o_r)$, where T_1 is the crossover time in years from $t = 0$ and $U(T_1)$ is the fraction urban population at that moment. Observe, e.g., that this fraction increases as the rate of urban natural increase decreases or as the rate of rural-to-urban migration increases (Ledent, "The Factors and Magnitude of Urbanization under Unchanged Natural Increase and Migration Patterns").

difference between rural and urban outmigration flows, for a national population that is $100U(t)\%$ urban, we have that $U(t)m_u(t) = [1 - U(t)]o_r - U(t)o_u$, whence

$$m_u(t) = \frac{1 - U(t)}{U(t)} o_r - o_u , \tag{4}$$

with $m_u(t) > 0$ if $[1 - U(t)]/U(t) > o_u/o_r$.

Since o_r and o_u are fixed by assumption, if $U(t)$ increases with t, then $m_u(t)$ must decrease over time. Hence $r_u(t)$ must also and so must the fraction of urban growth due to migration. And because, in our illustrations, increasing o_r increases the urban fraction more than proportionately, $m_u(t)$ and $r_u(t)$ must take on lower values than before.

A projection model that guarantees an ultimately declining fraction of urban growth due to migration is of limited value for answering the question whether it is natural increase or net migration that is the principal source of urban population growth. It appears that a more realistic model is needed, one that allows the natural increase rate to change over time along with the rate of net urban inmigration. The simplest way to introduce such realism is to disaggregate the population by age.

Decompositions with Age-specific Fixed Rates

Table 9 sets out age-specific population projections for India and for the Soviet Union. Tables 9A1 and 9B1 are the age-specific counterparts of tables 5A and 5B, respectively. Tables 9A2 and 9B2 are projections carried out with hypothetical growth regimes, in which the migration rates of one country are substituted for those of the other in the projection model, as in table 8. The projections show that exposing India to the migration rates of the Soviet Union would urbanize India in 50 years to the level ultimately attained by the USSR, whereas introducing India's migration rates into the Soviet Union's growth regime would rapidly "de-urbanize" that national population.

The introduction of age composition alters the results in favor of migration as a contributor to urban growth. In the Indian case it increases migration's ultimate contribution threefold (from 6.0% to 19.8%); in the Soviet Union example it reverses the ranking itself, making migration the principal source of urban growth. What accounts for this reversal?

The disaggregation by age does not change the pattern of evolution of the aggregate net urban inmigration rate $m_u(t)$. In both the Indian and the Soviet illustrations it declines sharply from its initial level. But now the aggregate rate of natural increase no longer remains constant, dropping from 2% to 1.5% in the case of India and from .9% to .05%

TABLE 9

AGE-DISAGGREGATED PROJECTIONS OF OBSERVED POPULATIONS EXPOSED TO DIFFERENT REGIMES OF GROWTH: INDIA AND THE SOVIET UNION

A. INDIA'S POPULATION

1. India's Growth Regime					2. India's Natural Increase Rates with Soviet Union's Migration Rates			
$100U$	r_u	m_u	$m_u/r_u \times 100$	T	$100U$	r_u	m_u	$m_u/r_u \times 100$
19.9	.037	.017	47.1	1970	19.9	.175	.155	88.8
21.6	.035	.015	42.8	1975	33.4	.087	.058	67.1
23.3	.033	.014	41.2	1980	44.4	.065	.038	57.9
27.7	.025	.009	33.8	2000	69.8	.026	.007	26.2
30.1	.023	.006	28.2	2020	77.1	.017	.002	10.9
33.8	.019	.004	19.8	Stability	79.0	.014	.001	3.8

B. SOVIET UNION'S POPULATION

1. Soviet Union's Growth Regime					2. Soviet Union's Natural Increase Rates with India's Migration Rates			
$100U$	r_u	m_u	$m_u/r_u \times 100$	T	$100U$	r_u	m_u	$m_u/r_u \times 100$
56.3	.025	.016	63.8	1970	56.3	.004	−.005	−132.8
60.5	.020	.012	59.5	1975	54.5	.003	−.004	−156.9
64.4	.018	.011	57.4	1980	52.8	.002	−.003	−167.4
73.4	.005	.003	60.9	2000	45.6	−.002	−.002	87.0
76.9	.004	.002	44.9	2020	39.6	.002	.000	27.3
77.5	.002	.001	72.7	Stability	29.3	.010	.007	71.8

in the case of the Soviet Union. The cause of this decline in the aggregate rate is, of course, the gradual aging of the population and the associated shift in its age composition. This shift alters the relative weights with which the fixed age-specific rates are consolidated to form the aggregate crude rates. The net result is an increased relative contribution of net migration as a source of urban population growth, a consequence apparently of the fact that as with mortality, and not with fertility, the risks of migration are experienced by individuals of all ages.

Table 9A2 illustrates the short-run impacts of high rates of rural to urban migration on urban natural increase. The crude rate of urban national increase, held fixed at 20 per 1,000 in table 5, now grows to 29 per 1,000 in 1975 and 27 per 1,000 in 1980 before declining to roughly half those levels in the subsequent decades. Nevertheless, the even higher short-run rates of net urban inmigration ensure the primacy of migration as a source of urban growth for over a decade. Observe that increasing rural to urban migration still produces an ultimately lower urban growth rate, but now only after migration ceases to be the principal source of urban population growth—a crossover that, in this illustration, occurs when the national population is about 50% urban.

In conclusion, it appears that the principal effect of introducing age composition into the fixed-rate projection model is to decrease the aggregate rate of natural increase over time, $n_u(t)$, while slowing down the decline of the net urban inmigration rate, $m_u(t)$. Since these two contributors to urban growth now can exhibit different rates of decline over time, their relative importance as sources or urban growth also can change, and in patterns that are difficult to anticipate.

The decompositions presented in this paper have attempted to identify the instantaneous contributions of migration and natural increase to urban population growth over time. The focus has been on estimating the fraction of growth at each moment, t, that could be attributed to migration or natural increase rates prevailing at that same moment. But as Todaro points out, migrants bear children, and it may be desirable to identify that particular contribution to urban growth more explicitly in efforts to answer the question of whether it is migration or natural increase that is the major source of urban population growth.[18] A convenient way of approximating this contribution is to disaggregate the projection model further to permit it to keep track of the respective places of birth of the projected populations.

Decompositions Focusing on Migrant Stocks

A number of studies dealing with the urban problems of the less de-

[18] Todaro.

veloped world today view with concern the high fractions of urban residents born in rural areas, implying that these high fractions of "lifetime migrants" reflect high rates of rural-to-urban migration. Table 6 has already indicated that this may not be true. Table 10, the age-disaggregated counterpart to table 6, provides further evidence to the contrary.

Table 10 presents the results of a further disaggregation of the age-specific projections summarized earlier in table 9. The additional disaggregation is by place of birth, as in table 6. Because no data are available to disaggregate the initial (1970) population along this dimension, we focus only on the allocation that evolves at stability, inasmuch as this result is independent of the starting condition and is a function only of the particular growth regime.[19]

The place-of-residence-by-place-of-birth (PRPB) projections demonstrate that the existence of a large fraction of rural-born urban residents is not necessarily an indication of high rural-to-urban migration rates. Indeed, the association is apparently the other way around. High rates of rural-urban migration, such as those experienced in the Soviet Union, for example, generate urban populations with a higher share

TABLE 10

AGE-DISAGGREGATED PLACE-OF-RESIDENCE-BY-PLACE-OF-BIRTH PROJECTIONS OF OBSERVED POPULATIONS EXPOSED TO DIFFERENT REGIMES OF GROWTH: INDIA AND THE SOVIET UNION

A. INDIA'S POPULATION

1. India's Growth Regime				2. India's Natural Increase Rates with Soviet Union's Migration Rates		
$100U$	$100U_N$	$100U_A$	T	$100U$	$100U_N$	$100U_A$
19.9	19.9	0	1970	19.9	19.9	0
21.6	19.1	2.6	1975	33.4	20.7	12.8
23.3	18.6	4.6	1980	44.4	23.8	20.6
27.7	18.6	9.1	2000	69.8	39.5	30.3
30.1	19.4	10.7	2020	77.1	51.3	25.7
33.8	23.6	10.2	Stability	79.0	66.9	12.1

B. SOVIET UNION'S POPULATION

1. Soviet Union's Growth Regime				2. Soviet Union's Natural Increase Rates with India's Migration Rates		
$100U$	$100U_N$	$100U_A$	T	$100U$	$100U_N$	$100U_A$
56.3	56.3	0	1970	56.3	56.3	0
60.5	53.9	6.6	1975	54.5	52.9	1.6
64.4	53.2	11.3	1980	52.8	50.0	2.8
73.4	53.5	20.0	2000	45.6	39.5	6.2
76.9	55.2	21.8	2020	39.6	31.0	8.6
77.5	61.2	16.4	Stability	29.3	16.5	12.8

[19] This independence is, once again, a consequence of the attribute of "strong ergodicity" mentioned earlier in the paper—an attribute that is shared by all of the fixed-rate projection models used in this paper.

of urban-born "natives" than do lower migration rates, such as those found in India. The reason for this apparent paradox is, once again, the influence of the urbanization level, $U(t)$.

High rates of net urban inmigration produce high levels of urbanization, with the result that urban areas account for increasingly larger fractions of national births over time. For example, on 1970 rates, roughly three-fourths of all national births occur in urban areas at stability in the Soviet Union, compared with only one-fourth in India. This situation gives rise to a high fraction of natives in urban areas and explains why only 21% of the Soviet Union's stable urban population is rural born, compared with India's 30%.

The place-of-birth disaggregation can be carried one step further by keeping track of the place of birth of the parent as well as that of the child. Such a projection disaggregates the native urban population into two parts, separating the first-generation natives (urban-born children of rural-born parents) from the rest.

On 1970 rates, a projection that separately identifies first-generation natives shows that of the 23.6% urban natives in India at stability, over a third (36.0%) are children of rural-born parents; whereas of the 61.2% urban natives in the Soviet Union at stability, only about a fifth (21.9%) fall into this category. Thus, if one includes the children of rural lifetime migrants into the accounting, more than half (55.3%) of India's ultimate urban population will consist of lifetime migrants and their direct (first generation) contribution to urban natural increase. The corresponding result for the Soviet Union illustration is only 38.5%.

IV. Conclusion

This paper seeks to contribute to the debate on the demographic sources of the historically unparalleled rates of urban population growth in today's less developed countries. Following a broad review of the estimated and projected global patterns of such growth during the period 1950–2000, the paper turned to an examination of the simple demographics of urban population growth and urbanization, focusing in particular on the relative contributions made by natural increase and internal migration. Responding to the apparently widespread dissatisfaction in less developed nations with the evolving spatial distribution of their populations, the paper has considered the question whether urban populations are growing mostly from their own natural increase or from net inmigration from rural areas.

The major conclusion of the paper is that this fundamental question does not have a simple unequivocal answer. At different periods during a nation's urbanization transition, its urban population may grow primarily as a consequence of net urban inmigration; at other times the main contributor may be urban natural increase. The "guaranteed"

ultimate decline of the relative contribution of migration projected by Keyfitz and Ledent was shown to be merely a direct consequence of their model specification, which ignored the effects of age distribution.[20]

In the process of analyzing the demographics of urbanization and the changing contributions of natural increase and migration over time, this paper has also put forward a few important observations:

1. The principal effect of migration is to establish the level of urbanization, whereas that of natural increase is to determine the rate of urban population growth.
2. Although a sharp increase in the rate of rural-to-urban migration temporarily raises the urban population growth rate, its ultimate effect is to urbanize the population more rapidly and thereby to depress the urban growth rate to a lower level than it would have reached in the absence of the increase.
3. The relative importance of the two sources of urban population growth and urbanization may differ depending on whether the focus is on periodical net additions to the urban population stock or on the changing projected composition of that stock, for example, the disaggregation between natives and lifetime migrants.
4. A relatively large fraction of rural-born people among urban residents is not necessarily a sign of high rural to urban migration rates.

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

Among those taking the negative view are many national planners, who view with growing concern the rapid shift of their national population from rural to urban areas and the concurrent rapid growth of their largest urban centers, fearing that the econonomic, social, and political costs will be excessively large. Since most locational decisions are private decisions made in response to perceived socioeconomic conditions, it is difficult to see how national policy can appreciably slow the rate and pattern of urbanization. The universality of the phenomenon in countries with different policies, cultures, and economies suggests that the impact of such policies may be minimal. Investing in education and transport facilities in rural areas, for example, may increase rural incomes, but this is likely to also increase rural outmigration. Increasing labor-intensive productive activities in cities would ease unemployment levels but would also encourage more rapid urban growth.

[20] Keyfitz; Ledent, "The Dynamics of Two Demographic Models of Urbanization" and "The Factors and Magnitude of Urbanization under Unchanged Natural Increase and Migration Patterns."

Nevertheless, regardless of how desirable or feasible it may be to restrict the movement of people in the interests of national welfare, it seems reasonable to ask whether such efforts could make a significant impact on the growth rates of urban centers. Our simple decompositions do not provide a clear-cut answer, but they nevertheless do cast some doubt on the matter, inasmuch as they indicate that slowing down rural-to-urban migration is not likely to produce more than a short-run reduction of urban population growth rates unless fertility levels are also reduced.

Rural-Urban Migration, Urbanization, and Economic Development*

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I. Introduction

Since the beginning of the last century, the world has experienced rapid urbanization as the proportion of the population living in urban areas has increased from 2.5% in 1800 to 40% in 1975.

Urbanization is a finite process experienced by all nations in their transition from an agrarian to an industrial society; thus, different urbanization levels reflect differing degrees of economic development. On the one hand, the countries that experienced the Industrial Revolution in the last century—that is, those countries that constitute today's more developed parts of the world—had about 65% of their populations living in urban areas in 1975. On the other hand, the economically poorer, less developed parts of the world, in which a large part of the population is still engaged in agriculture, have reached significant levels of urbanization only recently; in 1975, the proportion of their population that was urban amounted to 28%. According to the latest UN population projections of the world and its major areas,[1] urbanization will continue for some time in the less developed regions as well as in the more developed regions: by the year 2000, 44% and 76% of their populations, respectively, will be living in urban areas.

From a demographic point of view, urbanization depends on the interaction of two factors, that is, the rural-urban differential in natural increase and the migration exchange between the rural and urban sec-

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[1] UN Population Division, *Patterns of Urban and Rural Growth* (New York: UN Department of International Economic and Social Affairs, 1980).

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tors.[2] In most situations, however, the impact of the first factor is much smaller than the impact of the second, so that a large part of the world's continued urbanization is to be attributed to the continuation of rural-urban migration, which apparently shows little sign of abating in much of the less developed world.[3]

This indeed raises the question of how rural-urban migration evolves with economic development. In this paper, we attempt to characterize this phenomenon in quantitative terms, in contrast to past research which has described such an evolution in qualitative terms. In brief, a mathematical treatment of the relationship between rural-urban migration and degree of urbanization is presented. Initially general, such a treatment is later made more specific by assuming a logistic evolution of the degree of urbanization, reflecting the general observation that the evolution of urbanization levels can be adequately depicted by S-shaped curves.

The paper consists of eight sections. Section II, intended as a background section, discusses in qualitative terms the relationship between rural-urban migration and economic development. Section III presents the general mathematical framework concerning the relationship between rural-urban migration and the degree of urbanization. On the basis of this treatment, Section IV proposes an assessment of the evolution of the rural net out-migration rate in selected developing countries (India, Egypt, Mexico, and Honduras) as implied by recent UN 1950–2000 estimates and forecasts of urban and rural populations.[4] Section V derives a formula describing the evolution of the rural net out-migration rate that is consistent with a logistic evolution of the degree of urbanization. Such a formula indicates that, if the rural-urban natural increase differential is negligible, the ensuing rural net out-migration rate first increases, then passes through a maximum, and finally decreases. Such a result is shown to be only slightly affected by values of the rural-urban natural increase differential typically observed. Sections VI and VII illustrate the applicability of the rural net out-migration rate formula with the help of examples based on time-series as well as cross-section data on urbanization levels. Section VI determines the dates at which, in the four aforementioned developing

[2] There is, in fact, a third factor which may influence urbanization, namely, the continuous qualification of additional areas as urban: people can "move" from a rural to an urban area without ever changing their residence, provided that the area in which they live has reached the urban population threshold or has been annexed into an already urban area. Our concept of migration obviously includes the effect of reclassification.

[3] A. Rogers, "Migration, Urbanization, Resources, and Development," in *Alternative for Growth: The Engineering and Economics of Natural Resources Development*, ed. H. McMains and L. Wilcox (Cambridge, Mass.: Ballinger Publishing Co., for the National Bureau of Economic Research, 1978), pp. 149–217.

[4] UN Population Division.

countries, the rural net out-migration rate is expected to decline; Section VII investigates the evolution of the rural net out-migration rate with economic development measured by an objective index, per capita GNP.

II. Qualitative Considerations

Urbanization is a process of human settlement that arises from the polarization of economic development in urban areas. It is characterized by a rise in the proportion of the total population of an urban-rural system that is urban. Clearly, it is a population attribute differing from urban growth, for it also depends on rural growth.[5]

Thus, a better understanding of the dynamics of urbanization requires a focus on the process of rural *and* urban population change. But, owing to the nature of the urbanization concept, the emphasis should not lie so much on the absolute growth of the urban and rural areas as on their relative growths. When such a perspective is adopted, urbanization becomes a dynamic process generated by only two factors: (1) rural-urban differential in natural increase, and (2) population exchange from rural to urban areas through internal migration. We shall look at both factors in turn.

Natural increase is the difference between fertility and mortality, both of which are generally lower in urban areas than in rural areas. Table 1, which shows UN estimates of urban and rural crude birth- and death rates around 1960, reveals that:

a) Virtually everywhere the fertility of urban women is lower than that of rural women; except for North America, where the difference is slight, the rural-urban discrepancy is substantial, ranging from four points in Europe to nine points in Latin America.

b) The rural death rate exceeds the urban death rate by six points in the less developed regions of the world but only by about half a point in the more developed regions.

The aggregation of crude birth- and death rates indicates that rural natural increase exceeds urban natural increase in most parts of the world, but the difference between the two amounts to only a few points except for Latin America and Oceania. Yet, as shown in table 1, urban areas are growing much more rapidly than rural areas: the urban growth rate of the major regions of the world exceeds its rural counterpart by 13‰ in Oceania to 40‰ in East Asia. The conclusion here is that the *component of change fostering urbanization is the net transfer of population from rural to urban areas*. With the exception of Oceania, rural-

[5] Urban growth and urbanization do not necessarily occur together, although historically they have; urbanization accompanies urban growth only if the urban population grows faster than the rural population.

TABLE 1

COMPONENT RATES (‰) OF RURAL AND URBAN POPULATION CHANGE IN THE WORLD AND MAJOR REGIONS: DEATH, BIRTH, AND NATURAL INCREASE, 1960

REGION	CRUDE DEATH RATE			CRUDE BIRTH RATE			NATURAL INCREASE RATE		
	Rural	Urban	Rural-Urban Differential	Rural	Urban	Rural-Urban Differential	Rural	Urban	Rural-Urban Differential
World	19.1	11.6	7.5	39.8	27.7	12.1	20.7	16.1	4.6
More developed regions	9.3	8.9	.4	23.3	20.1	3.2	14.0	11.2	2.8
Less developed regions	21.7	15.4	6.3	44.1	37.9	6.2	22.4	22.5	−.1
Africa	25.1	18.0	7.1	47.8	41.6	6.2	22.7	23.6	−.9
Northern America	9.3	8.9	.4	24.8	24.2	.6	15.5	15.3	.2
Latin America	12.6	10.8	1.8	44.2	35.1	9.1	31.6	24.3	7.3
East Asia	19.3	12.9	6.4	36.7	29.8	6.9	17.4	16.9	.5
South Asia	22.9	17.2	5.7	47.1	40.0	7.1	24.2	22.8	1.4
Europe	10.0	10.2	−.2	21.8	17.8	4.0	11.8	7.6	4.2
Oceania	13.1	8.9	4.2	36.3	22.5	13.8	23.2	13.6	9.6
USSR	8.4	6.5	1.9	26.5	20.8	5.7	18.1	14.3	3.8

SOURCE.—UN, *Global Review of Human Settlements—a Support Paper for Habitat,* vol. 2, *Statistical Annex* (Oxford: Pergamon Press, 1976), pp. 51–52.

urban natural increase differentials have a small impact on the differential growth of urban and rural areas (negligible, in many instances).

The above contention, that urbanization is attributable to rural-urban migration rather than to the rural-urban differential in natural increase, is illustrated in table 2 with numerical values relating to a particular point in time (1960). But, since these values refer to world regions characterized by differing levels of development, it is likely that the role of rural-urban migration as a main contributor to urbanization also holds over time. In fact, although its importance may have varied at times, such a role has been observed historically and has been described by the generalization known as the mobility revolution first developed by Zelinsky.[6]

This mobility revolution is the spatial counterpart of the vital revolution or demographic transition, which is the process whereby societies with high birth- and death rates move to low birth- and death rates. In brief, Zelinsky argues that all forms of personal mobility experience an evolutionary sequence parallel to that of the vital revolution as countries go through the process of modernization. According to him, this sequence consists of five phases, of which the intermediate ones are of greatest interest for the study of rural-urban migration.

Initially (premodern traditional society), there is little genuine migration from the countryside to cities. In the second phase (early transitional society—characterized by a decline in mortality), massive movements take place from rural to urban areas. They tend to slacken in the third phase (late transitional society—characterized by a decline in fertility). They are further reduced in absolute and relative terms in the fourth phase (advanced society—with slight to moderate natural increase), possibly to totally disappear in the fifth and last phase (superadvanced society). The evolution of the rural exodus through the five phases described above is illustrated in figure 1, which shows a curve reaching a plateau during phases III and IV and then dwindling sharply.

III. The Relationship between Rural-Urban Migration and Degree of Urbanization: A Mathematical Framework

In contrast to the work of Zelinsky, which is rather qualitative, this paper adopts an analytic viewpoint and attempts to characterize in quantitative terms the evolution of rural-urban net migration with economic development, proxied by time or an objective index. More precisely, the objective here is to investigate: (*a*) the evolution, in any

[6] W. Zelinsky, "The Hypothesis of the Mobility Transition," *Geographical Review* 61 (1971): 219–49.

TABLE 2

TOTAL GROWTH RATE, NATURAL INCREASE, AND NET MIGRATION RATES (‰) IN THE WORLD AND MAJOR REGIONS, 1960

REGION	TOTAL GROWTH RATE			NATURAL INCREASE RATE			NET MIGRATION RATE		
	Rural	Urban	Urban-Rural Differential	Rural	Urban	Rural-Urban Differential	Rural	Urban	Urban-Rural Differential
World	12.5	33.0	20.5	20.7	16.1	4.6	−8.2	16.9	25.1
More developed regions	−2.6	23.5	26.1	14.0	11.2	2.8	−16.6	12.3	28.9
Less developed regions	16.5	45.5	29.0	22.4	22.5	−.1	−5.9	23.0	28.9
Africa	18.0	44.8	26.8	22.7	23.6	−.9	−4.7	21.2	25.9
Northern America	−1.2	24.3	25.5	15.5	15.3	.2	−16.7	9.0	25.7
Latin America	12.7	44.6	31.9	31.6	24.3	7.3	−18.9	20.3	39.2
East Asia	8.6	48.6	40.0	17.4	16.9	.5	−8.8	31.7	40.5
South Asia	21.2	36.7	15.5	24.2	22.8	1.4	−3.0	13.9	16.9
Europe	−4.2	17.9	22.1	11.8	7.6	4.2	−16.0	10.3	26.3
Oceania	13.2	26.2	13.0	23.2	13.6	9.6	−10.0	12.6	22.6
USSR	−1.4	34.5	35.9	18.1	14.3	3.8	−19.5	20.2	39.7

SOURCE.—Same as table 1.

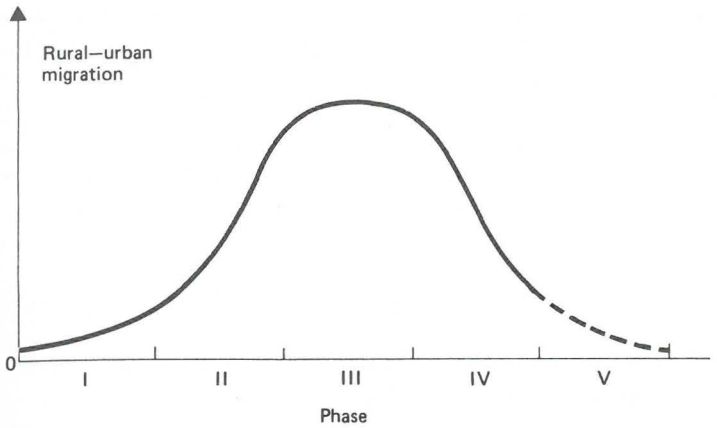


FIG. 1.—Changing level of the rural-urban migration through time (W. Zelinsky, "The Hypothesis of the Mobility Transition," *Geographical Review* 61 [1971]: 233).

given country, of the rural net out-migration rate over time; and (*b*) the evolution of the rural net out-migration rate with per capita GNP in the "representative" country described by a cross-sectional sample of noncentrally planned countries.

In a first step toward this objective, this section seeks to derive a general expression of the relationship linking rural-urban migration to the degree of urbanization on the basis of a simple framework of urbanization dynamics recently suggested.[7]

Let $P_r(t)$ and $P_u(t)$ denote the rural and urban populations, respectively, at time t. Thus,

$$\frac{dP_r(t)}{dt} = [r(t) - m(t)]P_r(t) \tag{1}$$

and

$$\frac{dP_u(t)}{dt} = u(t)P_u(t) + m(t)P_r(t) , \tag{2}$$

in which $r(t)$ and $u(t)$ are the natural increase rates in the rural and urban sectors, and $m(t)$ is the net migration rate out of the rural sector.

Letting $S(t)$ denote the ratio $[P_u(t)/P_r(t)]$ of the urban to rural population and differentiating with respect to time lead to

$$\frac{dS(t)}{S(t)dt} = \frac{dP_u(t)}{P_u(t)dt} - \frac{dP_r(t)}{P_r(t)dt} , \tag{3}$$

[7] N. Keyfitz, "Do Cities Grow by Natural Increase or by Migration?" *Geographical Analysis* 12 (April 1980): 142–56.

an equation indicating that the "tempo"[8] of urbanization, as measured by the growth rate of the urban-rural population ratio, is equal to the difference between the urban and rural population growth rates.[9]

Then, substituting equations (1) and (2) into equation (3) yields a differential equation linking the urbanization index $S(t)$ with its two factors: namely, the rural-urban natural increase differential $\Delta(t) = r(t) - u(t)$ and the rural net out-migration rate $m(t)$. We obtain

$$\frac{dS(t)}{S(t)dt} = m(t)\left[1 + \frac{1}{S(t)}\right] - \Delta(t)\ .^{10} \tag{4}$$

Since the proportion $\alpha\ (t)$ of the total population that is urban (or degree of urbanization) is linked with $S(t)$ by

$$\alpha(t) = \frac{S(t)}{1 + S(t)}\ , \tag{5}$$

equation (4) can be rewritten as

$$m(t) = \alpha\ (t)\left[\frac{dS(t)}{S(t)dt} + \Delta(t)\right]\ , \tag{6}$$

an expression which shows that the rural net out-migration rate is proportional to the degree of urbanization $\alpha(t)$ as well as to a term which is the sum of the tempo of urbanization and the rural-urban natural increase differential.

Finally, we can write equation (6) as

$$m(t) = \frac{d\alpha(t)}{[1 - \alpha(t)]dt} + \alpha(t)\Delta(t)\ , \tag{7}$$

which is precisely the relationship we sought to establish at the outset of this section. Note that, if the rural-urban natural increase differential is negligible, $m(t)$ is equal, in the first approximation, to the first term appearing in the right-hand side of equation (7) and denoted hereafter by $\bar{m}(t)$:

[8] Note that our definition of the tempo of urbanization is slightly different from Arriaga's definition, which considers the difference between the urban and *total* population growth rates (E. Arriaga, "Selected Measures of Urbanization," in *The Measurement of Urbanization and Projection of Urban Population*, ed. S. Goldstein and D. Sly [Liège: International Union for the Scientific Study of Population, 1975], pp. 19–87).

[9] This interpretation has been proposed in UN Population Division.

[10] This equation was initially derived in J. Ledent, "Comparative Dynamics of Three Demographic Models of Urbanization," Research Report no. 80-1 (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1980).

$$\bar{m}(t) = \frac{d\alpha(t)}{[1 - \alpha(t)]dt} . \tag{8}$$

Alternatively, if $\beta(t) = 1 - \alpha(t)$ denotes the percentage of the total population that is rural, $\bar{m}(t)$ can be written as

$$\bar{m}(t) = - \frac{d\beta(t)}{\beta(t)dt} , \tag{9}$$

thus indicating that the conditional rural net out-migration rate—that is, the rural net out-migration rate prevailing in case of zero rural-urban natural increase differential—is equal to the average rate of decrease of the rural percentage (a result which could have been derived intuitively as well).

Note here that the absolute error made by approximating $m(t)$ by $\bar{m}(t)$ is equal to $|\Delta(t)|\alpha(t)$, which in all cases is less than $|\Delta(t)|$. Ignoring the existence of the natural increase differential leads to an absolute error in the value of the rural net out-migration rate that is necessarily less than the absolute value of actual rural-urban natural increase differential. Since, in any instance, this differential is of the magnitude of 1‰–2‰, the approximation of $m(t)$ by $\bar{m}(t)$ is generally a satisfactory one.

IV. Evolution of Rural Net Outmigration Rates in Selected Developing Countries: 1950–2000

The mathematical framework presented above suggests the possibility of estimating rural net out-migration rates in countries for which data on the degree of urbanization are available at different times.

If the degree of urbanization of a given country takes on the values $\alpha(t_1)$ and $\alpha(t_2)$ at times t_1 and t_2, the average annual rate of rural net out-migration over the period (t_1, t_2) can be estimated, for the case of a negligible rural-urban natural increase differential, from

$$\bar{m}(t_1, t_2) = \frac{1}{t_2 - t_1} \ln \left[\frac{1 - \alpha(t_1)}{1 - \alpha(t_2)} \right] , \tag{10}$$

a relationship which follows immediately from equation (9).[11]

On the basis of this formula, estimates of the conditional rural net out-migration rate have been calculated for four developing countries—India, Egypt, Mexico, and Honduras—during the period 1950–2000,

[11] Eq. (10) summarizes, in a simpler and more elegant format, an earlier estimation procedure set out in J. Ledent and A. Rogers, "Migration and Urbanization in the Asian Pacific," Working Paper no. 79-51 (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1979).

from the estimated and projected degrees of urbanization recently pul lished by the UN[12] and shown in table 3.

Table 4, which presents the estimates thus obtained, suggests general upward tendency. Exceptions to this tendency concern Egypt- where the rural net out-migration rate fell substantially between 195 and 1975 (a phenomenon which can be associated with the variou wars in which that country was involved during that period)—an Mexico, where the rural net out-migration rate is expected to decreas slightly in the last 2 decades of this century. This observation for Mexic is in sharp contrast with the threefold to fourfold increase that the rur net out-migration rate is expected to experience between the earl 1970s and the end of this century in India and Egypt. Nevertheless, b the year 2000, the rural net out-migration rate in these countries wi still be smaller than that in Mexico.

Note that the four countries selected above for the purpose of ou illustration were not chosen at random. These countries (plus a fe other small countries of Central America) are, in fact, the only devel oping countries for which the UN,[13] in the recent past, has publishe

TABLE 3

ESTIMATED AND PROJECTED VALUES OF THE DEGREE OF URBANIZATION (%) IN SELECTED DEVELOPING COUNTRIES, 1950–2000

COUNTRY	YEAR						
	1950	1960	1970	1975	1980	1990	2000
India	16.79	17.90	19.70	20.74	22.26	26.92	34.05
Egypt	31.92	37.86	42.45	43.54	45.37	50.54	57.36
Mexico	42.65	50.75	59.04	63.03	66.69	72.83	77.35
Honduras	17.77	22.74	28.71	31.97	35.55	43.27	51.04

SOURCE.—UN Population Division, *Patterns of Urban and Rural Populatio Growth*, Annex C (New York: UN Department of International Economic and Socia Affairs, 1980).

TABLE 4

ANNUAL AVERAGE VALUES OF THE CONDITIONAL RURAL NET OUT-MIGRATION RATE (‰) IN SELECTED DEVELOPING COUNTRIES, 1950–2000

COUNTRY	PERIOD					
	1950–60	1960–70	1970–75	1975–80	1980–90	1990–2000
India	1.34	2.22	2.61	3.86	6.19	10.26
Egypt	9.13	7.31	4.53	6.63	9.95	15.40
Mexico	15.23	18.43	20.50	20.84	20.36	18.21
Honduras	6.24	8.04	9.46	10.80	12.75	14.74

[12] UN Population Division.

[13] UN Department of Economic and Social Affairs, *Demographic Yearbook 197* (New York: United Nations, 1977).

annual data on fertility and mortality rates according to urban and rural residence, thus allowing one to obtain estimates of the rural-urban natural increase differential.

It turns out that, in a given country, such a differential may vary rapidly due to changes in fertility/mortality patterns as well as shifts in age composition. For example, table 5 presents for our four countries the minimal and maximal annual values of this differential in the early 1970s (or the late 1960s, in the case of Honduras); however, the variation of this differential generally occurs around a rather stable average value, which is shown in the last column of table 5.

In accordance with the observation made in Section II, such average values appear to be generally small (3.6‰ in the case of Egypt), if not trifling (in the cases of India and Mexico). However, this is not so for Honduras, where the urban rate of natural increase is much higher than its rural counterpart.[14]

On the basis of the average natural increase differentials just described, we can readily derive estimates of the discrepancy existing between the conditional and unconditional net migration rates relating to our four countries observed in the first half of the 1970s. Not surprisingly, the conditional rate underestimates the unconditional one by a rather negligible quantity in India and Mexico (0.04‰ and 0.18‰, respectively). In Egypt, the discrepancy reaches 1.55‰, thus causing the 1970–75 average rural net out-migration rate to be 6.08‰ instead of the 4.53‰ conditional estimate derived earlier.

Finally, in Honduras, the consideration of the rural-urban natural increase reduces the conditional estimate of 9.36% by as much as 6.62%, thus bringing the value of the rural net out-migration rate to 2.74%.

In the absence of any further information on the rural-urban natural

TABLE 5

EXTREME AND AVERAGE VALUES OF THE RURAL-URBAN NATURAL INCREASE DIFFERENTIAL (‰) IN SELECTED COUNTRIES IN THE LATE 1960s OR EARLY 1970s

Country	Period	Minimal Value	Maximal Value	Average Value
India	1972–75	−.8	1.1	.2
Egypt	1970–74	1.5	6.9	3.6
Mexico	1965–73	−2.2	4.0	.3
Honduras	1965–70	−25.9	−18.0	−21.8

SOURCE.—UN, *Demographic Yearbook 1976* (New York: UN Department of Economic and Social Affairs, 1977). The 1973, 1974, and 1975 yearbooks were also used.

[14] This comparatively larger natural increase follows from an urban crude birthrate which is twice as high as its rural counterpart owing to the young population structure of urban areas, possibly brought about by a large influx of young immigrants.

increase differentials concerning the rest of the period 1950–2000, we simply assume, for illustrative purposes, that the average values derived above for the early 1970s for each country prevail throughout the whole period. Table 6 shows the ensuing unconditional estimates of the rural net out-migration rate as well as the discrepancies between corresponding conditional and unconditional estimates.

For various reasons, the simple derivation of average values of the conditional and unconditional rural net out-migration rates just described may, in some circumstances, be insufficient, and one may wish instead to determine estimates for any point in time during a given period. Let us note that, for this purpose, it is sufficient to know the function $\alpha(t)$ describing the evolution of the degree of urbanization with time. From such a knowledge, equation (8) allows the derivation of an expression of the conditional net out-migration rate $\bar{m}(t)$, and, if the evolution of the rural-urban natural increase differential is known, equation (7) yields an expression of the unconditional rate $m(t)$.

In general, no such expression of $\alpha(t)$ is known at the outset; therefore, one must either (*a*) use an adequate function interpolating between the observed values of the degree of urbanization or (*b*) fit a reasonable function to those observed values. In practice, these two alternatives are not really interchangeable. The first method is especially relevant when the period of reference is the observation period; the second method is more effective if the focus is on the likely evolution occurring past the observation period.

Both these alternatives are illustrated below. The interpolating method is examined in the remainder of this section, whereas the fitting technique is considered in Section VI.

TABLE 6

CONDITIONAL AND UNCONDITIONAL ESTIMATES OF THE RURAL NET OUT-MIGRATION RATE (‰) IN SELECTED COUNTRIES, 1950–2000

COUNTRY	PERIOD					
	1950–60	1960–70	1970–75	1975–80	1980–90	1990–2000
	Unconditional-Conditional Differentials					
India	.03	.04	.04	.04	.09	.06
Egypt	1.25	1.44	1.55	1.60	1.73	2.02
Mexico	.14	.16	.18	.19	.21	.23
Honduras	−4.40	−5.60	−6.62	−7.36	−8.58	−10.27
	Unconditional Estimates					
India	1.38	2.26	2.65	3.90	6.24	10.32
Egypt	10.38	8.75	6.08	8.18	11.68	17.42
Mexico	15.37	18.59	20.68	21.03	20.57	18.44
Honduras	1.84	2.44	2.74	3.44	4.17	4.17

Two of the most effective interpolating techniques rely on polynomial functions (whose degree is one less than the number of observations) and cubic spline functions, respectively. Although the latter technique is becoming increasingly popular in the field of demography,[15] the former is chosen here because of its simpler computing requirements.

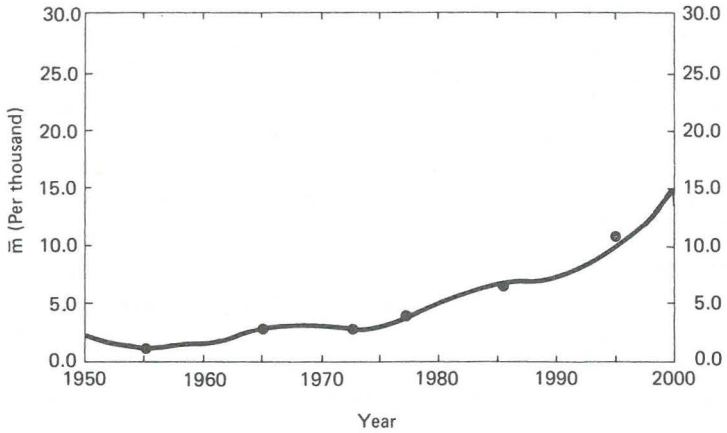
Figure 2 shows the evolution of the conditional rural net out-migration rate $\bar{m}(t)$ in the developing countries previously studied, based on the application of the polynomial technique to the UN data of table 3. The observation of this figure, indeed, confirms the general evolution observed earlier when estimating the average values of such a rate over the UN decennial (or quinquennial) intervals; but, in addition, it allows for a finer assessment of the evolution of such a rate if it is nonmonotonic (Egyptian case especially).

Note that, in virtually all cases, the average values of the rural net out-migration rates derived earlier are, if plotted at mid-period, located near the curve representing the evolution of $\bar{m}(t)$, an observation that indeed points to the soundness of our interpolation procedure. However, the average values are generally located farther away from the curve in the case of the last decennial period (1990–2000). This is in agreement with the well-known result that polynomial interpolations tend to perform poorly at each extreme of the interpolation period.[16]

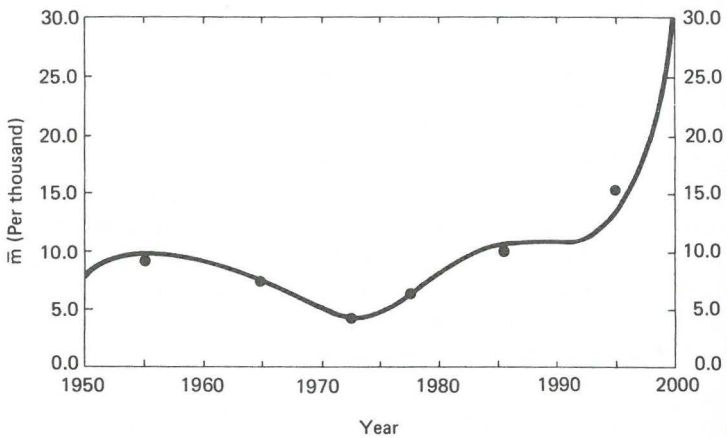
Finally, in the case of Honduras, the evolution of the conditional and unconditional rural net out-migration rates are contrasted in figure 3. The unconditional rates are based on a rural-urban natural increase differential $\Delta(t)$ equal to its observed value in the late 1960s. Aside from the two thick lines stressing the evolution of these two rates, this figure displays thinner lines indicating the evolution of the unconditional rates for alternative constant values of $\Delta(t)$. In principle, figure 3 could be used as a figure of reference to directly determine the evolution of $m(t)$ from the knowledge of the actual evolution of $\Delta(t)$.

[15] D. R. McNeil, T. J. Trussell, and J. C. Turner, "Spline Interpolation of Demographic Data," *Demography* 14 (May 1977): 245–52.

[16] To avoid such a poor interpolation for the first decennial period 1950–60, the observation period has been enlarged to include two pre-1950 observations. The values of the degree of urbanization thus required for India, Egypt, and Mexico, respectively, have been obtained from A. Bose, "Urbanization in India: A Demographic Perspective," in *Patterns of Urbanization: Comparative Country Studies*, vol. 1, ed. S. Goldstein and D. Sly (Liège: International Union for Scientific Study of Population, 1974); A. Khalifa, *The Population of Egypt*, CICRED Series (Cairo: Institute of Statistical Studies and Research, 1973); and L. Unikel, "Urbanization in Mexico: Process, Implications, Policies and Prospects," in *Patterns of Urbanization: Comparative Country Studies*, vol. 2, ed. S. Goldstein and D. Sly (Liège: International Union for Scientific Study of Population, 1975). In the absence of any reliable source, the necessary values for Honduras were simply obtained from a backward extrapolation of the logistic curve estimated later on in Sec. VI.

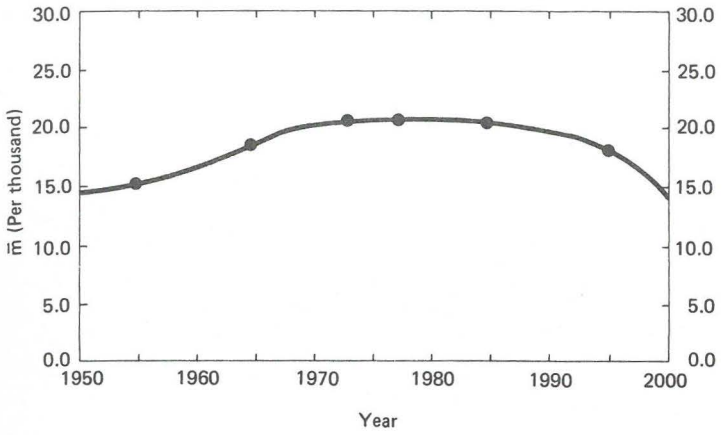


A. India

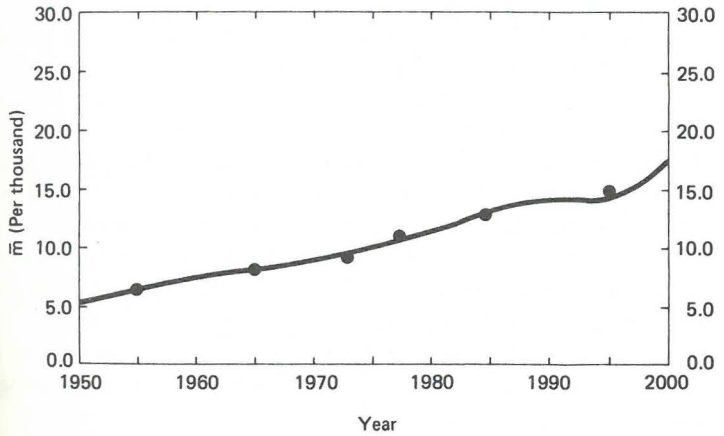


B. Egypt

FIG. 2.—Evolution of the conditional rural net out-migration rate: selected developing countries, 1950–2000.



C. Mexico



D. Honduras

FIG. 2 (*Continued*)

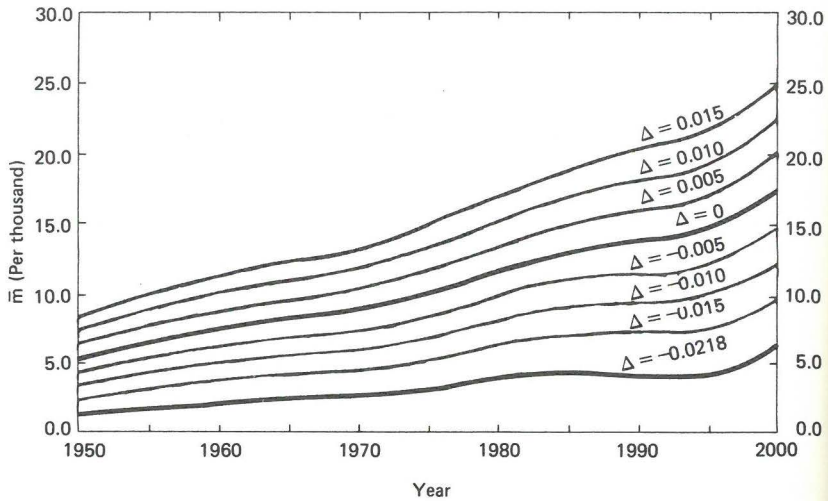


FIG. 3.—Evolution of the rural net out-migration rate under various constant natural increase differentials: Honduras, 1950–2000.

V. The Evolution of Rural-Urban Migration Compatible with a Logistic Evolution of the Degree of Urbanization

As mentioned above, another possible use of equations (7) or (8) follows from the availability of an expression for the degree of urbanization $\alpha(t)$. Is there any obvious functional form for such an expression? The literature does suggest that the past evolution of the degree of urbanization in the currently developed countries can be depicted by attenuated S-shaped curves (see fig. 4 for an illustration of the curves for selected countries). Furthermore, from a modeling viewpoint, these curves can be adequately represented by a logistic function.[17]

Thus, our focus naturally shifts to the functional form of the conditional rural net out-migration rate that is consistent with a logistic evolution of the degree of urbanization. Let

$$\alpha(t) = a + \frac{b}{1 + ce^{-ht}}, \tag{11}$$

where b, c, and h are positive constants and a is bounded from below and above by $-(b/1 + c)$ and $1 - b$, respectively. The variations of $\alpha(t)$ over time are illustrated in figure 5*A*, which shows the existence of a point of inflection occurring for t equal to

[17] IBRD, *Urbanization* (Washington, D.C.: World Bank, 1972); B. Berry, *The Human Consequences of Urbanization* (London: Macmillan Co., 1973).

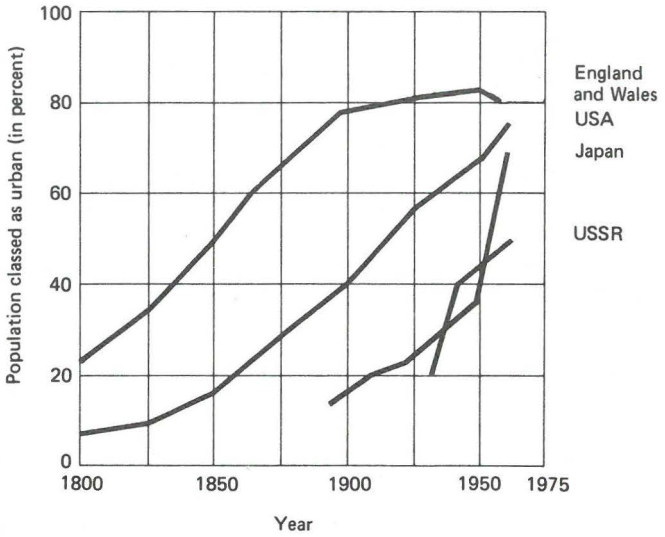


FIG. 4.—Historical evolution of population classed as urban in selected currently developed countries (Kingsley Davis, "The Urbanization of the Human Population," *Scientific American* 213 [1965]: 47).

$$t_\alpha = \frac{1}{h} \ln c \, . \tag{12}$$

In such circumstances, the part of the population that is rural is equal to

$$\beta(t) = \frac{1 - (a + b) + c(1 - a)e^{-ht}}{1 + ce^{-ht}} \, . \tag{13}$$

It is then readily established from equation (9) that the conditional rural out-migration rate can be expressed as

$$\bar{m}(t) = \frac{bche^{-ht}}{[1 - (a + b) + c(1 - a)e^{-ht}](1 + ce^{-ht})} \, . \tag{14}$$

The first derivative of this function has the sign of

$$x(t) = c^2(1 - a)he^{-2ht} - h[1 - (a + b)] \, , \tag{15}$$

an expression which is positive for all t less than

$$t_m = \frac{1}{2h} \ln \frac{c^2(1 - a)}{1 - (a + b)} \, . \tag{16}$$

Consequently, in case of a logistic evolution of the urbanization index, the conditional rural net out-migration rate first increases, passes through a maximum for $t = t_m$, and then decreases toward zero: see figure 5*B*.

In brief, if the rural-urban natural increase differential remains negligible over time, a logistic evolution of the urbanization index $\alpha(t)$ leads to a rural net out-migration rate function whose evolution through time is consistent with Zelinsky's mobility revolution hypothesis.

What if the rural-urban natural increase differential is not negligible? Then, the (unconditional) rural net out-migration is clearly obtained from

$$m(t) = \bar{m}(t) + \alpha(t)\Delta(t) , \tag{17}$$

where $\bar{m}(t)$ and $\alpha(t)$ are given by equations (14) and (11), respectively.

The evolution of the rural net out-migration rate, which now depends on the evolution of $\Delta(t)$, is likely to be similar to the one suggested by the evolution of $\bar{m}(t)$ in most circumstances.[18] But, as implied by equation (17), this evolution is such that, with respect to the case of a zero natural increase differential, the maximum is reached less (more) rapidly and takes on a larger (smaller) value if $\Delta(t)$ is a positive (negative) function.

VI. Long-Term Evolution of Rural-Urban Migration in Selected Developing Countries

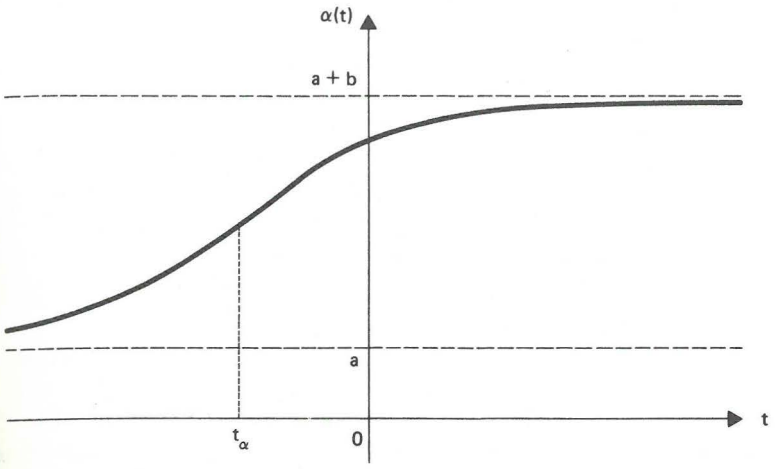
An immediate application that the mathematical developments of the preceding section suggests is the determination of the time at which the rural net out-migration will start to level off in the four developing countries already considered.

As a first step toward such a determination, we now fit a logistic curve to the UN's 1950–2000 urbanization data (see table 3 above) to obtain the values of the parameters *a*, *b*, *c*, and *h* necessary to project the future evolution of $\bar{m}(t)$. Such an estimation is performed with the help of a nonlinear least-squares method—the so-called Levenberg-Marquardt method—modified by Brown and Dennis.[19]

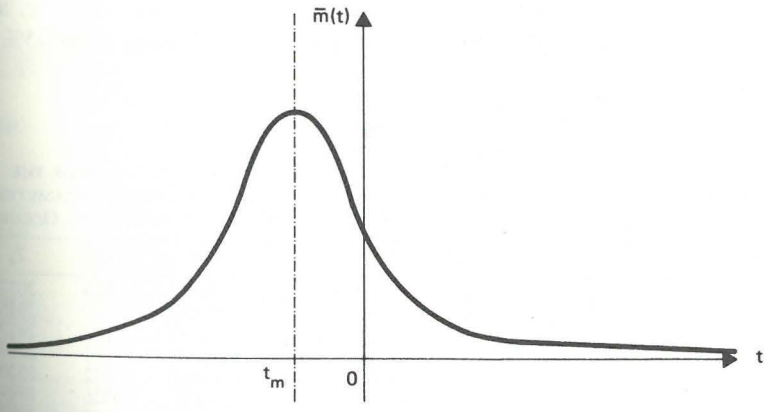
As suggested by the results shown in table 7, the estimation procedure yields reasonable results only in the case of Mexico and Hon-

[18] It is simple to analytically establish this result for well-behaved evolutions of $\Delta(t)$, such as a constant $\Delta(t)$ or one that is a linear function of the degree of urbanization.

[19] K. Levenberg, "A Method for the Solution of Certain Nonlinear Problems in Least Squares," *Quarterly Applied Mathematics* 2 (1944): 164–68: D. W. Marquardt, "An Algorithm for Least-Squares Estimation of Nonlinear Parameters," *SIAM Journal of Numerical Analysis* 11 (1963): 341–441; K. M. Brown and J. E. Dennis, "Derivative Free Analogues of the Levenberg-Marquardt and Gauss Algorithms for Nonlinear Least Squares Approximations," *Numerische Mathematik* 12 (1972): 289–97.



(A) Degree of urbanization



(B) Conditional rural net outmigration rate

FIG. 5.—Evolution of the conditional rural net out-migration rate compatible with a logistic evolution of the degree of urbanization. *A*, Degree of urbanization. *B*, Conditional rural net out-migration rate.

duras: the limiting values of the degree of urbanization are 85.7% and 91.5% and the dates at which the point of inflection occurs are 1963 and 1995, respectively.

The failure of the estimation procedure in the cases of India and Egypt is hardly a surprise and can be easily explained. On the one hand, the Indian degree of urbanization, as predicted by the UN, will still be, in the year 2000, in the swift-rise period preceding the reaching of the point of inflection, and therefore the estimation procedure is unsuccessful in determining a reasonable upper asymptote. On the other hand, urbanization in Egypt, which has evolved erratically between 1950 and 1975 because of the aforementioned wars, has not followed the smooth evolution characterizing a logistic curve.

However, in the Egyptian case, since the evolution predicted by the UN for the period 1975–2000 is well behaved, we could simply fit a logistic curve in relation to the narrower period 1975–2000. But this would leave us with only four observations, that is, as many observations as there are parameters!

Thus, in view of the impossibility of deriving a credible estimate of the ultimate degree of urbanization for India and Egypt, we adopt here the alternate methodology consisting of fitting a logistic curve with an exogenously determined ultimate degree of urbanization α_∞; different values of α_∞ are successively assumed in order to assess the sensitivity of the estimates of $\bar{m}(t)$ to the choice of α_∞.

Part of table 7 displays the values of the coefficients *a*, *b*, *c*, and *h* obtained for five predetermined values of α_∞ ranging from 75% to

TABLE 7

CALIBRATION OF THE LOGISTIC CURVES DESCRIBING THE EVOLUTION OF THE DEGREE OF URBANIZATION IN SELECTED DEVELOPING COUNTRIES:* PARAMETER VALUES, INDEX OF FIT, AND YEAR IN WHICH THE POINT OF INFLECTION OCCURS

Country	α_∞	*a*	*b*	*c*	*h*	*ssq*†	T_α
India	.75	.1590	.5910	55.91	.06410	.1004	2012
	.80	.1584	.6416	57.95	.06260	.0862	2015
	.85	.1579	.6921	60.16	.06135	.0758	2017
	.90	.1574	.7426	62.50	.06030	.0681	2019
	.95	.1570	.7930	64.91	.05940	.0622	2020
Egypt	.75	.3944	.3556	60.55	.08291	.0026	1999
	.80	.3875	.4125	48.62	.07422	.0003	2002
	.85	.3820	.4680	42.76	.06820	.0002	2005
	.90	.3775	.5225	39.57	.06377	.0004	2008
	.95	.3737	.5263	37.81	.06037	.0009	2010
Mexico	(.8574)	.2015	.6560	1.914	.05138	.0514	1963
Honduras	(.9150)	.0306	.8845	5.003	.03563	.0356	1995

* All curves were fitted to the UN's 1950–2000 data of table 3 except in the case of Egypt (1975–2000 data only).

† The index of fit *ssq* is the sum of squares of the residuals.

95%.[20] Note the regular variations of these coefficients with α_∞ and observe the small sensitivity of the parameter a and the high sensitivity of the parameter b to changes in the value of α_∞.

Table 8 displays the evolution, over the period 2000–2050, of the degree of urbanization resulting from the logistic trends just estimated. Considering first the two countries for which "full" logistic equations could be estimated, we observe a further 7.2% rise—in absolute value—of the degree of urbanization in Mexico, thus bringing this index to 84.5% in 2050, a close value to the estimated ultimate figure of 85.7%. As for the degree of urbanization in Honduras, it is expected to rise from 51.1% in 2000 to 80.5% in 2050.

Turning now to the other two nations and assuming an ultimate degree of urbanization of 85%, we also observe a sharp rise in the degree of urbanization, from 34.05% in 2000 to 77.02% in 2050 in the case of India and from 57.36% in 2000 to 82.91% in 2050 in that of Egypt. In fact, depending on its ultimate value, the degree of urbanization reached in 2050 could range between 70.0% and 83.4% in India and 74.5% and 90.2% in Egypt.

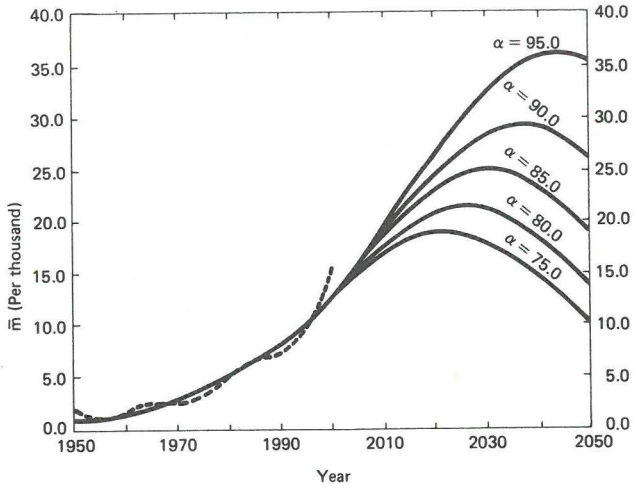
The evolution of the conditional rural net out-migration rates over the period 1950–2050 (1975–2050 in the case of Egypt), which follow from the logistic curves estimated above, are shown in figure 6.[21] In

TABLE 8—PROJECTED PERCENTAGES OF POPULATION IN URBAN AREAS IN SELECTED DEVELOPING COUNTRIES, 2000–50

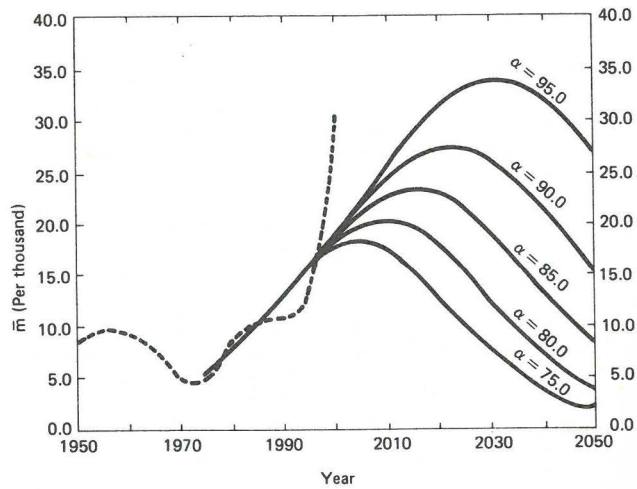
COUNTRY	α_∞	2000 (UN)	YEAR 2000	2010	2020	2030	2040	2050
India	.75	34.05	33.99	42.38	52.17	60.29	66.21	70.02
	.80	34.05	34.00	43.09	53.05	62.09	68.99	73.60
	.85	34.05	34.00	43.30	53.80	63.71	71.58	77.02
	.90	34.05	34.01	43.48	54.46	65.18	73.99	80.29
	.95	34.05	34.01	43.63	55.05	66.52	76.26	83.43
Egypt	.75	57.36	57.59	64.51	69.51	72.37	73.80	74.47
	.80	57.36	57.60	65.09	71.24	75.31	77.63	78.83
	.85	57.36	57.60	65.50	72.58	77.77	81.04	82.91
	.90	57.36	57.60	65.81	73.64	79.86	83.10	86.71
	.95	57.36	57.61	66.04	74.49	81.63	86.83	90.23
Mexico	(.8574)	77.35	77.35	80.45	82.47	83.75	84.53	85.02
Honduras	(.9150)	51.04	51.06	58.69	65.65	71.66	76.61	80.52

[20] The relatively better fit prevailing in the Egyptian case as suggested by the small values of the index of fit (sum of the squares of the residuals) simply reflects the limitation of the estimation procedure to the period 1975–2000 as against 1950–2000 in the case of India.

[21] Interestingly enough, the migration rate curves thus derived appear, over the observation period, to smooth the corresponding curves obtained earlier by use of the polynomial interpolation (see Sec. IV) and shown in each country diagram of fig. 6 by a dashed line. The comparison of the solid and dashed lines over the period 1990–2000 confirms the presumption that the earlier polynomial interpolation was inadequate for this interval.



A. India

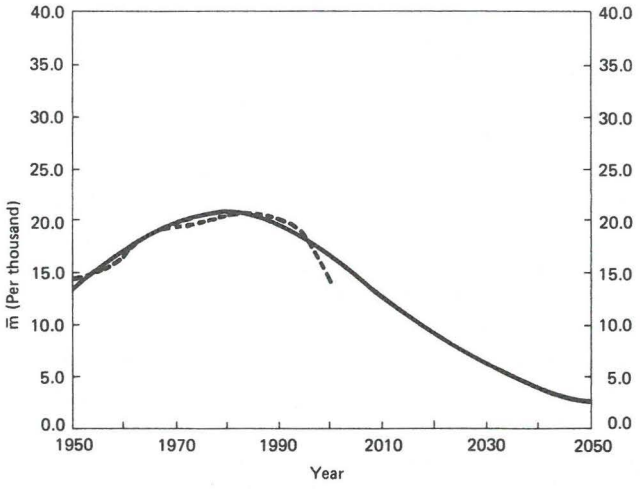


B. Egypt

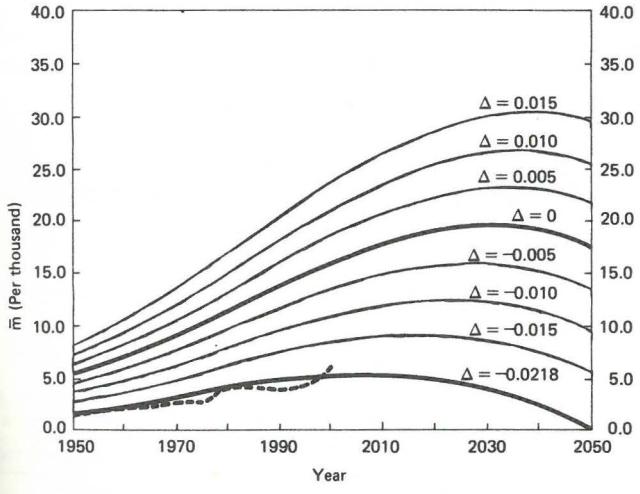
—1950–2000 evolution based on a logistic evolution of the degree of urbanization

- - -1950–2000 evolution based on polynomial interpolation of the degree of urbanization (from section 3)

FIG. 6.—Evolution of the conditional rural net out-migration rate: selected developing countries, 1950–2000. Solid lines, 1950–2000 evolution based on a logistic evolution of the degree of urbanization. Dashed lines, 1950–2000 evolution based on polynomial interpolation of the degree of urbanization (from Sec. IV). In the case of Honduras, the evolution of unconditional rate is also shown for alternative values of the rural-urban natural increase differential.



C. Mexico



D. Honduras

FIG. 6 (*Continued*)

the case of Honduras, alternative evolutions of the unconditional migration rate are also shown for various constant values of $\Delta(t)$, including the value observed in the late 1960s.

In accordance with the result mathematically derived in Section V, each migration rate curve presents an upward evolution that, after some time, gives way to a downward evolution. A closer look at the dates at which the reversal is predicted to occur in each country allows one to conclude, with reference to Zelinsky's mobility revolution hypothesis examined in Section II, that: Mexico is in phase III approaching phase IV; Honduras and Egypt are in the transitional stage leading from phase II to phase III; and India has just arrived at phase II at the present time. Therefore, while the Mexican conditional migration rate, currently at its peak (21.1‰ in 1979) is likely to decrease rapidly to less than 3‰ in 2050, the conditional migration rate in the case of the other countries is expected to continue increasing well into the next century, until 2029 in Honduras, 2031 in India, and 2016 in Egypt (on the basis of an 85% ultimate value for the degree of urbanization). As indicated in table 9, these dates appear to be barely affected by the consideration of a rural-urban natural increase differential equal to the observed values set out in table 5, except for Honduras, where the maximal value of the unconditional migration rate is reached as soon as 2008 versus 2029 in the conditional case.

The figures set out in table 9—if we disregard the cases corresponding to highly improbable ultimate values of the degree of urbanization in India and Egypt (e.g., α_∞ = .90 and .95)—also suggest a maximal value of the rural net out-migration rate in the order of 20‰–25‰, except in the case of Honduras.

TABLE 9

CONDITIONAL AND UNCONDITIONAL RURAL NET OUT-MIGRATION RATES: MAXIMAL VALUES (‰) AND CORRESPONDING YEARS IN WHICH THEY OCCUR

COUNTRY		CONDITIONAL		UNCONDITIONAL	
		Value	Year	Value	Year
India	.75	18.86	2022	18.97	2022
	.80	21.57	2026	21.68	2026
	.85	24.93	2031	25.06	2031
	.90	29.40	2036	29.54	2036
	.95	36.13	2044	36.29	2044
Egypt	.75	18.05	2005	20.25	2005
	.80	20.24	2010	22.58	2010
	.85	23.17	2016	25.69	2016
	.90	27.28	2022	29.98	2022
	.95	33.77	2031	36.74	2032
Mexico	(.8574)	20.86	1979	21.05	1980
Honduras	(.9150)	19.35	2029	5.01	2008

Finally, let us stress here the remarkable evolution of the Indian conditional migration rate that rises from less than 2‰ in 1950 to 3.6‰ in 1975 before increasing dramatically to 12.3‰ in 2000 and up to the maximal value of 24.9‰ in 2036 (on the basis of an 85% value for α_∞).

VII. Evolution of Rural-Urban Migration with per Capita GNP: The Case of the "Representative" Country

This paper has focused on the temporal evolution of the rural net out-migration rate for a given country. Because intercountry comparisons play an essential part in understanding the processes of economic development, we now adopt a larger perspective that attempts to quantify broadly the relationship between rural-urban migration and the degree of economic development, as measured by per capita GNP.

For this purpose, let us assume that per capita GNP is a simple function $y(t)$ of time. Then, recalling equations (7) and (8), we have

$$m(y) = \bar{m}(y) + \alpha(y)\Delta(y) , \tag{18}$$

where

$$\bar{m}(y) = \frac{dy}{dt} \cdot \frac{d\alpha(y)}{[1 - \alpha(y)]dy} . \tag{19}$$

In addition, let us assume, on the basis of the scatter diagram of figure 7, that the degree of urbanization $\alpha(y)$ is a logistic function of the level y of per capita GNP, measured in logarithmic terms:

$$\alpha(y) = a' + \frac{b'}{1 + c'e^{-h' \ln y}} , \tag{20}$$

where a', b', c', and h' are appropriate coefficients.

Then, substituting equation (20) into equation (19) leads to

$$\bar{m}(y) = \frac{dy}{ydt} \frac{b'c'h'e^{-h' \ln y}}{[1 - (a' + b') + c'(1 - a')e^{-h' \ln y}](1 + c'e^{-h' \ln y})} . \tag{21}$$

This formula suggests that, if the rural-urban differential remains negligible, the rural net out-migration rate is proportional to the growth rate of per capita GNP as well as to a term whose evolution is similar to that of $\bar{m}(t)$ as defined by equation (14). Moreover, if the growth rate of per capita GNP is constant, the evolution of the rural net out-migration rate with the level of per capita GNP necessarily follows the

pattern previously indicated: it first increases, reaches a maximum, and then decreases toward a value of zero.

The logistic equation (20) was fitted to the 88 observations in the scatter diagram of figure 7, again using the modified version of the Levenberg-Marquardt procedure. The ensuing logistic curve, whose coefficients have the following values: $a' = 0.0061$, $b' = 0.7332$, $c' = 1615.75$, and $h' = 1.3519$ is shown in figure 7,[22] whereas table 10 sets out the values of the degree of urbanization for selected values of y. Observe that the degree of urbanization of the "representative" country equal to 8.6% for $y = \$50$ increases to 50% for y slightly higher than \$500, reaches 70% for $y = \$2{,}000$, and then asymptotically tends toward the ultimate value of 73.9%.

Also shown in table 10 are the conditional and unconditional rural net out-migration rates calculated on the basis of a constant growth rate of per capita GNP equal to 3% (the unconditional migration rates were calculated by assuming a rural-urban natural increase differential

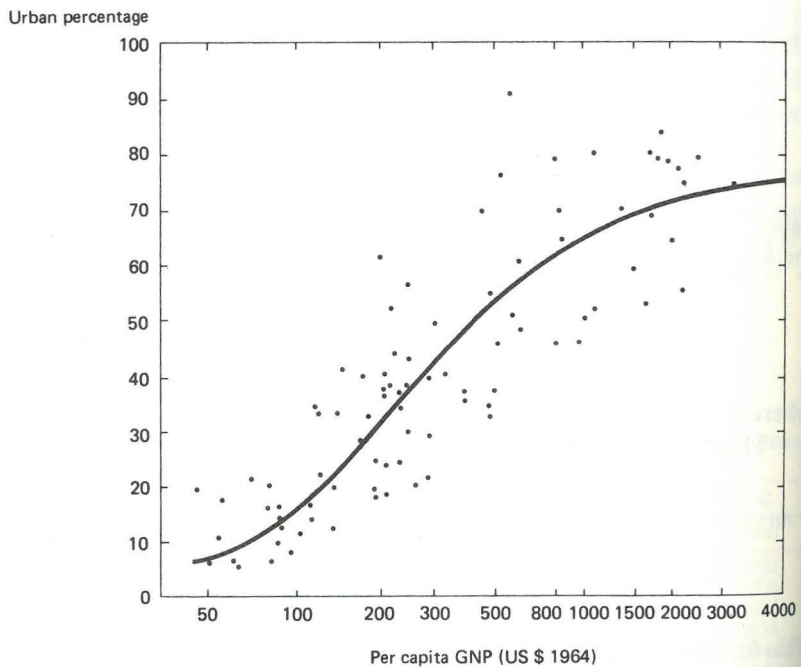


FIG. 7.—The association of the degree of urbanization with per capita GNP: scatter for 88 noncentrally planned countries (1965) and logistic evolution pertaining to the representative country. Source for scatter of points: H. Chenery and M. Syrquin, *Patterns of Development 1950–1970* (London: Oxford University Press, 1975).

[22] Note that this curve admits a point of inflection for $y' = [c']^{(1/h')} \approx \$236$.

TABLE 10

EVOLUTION OF THE DEGREE OF URBANIZATION (%) AND THE CONDITIONAL AND UNCONDITIONAL VALUES OF THE RURAL NET OUT-MIGRATION RATE (‰): THE CASE OF THE REPRESENTATIVE COUNTRY

PER CAPITA GNP (1964 US$)	DEGREE OF URBANIZATION	RURAL NET OUT-MIGRATION RATE			
		Conditional		Unconditional	
		$k = .03$	k Observed	$k = .03$	k Observed
50	8.62	3.17	0.50	3.56	0.90
70	12.49	4.61	1.97	5.18	2.55
100	18.09	6.59	4.47	7.42	5.30
150	26.36	9.20	8.45	10.41	9.66
200	33.17	10.98	11.64	12.51	13.16
300	43.15	12.74	15.51	14.72	17.50
400	49.80	13.08	17.01	15.37	19.30
500	54.41	12.74	17.19	15.24	19.69
750	61.22	10.99	15.37	13.80	18.19
1,000	64.81	9.21	12.94	12.19	15.92
1,500	68.37	6.59	9.07	9.74	12.21
2,000	70.06	4.96	6.57	8.19	9.79
3,000	71.65	3.17	3.84	6.46	7.13
4,000	72.37	2.25	2.48	5.58	5.81

equal to 4.6‰, a value estimated by the UN[23] as being the relevant figure for the world total in 1960). In addition, figure 8 illustrates the evolution of the conditional rural net out-migration rate consistent with alternative constant growth rates of per capita GNP (k = 1%, 2%, 3%, 6%, and 9%).

In accordance with the observation made immediately after deriving formula (21), all of the alternative curves designated by a thin line in figure 8 display the same evolutionary pattern: the rural net out-migration rate increases, passes through a maximum for a value of y equal to

$$y_m = \left[c' \sqrt{\frac{1 - a'}{1 - (a' + b')}} \right]^{1/h'}, \tag{22}$$

that is, $387, and then decreases toward zero.

Actually, as a country develops, its growth rate of per capita GNP varies. Observe the scatter diagram of figure 9 which plots the average annual growth rate of per capita GNP (actually per capita GDP) registered over the period 1960–70 against the 1965 per capita GNP for 100 noncentrally planned countries. Quite clearly, it suggests that the growth rate of per capita GNP is likely to follow an evolution represented by a bell-shaped curve oriented downward. This speculation is in fact confirmed by a simple regression analysis of the per capita GNP

[23] United Nations, *Global Review of Human Settlements—a Support Paper for Habitat*, vol. 2, *Statistical Annex* (Oxford: Pergamon Press, 1976).

against a polynomial of the second degree in the logarithm of per capita GNP. The following regression equation was obtained:

$$\frac{dy}{ydt} = -16.18 + 5.960 \ln y - 0.4353 (\ln y)^2 ,^{24} \qquad (23)$$

where the figures shown here relate to the measurement of (dy/ydt) in percentage.

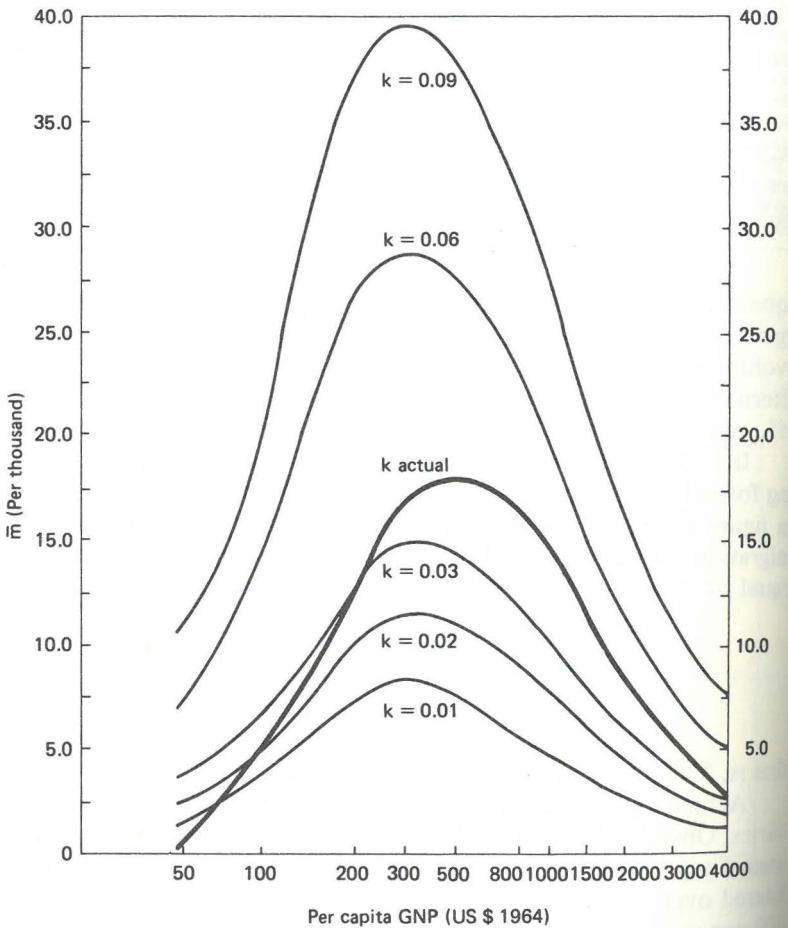


FIG. 8.—Evolution of the conditional rural net out-migration rate under alternative evolutions of the annual growth rate of per capita GNP: the representative country.

[24] The t-statistics relating to the coefficients of the logarithm terms are equal to 3.39 and −2.88, respectively, and the coefficient of determination R^2 is equal to .53. Note that the use of a polynomial of higher degree does not substantially increase the fit provided by the polynomial of degree 2.

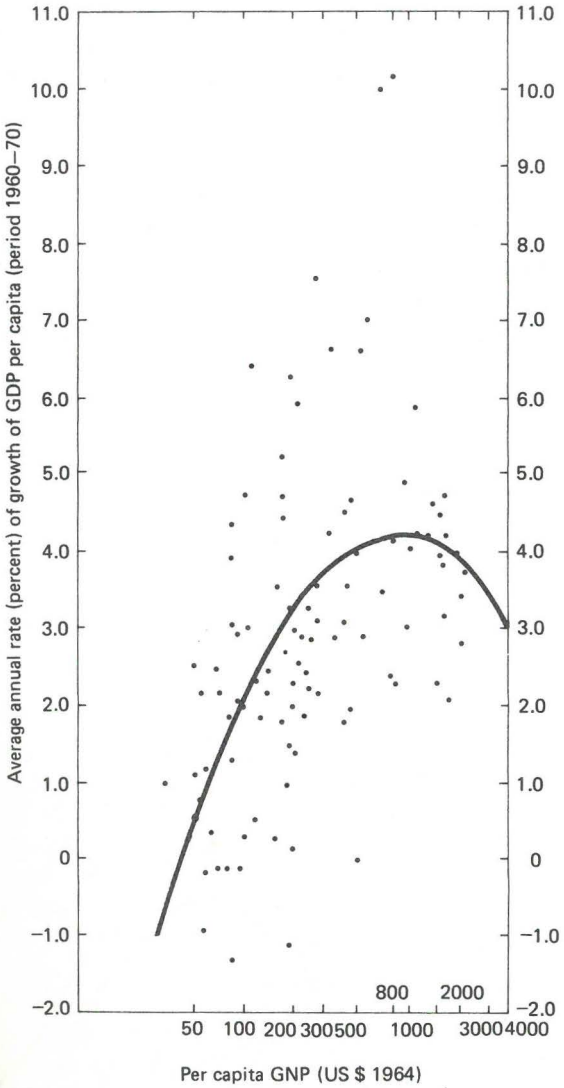


FIG. 9.—The association between average annual growth rate of GDP per capita (period 1960–70) and per capita GNP (1965): scatter for 100 noncentrally planned countries and evolution pertaining to the representative country. Source of per capita GNP: Chenery and Syrquin, *Patterns of Development 1950–1970* (London: Oxford University Press, 1975); source of annual average rate of growth of GDP per capita: IBRD, *World Tables 1976* (Baltimore: Johns Hopkins University Press, 1976).

The corresponding evolution of the conditional rural net out-migration rate in the representative country is shown in table 10 as well as in figure 8 (thick line). It still takes the form of a downward U-shaped curve, but, in the present case, both the ascent and descent appear to be steeper than in the case of a constant rate of growth of the per capita GNP. Observe that the maximal value of the conditional rural net out-migration rate that is reached for a per capita GNP just under \$500 is slightly higher than 17‰.

Finally, abandoning the assumption of a zero rural-urban natural increase differential, we now display in figure 10 the evolution of the unconditional rural net out-migration rate—assuming that the annual growth rate of per capita GNP follows the pattern described by equation

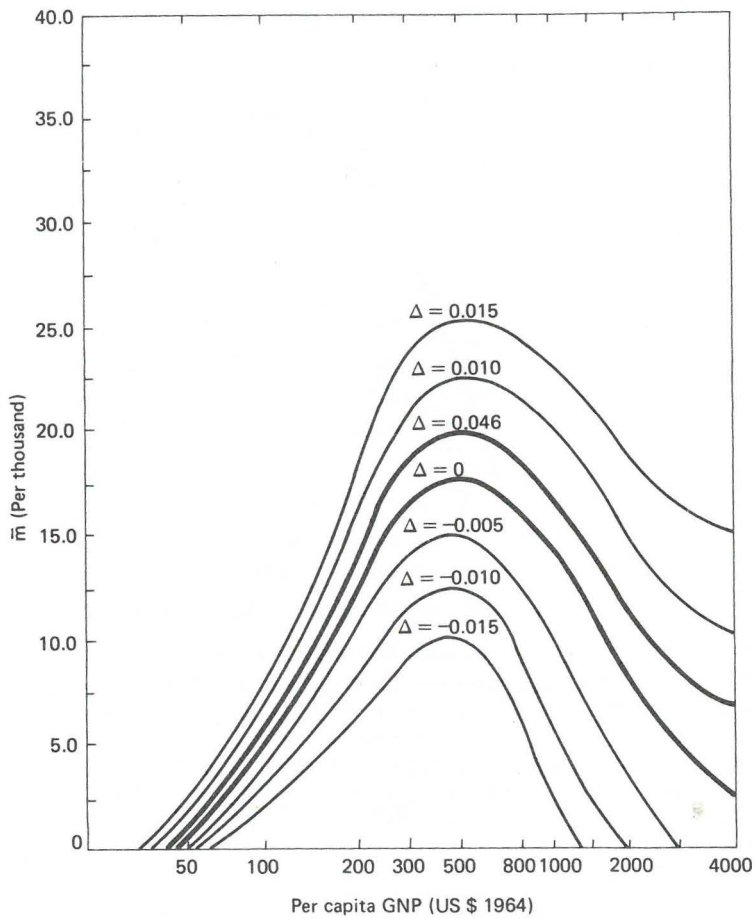


FIG. 10.—Evolution of the unconditional rural net out-migration rate under alternative values of the rural-urban natural increase differential.

(23)—for various assumptions regarding the rural-urban natural increase differential. The two curves designated by a thick line correspond to the case of a constant natural increase differential equal to zero (i.e., the conditional case) and to 0.046 (i.e., as already mentioned, the observed value for the world total in 1960).[25] The other curves designated by a thinner line also relate to the assumption of constant values of the natural increase differential, the two extreme curves corresponding to values of plus and minus 15‰.

In fact, the rural-urban natural increase differential is not likely to remain constant over the development process of the representative country. Because of the nonavailability of the necessary data, however, its evolution remains unknown to us. But should this evolution be known, then figure 10 could be used as a figure of reference to directly determine the evolution of $m(y)$. It is easy to see, from that figure, that the most likely evolution of $m(y)$ characterized by negligible values at both ends of the range of variation for y would lead to an evolution of the rural net out-migration rate necessarily following the general downward U-shaped scheme depicted earlier in this paper.

VIII. Conclusion

In this paper, we have attempted to clarify our understanding of urbanization dynamics by analyzing in *broad quantitative terms* its key element, that is, the net transfer of population from rural to urban areas that occurs as a response to the spatial imbalances between labor supply and demand during the course of modernization (industrialization).

In brief, the quantitative analysis carried out in this paper has sought to characterize the evolution of the rural net out-migration rate consistent with the course of the urbanization process commonly observed. The functional form of the rural net out-migration rate that we obtained was shown to be compatible with Zelinsky's mobility revolution hypothesis. A rather straightforward application of this quantitative analysis was the prediction of the evolution of the rural net out-migration rate implied by the most recent UN projections of urban and rural populations for selected developing countries.[26]

However, the sole consideration of the temporal evolution of the rural net out-migration rate, even for a wide range of countries, is insufficient to provide us with a meaningful understanding of urbanization dynamics. What is called for is a quantitative analysis of the relationship between rural-urban migration and the degree of development. A first step in that direction was made in Section VII of this

[25] In the latter case, the actual values of the unconditional migration rate for selected values of the per capita GNP are also shown in table 10.

[26] UN Population Division.

paper by building upon the methodology developed in the earlier sections. A rough quantification of the relationship between the rural net out-migration rate, on the one hand, and the level and annual growth rate of per capita GNP, on the other, was proposed. The main drawback offered by this relationship appears to lie in a too rigid dependence of the rural net out-migration rate on the growth rate of per capita GNP. More work in the direction of a more realistic association between these two factors appears to be necessary.

The Limits to Urban Growth: Suggestions for Macromodeling Third World Economies*

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I. City Growth and "Overurbanization"

While there are some signs that population growth rates may have peaked in many developing countries, there is yet another demographic event of major proportions currently besetting the Third World—city growth rates of spectacular magnitude. Projections to the end of this century yield urban agglomerations of unprecedented sizes: Mexico City at 31 million, São Paulo at 26 million, and Cairo, Jakarta, Seoul, and Karachi each exceeding 15 million.

While some observers have viewed these city growth projections with alarm, analysts are sharply divided regarding their validity and relevance. Pessimists stress the Third World's inability to cope with the resource and social systems requirements of rapid urban growth and high urban densities, thus prompting the term "overurbanization." The key notion here is that the social costs of continued in-migration to the cities exceed private costs, thus tending to create cities which are "too large" as well as "too many." Optimists view urban growth as the natural outcome of economic development and as the central mechanism by which average living standards and labor productivity are raised.

These city growth projections are based on models which fail to allow for the potential feedback of various city costs on the rural-urban migration decision. In addition, detailed analyses of Third World cities by urban economists and planners conventionally take in-migration as

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exogenously given. It is our view that the debate can be better informed by the application of general equilibrium models of Third World development which include some of the potential costs of urbanization—models which at least make an effort to internalize the most important of various alleged costs so that potential "natural limits" to urban growth can be evaluated and the relevance of UN forecasts assessed. Section II illustrates how existing macro models of the Third World are "pro-urban" biased: typically they minimize the potential limits to urban growth and are silent on the issue of overurbanization. Section III lists some key forces which might serve to retard the rate of urbanization. Section IV develops this theme at length by offering some explicit suggestions on how these forces might be introduced into a general equilibrium model of Third World development. Central to this discussion will be potential cost-of-living differentials between urban and rural areas, urban housing availability, the quality of urban public goods, urban land scarcity, modern sector factor requirements and resource "bottlenecks," and the competing demands of "unproductive" urban capital accumulation. While no conclusive results are offered in the present paper, it seems to us timely nevertheless to open the debate on strategies for macromodeling the "limits to urban growth" in Third World economies.

II. What's Wrong with Our Macro Models of Development?

Based on the firmly held belief that the current structure of an economy can influence its subsequent growth performance, macro models of Third World societies have stressed sectorial detail from the start. The classic examples are offered by the dual economy models pioneered by Lewis, Fei and Ranis, and Jorgenson, the latter extended by Kelley, Williamson, and Cheetham.[1] Central to these models and their more elaborate extensions are the output gains associated with resource transfers from "traditional" low-productivity sectors to "modern" high-productivity sectors. Such resource transfers—and labor migration in particular—have spatial implications, urbanization being the most notable example. In the classic labor surplus version, modernization (or urbanization) augments aggregate output both through short-run efficiency gains and long-run growth effects. In the short run, labor resources with low marginal productivity are shifted to high marginal productivity employment. In the long run, accumulation rates are raised

[1] W. A. Lewis, "Development with Unlimited Supplies of Labour," *Manchester School of Economics and Social Studies* 20 (May 1954): 139–92; J. C. H. Fei and G. Ranis, *Development of the Labor Surplus Economy: Theory and Policy* (Homewood, Ill.: Richard D. Irwin, 1964); D. W. Jorgenson, "The Development of a Dual Economy," *Economic Journal* 71 (June 1961): 309–34; A. C. Kelley, J. G. Williamson, and R. J. Cheetham, *Dualistic Economic Development: Theory and History* (Chicago: University of Chicago Press, 1972).

since saving rates are higher in the modern sectors—indeed, in the extreme version only capitalists save, and capital is an argument in the modern production functions only. Rising (urban) accumulation rates imply increased rates of modern sector job vacancies, a rural-urban migration response, and further urbanization. Thus, output growth, trend acceleration, and increasing urbanization are the likely outcomes of the labor surplus model. The neoclassical dual economy model makes the same prediction,[2] although in this case only the long-run accumulation effects are operative since with marginal factor productivities equated in the conventional neoclassical version, comparative static efficiency gains are not associated with the urban-accumulation-induced labor transfer.

What forces tend to inhibit the rate of urbanization in these dual economy models? In the medium term, the rise in the real wage is typically the only source of retardation in the rate of modernization. The rise in the real wage serves to choke off the rise in the saving rate, to reduce the rate of urban capital accumulation, and to retard the rate of increase in new urban job vacancies, thus to limit urban growth. The ultimate source of the limits to urban growth in the dual economy model is therefore agriculture, through the disappearance of labor surplus and/or through the rise in the relative price of agricultural products—the key wage good in such models. Nowhere in this account are competing, and potentially voracious, urban *"unproductive"* investment demands on the national saving pool considered. In addition, while inelastic agricultural land supply insures an eventual constraint on urbanization through rising food costs and real wage increases, nowhere is the impact of inelastic *urban* land supply on city rents—another key wage good—and urban cost of living considered. It seems to us that such models are poorly equipped to confront urbanization problems in the Third World. They say nothing about the costs of urbanization and are equally silent on the possible limits to urban growth generated within the growing urban sector itself. If our understanding of Third World urbanization is to be enriched by macro modeling, existing multisectoral models must be revised to capture the potential impact of city costs on urban population growth through migration.

III. How Can We Model the Limits to Urban Growth?

How might our models of development be revised to better capture the costs of urbanization? If there are endogenous forces which tend to inhibit the rate of urbanization independent of overt anti-urban policy, what are they? How potent might these forces be? Could they impose

[2] A. K. Dixit, "Models of Dual Economies," in *Models of Economic Growth*, ed. J. Mirrlees and N. Stern (London: Macmillan Co., 1973); Kelley, Williamson, and Cheetham.

important limits to urbanization, offering potential departures from the gloomy predictions produced by UN projections?

No doubt rapid rates of population growth explain much of the spectacular growth of cities in the Third World. Furthermore, one could appeal to the mechanics of the demographic transition as a potential limit to urban growth. It is well known that fertility rates are lower in the cities than in the countryside thus implying an eventual retardation in population growth rates as urbanization proceeds. City growth would retard on that score alone. Yet these long-run demographic transition forces are of doubtful magnitude to offer likely limits to urban growth in the next quarter century.

It seems likely that far more insight might be gained by examining various urban costs which influence the migration decision, on the one hand, and rising urban investment requirements which compete with "productive" capital accumulation, on the other. First among these influences are inelastic urban land supplies. Urban land constraints serve to raise (market or shadow price) rents, augment urban relative to rural living costs, and inhibit in-migration to the city. The importance of these urban land constraints on city rents can only be evaluated in a general equilibrium model which admits housing service activities and confronts issues of equilibrium land use. Furthermore, any urban land use characterization must allow for a variety of urban land requirements—residential squatter settlements, factory sites, land use for public social overhead, and luxury housing sites. Second, the housing-cum–social overhead investment requirements of city growth must be confronted. "Unproductive" urban investments of this type may well take priority over those forms of accumulation which create capacity for future urban employment.[3] In any case, unproductive urban investment requirements compete directly with productive capital accumulation. Any model of urban growth must deal with these competing requirements since new urban housing-cum–social overhead requirements may very well serve to check urban growth. Of course, if the housing-cum–social overhead investment is forgone, then housing costs will rise and the quality of urban services fall, further discouraging in-migration to the city. In short, the rise in the relative cost of living in the city may impose a limit to urban growth and/or the rise of urban unproductive investment requirements will diminish the rate of productive urban capital accumulation, new urban job vacancies, and thus limit urban growth.

[3] An early analysis of this framework is the study by A. J. Coale and E. M. Hoover, *Population Growth and Economic Development in Low Income Countries: A Case Study of India's Prospects* (Princeton, N.J.: Princeton University Press, 1958).

There are other possible constraints on urbanization worth considering. "Modern" sectors tend to be relatively intensive in both skills as well as intermediate inputs, and imported inputs in particular. The most visible manifestation of the latter influence is the cost of energy. As far as skill bottlenecks go, there is considerable debate. If capital and skills are complements and labor of different skills poor substitutes for each other, then rapid rates of urban capital accumulation imply increasing demands for skilled labor. Any model of the limits of urban growth must take these potential skill bottlenecks into account for they may place important constraints on capacity expansion in the modern urban sectors, retard the rate of growth in urban employment demand in general, and thus place further limits on urban growth. Any effort to relax this constraint by skill accumulation is likely to compete with productive urban capital accumulation and thus offer an alternative limit to urban growth.

We have no way of appreciating how important these and other limits to urban growth may be without their explicit evaluation in a general equilibrium model of Third World development. What follows is an attempt to move in that direction.

IV. A Menu of Possible Modeling Directions

A. Technology, Sectors, and Potential Resource Bottlenecks

It seems to us that the limits to urban growth cannot be adequately confronted unless at least eight sectors are specified. The distinguishing characteristic of our proposed approach is not the number of sectors, however, but rather the characteristics of the sectors. Our key emphasis is that five of these sectors produce outputs which are *nontradeable interregionally*, making rural-urban cost of living differentials possible, perhaps therefore influencing the rural out-migration decision. Our approach distinguishes between manufacturing (M), agriculture (A), modern services (KS), urban "traditional" services (US), rural "traditional" services (RS), urban high-cost housing (H,KS), urban low-cost housing (H,US), and rural low-cost housing (H,RS). While the first two of these are traded internationally and interregionally, the third is traded only interregionally, and the remaining five are consumed only at the site of production.

Like many multisectorial development models, ours stresses production dualism. Thus, the eight sectors exhibit quite different rates of technical progress, factor intensity, and substitution elasticities. Conventional physical capital, K_i, is used in agriculture, manufacturing, and the modern service sector, although it is specific to a given sector once in place. Unskilled labor, L_i, is used in all sectors except housing. Skilled labor, S_i, is utilized in the manufacturing and the modern service

sectors only while land, R, is used as an input in both agriculture and urban housing. In what follows, we shall focus on the two modern sectors—manufacturing and the modern service sector—and reserve discussion of the remaining sectors for sections to follow.

The production process in the two modern urban sectors is viewed to be more capital-cum-skill-intensive than both agriculture and the remaining service sectors. In addition, we shall impose restrictions on elasticities of substitution consistent at least in spirit with the "structuralist" school,[4] namely, that the elasticity of substitution in urban modern sectors is less than one. Yet, the presence of three factors of production in the modern urban sectors makes the conventional constant elasticity of substitution (CES) production function inappropriate. Since it is not possible to confront the issue of earnings distribution or skilled labor bottlenecks without paying explicit attention to labor heterogeneity, we insist that the working population be distinguished at the very minimum by skilled and unskilled labor. Furthermore, we are convinced by several empirical studies that the elasticity of substitution between each of the three pairs of inputs in these modern sectors is not the same. Rather, we are persuaded that conventional capital and skills are relative complements[5] and that this fact goes a long way in accounting for the phenomena of rising urban skilled wages, "wage stretching,"[6] and increased earnings inequality in much of the Third World where capital accumulation and urbanization is so rapid.

Most important, this specification introduces the possibility of skill bottlenecks accompanying rapid modern sector accumulation. Given complementarity between skills and capital in the modern sectors, rapid accumulation breeds sharply rising derived demands for skills. To the extent that skill accumulation is slow in matching that demand, modern sector output growth will be inhibited, new job vacancies for unskilled in the modern sectors suppressed, and rural-urban migration forestalled. Capital-skill complementarity in the modern sectors, therefore, suggests one possible limit to urban growth. Any effort to relax that

[4] H. B. Chenery and W. J. Raduchel, "Substitution in Planning Models," in *Studies in Development Planning*, ed. H. B. Chenery (Cambridge, Mass.: Harvard University Press, 1971).

[5] Z. Griliches, "Capital-Skill Complementarity," *Review of Economics and Statistics* 51, no. 4 (November 1969): 465–68; P. R. Fallon and P. R. G. Layard, "Capital-Skill Complementarity, Income Distribution and Output According," *Journal of Political Economy* 83, no. 2 (April 1975): 279–301; J. R. Kesselman, S. H. Williamson, and E. R. Berndt, "Tax Credits for Employment Rather than Investment," *American Economic Review* 67, no. 3 (June 1977): 330–49.

[6] S. Morley and J. G. Williamson, "Class Pay Differentials, Wage Stretching, and Early Capitalist Development," in *Essays on Economic Development and Cultural Change in Honor of Bert F. Hoselitz*, ed. M. Nash (Chicago: University of Chicago Press, 1977).

limit by accelerated skill accumulation implies forgone physical capital accumulation and thus an alternative limit to growth in those sectors which use capital most intensively, namely, the urban modern sectors themselves.

Given the need to specify modern sector production functions that allow for relative complementarity between skilled labor and capital, the most useful specification is the "nested" CES first proposed by Sato[7] and since applied to developing economies in a number of case studies.[8] The two modern sector production functions therefore take the following form:

$$
\begin{aligned}
Q_i &= A_i Q_{i,F}^{\alpha_{i,F}} Z_i^{\alpha_{i,Z}} \prod_{j=A,M,KS} Q_{i,j}^{\alpha_{i,j}}, \qquad i = M,KS \neq j \\
Q_{i,F} &= \{\xi_i \Phi_i^{(\sigma_i-1)/\sigma_i} + (1-\xi_i)[zL_i]^{(\sigma_i-1)/\sigma_i}\}^{\sigma_i/(\sigma_i-1)}, \qquad i = M,KS \\
\Phi_i &= \{\xi'_i [xK_i]^{(\sigma'_i-1)/\sigma'_i} + (1-\xi'_i)[yS_i]^{(\sigma'_i-1)/\sigma'_i}\}^{\sigma'_i/(\sigma'_i-1)}, \qquad i = M,KS \\
\Sigma\alpha_{i,j} &= 1, \qquad i = M,KS \neq j = F,Z,A,M,KS,
\end{aligned}
\tag{1}
$$

where Q_i is gross output in sector i, Z_i is imported raw materials, $Q_{i,j}$ are intersectoral inputs (excluding intrasectoral inputs), $\alpha_{i,j}$ are the cost shares of each factor in gross sales, Φ_i is a composite input index of conventional and human capital (skills), ξ_i and ξ'_i are distribution parameters, and σ_i and σ'_i are substitution elasticities. Factor-augmenting technical progress determines the level of $x(t)$, $y(t)$, and $z(t)$.

The reader will also note the presence of both imported raw materials, Z_i, and domestic intersectoral inputs in these modern sector production functions. The distinction is likely to be of substantial importance since without it we could hardly investigate the impact of, say, future increases in the price of energy—another resource bottleneck which may serve to limit urban growth since Z_i is used most intensively in these modern sectors.

B. Labor Migration, "Wage Gaps," and Cost-of-Living Differentials

The most popular model of migration appears to be that first offered by Todaro.[9] Todaro's model was motivated by issues similar to those central to this paper, namely, how to account for apparent overurban-

[7] K. Sato, "A Two Level Constant Elasticity of Substitution Production Function," *Review of Economic Studies* 34, no. 2 (April 1967): 201–18.

[8] For example, see I. Adelman and S. Robinson, *Income Distribution Policy in Developing Countries: A Case Study of Korea* (Stanford, Calif.: Stanford University Press, 1978).

[9] M. Todaro, "A Model of Labor, Migration and Urban Unemployment in Less Developed Countries," *American Economic Review* 59 (March 1969): 138–48.

ization in Third World economies in the sense that urban underemployment in "traditional" urban service sectors was expanding rapidly in spite of impressive rates of accumulation and modern sector expansion.

The Todaro hypothesis is simple and elegant. While similar statements can be found elsewhere, the most effective illustration can be found in Corden and Findlay[10] (reproduced in fig. 1) assuming perfect capital mobility. There are only two sectors analyzed, but they are sufficient to illustrate the point. Under the extreme assumption of wage equalization through migration, and in the absence of wage rigidities, equilibrium is achieved at E (the point of intersection of the two labor demand curves, AA' and MM'). Here $w^*_A = w^*_M$ and the urbanization rate is $O_M L^*_M / L$, where M denotes the manufacturing sector and A denotes agriculture. In addition, the Corden-Findlay model incorporates the widely held belief that the wage rate in Third World manufacturing sectors is "pegged" at artificially high levels, say at $\bar{w}_M$. If overt unemployment is assumed away, then all who fail to secure the favored jobs in the M sector would accept lower-paying jobs in the A sector at w^{**}_A. Clearly, the level of employment in the urban sector has been choked off by the high wage in manufacturing and both migration and urbanization have been forestalled. As Todaro initially pointed out, however, urbanization rates have been dramatic in the Third World and furthermore there has been an expansion in traditional urban service underemployment. Todaro explains this apparent conflict

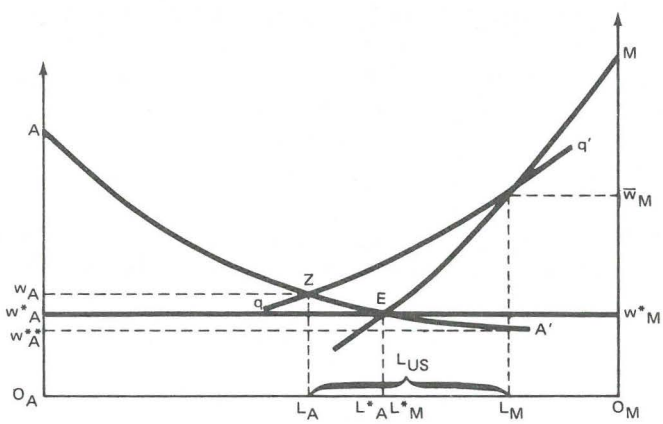

FIG. 1.—The Harris-Todaro-Findlay model

[10] W. Corden and R. Findlay, "Urban Employment, Intersectoral Capital Mobility and Development Policy," *Economica* 42 (February 1975): 59–78.

(e.g., migration in the face of urban underemployment) by developing an expectations hypothesis which in its simplest form states that the favored jobs are allocated by "lottery," that the potential migrant calculates the expected value of that lottery ticket, and compares it with the certain employment in the rural sector. Migration then takes place until the urban expected wage is equated to the rural wage. Given the pegged $\bar{w}_M$, at what rural wage would the migrant be indifferent between underemployment in the traditional urban service sector and employment in the agricultural sector? If his probability of getting the favored job is simply the ratio of L_M to the total urban labor pool, L_U, then the qq' curve in figure 1 indicates the agricultural wage at which he is indifferent between employment locations. The equilibrium agricultural wage, w_A, and urban underemployment (e.g., the size of the traditional, unorganized sector) is thus given at Z.

This conventional wisdom is elegant, and we adopt it here with qualifications. These qualifications are motivated by the following observations. First, we are not convinced that $\bar{w}_M$ can be viewed as pegged in the Third World and independent of market forces.[11] Put differently, the apparent wage rigidity attributed to institutional factors (unions, government regulations) may in fact be explained by market forces, with institutions merely responding to those forces.[12] Second, we agree with Willis that the lottery view of who gets favored jobs is naive and ignores property rights.[13] It seems to us that the allocation of new job vacancies in the favored sectors is hardly random, but rather very much a function of bribes, nepotism, employment search costs, union dues, and the like. That is, these favored jobs have property rights earning rents that command an implicit or explicit price. Third, the Todaro formulation ignores the obvious fact that the majority of the favored jobs are more skill-intensive than either farm labor or traditional urban service activity. Finally, and we think most important, the formulation ignores cost-of-living differentials between regions.

Our approach is a hybrid which attempts to meet at least some of these criticisms. On the one hand, we assume perfect mobility of unskilled labor *within* the rural sector since everyone seems to agree that free entry and costless mobility are reasonable approximations there. We make the same assumption for both skilled and unskilled labor between the two modern urban sectors, certainly an acceptable premise

[11] See D. Mazumdar, "The Urban Informal Sector," Staff Working Paper no. 211 (Washington, D.C.: International Bank for Reconstruction and Development, 1975).

[12] See L. Taylor, *Macro Models for Developing Countries* (New York: McGraw-Hill Book Co., 1979), chap. 5.

[13] R. Willis, "Comment on International Migration in Developing Countries: A Survey," in *Population and Economic Change in Less Developed Countries*, ed. R. Easterlin (Chicago: University of Chicago Press, 1979).

to the Todaro adherents given their willingness to aggregate all modern sector activities. On the other hand, we model the unskilled wage gap between traditional urban services and the modern sectors by inserting an exogenous differential, κ, that reflects the costs of the property right as discussed above. Thus,

$$w_{M,L} = w_{KS,L} = \kappa w_{KS,L} . \tag{2}$$

Finally, and most important, the rural-urban migration process must be specified. Here we adopt a position which is closer in spirit to the Todaro hypothesis. The potential rural-urban migrant is assumed to behave as if he calculates expected urban nominal earnings, w_U. These earnings are simply the weighted average of potential urban unskilled earnings and skilled earnings (net of taxes), where the weights are *marginal* probabilities rather than average probabilities as in the simple Corden-Findlay version. Thus,

$$w_U = [(1 - \tau_T)w_{M,S}]\left[\frac{\dot{S}(-1)}{L_U(-1)}\right] + \left[1 - \frac{\dot{S}(-1)}{L_U(-1)}\right] \times \left[w_{M,L}\frac{L_M(-1)}{L_U(-1)} + w_{KS,L}\frac{L_{KS}(-1)}{L_U(-1)} + w_{US,L}\frac{L_{US}(-1)}{L_U(-1)}\right], \tag{3}$$

where τ_Y is the income tax rate on high-wage skilled labor. The migrant has accessible current information on city wages, but not on his employment probabilities. Thus employment weights are lagged 1 year in the migrant's calculation of expected urban income. In summary, the migrant is induced into the cities with the anticipation of having the chance to gain one of two favored modern sector jobs: either unskilled employment at a higher wage rate, or training and thus (perhaps subsequently) skilled employment at an even higher wage. Training and skills creation will be discussed below (see subsection *D*, "Education, Training, and Skills Accumulation").

Finally, we assume that the migrant is not motivated solely by nominal (expected) earnings gaps, but rather by *real* income differentials. Thus,

$$\frac{w_{A,L}}{\mathrm{COL}_R(-1)} = \frac{w_U}{\mathrm{COL}_{US}(-1)}, \tag{4}$$

where the location-specific cost-of-living indices, COL_i, are influenced by price differentials for nontradeables.

In summary, such a model is capable of generating an endogenous

earnings structure in four dimensions: rural unskilled earnings, urban traditional sector unskilled earnings, modern sector unskilled earnings, and skilled earnings. The wage spread over these employment categories will be determined by the endogenous forces of market demand, supply, and the migration process itself. The speed of urbanization will be determined by the same set of forces. While expectations of favored sector employment may well generate the Todaro result of overurbanization, it is also possible that cost-of-living influences may choke off that tendency without the overt introduction of government policy. One such cost-of-living influence is the relative scarcity of urban housing.

C. Housing, Land Markets, and Equilibrium Land Use

At the very minimum, there are at least two competing uses to which land stocks can be put in any model of urbanization—farming and urban residential land sites. We shall assume that urban residential sites implicitly include in fixed proportion factory-site requirements as well as public land (parks, roads, schools). The fixed proportion assumption will simplify the analysis considerably, since we can focus exclusively on the residential site demand component of urban land use. Furthermore, we shall assume that "wasteland" exists in the rural area. This wasteland has no inherent site value, but it can be used for rural housing construction. Thus, the stock of productive land is defined as

$$R = R_{U,US} + R_{U,KS} + R_A , \tag{5}$$

were urban land sites are utilized for two types of housing—low-cost "squatter settlements" ($R_{U,US}$) and high-cost "luxury housing" ($R_{U,KS}$).

It seems to us that the urban housing market must be central to migration behavior and thus to any analysis of the urbanization process. One of the limits on urban growth rates in the Third World is the availability (and cost) of urban housing facing new urban households, whether the housing is of the informal, labor-intensive, owner-occupier type in squatter settlements, or more substantial dwelling units constructed by capital-intensive techniques and rented in a formal housing market. Any serious model of urbanization must admit this possible source of limits to urban growth. The limits may take various forms, but we shall focus on two constraints in particular. First, urban rents may rise in the long run due to the inflation of urban site rents as in classical urban location theory.[14] In addition, urban rents may also rise in the short run if investment in new structures lags behind demands

[14] E. Mills and B. N. Song, "Korea's Urbanization and Urban Problems, 1945–1975," Working Paper no. 7701 (Seoul: Korea Development Institute, 1977); J. V. Henderson, *Economic Theory and the Cities* (New York: Academic Press, 1977).

generated by rapid urban population growth. Second, to the extent that investment in housing responds to those demands generated by the immigration, aggregate saving available for productive accumulation or training will contract and thus the rate of output expansion will suffer economy-wide.[15] Since physical capital and skills are used most intensively in the modern sectors, the rate of urban labor absorption is diminished. As a result, in-migration to the cities and urbanization rates may slack off.

As we pointed out above, there are two housing types in our model. In this we follow the United Nations' *Habitat* where they state: "In many less developed countries building is characterized by the existence of two sectors: (a) a multiple of very small enterprises . . . which operate in the rural and peri-urban areas, belonging almost entirely to the informal sector of the economy; (b) a small number of large firms using modern techniques and organization,"[16] and where "squatter settlements" "generally refer to areas where groups of housing units have been constructed on land to which the occupations have no legal claim. In many instances housing units located in squatter settlements are shelters or structures built of waste materials without a predetermined plan. Squatter settlements are usually found . . . at the peripheries of the principal cities."[17] According to the same source, these squatter settlements account for the bulk of the growth in urban dwellings throughout the Third World. It seems to us important to distinguish these two types of urban dwellings, the different sectors that produce them as well as the different socioeconomic classes that consume the rental services that flow from these residential structures.

Suppose urban housing services are produced under constant returns to scale with housing structures, H_j, and land $R_{U,j}$, as inputs. While estimates of the elasticity of substitution between land and structures in residential housing production functions vary considerably,[18] the estimates are almost always quite high. We shall, therefore, adopt a Cobb-Douglas specification for urban housing in what follows:

$$Q_{H,j} = A_{H,j} H_j^{\alpha_{H,j}} R_{U,j}^{\alpha_{R,j}}, \quad j = US, KS, \tag{6}$$

where $\alpha_{H,j} + \alpha_{R,j} = 1$, $Q_{H,J}$ is the service flow from housing of type j, US denotes squatter settlements, and KS is luxury housing. In con-

[15] Coale and Hoover.

[16] United Nations, *Global Review of Human Settlements: A Support Paper for Habitat*, 2 vols. (Oxford: Pergamon Press, 1976), 1:70.

[17] Ibid., 2:11.

[18] For example, see R. Muth, *Cities and Housing* (Chicago: University of Chicago Press, 1969), and "The Derived Demand for Urban Land," *Urban Studies* 8, no. 2 (June 1971): 243–54; G. D. Ingram, *Residential Location and Urban Housing Markets* (Cambridge, Mass.: Ballinger Publishing Co., 1977): Henderson.

trast, rural housing services are not likely to require the input of land of significant site value, so that a fixed coefficient production function $Q_{H,RS} = a_{H,RS}^{-1} H_{RS}$ is assumed to apply.

This rural-urban asymmetric treatment of housing insures that rising land prices and increased site rents will have a disproportionate effect on cost of living in urban areas as urbanization proceeds. Perhaps this can be seen more clearly when the total rental price for urban housing is written explicitly as

$$P_{H,j} = \frac{r_{H,j}^{\alpha_{H,j}} d_U^{\alpha_{R,j}}}{A_{H,j} \alpha_{H,j}^{\alpha_{H,j}} \alpha_{R,j}^{\alpha_{R,j}}}, \quad j = US, KS, \tag{7}$$

where d_U is the site rent and $r_{H,j}$ is the structure rent. In our model all of these are shadow prices since all dwellings are owner-occupied. (In Korea, for example, 94% of rural and 83% of urban households were owner-occupiers in 1975.)[19] Nevertheless, it will still prove analytically useful to decompose total rental (shadow) prices in this fashion. In percentage rates of change (denoted by an "*"), these rental prices are related by

$$P^*_{H,j} = \alpha_{R,j} d^*_U + \alpha_{H,j} r^*_{H,j}, \quad j = US, KS, \tag{8}$$

Land's share, $\alpha_{R,j}$, has been estimated to be about 0.10.[20] It follows that modest increases in urban rental prices may be consistent with dramatic increases in urban site rents (called the "magnification effect" in the urban literature). Dramatic increases in urban site rents imply equally dramatic increases in urban land prices and the latter have become a notable feature of twentieth-century development even in the Third World. For example, Korean urban land prices have been rising in real terms at 16% per annum since the early 1960s.[21]

What, then, determines land rents and land use in our model?

If the agricultural production function is Cobb-Douglas, land rents per hectare can be written as

$$d_A = P_A \alpha_{A,R} \frac{Q_A}{R_A}, \tag{9}$$

where Q_A is agricultural output, R_A is farmland, P_A are farm product prices, and $\alpha_{A,R}$ is the output elasticity of land in agriculture. Alter-

[19] S. M. Suh, "The Patterns of Poverty in Korea," Working Paper no. 7903 (Seoul: Korea Development Institute, 1979), table 11, p. 47.

[20] Muth, *The Derived Demand for Urban Land.*

[21] Mills and Song.

natively, expression (9) can be written as a derived demand function for farmland:

$$R_A = P_A \alpha_{A,R} Q_A d_A^{-1} . \tag{10}$$

Similarly, the urban housing Cobb-Douglas production functions imply derived urban land demands for residential purposes (recalling that "residential" requirements embody commercial, factory, and public site needs). Thus,

$$d_{U,j} = P_{H,j}^{S} \alpha_{R,j} Q_{H,j} R_{U,j}^{-1} , \quad j = US, KS , \tag{11}$$

where $P_{H,j}^{S}$ is the net rent received by the owner (imputed, not cash) after paying an urban property tax. Since it is not our purpose here to determine the distribution of urban populations across urban space—as in classic urban location theory—nor to confront the Third World reality that squatter settlements tend to locate at the fringe of the city while luxury housing tends to locate nearer the central business district,[22] we shall assume that urban site rents are the same for all urban households. Thus,

$$R_{U,j} = P_{H,j}^{S} \alpha_{R,j} Q_{H,j} d_U^{-1} , \quad j = US, KS , \tag{12}$$

The *aggregate* derived demand function for urban land is simply

$$R_U = d_U^{-1} (P_{H,US}^{S} \alpha_{R,US} Q_{H,US} + P_{H,KS}^{S} \alpha_{R,KS} Q_{H,KS}) . \tag{13}$$

Our model is in no way a true spatial framework since distance plays no role in either of the two sectors. Thus, farm gate prices do not rise with greater proximity to urban markets and therefore farmland does not exhibit a "rental gradient" reflecting such heterogeneity. Similarly, proximity to the central business district does not offer any of the advantages typically postulated in conventional urban location theory. There is therefore no urban rental gradient implied. Since urban land is homogenous in this sense, only the "extramarginal" rent at the fringe of the city matters in determining land use.

Figure 2 supplies the optimal land-use solution under such conditions. The equilibrium rent is denoted by $d^*(0)$, and the optimal land-

[22] This process is discussed in R. Mohan, *Urban Economic and Planning Models* (Baltimore: Johns Hopkins University Press, 1979); G. K. Ingram and A. Carroll, "The Spatial Structure of Latin American Cities" (paper read at the American Economic Association Meetings, Chicago, 1978); Mills and Song.

use mix is derived accordingly. What seems interesting to us is how many central land-use issues are captured by this simple framework. Three such issues are confronted in what follows: Does the model predict rising urban densities over time? Can it account for the dramatic rise in urban land values? Will it produce an encroachment on farmland over time?

It is common theorem of growth theory that factors in relative inelastic supply will increase in relative rent (and thus price or value) unless technology tends to be very factor-saving of the inelastically supplied input.[23] In our model, capital accumulates, skills are augmented through training, population growth swells the labor force (and thus residential housing stocks), but the stock of land grows exogenously, and presumably at relatively low rates. The presumption is that relative rents will rise over time unless technological change serves to save on land. If one focuses only on land for agricultural uses, "technological change" surely *does* tend to save on land since the agricultural sector declines in relative size with successful economic growth. On the other hand, our model explicitly introduces an additional land use—urban residential site needs—and since successful economic growth implies rapid urbanization, the land-saving attributes of the simpler

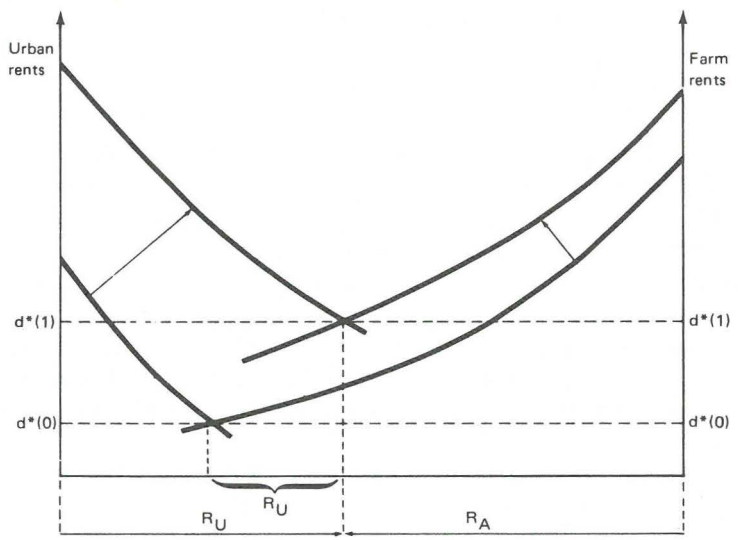

FIG. 2.—The determinants of land rents and optimal land use

[23] See, e.g., D. Nichols, "Land and Economic Growth," *American Economic Review* 60 (June 1970): 332–41.

growth model are no longer so relevant. Indeed, while our urban housing production function specifications include the possibility of extensive substitution of structures for land (guaranteeing that urban densities will increase in the face of rising land rents), rapid urbanization implies a relatively voracious demand for land and the encroachment of farmland at the cities' margin. Additionally, there are forces at work in agriculture which will shift outward the derived demand for farmland: the rising price of foodstuffs and the accumulation of agricultural capital. In short, we would expect such a model to produce an outward shift in the derived demand for land in both uses over time, but we would also expect that the derived demand for urban land would shift outward at a more rapid rate.

The long-run implications of such derived demand growth can be seen in figure 2, where the following trends should be observed: rents rise at a rapid rate, urban and rural; land use shifts in favor of urban residential use, but the rate of shift is choked off by two forces—the downward-sloping character of the derived demand for farmland and the tendency for urban housing to consume less space as land gets scarcer; urban land densities rise. All of these attributes are "stylized facts" of urbanization in the Third World. In addition, urban land values can be calculated assuming naive expectations regarding the behavior of future rents (i.e., d_U is expected to prevail at the current rate forever) and assuming infinite life. Thus,

$$V_U = d_U/i \,, \tag{14}$$

where i is the economy-wide "discount rate." In the absence of any upward drift in i over time, increases in the relative price of urban land should be a characteristic of our model of urban growth as well.

In short, we have uncovered another natural limit to urban growth. Rising urban land scarcity is assured in our model and the resulting increased urban site rents will tend to widen urban-rural cost-of-living differentials as urbanization proceeds. Whether the relative rise in the urban cost of living will seriously inhibit urban in-migration is an empirical issue, but it is a limit to urban growth worth considering in greater detail.

D. Education, Training, and Skills Accumulation

The availability of skilled labor may have a potent impact on growth and urbanization. Slow rates of growth in the stock of skills can constrain expansion in the modern urban sectors where skilled labor is utilized intensively. Demand shifts favoring these skill-intensive sectors serve to raise skilled labor's wage, to produce wage stretching and earnings inequality, as well as to generate skill bottlenecks. The po-

tential importance of these bottlenecks depends critically on the degree to which unskilled labor and capital can be used as substitutes for skills. Debate on this issue has been extensive and until recently divided into two camps: the manpower "structuralists" who see little opportunity for substitution between labor of different skills, and their opponents who argue on the contrary that substitution elasticities are very high between labor of different skills. We have been persuaded by the structuralist position so that relatively low substitution elasticities should be incorporated in the production function presented in equation (1).

The importance of a skilled labor bottleneck also depends on the response of skill accumulation to demand. Skill formation rates are a function of three forces in the specification which follows: the stock of "trainable" urban labor, the relative scarcity of skills, and the level of government expenditures on formal education which influences the ease with which "trainables" can in fact be converted to skilled labor. We are aware that many Third World economies appear to exhibit a glut of formal school graduates. The specification which follows is designed to account for a variety of Third World experience, since the model may generate abundance or scarcity of those formally schooled. In any case, the stock of trainables is limited to *urban* workers only: rural workers, regardless of educational training, must first migrate to urban areas before being considered for training.

How, then, might the skills acquisition process be modeled in a general equilibrium model of urban growth? We shall assume the training to be financed by the industries which utilize skilled labor, and that individuals cannot gain access to training unless selected by firms who find it profitable to make such investments. The full cost of the training is therefore borne by the industries rather than the individual. (Trainees do bear the time cost of training, but only in forgone leisure.) Furthermore, we shall treat our urban modern sectors as if in collusion on their training investments, and no industry tries to obtain a "free ride" by simply hiring newly skilled workers after another industry has made the necessary investments.

The procedure involves first determining the returns to investment in training (and thus the demand function for skills), second determining the costs of training (and thus the supply function for skills), and third determining the supply of workers actually trained. Given the latter, the training activity can be priced and thus the total investment requirements computed. These investment requirements become another claim on the current saving pool. The economy therefore accumulates three types of long-lived assets—physical capital, housing, and skills.

We are conscious of the fact that the KS sector relies more heavily on skilled workers drawn directly from the formal education sector (clerks, bureaucrats, teachers, and doctors), while the M sector nor-

mally relies more heavily on blue-collar workers who acquire skill by on-the-job training. Yet, our simplification does not appear to be totally inappropriate. Public education *is* determined in part by government investment decisions, and thus the formal-education-using KS sector can also be viewed in the same light as the M sector. Moreover, considerable training may even be required in government activity to convert the formally educated student into a worker of more immediate use.

After taxes, total profits are simply $r_j(1 - \tau_{\Pi,j})K_j$, where r_j is a pretrade rate of return in the jth sector ($j = M,KS$) and $\tau_{\Pi,j}$ is the profit tax rate. With physical capital stocks fixed in the short run, total profits are augmented by the marginal addition of one more trained skilled worker as follows:

$$\frac{\partial[r_j(1 - \tau_{\Pi,j})K_j]}{\partial S_j} = K_j(1 - \tau_{\Pi,j}) \left.\frac{\partial r_i}{\partial S_j}\right|_{s_j + \dot{s}_j} = \Phi_{S,j} , \quad j = M,KS , \tag{15}$$

where $\Phi_{S,j}$ is the marginal after-tax revenue from the addition of one skilled worker.

For purposes of simplification, assume for the moment that the per unit costs of training a worker are constant at c. These are marginal (and average) costs common to both industries. While these training costs are all incurred in the current time period, the revenue stream will continue throughout the working life of the skilled worker. We shall assume that firms find it profitable to train only young workers with a long working life. For computational simplicity, we shall also assume that firms compute the present value of these anticipated returns assuming naive expectations that $\Phi_{S,j}$ shall prevail indefinitely and that the young skilled laborer can be viewed (at least approximately) as an asset with infinite life. The resulting present value of the benefit stream generated by current investment in training is simply

$$\hat{r}_{S,j} = \frac{\Phi_{S,j}}{i} , \quad j = M,KS , \tag{16}$$

where i is an economy-wide discount rate, the latter taken as the weighted average of returns to physical capital in the various sectors. Thus, we have explicitly introduced the notion that training must compete with alternative investments in economy-wide physical accumulation. Presumably, the firm is indifferent between investment in training and alternative modes of accumulation such that current costs and capitalized benefits are equated:

$$\hat{r}_{S,j} = c\ , \quad j = M,KS\ . \tag{17}$$

What determines the stock of potential trainables? Generally, this includes all of last year's unskilled workers (excluding deaths and retirements) plus all new entrants who are children of urban households, but excludes any of this year's rural in-migrants. The exclusion of recent in-migrants is based on a two-staged view of in-migration: only those unskilled who have already had some exposure to urban work are considered trainable by modern sector firms. The urban unskilled are also distinguished by level of *formal* education, the latter dictated by previous government educational policy and the demographic structure of the urban population. Thus, the current stock of urban trainables by formal educational achievement is determined exogenously. Furthermore, it seems reasonable to assume that those with high formal educational attainment tend to be relatively cheap to train. A "step" cost function of the following kind might be postulated:

$$c = \begin{cases} c_0\ , & 0 \leqslant \dot{S} \leqslant L_{U,0}\ , & k = 0\ , & Ed > n \text{ years} \\ c_1\ , & L_{U,0} < \dot{S} \leqslant L_{U,1}\ , & k = 1\ , & n-1 < Ed \leqslant n \\ \vdots & & & \vdots \\ c_n\ , & L_{U,n-1} < \dot{S} \leqslant L_{U,n}\ , & k = n\ , & Ed = 0 \end{cases}\ , \tag{18}$$

where K represents the formal education class ($k = 0$ denoting highest attainment), and the total trainables constraint is

$$\dot{S} = \Sigma_j \dot{S}_j \leqq L_U\ , \quad j = M,KS\ , \tag{19}$$

where L is the optimal class trained satisfying (17) and $\dot{S}$ are total workers trained.

Figure 3 portrays the training market. Anticipated returns and the discount rate dictate the aggregate demand function for training. High anticipated returns generate buoyant demands in the two industries combined; such high anticipated returns may manifest themselves in skill bottlenecks with sizable skill premia. Figure 3 illustrates two possibilities. At point X, demand ($\hat{r}_i$) is slack and a substantial share of those in the $k = 1$ educational class would find themselves glutting the market and thus employed at unskilled tasks. (In the $k = 1$ class $\overline{AB}$ workers will be trained and $\overline{BC}$ workers will remain untrained.) In contrast, at point Y, a much larger share of those with formal education are trained as skilled workers, leaving perhaps only elementary school graduates ($k = 2$) and dropouts plus illiterates ($k = 3$) in unskilled jobs.

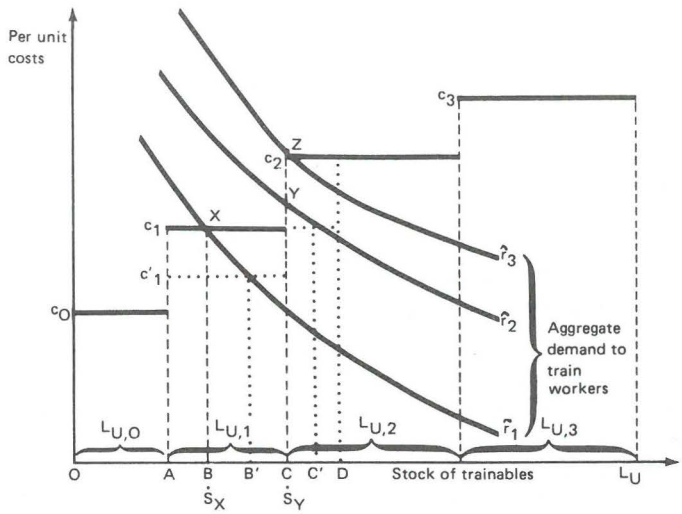

FIG. 3.—The skills investment market

Note too that an expansion in demand for skilled workers may in some circumstances be met with a rise in skilled wages and *no* additional training (from *Y* to *Z*), while in other circumstances the training rate may rise (from *X* to *Y*). The stock of trainables by *k* class as well as the height of the step in the cost function both matter to this result.

Total training costs, or total investment in training, can be written in either of two ways:

$$\text{Training costs} = \Sigma_k c_k L_{U,k} + c_l[\dot{S} - \Sigma_k L_{U,k}], \quad k = 0, \ldots, l-1 \qquad (20)$$

and

$$\text{Training costs} = P_{KS} \cdot I_{S,KS} \ . \qquad (21)$$

These training costs must lay claim on some real resources in the economy, that is, some "capital goods" sector must allocate resources to that investment activity and the investing firm's training cost ("tuition") must accrue as income to some sector. As is apparent in equation (21), it seems sensible to us to assign this capital goods activity to the *KS* sector since, after all, *KS* includes formal education. We are aware that this specification may have important implications for wage structure dynamics: high skill premia and earnings inequality imply profitability of investment in skills acquisition. The training investment response places demands on the *KS* sector. These added demands for *KS* output imply the augmentation of demand of skills (since they are

used especially intensively there), and thus the wage premium may remain high in spite of rapid skills accumulation.

E. Housing Investment, "Productive" Accumulation, and Aggregate Saving

Aggregate saving determines accumulation possibilities, and this savings pool is generated from three sources: retained after-tax corporate and enterprise profits, government saving, and household saving. (Foreign saving serves to augment government resources and thus indirectly appears as a component of government saving; see subsection *F*, "Demand, Urban Bias, and the Role of the State".) These three sources can be written as

$$\begin{aligned}\text{Savings} = {} & (1 - \psi_M)[(1 - \tau_{\Pi,M})(r_M - \delta_M \bar{P}_M)K_M] \\ & + \delta_M \bar{P}_M K_M + (1 - \psi_{KS})[(1 - \tau_{\Pi,KS})(r_{KS} - \delta_{KS}\bar{P}_M)K_{KS} \\ & + \delta_{KS}\bar{P}_M K_{KS} + s_{US}L_{US} + s_M L_m \\ & + s_{KS}L_{KS} + s_R L_R + s_C C + s_S S + G_s ,\end{aligned} \tag{22}$$

where the ψ_j are after-tax firm pay-out rates, δ_j are depreciation rates, s_j are class-specific per capita savings, G_s is government savings, and C are the number of property income recipients. There are three competing demands on this savings pool: investment in physical ("productive") capital, investment in human capital (training), and investment in ("unproductive") housing. Following the conventional emphasis in the development literature, the value of physical capital accumulation (investment goods produced by the M sector or imported) is written as a residual in equation (23):

$$\bar{P}_M I_M = \text{Savings} - \text{Housing} - \text{Training costs} , \tag{23}$$

but it should be emphasized that these three modes of accumulation are determined simultaneously and in competition. The determinants of training investment were described above. This section will focus on housing investment demand under imperfect capital markets. It will then conclude with a summary of the mechanism which dictates overall investment allocation.

Following Coale and Hoover, we distinguish between "productive" and "unproductive" investment. Unproductive investment is captured by housing requirements, a component which is sensitive to demographic and urbanization forces. Furthermore, housing investment might be viewed in much the same way that subsistence con-

sumption requirements are treated in most consumer demand systems. That is, private households might be assumed to behave in a fashion such that housing needs receive first priority in their investment portfolios. Only after these investment needs are satisfied might households release their residual savings for productive accumulation purposes, through banks, nonbank financial institutions, and informal "curb" markets. This characterization is motivated by McKinnon's emphasis on "financial market fragmentation."[24] Since the formal mortgage market is poorly developed or nonexistent in much of the Third World, we might for simplicity assume that *none* of the three private housing sectors (rural, urban squatter settlements, and urban luxury housing) are able to secure external finance to satisfy investment requirements. Housing investment would therefore be self-financed by each household sector independent of other surplus-generating sectors. While this specification eliminates the possibility of *inter*sectoral housing financial flows, it does not exclude the possibility of *intra*sectoral housing financial flows. For example, fathers may loan to sons, but middle-class skilled households cannot loan to poor unskilled households. Certain sectors may therefore be starved for housing finance while others have a surplus which they allocate to the national saving pool for productive accumulation or training investment.

Under conditions of rapid population growth, it is quite possible that household savings will be fully exhausted by housing investment requirements. This potential demographic burden would be reinforced in our model by rapid rates of urbanization since migration of even a stable aggregate population requires new housing construction in the receiving regions, and net investment economy-wide. Yet, future in-migration and urbanization may well be curtailed given the urban housing requirements that current population movements imply. After all, increased urban housing investment serves to inhibit the accumulation of productive capital, and we know that the rate of productive capital accumulation is a central determinant of the relative expansion of employment in the modern sectors and thus migration and urban growth. On the other hand, urban housing investment shortfall will result in a rise in urban rents thereby attenuating in-migration through cost-of-living effects.

What remains is to convert these qualitative descriptions of investment demand in housing under capital market fragmentation into explicit quantifiable equations. At given prices and incomes, suppose we were to specify the following type of investment demand equation:

[24] R. McKinnon, *Money and Capital in Economic Development* (Washington, D.C.: Brookings Institution, 1973).

$$I_{H,j} = \min \{s_j L_j P_j^{-1}, I_{H,j}^N + \delta_{H,j} H_j\} ,$$
$$I_{H,j} = \max \{0, I_{H,j}\} , \tag{24}$$

where $s_j L_j P_j^{-1}$ is the saving generated by households consuming the jth type of housing (deflated by P_j and thus converted into housing investment quantities), $I_{H,j}^N$ is *net* investment in housing, $I_{H,j}$ is *gross* investment in housing, and H_j is the housing stock of type j ($j = US, RS, KS$). The first expression simply states that household saving in sector j may be binding on housing investment in that sector. If not, dwelling investment will not exhaust the sector's household saving and a surplus will be available for accumulation in other forms. The second expression above simply states that gross investment cannot be negative. This expression is unlikely to be binding under conditions of rapid population growth, even with substantial rural out-migration rates.

In discussing the determinants of net investment, it will be helpful to define the following terms, some of which are new while others are added to refresh the reader's memory:

$\hat{r}_{H,j}$ = an index of profitability of housing investment in the jth housing stock, a "benefit-cost" ratio computed as the ratio of the discounted stream of net rents to current construction costs;
P_j = per unit construction costs of H_j;
$r_{H,j}$ = per unit "structure rent" on H_j (a shadow price since owner-occupied status is assumed, and thus rents are fully flexible with no market stickiness);
i = the discount rate, or average rate of return on physical capital economy-wide;
$P_{H,j}$ = total rental price, including both the site and structure rental components.

Using these definitions, net investment in housing in the jth sector is written as

$$I_{H,j}^N = \Theta_{H,j}(\hat{r}_{H,j}^{\varepsilon_H} - 1) , \tag{25}$$

where $\hat{r}_{H,j}$ is the index of investment profitability:

$$\hat{r}_{H,j} = [(r_{H,j} - \delta_{H,j} P_j) i^{-1}] P_j^{-1} , \quad j = US, KS, RS . \tag{26}$$

High values of $\hat{r}_{H,j}$ indicate high profitability with positive gaps between capitalized anticipated net rents and current construction costs. This

expression also states that net investment in housing should be zero when the benefit-cost ratio is unity, that is, where the economy-wide percentage rate of return equals the rate of return on sector j's new housing investment. Higher values of $\hat{r}_{H,j}$ imply more housing investment at the expense of alternative investment elsewhere in the economy.

As equation (26) reveals, structure rents are central to the determination of $\hat{r}_{H,j}$. Given Cobb-Douglas urban housing service production functions (see subsection *C*), urban structure rents are

$$r_{H,j} = \left(\frac{A_{H,j} P_{H,j}{}^{S} \alpha_{H,j}{}^{\alpha_{H,j}} \alpha_{R,j}{}^{\alpha_{R,j}}}{d_{U,j}{}^{\alpha_{R,j}}} \right)^{1/\alpha_{H,j}}, \quad j = US, KS . \tag{27}$$

Recall that $r_{H,j}$ is a shadow price since we have assumed for convenience that all housing is owner-occupied. Note, too, the presence of $P_{H,j}{}^{S}$ in the expression for $r_{H,j}$. It is the total rental price *after* urban residential property taxes have been assessed and paid.

There are three sectors involved in housing construction in our simplification. $I_{H,RS}$ represents rural dwellings produced by the informal *RS* sector, perhaps even constructed by the occupying household itself and with waste materials. $I_{H,US}$ represents similar low-cost urban dwellings (shanty housing or squatter settlements) produced by the informal labor-intensive *US* sector, also perhaps even constructed by the occupying household itself. $I_{H,KS}$ denotes high-cost housing, produced by the formal construction sector, which, as part of *KS* activities, is relatively capital- and skill-intensive, and generates intermediate input demands in the primary product and manufacturing sectors. When these housing investment requirements are valued by current construction costs, P_j, total investment demand for housing is obtained in value terms:

$$\text{Housing} = P_{RS} I_{H,RS} + P_{US} I_{H,US} + P_{KS} I_{H,KS} . \tag{28}$$

It might be helpful to summarize saving, accumulation, and capital goods sector activity at this point. In terms of the majority of computable general equilibrium models, we are suggesting an unusual treatment of accumulation. There is not just one capital goods sector, but rather four (*KS* producing skills; *RS*, *US*, and *KS* constructing dwellings; and *M* producing physical capital goods). There is not just one mode of accumulation, but rather there are three (skills, physical capital, and housing). Note, too, that the three modes of accumulation are explicitly competitive. Skills accumulation takes place up to the point where rates of return are equated to the economy-wide rate on physical

capital accumulation. Physical capital goods are allocated across the three capital-using sectors so as to minimize rate of return differentials. Dwelling investment will utilize household saving only up to the point where rates of return are equated to the economy-wide rate on physical capital accumulation. Of course, there are important institutional and technological features which seriously restrict the economy's ability to equate rates of return at the margin. Any of the three dwelling markets may be starved for funds since the absence of an intersectoral mortgage market may leave housing investment requirements in excess demand. The immobility of physical capital stocks between sectors makes it possible that current physical investment allocations are insufficient to equalize rates of return to capital. Indeed, the larger housing investment requirements are, the smaller is the residual pool available for "productive" capital accumulation and the more likely it is that current investment allocations are insufficient to equalize sectoral rates of return between A, M, and KS. Furthermore, firms' demands for skills may be unsatisfied if the stock of "potential trainables" is insufficient to meet the training investment levels which would equalize rates of return economy-wide. In short, capital market disequilibrium may well be a permanent attribute of our urbanizing economy.

F. Demand, "Urban Bias," and the Role of the State

Thus far we have made no mention of demand, either public or private, and this is an obvious pro-urban force. Private sector demand can be dispatched quickly. Whichever formal demand system one favors (and we favor the extended linear expenditure system), it will clearly exhibit a pro-urban bias since implied income elasticity of demands will surely favor urban goods following Engel's law. Given high income elasticities attached to saving, we have an additional pro-urban demand bias since the majority of the capital goods producing sectors are urban located. The same is likely to be true of the government sector, although here the pro-urban bias is almost certainly larger. While we have focused on supply-side limits to urban growth up to this point, this section therefore dwells on some especially strong urban growth stimuli coming in particular from government demand.

It seems apparent that government demands are far more urban biased than are private demands, and we capture this characteristic by assuming that *all* government final demands are satisfied by the capital-cum-skill-intensive (KS) modern service sector. Thus, a shift in current income from the private to the public sector imparts an inevitable pro-urban bias from the demand side. The key to this urban bias is therefore the endogenous determinants of the tax revenue share in GNP.

Total tax revenues, T, come from a wide range of sources. For brevity, it will suffice to simply list these sources: taxes on households'

consumption of M sector goods; taxes (or subsidies) on agricultural intermediate inputs purchased from manufacturing (e.g., fertilizer); taxes on urban property (uncommon in Third World economies at present, but a potential future revenue source); taxes on net enterprise income in the M and KS sectors; taxes on high-income households—that is, taxes on distributed profits, rental income in agriculture, skilled labor's income; and foreign trade duties. Any total tax revenue function with these component sources is certain to exhibit a high elasticity with respect to GNP and its correlates—especially urbanization itself—an increase in the share of manufactured goods in total household expenditures, a rising share of modern sector output, a shift of the labor force into higher-skilled occupations, and an increasing inequality in the distribution of income in the early to intermediate stages of economic development. A rising share of taxes and government spending in GNP is a likely outcome from our model, and such patterns would conform with several empirical studies.

Unlike most general equilibrium models, government spending is *not* exogenously given in our model.[25] The present model attempts, albeit in a highly simplified fashion, to capture aspects of government spending over time by appealing to much the same forces that determine private consumption and saving behavior. The government is assumed to allocate its budget to saving, G_S, in response to increments in the resources available to it from taxes and foreign sources, and in response to demographic and urban pressures—by assumption the main source of public investment demands. Thus,

$$G_S = \alpha_G + \beta_G(T + \bar{F}) + \gamma_G[\dot{N}_U(-1)] \,, \tag{29}$$

where $N_U(-1)$ is the lagged increase in the urban population and $\bar{F}$ denotes external aid and net private foreign capital, both assumed to flow through government channels. We anticipate that government's marginal propensity to save, β_G, exceeds that of the private sector, based on the literature accumulated to date on this issue. [26] We also expect, contrary to the Coale and Hoover hypothesis, that public saving is positively related to increasing urban populations, $\gamma_G > 0$.[27] Some analysts, like Michael Lipton, would view this prediction as an accurate

[25] For an exception, see P. S. Heller, "A Model of Public Fiscal Behavior in Developing Economies," *American Economic Review* 65, no. 3 (June 1975): 429–45.

[26] R. F. Mikesell and J. E. Zinser, "The Nature of the Savings Function in Developing Countries: A Survey of the Theoretical and Empirical Literature," *Journal of Economic Literature* 11, no. 1 (March 1973): 1–26; P. Yotopoulos and J. Nugent, *Economics of Development: Empirical Investigations* (New York: Harper & Row, 1976); J. G. Williamson, "Why do Koreans Save 'So Little'?" *Journal of Development Economics* 6, no. 3 (September 1979): 343–62.

[27] Coale and Hoover.

reflection of the realities of the "urban bias in world development."[28] A pooled sample of representative Third World economies covering the 1960s and early 1970s confirms both expectations. Indeed, $\hat{\beta}_G$ and $\hat{\gamma}_G$ are estimated as 0.334 (9.19) and 0.484 (4.06), respectively (t-statistics in parentheses). This result is not conditional on our definition of saving since similar results are forthcoming when expenditures on education are excluded from government saving.

Finally, note that since $\hat{\beta}_G < 1$, changes in levels of foreign aid do not augment the domestic saving pool by an equal amount, but rather by only $\hat{\beta}_G \cdot d\bar{F}$. This places us squarely in the "revisionist" foreign aid camp.[29] That literature has pointed out that domestic saving appears to bear a negative correlation with foreign aid levels, implying that the domestic savings effort is relaxed with the addition of foreign aid. Presumably, the "relaxation" of the domestic saving effort lies primarily with the government sector where, it is thought, the tax effort is diminished and current expenditures are expanded at the expense of government saving. While our model has little to say about a diminished tax effort, it is apparent from the expression $\beta_G \cdot d\bar{F}$, where $\hat{\beta}_G = 0.334$, that foreign aid does not augment the domestic saving pool dollar for dollar.

V. Research Agenda

The popular and scientific literature has raised cries of alarm over the exceptionally rapid urban growth in the Third World. This alarmist reaction to an important historic event makes all the more imperative research on demoeconomic models capable of revealing the causes and consequences of urban growth. Descriptive accounts of poverty in sprawling squatter settlements, of urban congestion and pollution, and of rising social and political unrest provide insufficient evidence for passing final judgment on the merits of urban growth. Nor does such evidence necessarily imply overurbanization.

Those who view urban growth as unequivocally bad have failed to consider the far worse counterfactual alternative of no growth at all. They certainly fail to take seriously the thousands of migrants voting

[28] M. Lipton, *Why Poor People Stay Poor: Urban Bias in World Development* (Cambridge, Mass.: Harvard University Press, 1977).

[29] K. B. Griffin and J. L. Enos, "Foreign Assistance: Objectives and Consequences," *Economic Development and Cultural Change* 18, no. 3 (April 1970): 313–37; T. Weisskopf, "The Impact of Foreign Capital Inflow on Domestic Savings in Under-developed Countries," *Journal of International Economics* (February 1972), pp. 25–38; G. F. Papanek, "Foreign Aid, Private Investment, Savings, and Growth in LDC's," *Journal of Political Economy* 81 (January/February 1973): 120–30; J. Bhagwati and P. Grinols, "Foreign Capital, Dependence, Destabilization and Feasibility of Transition to Socialism," *Journal of Development Economics* 2 (June 1975): 85–98; E. Grinols and J. Bhagwati, "Foreign Capital, Savings and Dependence," *Review of Economics and Statistics* 58, no. 4 (November 1976): 416–24.

with their feet. Migrants leave the farm in favor of the city because they project improvements in their living standards. Equally important, recent arrivals, on net, *stay* in cities even after personally experiencing the alleged disamenities and high pecuniary costs of urban life. This evidence offers an overwhelming rejection of the view that migrants are irrational, that they fail to take into account the nonpecuniary costs of urbanization, and that they are misinformed regarding the true costs and benefits of urban life.

Analysis of urbanization must, it seems to us, be shifted from the normative perspective which the word "overurbanization" implies. It should shift its focus back to the underlying causes of growth, accumulation, and spatial distributions of population.

The present study has suggested some components which might be incorporated into a general equilibrium model of Third World urbanization. While the complete model is developed more fully elsewhere,[30] here we have focused our discussion on the limits to urban growth in an effort to redress the imbalance in the literature which stresses overurbanization. Having said as much, we must emphasize that our model is neutral on the overurbanization issue. It is a general *equilibrium* model, after all, but we feel that it is a relevant perspective for any realistic assessment of the sources of third World urbanization.

One way to characterize our somewhat complex model is to divide it into two parts; the first part offers a detailed specification of migrant behavior; and the second part embeds that specification in an elaborate economic superstructure which influences and is influenced by this behavior. The migrant responds positively to prospects for improving his living standards. Factors in this decision include his known rural and his anticipated urban rates of pay, his prospects for obtaining favored urban employment, the relative regional costs of housing and other services, and the opportunities he and his children have to consume various urban amenities and public goods (e.g., formal education and on-the-job training). While no single model can specify every aspect of migrant behavior, we feel our characterization is quite rich.

The remainder of the model—the economic superstructure—makes endogenous many features of a potential migrant's decision. This includes relative wage rates, housing and service prices, training opportunities, job creation in various industries, and the like. Central to this modeling effort is the general equilibrium notion of feedback: migrants respond to economic change, and economic change is influenced by migration. Adjustment occurs in markets where prices (e.g., output prices, interest rates, rents, wages) play a signaling and rationing

[30] A. C. Kelley and J. G. Williamson, *Modeling Urbanization and Economic Growth* (Laxenburg, Austria: International Institute for Applied Systems Analysis, 1980).

function, and where factors (e.g., capital, land, labor, commodities) move in response to the signals. While our model does not assume perfect and instantaneous market adjustment—indeed, capital market fragmentation, imperfect labor markets, and nonmarket activities are prominent features of our Third World paradigm—a tendency toward long-run equilibrium is a key attribute of the system. It is this attribute which gives analytic content to the primary prediction of our study—even in a dynamic and growing economy, forces are set in motion which generate endogenous *limits* to urban growth. The paper has spelled out in considerable detail some of these forces.

When will city growth slow down and then cease? At what level will urbanization ultimately settle? These are empirical questions of more than just academic interest. They can be answered by parameterizing demoeconomic models like the one outlined in this paper, by simulating these economies over time, and by analyzing in detail—possibly through the use of the historical counterfactual—many of the forces which are alleged to explain urban growth. It should be apparent that this represents a very ambitious research agenda. We would argue, however, that it also represents the minimum necessary effort for providing even a preliminary assessment of the sources and consequences of Third World urbanization. While serving as a catalyst for such research, alarmist prophecies of doom are poor substitutes for computable general equilibrium models in providing useful answers to questions of overurbanization in the Third World.

Development and the Elimination of Poverty*

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Why does inequality in poor countries still persist after at least 30 years, during which the need for leveling as well as raising incomes has been in the consciousness of all concerned? Why the great expansion of government, with policies that inhibit growth of a native bourgeoisie, so that the classic nineteenth-century interplay between bourgeoisie and proletariat cannot be acted out on the national stage? Why the neglect, indeed the handicapping, of agriculture through contrived price and other policies in countries where many people are hungry, and agriculture, the main industry, is the prime basis of a higher standard of living? Agriculture is the industry of two-thirds of the population; why does the educational system almost wholly disregard it, and why is research to improve it infinitesimal?

These are questions that puzzled me when I worked in Burma and Indonesia around 1950. I hope to show that there is at least one common component in the answers to each of these apparently very different questions—concerning inequality, government expansion, neglect of agriculture, the urban bias of education and research. That component is the drive toward a certain way of living, one which readers of this article so take for granted they tend not to notice it—the style of life that we may call middle class or consumerist, with all the good and bad connotations of those terms.

Groups and Classes in Development

Development occurs in a context of older institutions, and change in those institutions is a central part of the development process. New leading groups have been gaining ascendancy over preexisting landlords. For the new group, development is the means by which it can

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assert itself; it can overcome settled landlords by identifying itself with development and gain popular support as it shows signs of being able to achieve it. The traditional culture that gave ideological underpinning to the previous leadership ceases to satisfy, and the new group promises change to something different. In the place of religion appear goods of hitherto unknown variety and attractiveness that make possible a fully legitimized new way of living, a vision to be made real by the mastery of modern technique.

Most writers take the new class for granted; some few give it explicit mention as an actor in development. Thus Paul Streeten asks, What are the forces that support the multinational corporation in the developing country? He replies that they include ". . . the small employed aristocracy of workers who enjoy high wages and security, the satellite bourgeoisie to whom world-wide mobility and prospects are opened." He goes on to say, "On the other side of the fence are the masses of unemployed . . . and underemployed."[1] I shall argue that the kind of employment offered to senior local employees by the multinational is much more attractive than the work life of the innovator and entrepreneur of indigenous capitalism.

The opposition that these pages will take up is that between the elite, usually urban, of the Third World, and their masses, mostly rural. Like other conflicts, this one is sometimes strident, sometimes muted. For a generation there have been parts of rural Burma where city people cannot go without the protection of an army detachment; in most of Indonesia the well-off stranger is welcomed. Yet observation of any one of the 100 or so developing countries shows some difference of interest, expressed or latent, between the middle class on the one side and the poor on the other.

The influence of the middle class in determining the course and type of development is strong even in those countries in which there is full democracy and in which the peasants are by far the largest part of the electorate. In Ceylon during the late 1950s and 1960s the middle class was defeated at the polls. The rural-based Bandaranaikes initiated equalitarian policies whose effects linger, but Sri Lanka seemed unable to persist in the course that they set.

The middle class has access to education and can understand the issues, is aware of its interests and able to act politically to further them. Schooling and influence enable it to pass its status to its young, and so it tends to be hereditary. (Nee shows this even for the equalitarian society of China.)[2] It recruits from the peasantry through the process of urbanization, in highly selective fashion. Its initial task is

[1] Paul Streeten, *The Frontiers of Development Studies* (London: Macmillan Co., 1972).

[2] Victor Nee, "Post Maoist Changes in a South China Production Brigade" (unpublished manuscript, Center for International Studies, Cornell University).

to break the rural landholding class; once that is accomplished its influence is decisive, for the dispersed, uneducated peasantry are no match for it. The peasant in an economy exporting rice cannot judge the effect on himself of a tariff on flashlight batteries; once it is explained to him that this is a way of getting cheaper batteries in the long run, if only he will be patient, he may well cease to argue. Yet even when he understands well enough to be in chronic rebellion, the government somehow carries on without him, determining national policies in the light of its own (urban) interests, and identifying itself with progress and development.

Diffusion of the Modern Culture

Development is not simple but multiple, and each of its distinct attributes can provide a definition of it. It may be seen as the investments in people that make them more valuable items of human capital; it may be seen as the accumulation of physical capital and the resultant rise of income, or as the creation of a certain state apparatus, usually with social welfare coloring. Without dropping the other definitions, this article regards it as the diffusion of a certain culture and the dominance of a new class that carries that culture. Like any culture, this one exists in people's heads, but its expression depends on material artifacts. The point of view of this article is complimentary to, rather than inconsistent with, the view of development as rising average income per head; it attempts to place the economics of development in a social and cultural framework.

The Modern Way of Life

The middle-class style has been taught to the Third World by the United States and to some extent by Europe. It consists of centrally heated and cooled homes equipped with television sets and refrigerators, transport by automobile, and procurement of foodstuffs and other supplies in self-service supermarkets. It is found most typically in cities with paved streets, the countryside between those cities being laced with a network of paved roads and another network of air transport. Literacy is essential to it, and the daily press and monthly magazines are conspicuous, along with television. The content of its press and other media has remarkable similarity worldwide: local, national, and world politics; urban crime; and other problems like the cost of living that arouse its mass public. Whether there is a worldwide culture of poverty one can doubt—poor people seem to retain their indigenous and differentiated ways rather well—but there is a worldwide middle-class culture—right down to such matters as when to eat one's three meals, the way to set a table for dinner, what to do on workdays, and how to spend one's weekends.

Of course, national and regional variants exist. Most obvious is

language; the new life goes on not only in its language of origin, English, but in Indonesian or Thai or Brazilian. The supermarket in Paris carries better wines, cuts its meat differently, has different bread from the supermarket in Chicago. Automobiles in the United States are heavier than those in Japan. Americans use twice as much energy on the average as Europeans. But these differences are smaller than the differences between the middle-class person of any of those countries and his national predecessor, say, the minor nobility of eighteenth-century Europe or the samurai of Japan.

The unimaginative see our way of life as unique—as the only form that our wealth can assume. Yet plainly we could, like the wealthy Buddhist, take our productivity out in leisure for contemplation. Like our ancient Greek opposite numbers we could live simply and spend our time in gymnastics and in amateur science and philosophy. Like an eighteenth-century baroque prince, we could indulge in making and listening to chamber music. We could support clubs more luxurious than those around St. James's Park and gardens that would outdo Versailles. These are not the mainstream of the consumer or middle-class culture.

The medieval community was not rich, and neither was the Puritan community of New England, but it was productive enough to have Sundays free of labor and devoted to piety. We are rich enough to have similar luxury 5 days per week and do all our work in 2 days, and we could take out our productivity in piety. Yet far from spending 5 days a week communing with one another and with transmundane beings, we mostly do not even spend 1 day, or even 2 hours, per week at a church service. The bourgeois Victorian family could have half a dozen children, and find much of its pleasure in watching them at home well into mature life. We are down to fewer than two children per family, and by common consent these leave home as soon as can be managed.

The point of such comparisons is that the modern middle-class way of life is, like all culture everywhere, in considerable part an arbitrary choice out of a wide range of possibilities. The participants in a culture do not perceive how wide the range is, but the observer can have an idea of it in the degree that he is acquainted with a variety of cultures. The elements of modern living that are dictated by man's physical and psychological nature are few. Up to 3,000 calories of food, heating in winter, air conditioning in a warm climate, clothing, some means of transport, and some entertainment are in various degrees essential; people will seek them as soon as their income permits. On the other hand, the food need not include most of a pound of meat per day; wealthy Indians from time immemorial have eaten no meat at all and lived long lives with vegetable sources of protein.

The only aspect of living in past ages that cannot be reproduced in

our age of mass consumption is their retainers. If the middle-class style of life is to be universal in a community, then by definition it cannot depend on human domestic help. Once the wages of those who might be servants approach 10% of the incomes of those who might be masters, servants can no longer be afforded. But this one constraint by no means prescribes the modern way of life, which must be regarded as an arbitrary cultural form, selected from the many that our high productivity could provide.

The American Contribution

Americans have pioneered in the organization of the workplace, both office and factory. The design of the home, with its kitchen including refrigerator, has many American touches. The 3-day weekend spent on the highway and at the beach is a product of the automobile, whose mass use came first in the United States. We have put together elements borrowed from here and there, with some created by ourselves, into a way of life that is wholly different from the way of life of those who are our peers as far as relative income is concerned—the ruler of a minor German principality, the Indian landlord, or the Chinese mandarin scholar.

Free land made American society unprecedentedly equalitarian from the beginning. Under the constraint that individual wealth for most of us can no longer be taken out in domestic service, we have broken through to new forms of consumption. Deodorants, motor boats, bathing suits, cigarettes, and daily newspapers, which we may or may not have invented but did much to spread, take their place in a culture that we designate "middle class." That way of life is not static. The innovation of refrigerators in the 1920s, television in the 1950s, and new clothing styles in the 1960s has kept our culture moving; airlines and the interstate highway network destroyed our passenger railways a decade or two back; computers are changing our lives today.

It is this culture that is now becoming worldwide, and the development process is the means by which it is spreading. Economists have written on one aspect of this modern conception of how to live and how to work, calling it the demonstration effect. People learn from films and other media to want a level of consumption that is for the moment beyond the capacity of their national productive apparatus to support. Their having such wishes causes premature spending and impedes the saving and investment that would bring such benefits within the scope of national production and trade. But in fact the demonstration effect has not had a large impact on economics. It forms a very small part of the models of development, mathematical or other, that are used to guide policy. It should be taken seriously, both in its negative aspects, and positively as the motor of development.

Measuring the Poor and the Middle Class

The usefulness of the concept of middle class does not entirely depend on our being able to measure it. We talk about the hungry, the rich, the managerial class, and many others, and there is no way of drawing a boundary around such categories or of accurately counting their members.

The work of Mollie Orshansky and the Social Security Administration has been the major serious effort to count the poor. Choosing a point on the overall income distribution for individuals or families will not do; one must make specific assumptions about requirements, which will differ according to the ages of a couple and the number of their children. In the United States it is easier to measure poverty and take the middle class as a residual; when we extend the measure to other countries it is on the whole easier to measure the middle class, who are the minority, and take the poor as the residual.

The U.S. Department of Agriculture designed a 1961 Economy Food Plan that forms the basis for the calculation of the poverty income thresholds, recognizing family size, sex, and age of the family head; number of children under 18; and farm-nonfarm residence. Farm levels are set at 85% of the corresponding nonfarm level. Annual adjustments are made on the basis of the Consumer Price Index, but the consumption levels continue to be those established for the base year 1963.[3] The number of families that fall below the poverty line in the United States was just under 40 million in the late 1950s, and had dropped to 25 million by 1977.[4] Particularly useful are the breakdowns showing, for instance, that of white families 8.9% were below the poverty line in 1977; of black, 29.0%; of families with male head, 6.9%; with female head, 32.8%. Among Puerto Rican families with female head, 70.4% were below. In New Hampshire, 7.9% of the population were below the poverty line in 1975; in Mississippi, 26.1% were below. Among those 65 and over, 14.1% were poor in 1977.

We note that the percentage of families that owned automobiles in the United States in 1974 was 83.8, at a time when the percentage above the poverty line was 88.8. Apparently owning a car is a somewhat more stringent criterion than being above the poverty line. Different individuals are involved; 37% of households with incomes under $3,000 have cars, and 3% of those above $25,000 do not have cars.[5]

Thus the Social Security Administration figures, extrapolated to 1980, show 24 million poor, 196 million middle class, for a total population of 220 million. Our task is to find how this can be extended to the world.

[3] U.S. Bureau of the Census, *Statistical Abstract* (Washington, D.C.: Government Printing Office, 1978), p. 438.

[4] Ibid., p. 465.

[5] Ibid., p. 474.

A sharp dividing line between poor and middle class is hardly to be expected. Marx recognized gradations and intermediate types between capitalist and proletariat. Alfred Marshall's entrepreneurs shaded off into capitalists and into workers. Similarly with our middle class; it is easy enough to see the difference between the resident of a suburb of Detroit who has a job as office manager with General Motors and the Javanese peasant with a holding of half an acre on which he is trying to grow enough to feed his five children, but it is not easy to draw a sharp boundary through the intermediate conditions.

Yet the concept is sharper than many that are used, for it meets all three of the criteria of class. The middle class has a superior position in the market, that is, its income is high—above the U.S. poverty line of $7,000 for a family of four. It has a style of life and a status in the world characterized by its enviable pattern of consumption. It has power, being the major component of the ruling group in countries as far apart as India and Brazil. Aside from these three characteristics mentioned by Max Weber, it has a common way of thinking on many subjects, and even some capacity to coordinate itself in the defense and enlargement of its interests.

The middle class can be traced at least broadly through statistics of ownership of certain artifacts. An automobile is one indicator, and we have statistics of automobile ownership for 75 countries. Of course, we know that an automobile is seen as more essential in America than it is in Europe, though there are well-off New Yorkers who own no car. One poor country—India—discourages the use of automobiles, while another—Thailand—imports them freely. Counting two persons per automobile, the American standard, is a first approximation on which we can improve slightly.

The *United Nations Statistical Yearbook* gives 271,620,000 passenger vehicles in the world in 1976, of which 109,003,000 were in the United States. Using this ratio to bring the U.S. middle class of 196 million to a world total gives us $196 \times 271{,}620/109{,}003 = 488$, or just short of 500 million. But because automobiles are less used in Europe and elsewhere by people who could afford them than they are in the United States, this is a low figure. It is also low insofar as families elsewhere are larger than in the United States. A figure of 2.5 or 3 middle-class persons per vehicle would bring us closer, but we turn to other artifacts.

Energy consumed is one indicator. The total in million tons of coal equivalent for the world in 1976 was 8,318, and for the United States it was 2,485.[6] This ratio would bring us to 656 million middle-class people

[6] United Nations, *United Nations Statistical Handbook* (New York: United Nations Department of International Economic and Social Affairs, 1978), p. 389.

in the world. Better than automobiles, but still probably too low; the American burns more energy than middle-class people elsewhere.

Income partly allows for this, and the problem with it is that distribution is not the same in all countries and is very difficult to measure. We note the total for the market economies of the world in 1976 at 5,426 billion, and the United States in that year at 1,695 billion.[7] The ratio used crudely gives us 627 million people above the poverty line. To it would have to be added the number of middle class in nonmarket economies for which we lack data—on the order of 150 million. (The United Nations calculates for the centrally planned a weight of 0.196 in the world economy.)[8]

On the basis of such evidence, the number of middle class in the world in 1980 might be 700–800 million. Their distribution by country, as obtained using the national income figure and continuing to accept the figure for the United States of 196 million, is shown in table 1.

This calculation is essentially the same as made above for the world total. One crude way of saying it is that if in the United States

TABLE 1

ESTIMATED DIVISION OF POPULATION BETWEEN POOR AND MIDDLE CLASS FOR 14 COUNTRIES, USING GROSS DOMESTIC PRODUCT AS INDICATOR (in Millions)

Country	GDP (Billions of $)	No. of Middle Class Based on GDP	No. of Poor as Residual	Total Population
Canada	196	22	2	24
United States	1,695	196	24	220
Brazil	124	14	108	122
Mexico	80	9	63	72
India	86	10	657	667
Indonesia	37	4	151	155
Japan	564	65	53	118
France	349	40	14	54
Federal Republic of Germany	447	52	10	62
Italy	171	20	38	58
United Kingdom	221	26	30	56
Sweden*	74	8	0	8
Switzerland*	57	6	0	6
Australia	101	12	3	15
Total	...	484	1,153	1,637

NOTE.—Numbers intended to apply to 1980. The extrapolation of the total population was made from the 1970 and 1977 figures of the United Nations, and the national income (strictly GDP) figures used as indicators are for 1976.

* We assume no poor in Sweden or Switzerland.

[7] Ibid., p. 748.

[8] Ibid., p. 10.

1,695 billions of income can produce 196 million middle class, then 1 billion of income produces 196/1,695, and the Federal Republic of Germany with 447 billions of income must have 447 × 196/1,695 = 52 million middle class.

The defect of this way of doing the calculation is apparent. The right way is to duplicate country by country and over time the procedures used by Mollie Orshansky for the United States. Some variation in the minimum standard of living according to the requirements and prices of the country would be accepted. Fortunately, the conclusions that are to be drawn are robust in relation to the method of measurement.

Over time we might identify the increase of the middle class with that of the GDP for the world as a whole, supposing that no great change in distribution has taken place. The U.N. index is 48 for 1960 and 110 for 1977, an average annual increase of GDP of 5%.[9] Passenger motor vehicles in use were increasing at 5.7% during the years 1968–77, but this seems too high for net additions to the middle class. Averaging with other material suggests somewhat under 5% as the annual rate of increase of the middle class over the past 30 years.

The important matter is that a similar calculation gives 200 million for the middle class of 1950. The entry of Europe and Japan, plus some progress in the Third World, was what brought the total to 800 million by 1980. Progress can be indicated by the 20 million per year of average addition to the middle class. If the same amount of progress is occurring now as in the years 1950–80, then each year 20 million new entrants have been joining the middle class. The world population increases at about 75 million per year, so if 20 million of the increment are comfortable, then 55 million are poor (table 2).

The figures are to be taken as illustrative or hypothetical only; among other gaps, we do not have any record of births and deaths

TABLE 2

WORLD POPULATION AND ITS DIVISION INTO POOR AND MIDDLE CLASS (in Millions); ILLUSTRATIVE NUMBERS

	Poor	Middle Class	Total
1950	2,300	200	2,500
1980	3,600	800	4,400
Increase	1,300	600	1,900
Increase in the year 1980	55	20	75
In middle-class families	...	6	...
New middle class	...	14	...

[9] Ibid.

according to whether the person is poor or middle class. The 6 million children (strictly the net addition, i.e., children born less deaths) born per year into middle-class families have in practice the best chance to be middle class, and the remainder of the 20 million are somehow chosen around the world from among both the rich and the poor countries.

This accounting is optimistic in various ways. It assumes that the economic advance of 1950–80 is continuing and will apply to 1980–81. The pace of absolute real income gain in the early 1980s is probably less than the average of 1950–80, and (omitting oil) the part of the increase obtained by the poor countries in the present time of disarray could well be less than it was in a time of more widespread prosperity.

Hollis Chenery has published calculations of the poor population of the world, using a more austere definition than mine.[10] Thus he finds only 59% of the population in poverty in Indonesia, 55% in Uganda, 43% in Pakistan, and 46% in India. His basis is the 2,150 calories per person, emergence from sheer hunger, in India; other countries are taken at the point in their income distribution corresponding approximately to the forty-sixth percentile of the Indian population.[11] My purpose is different; it is to see how large a fraction enjoys something like middle-class high-energy consumption—typically that drives an automobile, has a refrigerator, watches television. My basis being the U.S. standard of living, it of course gives larger proportions in poverty in less-developed countries.

Production

Being middle class is not a matter of consumption alone; certain kinds of work are middle class and other kinds (like being a peasant, even a rich one) are not. Office work at a salary that permits owning a car and an adequately equipped house is the ideal; if the salary does not permit buying a car, then obtaining one as a perquisite of office will do. The boundary of the middle class does not coincide with that of nonmanual workers. With contemporary wage scales in advanced countries and in some less developed ones, manual and nonmanual wages converge so that all can aspire to middle-class style.

Middle-class workers seek to avoid the hazards of entrepreneurship. The hurly-burly of the early Ford or Carnegie epoch is no longer the ideal either in its native America or abroad. Much better is the job of senior administrator, working according to fixed rules and understandings within a framework of law, with no personal capital at stake. Next in desirability to a job in government, and paying better, is

[10] Hollis B. Chenery et al., *Redistribution with Growth* (London: Oxford University Press, 1974), p. 460.

[11] Ibid., p. 459.

being hired by a multinational corporation. Once again there is nothing in common between the work life of the Thai or Nigerian local executive of Exxon and the life of its founder, Rockefeller.

If the multinationals have access nearly everywhere, despite so many words said so loudly against them, it is partly because their kind of steady operation, with administratively determined salary scales and relatively fixed hours of work, is understandable and gratifying. They are seen as offering the right kind of jobs to the right kind of people.

The entry of such cultural preferences into the work world creates a difficulty. The kind of work people like to do, and which they somehow manage to get jobs doing, diverges from the kind of work that produces the goods on which collectively they want to spend their salaries. In a competitive economy this is no problem: the total production of all concerns is bought by the total of their employees, or by outsiders; any concern that produces things no one wants goes out of business and its employees look for other jobs. But the government employee may be engaged in administering the collection of taxes, or the organization of cooperatives, or the country's foreign policy. These activities make little contribution to producing the groceries he seeks to buy at the supermarket or the plumbing fixtures for his new house. This lack of congruence between what the person wants to spend his worktime doing, and the sorts of goods he wants to spend his salary on, could well be the subject of economic study. Elaborate 5-year plans involving heavy government expenditure provide little protection against the lack of congruence to which noncompetitive elements in every economy are subject, and that seems to be a special hazard of the LDCs.

Relief of Poverty versus a New Culture

Those sponsoring development, whether in the poor countries as actors, or in rich countries as observers, do not describe the process as the preceding paragraphs have done. They see its objective as the relief of poverty, the lessening of hunger and sickness, the spread of education. It is of course all of these things, as well as the creation and spread of a social group that we call middle class, and this last aspect is stressed here only because it has elsewhere received so little attention. For Robert McNamara, development is a twofold task: "to accelerate economic growth and to eradicate absolute poverty."[12] The two are not the same. Growth in the form of an expanding middle class is consistent with an increasing number of poor.

Of course the middle-class way by itself is relief of poverty for

[12] Robert S. McNamara, *Address to the Board of Governors* (Washington, D.C.: World Bank, September 30, 1980), p. 44.

some. Those who have gained entry into it do have enough to eat, are well clothed, have adequate medical services, can read and write. Yet this relief of poverty seems to be incidental. For if adequate food and clothing, basic medical services, and literacy were the main objectives of development it would go on in a very different way from that now pursued. Brazil's national income per capita of $1,400 could provide these amenities for every one of its 120 million inhabitants. Yet in fact the majority of its inhabitants, and conspicuously those in the northeast, lack these altogether, while others in the south have them and much more—television sets, automobiles, air conditioning. After 30 years of formal development effort in 75 countries we can infer the objective of the process from actual observation. As much as anything it is the diffusion of the artifacts that support a certain way of life, and in a poor country only a minority can benefit.

While the particular culture of the middle class belongs to the second half of the twentieth century, the idea of an urban industrial group with incomes far higher than their rural contemporaries goes back much farther. Adam Smith saw development as taking place in the measure in which material capital accumulated in cities. With each increment of city capital some jobs would be created. A new textile factory, or pin-making concern, or steel mill could offer wages high enough to attract people from the countryside. Until the call to city employment came from a productive enterprise, the peasant would remain in his ancestral village, doing what he and his forebears had been doing since time immemorial, in a static society that was no burden to urban industry.

But Adam Smith's path of development is out of ideological favor now, replaced by an alternative offered in its clearest form by Mao Zedong. On this equalitarian pattern, which is indeed the relief of poverty, everyone would go up at the same time. It would not be a matter of a few joining the middle class each year, but rather of everyone in the country having a small increase of income each year.

The difference in the distribution of the increment of income between the two ways of doing development appears conspicuously in the physical accoutrements. On the equalitarian path, instead of a few having automobiles in the early stages, everyone would have a bicycle. Instead of college for a few, everyone would learn to read and write. Instead of rags for most and Arrow shirts for a few, all would wear neat and sturdy, if not very elegant, clothing. Corresponding differences would appear in medical services, in diets, in housing, in entertainment. China offers the best example on the one side, Brazil on the other.

Of course, the two routes of development can end up at the same place. If 2% of the original population enter the middle class each year

and have five times their original income, then at the end of 50 years all would have been relieved of poverty. If the income of everyone goes up by 10% of its original value each year, then at the end of 50 years all have fivefold their predevelopment incomes. But though the end point may be the same, the trajectory is different, and on any criterion more humane in the Mao Ze-dong model. It is praised even by those whose policies lead in a different direction.

Middle-class living is a rounded entity, a lump that seems unstable piecemeal. Those who obtain some part of it want the rest quickly; they are not willing to be held back by the slow pace that making all of their fellow citizens middle class at the same time would require. Each element brings a demand for the next. One who obtains a transistor radio wants to move up to a television set. A kind of standard package is in everyone's mind—including a home, automobile, and the means to do some traveling; within the house must be electric lighting, a refrigerator, and a television set. One can imagine people being satisfied to slow down their progress once they have these facilities and allow the rest of the country to catch up, but not before. Lower-level substitutes are unsatisfactory; for those who are well started on this path a bicycle or even a motor scooter will not do for transport, nor will the services of a barefoot doctor be acceptable.

The consolidation of the less equitable form of development is furthered by the institution of the family; the man who has made it to the good life will do everything possible to ensure that his sons have access to the same. The means to do so vary from regime to regime; in the Soviet Union one cannot pass on stocks and bonds or a house in the suburbs to his sons, but one can exercise influence over his education and subsequent employment.

Temporary Inequality May Be the Only Way

Does the phenomenon of unequal development occur in a free market, or is it the result of governments determining the kinds of goods that are produced and the kinds of jobs provided? That Adam Smith first described this route of development may suggest that it mainly takes place in the free market he recommended, but we cannot be sure. Comparisons of income distribution between places like Hong Kong, where market freedom prevails, with directed economies like the Soviet Union or Cambodia, show inequality produced by government no less than by the market.

That the tendency to inequality is strong was noted in China, where Mao warned of the danger, giving the Soviet Union as an example to be avoided. The Cultural Revolution was the crowning expression of the view that the masses can do everything. Statistics are needed, but not specialized statisticians—everyone can get into the

counting. Forecasting of earthquakes can be provided by the masses, each making observations near his own house with rudimentary instruments, or watching the behavior of animals. City youth must live at least a year or two with the rural masses.

Yet even China during the last few years has relaxed its insistence that city youth must spend time in the countryside, or that higher education and research wait until poverty has been relieved. However, the reversal did not take place until arrangements had been made for the equitable distribution of food, for adequate clothing allowances, and for some kind of minimal medical service for all.

This paper cannot describe the deep social forces that everywhere support the unequal pattern of development. It is not enough to say that the mass media, including films, have taught that there is a certain way to live, and everyone wants it. That they want it would not suffice to explain why the Indian factory manager can get it, while more numerous peasants go to bed hungry, when the latter can outvote the former by 50 to one. It can only be that even in democracies the levers of power are in the hands of the middle class, which determines the policies that make the cities grow and the countryside wilt. Thus subways often come ahead of irrigation schemes, new housing in preference to grading up squatters' colonies. Insofar as the subways will make life easier for city people, they increase the city populations.

Incentives to Rural-Urban Migration

This tendency of the middle class perpetually to enlarge itself acts in various ways to increase the city populations. Harris and Todaro, Henry Rempel, and others regard the city poor as queued up to enter the protected labor market, which would make them middle class or close to it. I would add that the city attracts people because it is so visibly the place where important things are going on. Its boulevards and great buildings symbolize the nation, the major social organization of our age. If people have a chance of becoming middle class anywhere, it is here.

Whatever expands city facilities, or lowers the price of foodstuffs, increases the size of the city. Numerous economic measures provide material support to life in the city. We can even suggest a positive feedback that results from legislation and administrative action. The price of rice is, in many countries, fixed well below the world market (translated at a true foreign exchange rate), and a law requires peasants to deliver some part of their crop at this price. Officials go into the countryside to execute the procurement. The unpleasantness and actual loss contribute to causing some of the peasants to leave and go to the city. That increases the need for foodstuffs, including rice, in the city, so that the procurement activity is intensified; the result is to

discourage more peasants, and so on. Where the countryside is overpopulated such feedback can build up city populations rapidly.

One might think that rather than positive feedback there would be an equilibrium point in migration. In a crowded countryside, when some people have left, the remainder should be able to make a better living. When enough have left, the living should be equal to what migrants could get by going to the city, and at that equilibrium point migration should stop. One reason it does not, as Alfred Marshall pointed out a long time ago (quoted by Lipton), is that there is selection on who comes to the city; while empirical studies show mixed results, on the whole those who come are better educated, and have more initiative.[13] Thus their departure does not make things better but worse; this I call positive feedback, and Myrdal and Lipton, cumulative causation. From Szentes we have the "pulling-out of manpower from the 'traditional' economies which deprives the latter of the most able-bodied young male labour, needed for the physically hard work in agriculture."[14]

Notwithstanding overpopulation, we can imagine policies that would discourage internal migration. For one measure, taxes to provide urban services could be levied on urban real estate rather than coming out of the national budget. Inputs to agriculture could be subsidized. Some effort is made in this direction, but it is not enough. The right way to consider the cost of fertilizer is not in terms of nominal subsidies, but the amount of rice or wheat required to buy a pound of typical fertilizer mix. Lipton reports that in developed Japan farmers received 1.43 times as much for a kilo of paddy as they paid for a kilo of fertilizer, while in nine poor countries of Southeast Asia the ratios ranged from 0.96 (South Korea) to 0.12 (Burma), averaging around 0.4.[15]

An effect similar to subsidies would be obtained by better prices for farm outputs. Aside from the compulsory procurement at government-established low prices in Burma and many other countries, governments often make market purchases at harvest time in what amounts to a forced sale, as the farmer is pressed by debtors and unable to hold his crop for more favorable markets. On the other side, the inputs to industry bought abroad tend to be artificially cheapened, most commonly by overvaluation of the local currency. Even if capital

[13] Michael Lipton, *Why Poor People Stay Poor: Urban Bias in World Development* (Cambridge, Mass.: Harvard University Press, 1977), p. 376.

[14] Tamás Szentes, "Unemployment, Miseducation, Wasteful Utilization of Human Resources, Widening Income Gap and Rural Marginalization—as the Inherent Structural Defects of Periphery Economies Dominated by International Capitalism" (paper delivered at the Sixth World Congress of the International Economic Association, Mexico City, 1980).

[15] Lipton, p. 292.

goods are cheapened equally to the farmer and the urban industrialist, there is a bias, for capital is a more important part of the productive process in the city. Credit in the city is more available and cheaper than in the countryside. And the output of industry is made more expensive by tariffs, as well as by trade unionization of employees (practically impossible for peasants) and by monopoly practices permitted by the limited number of establishments.

Such are the policies that improve the lot of city people and so incidentally increase city sizes. They help explain the perversity of urbanization, in which a Mexico City of 12 million or Cairo of 9 million are likely to double by the end of the century. Most of the newcomers to the city are queuing in the hope of ultimately landing in middle-class jobs. Those who have already attained such jobs and are in power may not be directly trying to expand their numbers, but it is hard for them to avoid doing so. For one thing, the urban amenities that they introduce—roads, local transport, and schools—are available in some degree to the poor. The elite cannot make the city better for themselves without in some degree making it better for the newcomers, and so encouraging further newcomers. They could of course forcibly prevent migration, or expel existing migrants, and this has been tried in Moscow, Jakarta, and elsewhere, but by and large has not been successful. An exception is Pnom Penh of the late 1970s, where extreme violence deurbanized rapidly.

The masses in the capital city are physically close enough to the government to communicate their wishes, as those of Cairo did 2 years ago when they forced the government to cancel its increase of food prices. Such an increase would have helped the peasant and discouraged migration, but the political forces in place did not permit it. In the same way the housing problem is constituted by the pressure of those within the city for middle-class accommodation at something below the equilibrium price. Governments cannot always resist the very reasonable demands of their employees and other members of the protected segment of the labor force for decent places to live. And with wages insufficient to buy premises, with no private mortgage market at affordable rates of interest, the government often intervenes and builds houses with funds that could equally have gone to rural roads, schools, irrigation works, latrines, or other rural investment. As a seeming irony, poor villagers are asked to build these things voluntarily, under community development schemes. Yet the argument for community development is strong: it makes use of otherwise unemployed people.

Local transport within the city is often government run. The costs of the buses it imports, and the fares it charges, are public matters, and very much the business of administrators and legislators. They tend to set the custom duties on imported vehicles and the fares charged, so as to hold down the cost of transport to users. They do not always set the

fares high enough for even their low-cost imported buses, and when the bus operations make a loss it is covered from general revenues, which means in some part from the rural sector. The middle class may not partake directly of this benefit, since it uses its own cars. But the middle class benefits indirectly from reducing transport within the city for subordinate office and factory workers on whom the middle class depends.

Other public utilities run by government at a loss even more clearly favor the middle class. Electricity is largely used by them, in their homes, offices, or factories; even less of it is available to the peasant than of the subsidized bus transport. The view has been that industry needs protection more than agriculture, that manufactured exports are better than farm exports, that agriculture's decreasing returns justify removing resources to help industries giving increasing returns. That city-oriented capitalist farming is better than village-oriented peasant farming was said in early nineteenth-century Britain.[16] Szentes speaks of "the heavy bias of the whole pattern of transport facilities, market institutions, banking and credit system, etc. and of the consumers' demand, too, against the 'traditional' sector and its products."[17]

The need for food supplies to permit the town people to engage in manufacturing was accepted by all the classics: thus Smith says, ". . . it is the surplus produce of the country only, or what is over and above the maintenance of the cultivators, that constitutes the subsistence of the town, which can therefore increase only with the increase of the surplus produce."[18] For Cantillon, ". . . towns are limited by the product of the lands owned by the landowners who live there, net of transport costs."[19]

Holding the price of grain down is not the way to increase the supply. Investment in agriculture is called for. Szcaepanik shows that the gross marginal capital/output ratios for 1960–65 are very much higher for nonagricultural than for agricultural investment. Thus the capital required per unit of income for countryside and city, respectively, in three typical countries is:[20]

	Rural	Urban
Philippines	0.7	2.5
Sudan	1.3	3.3
Tanzania	1.9	4.0

[16] Ibid., p. 93.
[17] Szentes.
[18] Lipton, p. 94.
[19] Ibid., p. 374.
[20] United Nations, *FAO Monthly Bulletin* (Rome: Food and Agricultural Organization of the United Nations, 1969), p. 2.

There are a few observations in the FAO table in which the opposite appears, but on the whole the capital required to produce a given amount of income is more than double in industry what it is in agriculture. For all countries with data the average is 1.7 for rural and 3.9 for urban.

Some of these points are now being recognized, and efforts are being made on behalf of agricultural output. The efforts tend to be guided by city people; the passive elements of the peasantry are not expected to take the initiative. The Mexican government is investing a good deal in modernization, and it is stressing the use of machinery. "If we do not mechanize our countryside we run grave risks . . . to mechanize the farm is an urgent task," runs the official message, reiterated on television and in the press. The man with the bullock is no longer portrayed as a romantic figure, but one to be replaced by a tractor operator, with backing by soil chemists, agronomists, irrigation specialists, and bankers ready to advance rural credit. All this will indeed provide employment, but for specialists and not for the masses in the countryside. It will produce a surplus available for sale abroad and to the cities of Mexico, but will in no way inhibit movement to the city—indeed, in the degree to which it is successful in converting to large-scale agriculture it could accelerate the move to the city.

Here much depends on the patterns of consumption and residence of the new classes in the rural areas. If the tractor operator and the soil chemist live in the city and commute to the rural area, or if they live in the village but use their new incomes on city goods, following the middle-class pattern of life described in preceding pages, then unemployment in the countryside will be greater than ever, and cityward migration will continue and even accelerate. If they use their incomes on domestic retainers and live like the *caciques* of tradition, or if they adopt the style of the traditional English squire so that each of the new farmers has 10 or 20 servants, then the countryside will be able to hold its people. But in fact no one expects this. The new agricultural producers want automobiles, refrigerators, and television sets. One fears that the present policy, sound as it is from the balance-of-payments viewpoint, will do little to check urbanization. The one measure that will help in this regard is Mexico's recent removal of the 5% export tax on certain agricultural products.

T. W. Schultz has more than once criticized the patronizing view that peasants are not very capable or adaptable, so that they need regulating, and even then not too much is to be expected of them. He demonstrates that they are in fact very quick to respond to price incentives, and the trouble with agriculture in most LDCs is that the price incentives are not set in such a way as to elicit more output.

In few fields does the middle-class urban bias reveal itself as

clearly as in education. In the first place, most schools above the primary level are in cities, and the ordinary peasant's children stand little chance of attending. The disparity in numbers of secondary schools between rural and urban areas is matched by some disparity in the quality of instruction. Moreover, the primary schools that are now to be found everywhere in the developing world, and which are attended at least long enough for most peasant children to learn to read and write, have little to do with peasant life. Rather than being planned to make better farmers, they serve as a selection device, by which ability is discovered and sent to secondary school, usually in the city; it is not wholly wrong to think of rural elementary schools as a vast selective mechanism that combs the countryside for ability that will be of use to the city.

Arguments for Inequality

Is it possible that creating a middle-class enclave, and allowing that to expand until it covers the country, and then the world, is still the efficient way to eliminate poverty? There are many ways of arguing that it is. One of these is the demographic argument: to raise the poor a little bit at a time, which is all that one could do with the resources available, would only encourage childbearing, at the same time as it increases the survivors among children born. Only when people make a quantum leap into the middle class do they control their childbearing. This crude argument does not take into account the spectacular fall in the birthrate in equalitarian China and Ceylon, but it is not without proponents.

An analogous argument applies to saving and the accumulation of physical capital. If increases in production go to the poor majority of the population, necessarily in small amounts, they will only add to consumption. The family that is on the edge of starvation does not save any appreciable part of its marginal increase of income. Hence confining the initial benefits of the development process to a minority, each of whom obtains substantial increase of income, will enable a larger part of the increment of income to be saved. Again a crude argument, but one that has appeared in print before this.

It may also be said that if full development is the ultimate objective, then it is physically more economical to provide it for a small part of the population and then spread out, rather than provide a little bit at a time for all. For different artifacts and methods of production are involved. If automobiles are the ultimately satisfactory means of transport, then why start by making millions of bicycles? Better to make a few automobiles, and build up the organization and skills; it will be easier to expand later than to convert from bicycles. To carry the argument further, to produce more food along present lines is to ex-

pand the peasant sector, which cannot be development, since it has been going on for centuries. Better start up new lines of activity in manufacturing, which will then later turn out tractors and other agricultural implements, and transform agriculture to the way it must ultimately be.

Another reason for depriving the peasant and arranging tariffs, exchange rates, utility prices, and taxes so as to favor city industry is that extreme encouragement is necessary if the new enterprises are to start at all. Imperial Germany's tariffs protected her infant industry against that of England. Japan has used even more drastic kinds of protection and continued them long after she had attained preeminent manufacturing efficiency. In the early days of development import permits in many countries were allocated to members of the government and businessmen, with the aim of stimulating them to secondary processing. They often merely sold the import permits and used the proceeds for consumption. Even while this was occurring the government thought that the process was worthwhile, in that it provided the funds for the formation of an indigenous bourgeoisie. It failed to note that someone who gets rich by trading import permits is not likely to put his gains into a difficult and risky productive enterprise; as he earned his fortune—by his influence on government—so he will try to add to it.

Explanation Rather Than Policy Guidance

The number of middle-class people in the world was about 200 million in 1950; it has grown to about 800 million by 1980. The growth was so rapid that it has pressed on oil and other resources. It was too rapid, in that it has not given time for the technological progress that will substitute for the materials that are running short, as Britain was able to substitute coal for firewood at the slower pace of the eighteenth century.

Yet from the viewpoint of those waiting to join the middle class, growth was much too slow. The world population went from 2.5 billion to 4.4 billion during 30 years. It is true that the increase of the middle class was nearly 5% per annum, which seems very rapid indeed compared with the population's 1.8%. But percentages are not what count, and it looks as though each year something like 20 million people are added to the middle class, and two or three times that number to the poor. To recognize only one category—the whole population—and measure progress by per capita figures of GNP gives a picture that by itself is less satisfactory than the two-class model, even when the numbers are as crude as these are.

The present paper stands back from development and refrains

from offering policy advice, at the same time that it tries to look at it from a point of view closer to the experience of the citizen undergoing the process than to that of the expert. The citizen of poor countries under any political regime sees development as the advent of goods that make possible a modern style of life. For the typical urban dweller development is what will enable him to have a pukka house with electric appliances, including a refrigerator and television set; above all an automobile; and that will enable him to send his children to college so that the social ascent will not have been for himself alone but for his whole line of children and grandchildren. The goods are, of course, useful for themselves, but they are above all symbols that one has attained a certain status. Middle-class status may be something that the vanguard of Americans are increasingly indifferent to, but it retains novelty and glamor in the poor countries of the world.

This wish of people for middle-class status is an engine of development—it can induce acceptance of the hard work and abstinence that development requires. Yet it is not a readily manipulated policy variable, like a tariff or the rate of interest or some other lever in the hands of a government. The object of this paper is not to reveal some easy way by which development can be brought about but to make it look as difficult on paper as it apparently is in reality. Rather than add further policy advice, I have tried to build a framework that will show why excellent policy advice is disregarded. Thus, reaching for middle-class status is an explanatory rather than a policy variable. It tells us why government has grown, why cities have expanded, why poor countries aim to produce automobiles rather than bicycles, why the import of consumption goods is everywhere so large an element in the balance of payments.

Other articles in this issue discuss questions of aid and trade, provide models for the analysis of tax policies, take up questions of capital and labor, examine the several levels of technology, and make statements about the path of development in economic and technological terms. They are oriented to policy, to finding the variables and the relations among the variables that will give the policymaker a handle on the things he wants to influence, and principally speeding up the rise of the Gross National Product.

The Empirical Study of Development

When development as a conscious and controllable process came on the scene in the 1950s one was free to hold to any ideal one wished about its course. Much of the early writing on the subject was normative—how development ought to take place. But a quarter century of experience has placed some constraints on our thinking, in the

form of facts on how the process has gone. Sometimes these facts are summarized by saying that development has been disappointingly slow: poverty still persists, and because of the rate of population increase, is numerically greater than it was at mid-century. Yet from another point of view the process has been a great success. Within each of the poor countries there is an expanding middle-class enclave. We need to observe more closely the social mechanisms that cause the spread of the middle class to take precedence over the alleviation of poverty.

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