2

Urbanization and Economic Development

George S. Tolley

Concerns about urbanization and economic development go hand in hand, for a number of reasons. Beyond the question of whether urbanization is a cause or a consequence of development, it is the backdrop for development in almost all nations. Rapid urbanization poses complex management problems in housing, transport, land use, the environment, energy, public services, and finance. These problems are responsible in part for interest in whether overurbanization has occurred and whether more active policies are needed to control and direct urbanization. To deal adequately with urbanization issues, an understanding is needed of why the process takes place and what determines its rate, its geographic pattern, and the characteristics of people in cities.

That there is a close relation between urbanization and economic development is evident from experience in most countries that have undergone development. It also seems clear that urbanization is not a primary cause of economic development.

In a very long view of history the role of cities in promoting economic development—through being centers of the learning and interactions that lead to innovation—would be a concern. In recent history, as communications have been revolutionized, economic development has come more to consist in applying ideas, no matter where they originate.

It seems reasonable that some, and perhaps most, urbanization is the result of economic development processes. But accepting a general line of causality from economic development to urbanization does not answer the question of how the causality works. Economic development makes it possible for people to produce more. Why should this possibility lead to urbanization? Can our understanding of the links between development and urbanization be carried to the point of quantification? What are the main implications of a better understanding of urbanization?

In seeking answers to these questions in this chapter it is recognized that the explanation of urbanization is largely an explanation of economic activity. Cities would not grow unless there were productive things for people to do in them.

In the past hundred years enormous growth of cities occurred in the Western world as people took the fruits of development in the form of products, other than food and fiber, that could be produced more economically in cities than in the countryside. Rapid urbanization in developing countries today is in some part a result of a similar wish to take the fruits of development in the form of goods and services suited to urban production.

But more than in the past, urbanization appears to be related to international specialization that is freed from great dependence on domestic demand. People are producing goods in the cities of the developing world and trading them in international markets for all manner of other goods, including food. The links between the composition of domestic consumption and urbanization have been greatly weakened. Actually, the links were never exclusive, and they have become progressively less so throughout the world with the increasing importance of international trade to all economies.

Domestic and international demands for urban and nonurban goods, as just discussed, are the basis for demand influences on urbanization. The ability to pro-

Note: Kenneth Miranda provided valuable help in the preparation of this chapter.

duce more urban and nonurban goods acts to increase abundance and is a supply consideration. Population growth results in growth of human inputs and is likewise a supply consideration. Many of the puzzles of urbanization can be understood by analyzing how these demand and supply influences interact. The demand and supply influences provide headings under which urbanization is analyzed in this chapter.

A traditional model of urbanization, appropriate to closed economies, is considered first. Relations between urban and nonurban productivity, income elasticities of demand, and population growth as determinants of urbanization are analyzed. Then urbanization is considered in a more general setting, with international trade. Attempts are made to distinguish between first-order and second-order effects for countries that are price takers in world markets. One of the conclusions from the resulting model, which is applicable to most countries, is that greater urban productivity leads to more urbanization rather than (as in the traditional model) less. Symmetrically, and again contrary to the traditional model, greater nonurban productivity leads to less urbanization.

The model is applied to sixty-six developing economies, leading to explanations of the degree of urbanization in each economy in terms of growth in urban productivity, nonurban productivity, and population. The use of the framework developed in this chapter to further deepen understanding of urbanization in individual countries is discussed, and some important policy implications are noted.

Demand and Supply Factors

A first step toward an understanding of urbanization is to consider the underlying demand and supply conditions that determine how the resources of an economy are divided between urban and nonurban activities. A first approximation is to associate nonurban activities with agriculture and urban activities with industry and other nonagricultural pursuits. The distinction ignores nonagricultural production by farm households and industry in rural areas, and it begs the question of exactly how *urban* is defined—that is, whether small towns are urban or rural and where the dividing line between urban and nonurban phenomena lies. Although the distinction is not perfect, the discussion here proceeds on the assumption that some degree of approximation is inevitable and that nonurban situations in most parts of the world are overwhelmingly agricultural.

Demand conditions determine how people split their income between urban and nonurban products. Important factors in the allocation of income are the level of income and the relative prices of the two types of goods. These factors are in turn influenced by supply conditions. The total resources of an economy are devoted to either urban or nonurban activities. The amounts of output of the two types of activities depend on how the available resources are split between them and on production considerations that determine how much of each type of output can be obtained from a given amount of resources.

Over time the total number of persons working in the economy may grow, and for both urban and nonurban activities the amount of output that can be obtained for a given amount of inputs may increase. Given the increases in the number of persons, in the total stock of capital in the economy, and in productivities, the responses to the demand and supply changes that occur during economic growth will determine changes in the allocation of resources between urban and nonurban activities.

The view that urbanization accompanies economic development implies that the demand and supply changes are such that increasing urbanization in fact results. Why is this, and is it necessarily to be expected? The explanation of urbanization has been best explored for the high-income Western countries which have experienced dramatic declines in the proportion of people working in agriculture and in this sense have become the most fully urbanized. The received explanation of this result centers on one element on the demand side and one on the supply side.

Income Elasticities of Demand

The element on the demand side is income elasticity of demand. Because of the low income elasticity of demand for agricultural products—say, 0.10 to 0.20—people are viewed as choosing to spend an increasing proportion of income on urban products as per capita income rises. The low income elasticity of demand for agricultural products has thus been cited as one of the principal reasons why a society devotes more and more of its resources to nonagricultural pursuits and thus becomes more highly urbanized. Since people must spend all their income on either urban or nonurban commodities (where commodities are comprehensively defined to include both consumption goods and the capital goods on which savings are spent), the income elasticity of demand for agricultural (nonurban) commodities can be translated into an income elasticity for urban commodities. If all income elasticities are unity, a 1 percent increase in income leads to a 1 percent increase in expenditures on every commodity. If the income elasticity for some commodities is less than unity, expenditures on them will rise by less than 1 percent and

the income left over will enable expenditures on other commodities to rise by more than 1 percent. Thus, if the income elasticity for nonurban products is less than unity, the income elasticity for urban products will be greater than unity.

The balance of income elasticities above and below unity depends on the relative amounts of expenditure on each kind of commodity. A well-known condition is that the expenditure-weighted sum of income elasticities over all commodities is equal to unity. For example, if 20 percent of expenditures are for nonurban commodities and 80 percent for urban commodities, and if the income elasticity of demand for agricultural products is 0.10, then the income elasticity for urban products is 1.225, implying a 1.225 percent increase in expenditures on urban products for every 1 percent increase in income. To obtain this result, note that the weighted income elasticity condition is $w_u\eta_u + w_a\eta_a = 1$, where the ws are the urban and nonurban expenditure weights and η_u and η_a are the income elasticities. The solution of the income elasticity for urban products, η_u, is $(1 - w_a\eta_a)/w_u$, or, with the numbers in the example, $(1 - 0.2 \cdot 0.1)/0.8$, or 1.225.

The example is for a high-income country; a different result may be obtained for a low-income country. It is generally thought that the income elasticity demand for agricultural products goes down as income rises. Thus, for lower-income countries a higher agricultural income elasticity implies a lower income elasticity for urban commodities and hence, other things being equal, a lower rate of urbanization. A country could still experience urbanization, but the lower income elasticity for urban commodities might contribute to a lower rate of urbanization in the early stages of development.

In addition to differences in income elasticities (the ηs), another difference between high-income and low-income countries—and one that operates in the opposite direction—is the fraction of expenditure devoted to urban and nonurban commodities (the ws). If the fraction spent on nonurban commodities is high, the weight on the income elasticity for nonurban commodities will also be high. At an early stage of development, when per capita income is low, a large fraction of income is likely to be spent on agricultural commodities. The income elasticity of demand for agricultural commodities will not be as far below unity as in a high-income country and, because its weight is greater, it will tend to make the income elasticity for urban commodities only slightly above unity.

As development proceeds, the gradual decline in the income elasticity for agricultural commodities will act to increase the income elasticity for urban commodities, while the decline in the agricultural weight will act to decrease it. Whether the income elasticity for urban commodities rises or falls during development depends on which effect predominates.

It is conceivable that the income elasticity for urban commodities is low during the early stages of development, rises to a peak during a middle period, and falls at the later stages. If so, there will be a tendency for the rate of urbanization to start out low, rise to a peak, and fall to a low rate. The first column of table 2-1 shows various values of the income elasticity of nonurban commodities and the second column shows accompanying percentages of expenditures on those commodities that might be observed. The third column shows the income elasticity of demand for urban commodities that results from these combinations, as derived from the formula for η_u, above. The entries in the table progress from the top row, which corresponds to conditions that might be encountered in the initial stages of development, to intermediate situations (the middle of the table), to advanced development (the last row).

In the first row the income elasticity of demand for agricultural products is at its high value, unity. The income elasticity of demand for urban products is then also unity, no matter what the expenditure fractions are. The income elasticity effect would not lead to any relative urbanization, for it would leave the urban proportion of the population unchanged. In the second set of entries the income elasticity of demand for agricultural commodities has fallen to 0.8. Some possible values of the expenditure share accompanying this elasticity are shown. If the share of expenditure on agricultural commodities remains high (80 percent), the income elasticity for urban commodities rises to 1.8; it does not rise as much if the expenditure shares are less. In the next set of entries the income elasticity for agricultural products is 0.5. If the expenditure share has fallen by this time to 50 percent, the income elasticity of demand for urban commodities will be 1.5, with higher and lower values for different expenditure shares. The last row corresponds

Table 2-1. *Determinants of Income Elasticity of Demand for Urban Commodities*

Income elasticity of demand, nonurban commodities	*Income spent on nonurban commodities (percent)*	*Income elasticity of demand for urban commodities*
1.0	0–100	1.0
0.8	80	1.8
0.8	50	1.2
0.8	20	1.05
0.5	80	3.0
0.5	50	1.5
0.5	20	1.125
0.1	20	1.225

to the example originally given for a high-income country, with an income elasticity for urban commodities of 1.225.

Table 2-1 suggests that the income elasticity for urban commodities will first rise and then fall during development. If the share of expenditure on agricultural commodities falls only slowly, the income elasticity for urban commodities rises longer and further than if the share of expenditures on agriculture falls rapidly.

In addition to demand conditions within the country, the proportion of the population which is urbanized will be affected by changes in the degree of international specialization that occur during development. A country may develop primarily by increasing its output of manufactured goods for export to the rest of the world. If agricultural output does not increase enough to meet domestic demand, the exports of manufactured goods will be used in part to pay for increasing imports of agricultural commodities. As a result, the increase in production of urban commodities will be larger than if there were no changes in the degree of international specialization, and a smaller fraction of the increased demand for agricultural commodities will be met from production inside the economy. The income elasticity for agricultural commodities must be redefined to pertain only to the percentage increase in domestic agricultural production associated with a 1 percent rise in income, and increases in output of urban commodities will be larger than implied by domestic elasticities. Changes in the degree of international specialization may thus accelerate the rate of urbanization during development.

Changes in international specialization appear to be the rule and not the exception during development. They have been particularly pronounced in such dramatic growth experiences as the "Pacific growth miracles" in which Hong Kong, Japan, Korea, and Taiwan all experienced rapid development simultaneously with increases in output of nonagricultural goods for export. In these economies and in others with similar, although less extreme, growth patterns, concern has arisen over the loss of agricultural self-sufficiency as imports of agricultural products rise along with the rising output of the economy. A more positive way of looking at the decline in agricultural self-sufficiency is to view it as a manifestation of gains from international specialization. It is more economical to produce manufactured goods and exchange them for agricultural products than to forgo the additional manufactured output and try to produce agricultural products that can be produced more efficiently elsewhere.

Although generalizations are hazardous, historically economic development has been almost universally accompanied by increasing specialization of production. Indeed, the very possibility of economic development has often been based on such specialization. Increasing international specialization is part of a wider process of specialization and provides a reason for increasing urbanization that is related to economic development.

Increasing specialization can occur in agricultural as well as in urban production. It is conceivable that some countries could become less rather than more urbanized during development, although no prominent example comes to mind. A large part of the internationally traded portion of agricultural production comes from high-income countries, which are already highly urbanized. Growth of domestic demand and comparative advantage in nonagricultural production are more important in explaining urbanization than is specialization in international agricultural trade.

Supply Factors

When attention turns from the demand to the supply side, concern shifts from changes in output to changes in the numbers of people used to produce the output. If human inputs were equally substitutable for physical capital in urban and in nonurban production activities, and if the rates of growth of factor productivity in the two types of activities were the same, changes in output and changes in numbers of people would go together exactly, and the demand considerations already discussed would suffice to explain the rate of urbanization during development. But this is not the case. Conditions vary widely, and output per person in production of urban commodities may rise more or less rapidly than for nonurban commodities.

Traditional explanations have emphasized rapid technological change in agriculture, which leads to more rapid growth of output per agricultural worker as the major supply consideration that acts in conjunction with low income elasticity of demand to eject resources from agriculture. Several considerations other than technological change, however, affect output per worker, as will now be discussed.

Land scarcity is overrated as a factor that could decrease output per worker in agriculture. If output did go down, the rate of urbanization would be retarded as more workers were kept in agriculture to produce a given agricultural output. This outcome could occur if growing population pressed seriously against scarce land supplies, but the evidence even for the prime example of a country that might be in these straits—China—is unclear. New land has been coming into production in some parts of the world, notably in Latin America. Improvement of the quality of land through investment

retards declines in output per worker. International specialization has worked against agriculture in many countries and has eased pressure on land supply.

Agricultural research has effects opposite to those of scarce land supply. An increase in output per worker in agriculture permits a given demand to be met with fewer agricultural workers, releases people for urban pursuits, and increases the rate of urbanization. Even if the increase in productivity as a result of agricultural research leads to income growth, workers will be released to urban areas if the income elasticity of demand for the products whose output is increased is less than unity, as seems likely. It is also true that the Green Revolution and other innovations resulting from agricultural research have sometimes been more saving of land and related physical inputs than of workers. The effect of these innovations has in any case been extremely varied among and within countries, so that it is more than usually difficult to generalize about it.

As development proceeds there is a tendency for more of the inputs used in agriculture to be produced in urban areas. This phenomenon is part of the increasing specialization that has already been mentioned and appears to be speeded up by innovations resulting from agricultural research. Gasoline, feed concentrates, and fertilizers and other nutrients are among the inputs produced in urban areas that replace inputs formerly produced on farms. In addition, home garden plots and home food processing decline.

Successful economic development is characterized by rising returns to human inputs, resulting in part from substitution of capital for labor. These changes may affect urban and nonurban production differently. Urbanization will be favored if the substitution of capital for labor is higher in nonurban than in urban production—another of the circumstances that may differ from one country to another. A large source of the substitutions is replacement of labor-intensive human or animal sources of power by machine power, and possibilities for substitutions abound in nonurban as well as urban production. (The mechanization of cotton growing in the United States had wholesale effects on rural-to-urban migration and profoundly affected American cities.) Urban production, which uses readily transferable techniques from other countries, may offer greater possibilities for substitutions, at least in manufacturing industries. But urban production is more intensive than nonurban production in services, where capital appears to be less substitutable for labor.

One of the effects of economic development is the gradual elimination of so-called traditional production in both urban and nonurban areas. Urbanization will be speeded if there is more of this traditional production to be eliminated in nonurban than in urban areas. Here, again, countries are not alike. Family and home businesses abound in many cities, as do small unviable farming operations in many parts of the world. (Much campesino agriculture is of this type.) The important characteristic of traditional production for the purposes of this discussion is that, in spite of all of its adjustments to relative prices and other changes during development, it is outcompeted by other forms of production. During economic development people are released from the declining traditional forms of production to other activities. If they are released from traditional employment in urban areas and go into other employment in urban areas, there is no effect on urbanization, but if they are released from traditional employment in agricultural areas where there are no expanding employment opportunities, they will seek employment in urban areas, and urbanization will increase.

Because of the low amount produced per person in traditional production, a reduction in traditional employment leads to increased output per person. Whether output per person rises more in urban or in nonurban areas depends on the rate of reduction in traditional production in the two types of areas and on its relative importance in the areas.

Changes in the quality of human inputs through education and other forms of human capital formation deserve mention in relation to urbanization. Urbanization and human capital formation both appear to be responses to factors that lead to economic development, rather than urbanization being a primary cause of human capital formation or vice versa. Like physical capital formation, human capital formation results in increases in output per person and allows a given demand to be fulfilled by fewer people. Given the demands for urban and for nonurban commodities, a higher rate of increase in human capital per person in nonurban than in urban production will be conducive to a high rate of urbanization, since the demand for nonurban commodities can be fulfilled by fewer people. The increase in educational levels and the growth of skilled and professional categories of employment in cities are sometimes thought to be necessary conditions for development. Yet farmers also become better educated. Nonurban production may use a lower amount of human capital per person at the early stages of development, and the level may remain lower through a great part of the development process even though human capital per person in nonurban production is continually rising and may indeed be rising at a faster rate than in urban production. The faster rise in human capital per person in nonurban than in urban production leads to the hypothesis that increases in nonurban human capital could contribute to a high

rate of urbanization. This effect, however, may be secondary to the consideration that both urbanization and human capital formation are basically results rather than causes of economic development.

Population

The demand and supply considerations discussed so far pertain to the relative rate of urbanization, or urbanization per capita, and would be sufficient to explain urban growth in a country with stable population. Growing total population provides a kicker to both urban and nonurban population growth. The rapid population growth rates in some parts of the world mean that much urbanization comes simply from the fact that there are more people in the country.

The Traditional Model of Urbanization

The discussion has considered the role of the income elasticities of demand in determining urbanization, the factors that affect output per person in each sector, and the role of total population growth. The following formula brings those factors together into an expression for understanding their combined influence on the rate of urbanization.

$$\dot{N}_u = \frac{(\eta_u/\eta_a)\dot{T}_a - \dot{T}_u}{(\eta_u/\eta_a)\,(N_u/N_a) + 1} + \dot{N}. \tag{2-1}$$

Since the urban population N_u equals the proportion urban n_u times total population N (or, $N_u = n_u N$), the percentage change in the urban population $\dot{N}_u$ is the percentage change in proportion urban $\dot{n}_u$ plus the percentage change in total population $\dot{N}$ (or, $\dot{N}_u = \dot{n}_u + \dot{N}$), which is the basis of equation 2-1. The variable on the left-hand side, $\dot{N}_u$, is the annual percentage rate of growth of the urban population. The first term on the right-hand side is the percentage rate of change in the proportion of the population which is urban. It includes all the considerations discussed earlier except the effect of total population growth of the country, which is given by the second term on the right-hand side, $\dot{N}$.

Note that the ratio of the percentage increases in output per capita of urban and nonurban commodities will be in the ratio of their income elasticities. (Recall that the income elasticities are redefined to take account of international trade effects.) This first condition can be written $\dot{y}_u/\dot{y}_a = \eta_u/\eta_a$, where $\dot{y}_u$ is the percentage rate of growth of urban output per capita ($\dot{y}_u = Y_u/N$, or urban output divided by the country's total population) and η_u is the trade-adjusted income elasticity of demand for urban commodities. Similar definitions apply to $\dot{y}_a$ and η_a, where the subscript a stands for nonurban commodities.

Considerations that affect output per person are brought in by noting that the percentage increase in output per capita for any commodity is equal to the percentage change in output per person engaged in production of the commodity plus the percentage change in the proportion of people in the nation engaged in that production. The second and third conditions are thus $\dot{y}_u = \dot{T}_u + \dot{n}_u$ for urban commodities and $\dot{y}_a = \dot{T}_a + \dot{n}_a$ for nonurban commodities, where $\dot{T}$ is percentage change in output per person engaged in production and $\dot{n}$ is percentage change in the proportion of people engaged in production. The second and third conditions follow from differentiation of the identity that output equals number of workers times output per worker. The fourth condition is that any change in the urban proportion of the population must be accompanied by an equal and opposite change in the nonurban proportion. In percentage terms the fourth condition is $\dot{n}_u = -(N_a/N_u)\dot{n}_a$, where N_a and N_u are the numbers of persons in nonurban and urban areas. The four conditions that have been given determine the four variables $\dot{y}_u$, $\dot{y}_a$, $\dot{n}_u$, and $\dot{n}_a$. The first term on the right-hand side of the above expression for the rate of growth of urban population is the solution of the set of four conditions for $\dot{n}_u$, the percentage change in the proportion of the population which is urban.

As can be seen from equation 2-1, the numerator of the term giving the percentage change in the proportion urban is equal to the negative of the rate of growth of output per person in production of urban commodities (that is, an increase in urban productivity, acting alone, leads to a decrease in urban population because the demand for urban commodities can be met by fewer people) plus the ratio of urban to nonurban income elasticities multiplied by the rate of growth of nonurban output per person (growth in nonurban output per person releases persons for urban activities, and the magnitude of the effect depends on the income elasticities). The denominator—one plus the product of the ratio of income elasticities and the ratio of the numbers of people in urban and in nonurban areas—arises because of the interactions of the various effects.

The second term in equation 2-1 is $\dot{N}$, the percentage rate of growth of total population of the country. Its presence indicates that when changes in the proportion of the population that is urban are taken into account, the urban population varies in direct proportion to the number of people in the country.

From the formula it is clear that rates of urbanization may differ with conditions in particular countries. As an example consider a country, still at an early stage of development, in which per capita income is rising somewhat rapidly. If the growth is oriented toward growth of manufacturing products that are exported to world mar-

kets, the ratio of the increase in urban and in nonurban output, η_u/η_a, will be rather high—say, 4. Suppose that one-third of the population is in urban areas and two-thirds is in rural areas, so that the value for N_u/N_a is 0.5. Output per worker in urban areas is assumed to be rising at 2 percent a year ($\dot{T}_u = 0.02$). As a result of progress in a commercialized part of agriculture and the decline of subsistence agriculture, output per worker in agriculture is also assumed to rise at the rate of 2 percent a year ($\dot{T}_a = 0.02$). It is assumed that the total population of the country is growing at 1.5 percent a year ($\dot{N} = 0.015$). The values are substituted into the formula for the yearly percentage growth in the urban population.

$$\text{(2-2)} \qquad \dot{N}_u = \frac{4 \cdot 0.02 - 0.02}{4 \cdot 0.5 + 1} + 0.015 = 0.035.$$

That is, the annual growth rate for the urban population is 3.5 percent.

Examples of much more rapid or of slower urbanization can be constructed by varying the values. The purpose of this section, however, has not been to explain the rate of urbanization for any one country but to begin to suggest the nature of the underlying changes in demand and supply that determine urbanization.

A More General Explanation

The discussion points to generalizations about why worldwide urbanization is occurring. One reason is that incomes are rising in many places, albeit in varying degrees. The higher income elasticity of demand for urban than for nonurban commodities is a fundamental reason why urbanization can be expected to accompany economic development throughout the world.

Another reason for world urbanization is more closely related to the nature of the economic development that is occurring. For much of the world economic development entails a transfer of techniques of production, and by and large the techniques are more transferable for urban than for agricultural commodities. Techniques of agricultural production are much more tied to local land and climate conditions. Efforts are being made to develop and adapt agricultural techniques to suit the unique conditions of each area of each country, but the pace, at best, is slow. Moreover, agriculture, as an inherent user of location-specific resources, is subject to intrinisic comparative advantages. Increasing specialization of agricultural production among major regions of the world may be in store.

Urban production, on the other hand, is not nearly as location-bound. Factories, machines, and electronics parts tend to be physically similar the world over in their requirements for productive inputs. It is not surprising that developing countries are increasingly getting out of the agricultural business and into urban-based production.

Although the model of the preceding section allows for the effects of trade in the specification of income elasticities, it is not fully consistent with the general reasons for rising urban population connected with specialization in production noted above. In equation 2-1 a rise in agricultural productivity will increase urbanization because a given demand for agricultural products can be satisfied by fewer people and the excess people move to the cities. In like fashion, a rise in urban productivity acts to decrease urbanization, since fewer people are needed to satisfy the demand for urban products. The amounts of labor required for production in both sectors change according to a life of their own, and amounts of output are not affected by productivity changes.

Yet one might think that if a sector became more efficient, it would increase its production, not decrease it. An increase in efficiency lowers the price at which a given quantity can be produced. If the price elasticity of demand is greater than zero, a lowering of the price will increase the amount that can be sold. A production response is to be expected.

Indeed, if the responses to changes in production take the form of adjustments in foreign exports and imports, prices are effectively set in world markets where demands are highly elastic and where in many cases prices can be taken as given. Even within an economy, a more adequate view of the differences between urban and rural production will recognize that there is not a strict dichotomy in the types of goods produced. Aside from local or nontraded goods in each sector, there are goods that may be produced in either sector and that can be traded between the two sectors. There may be little farm output in urban areas (although chickens and garden plots can be significant in cities), but factory production and home production of urban-type goods abound in rural areas, and trade between sectors in processed foods and other commodities is commonplace. For most of the world it may be that most consumption in either rural or urban areas is of goods produced within each area and that trade in marketed surpluses of rural and urban goods is confined to a small part of output, much of which can actually be produced in either sector.

These considerations of the way trade occurs suggest that it may be more reasonable to take prices facing rural and urban areas as given rather than to take relative quantity growth as given, as in the model presented above. If, as a first approximation, prices are taken as given, productivity changes will have the opposite effect from that implied by the model. A rise in productivity in urban areas enhances cities' ability to compete in inter-

national markets and to compete with production in rural areas and thus leads to an increase in urban production, not a decrease. An analogous result is obtained in nonurban areas, with the implication that rising nonurban productivity will retard urbanization. The results are consistent with the hypothesis that urbanization results from changing advantages in production.

Given that a rise in productivity leads to an expansion rather than a contraction of sector output, the question becomes how great the expansion will be. Since relative quantities of output change are endogenous rather than exogenous, a careful distinction is needed between changes in average labor productivity and changes in marginal labor productivity as affected by diminishing returns to employment in a sector. If there were no diminishing returns as employment increased in a sector, the assumption of given output prices (suggested here as a first approximation) would imply that, except by accident, one sector would have a higher marginal productivity of labor than the other. Migration would then lead to all the employment being in one sector or the other—one sector would go to zero and the other would have all the employment.

To avoid this unrealistic solution the assumption of given prices might be dropped, leading to a solution governed by changing prices of urban goods in relation to those of nonurban goods. But the idea that urbanization is primarily explained by massive changes in prices of urban goods in relation to those of nonurban goods—in particular, by increases in relative prices of urban goods—is not appealing. This type of change does not appear to be a pervasive world phenomenon. Endogenous relative prices can be introduced, but it would be best to do so only after a situation of given relative prices has been more fully explored.

Another way to avoid the unrealistic solution of having all employment end up in one sector or the other would be to base a solution on impediments to labor migration. Then a rise in, say, urban compared with nonurban labor productivity would increase the attractiveness of urban employment. Imperfect labor mobility would lead to a rising gap in real incomes between urban and rural sectors that might be reduced only gradually over time. One problem with this solution is that it does not avoid the outcome that all employment ends up in one sector; it only delays that outcome. Eventually, over generations, if not earlier, people all migrate to the cities in response to relative differences in earnings opportunities. The only reason for not doing so would be nonpecuniary attachments to rural life. Basing an explanation of urbanization on permanent nonpecuniary attachments to a way of life is at least as unappealing as basing it on changing relative output prices of the sectors.

If one has to choose between no labor mobility and a degree of mobility that leads to rough equalization of opportunities for real earnings between sectors, the latter appears far more defensible. One is likely to find that, historically, real earnings of comparable labor in urban and rural areas have changed by about the same amount, and the degree of net and gross migration observed between urban and rural areas is so great as to belie the notion that responses do not occur. The single most important distinguishing feature in the relations between the urban and rural parts of an economy may be that they are connected by migration. If one is not to base an explanation of urbanization on a growing disparity between real earnings of comparable labor in urban and in rural areas, it is reasonable to suppose that there is sufficient labor mobility to roughly equalize the urban and rural changes in marginal productivity that occur during economic development. The implications of lesser degrees of mobility could be considered, but this can be done more easily and with more insight after the first approximation is explored.

In distinction to the variable T that was used above to refer to average labor productivity, let A denote the influence of nonlabor inputs on the amount of output (taken to be synonymous with income produced). For nonurban production, the availability of land may partly determine A. Port facilities and other natural limitations could play a similar role in urban production. For both urban and nonurban production, private capital and the amounts of various types of infrastructure influence A. With labor N measured in terms of numbers of people or hours, A is influenced by the productive quality per person, which in turn is determined in part by human capital investment. For both urban and nonurban production, perhaps the greatest influence on A is technical knowledge used in production, which depends on encouragement of or impediments to international transfer of technology, entrepreneurship, incentive structures, and other policy and institutional considerations.

To obtain a formulation consistent with growth source analysis, take time derivatives of the production relation $Y = AN^{\varepsilon}$ and express as yearly percentage changes. Then growth in output will equal the percentage growth in nonlabor influences, $\dot{A}$, plus the product of elasticity of output with respect to labor, ε, and the percentage change in labor. For urban production,

$$\dot{Y}_u = \dot{A}_u + \varepsilon \dot{N}_u \tag{2-3}$$

and for nonurban production,

$$\dot{Y}_a = \dot{A}_a + \varepsilon \dot{N}_a. \tag{2-4}$$

The elasticity of output, ε, is almost certainly between zero and one and is closer to one than to zero. If it were one or greater, the implication would be that—other inputs being held constant—output could be increased

in equal or greater proportion to increases in labor. Under the assumption of fixed proportions the elasticity would be zero. That assumption, however, ignores the myriad of possibilities for drawing on a given amount of nonlabor inputs to produce varying physical quantities and qualities of outputs in modern factory production, office work, retailing, personal services, and traditional production as the amount of labor is varied. The relation between average labor productivity T in the preceding section and the influence of nonlabor inputs A in this section can be seen by combining the conditions $T = Y/L$ and $Y = AL^{\varepsilon}$ to obtain $T = AL^{\varepsilon - 1}$. If ε is close to one and if nonlabor influences A are more predominant as causes of change in average labor productivity than the elasticity effect of changes in labor inputs $L^{\varepsilon - 1}$, then T and A will move in a similar fashion.

To proceed to the rest of the model in this section, suppose that labor is paid a wage w that is equal to its marginal product m multiplied by price output p (or, $m = w/p$). The elasticity of output (the marginal product m multiplied by the amount of labor n divided by output y) is seen to be equal to wage payments wn divided by the value of output py. This implies that ε in equations 2-3 and 2-4 equals the share of product paid to labor, wn/py. The order of magnitude of ε as labor's share can in principle be observed rather readily. Although the elasticity of output may be different in urban and in nonurban production, in this example it is taken to be the same. Not to do so would imply that major reliance is placed on differences in factor shares in explaining urbanization.

The rate of urbanization may indeed be affected by urban-rural differences in elasticity of output as well as by changes in elasticities in particular countries. There are no compelling studies that indicate systematic differences and changes in factor shares, and the shares do seem in fact to be fairly stable. The formula for elasticity of output followed here therefore seems appropriate for an overview of major factors that explain rate of urbanization.

Given observed values of ε, equations 2-3 and 2-4 can be used in connection with measurements of income growth $\dot{Y}$ and population growth $\dot{N}$ to obtain estimates of the growth of nonlabor influences, $\dot{A}$. When either equation 2-3 or equation 2-4 is solved for $\dot{A}$, $\dot{A}$ is found to be $\dot{Y}$ minus $\varepsilon\dot{N}$. The estimate of growth of nonlabor sources of income in a sector is the observed income growth less that part of income growth attributable to labor, which in turn is equal to labor's elasticity of output multiplied by the population growth of the sector.

An essential feature of the model is that labor will adjust to keep the relative earnings of urban and rural employment in line. To incorporate this feature, the condition pertaining to the elasticity of output derived above, $\varepsilon = wn/py$, can be rearranged as an expression for the wage in a sector, $w = \varepsilon py/n$. With the use of rates of change for the two sectors,

$$\dot{W}_u = \dot{P}_u + \dot{Y}_u - \dot{N}_u \tag{2-5}$$

and

$$\dot{W}_a = \dot{P}_a + \dot{Y}_a - \dot{N}_a \tag{2-6}$$

assuming that ε is a stable parameter ($\dot{\varepsilon} = 0$). The Ps in these conditions refer to prices of output produced; the relevant deflator that determines labor supply response is an index of prices of goods consumed. The level of prices may differ greatly between urban and rural areas. If prices move proportionately over time and relative real earnings in urban and rural areas remain roughly the same, the rate of growth of wages in the two sectors will be similar, which yields the condition $\dot{W}_u = \dot{W}_a$. The right-hand sides of equations 2-5 and 2-6 can then be set equal to each other.

If the approximation is retained that changes in prices of urban-produced goods relative to those of rural goods will not in the first instance be used as an explanation of the rate of urbanization, $\dot{P}_u = \dot{P}_a$. Then the condition obtained from setting the right-hand sides of equations 2-5 and 2-6 equal to each other is

$$\dot{Y}_u - \dot{N}_u = \dot{Y}_a - \dot{N}_a. \tag{2-7}$$

This condition has the strong empirical implication that the excess of the rate of income growth over the rate of employment growth will be the same in urban and in nonurban areas. Put another way, average labor productivity will change by the same proportion in both sectors.

Income produced in the two sectors may change by greatly different amounts—that is, $\dot{Y}_u$ and $\dot{Y}_a$ may be very different. The differential changes in income produced are a result of differences in growth of nonlabor sources of income, which lead to corresponding differences in growth of demand for labor. For example, if nonlabor sources of income growth increase more rapidly in urban than in rural areas, the demand for labor will increase more in urban than in rural areas. The increase in nonlabor sources of income and the associated increase in labor inputs will raise income by $\dot{Y}_u$ and employment by some lesser amount, $\dot{N}_u$. Meanwhile, because of the slower growth of nonlabor income sources in rural production, $\dot{Y}_a$ will be smaller than $\dot{Y}_u$ and $\dot{N}_a$ will be correspondingly smaller than $\dot{N}_u$ (owing to a lesser growth in demand for labor in rural areas). If factor shares and relative wages and prices are not to change, the rise in ratio of income to employment must be the same in the two sectors.

How well does the condition stated in equation 2-7, that average labor productivity will change by the same

proportion in urban and rural employment, fit the facts? For sixty-six low- and middle-income economies for which the requisite income and population figures are available to study growth rates for 1960–80, the mean of the excess of the proportionate change in average urban labor productivity over average rural productivity is − 0.0001. The standard error of this mean is 0.0029. In these comparisons real nonagricultural and agricultural incomes are used as surrogates for urban and rural incomes. It is assumed that employment is roughly proportional to population, so that urban and rural populations can be used as surrogates for employment.

Alternatively, still with nonagricultural and agricultural incomes as surrogates for urban and rural incomes, the labor force in agriculture can be used as a surrogate for rural employment and the nonagricultural labor force as a surrogate for urban employment. Or, more simply, the comparison may be viewed as an application of the model to agricultural versus nonagricultural employment rather than to urban versus rural employment. If agricultural and nonagricultural labor forces are used, rather than rural and urban populations, the mean of the excess of the proportionate change in average nonagricultural labor productivity over that of average agricultural productivity is 0.0024 and the standard error is 0.0029.

To further test the extent to which equation 2-7 is satisfied, if the error attributable to the fact that observed changes in average productivity do not exactly fulfill the equation is small, most of the observed changes in output and employment will be explained by the model. The small size of the error in relation to total income or employment change is an indication of the extent to which the hypothesis of equal proportionate changes in average labor productivity is fulfilled.

An error-of-fit measure, calculated for each economy, is the proportionate annual change in average labor productivity as a fraction of the mean of annual proportionate urban and rural population growth. The median of the error-of-fit measures over all sixty-six economies is 0.030. Two-thirds of the measures fall between − 0.735 and 0.826. When nonagricultural and agricultural labor forces are used instead of urban and rural populations, the median error-of-fit measure for the sixty-six economies is 0.067. Two-thirds of these measures fall between − 0.981 and 0.828.

The fact that most of the error-of-fit measures are substantially less than 1 indicates that most of the observed variation in output and employment is associated with growth of nonlabor income sources and the hypothesized proportionate changes in labor and that relatively little change is left to be explained by errors or departures from the hypotheses of the model. The existence of nonzero error of fit may be partly a result of errors or differences in the way variables are calculated from available data. The uncertainty of output and employment figures is well known, and the reasons for differing changes in measured employment and output connected with changing market orientation of production during development have often been discussed. In general, more production may pass through the marketplace as economic development proceeds over a twenty-year period, but because of lags in data collection, statistics may capture these changes only imperfectly.

Nonzero error of fit may also occur because assumptions of the model that are justified as first approximation may not be exactly fulfilled. But the small size of the errors suggests that the principal factors are indeed captured by the model. In view of all the possible reasons for existence of error, it is fair to say that the data fit the model well.

It was specified that growth in output can be represented as the sum of labor and nonlabor effects in each sector in equations 2-3 and 2-4. Condition 2-7 (for changes in employment relative to output in each sector as migration occurs in response to changes in demand) was then derived. The model is completed by using the condition discussed above—that the total amount of labor used in the economy is the sum of urban and nonurban labor, or $N = N_u + N_a$. The equation is differentiated with respect to time and divided by the original values of the variables. The annual proportionate rate of growth of the total population is expressed as the product of the urban share of population and annual proportionate rate of growth of the urban population, plus the product of the nonurban share and the annual proportionate rate of growth of the nonurban population; that is,

$$\dot{N} = F_u \dot{N}_u + F_a \dot{N}_a. \tag{2-8}$$

The four-equation model given by formulas 2-3, 2-4, 2-7, and 2-8 determines the four rates of growth that pertain to output and employment in the two sectors, that is, $\dot{Y}_u$, $\dot{Y}_a$, $\dot{N}_u$, and $\dot{N}_a$. To solve for the variable of interest—urban population growth, $\dot{N}_u$—equations 2-3 and 2-4 are substituted into equation 2-7 to eliminate the Ys. The result is a relation between $\dot{N}_u$ and $\dot{N}_a$ that depends on the rates of growth of nonlabor sources of income in the two sectors. The relation can be written $\dot{N}_a = \dot{N}_u + (\dot{A}_u - \dot{A}_a) / (1 - \varepsilon)$, indicating that urban and rural populations move proportionately except as they are influenced by differential changes in growth of nonlabor sources of income, which have a multiplier effect of $1 / (1 - \varepsilon)$ because under the model enough labor must be hired to drive the return to labor down to the same level in each sector. The result for $\dot{N}_a$ is inserted into condition 2-8 for total employment and the equation is solved for $\dot{N}_u$:

$$\dot{N}_u = \dot{N} + \left(\frac{F_a}{1-\varepsilon}\right)\dot{A}_u - \left(\frac{F_a}{1-\varepsilon}\right)\dot{A}_a. \tag{2-9}$$

The solution of the model for $\dot{N}_u$ given by equation 2-9 provides the basis for decomposing the rate of growth of the urban population into three factors. The first is total population growth of the nation, $\dot{N}$, which has a proportionate effect on urban population growth. The second is an urban productivity factor that stems from growth of nonlabor sources of urban production. The positive effect of increases in nonlabor sources of urban production is enhanced by the multiplier $1 / (1 - \varepsilon)$ that is connected with keeping earnings growth the same in the two sectors, and the magnitude of the effect is also proportional to the fraction of the population in agriculture. A given change in the absolute level of employment as labor is reallocated will have a greater proportionate effect on urban population the smaller is the existing fraction of the population that is urban (which is to say, the larger the fraction that is nonurban). The third factor into which urban population growth is decomposed is a rural productivity factor which stems from growth of nonlabor sources of rural income. It is exactly analogous to the urban productivity factor, but it acts on urban population growth with a negative sign, since in this model a rise in rural productivity increases rural population.

Application to the Sample

Measures of the rate of population growth $\dot{N}$ to be applied to equation 2-9 are readily available. The fraction of the population that is not urban, F_a, is available for many countries but may be subject to more error than total population. Systematic measures of labor's elasticity of output ε that are comparable among sectors and nations are apparently not available, but impressions about general orders of magnitude can be obtained. Although the growth in nonlabor sources of income (the $\dot{A}$s) cannot be directly observed, first-cut measurements can be obtained with the use of equations 2-3 and 2-4. That is, when either equation is solved for $\dot{A}$, the contribution of growth in nonlabor sources of income to observed income growth is equal to the observed income growth $\dot{Y}$ minus the product of elasticity of output of labor ε and the growth rate of labor $\dot{N}$. (That is, the nonlabor source of income growth is total income growth minus the contribution of labor to income growth.)

The calculations just described give only first-cut or, at most, suggestive measurements of the $\dot{A}$s because they ignore the stipulation of the model that average labor productivity rises at the same rate of growth in both sectors. The measures are dependent on the estimates of growth of urban and rural income, which may be subject to great measurement errors and possible inconsistencies in definition. To minimize the effects of measurement problems, the procedure used here is to average the changes in income in the two sectors and thus obtain income measures that conform to the productivity condition. Specifically, the average excess of the rate of growth of income in each sector over the rate of population growth in each sector yields an estimate of the common rise in average labor productivity in the two sectors. This estimate made on the basis of the observed average for the two sectors can be added to population growth in each sector to obtain the measures of income growth in the sectors that would prevail if the model fitted the real situation precisely. After this attempt to purge the income measurements of error and to eliminate the effects those errors would spuriously introduce into estimates of the factors that affect urbanization, estimates of the $\dot{A}$s may be obtained as before by subtracting the product of labor elasticity of output and the amount of labor from the income values that conform to the average labor productivity condition.

Table 2-2 presents the results obtained when the model is applied to sixty-six low- and middle-income economies, using urban population statistics from the World Bank and an estimate of labor's share ε of 0.7. Column 1, the annual proportionate growth of urban population in each economy from 1960 to 1980, is the variable to be explained. Column 2 is the average fraction of the population that is urban for 1960–80. This fraction was calculated to conform to equation 2-8, which relates the rates of urban and rural population growth to the rate of growth of the total population. The fraction of the population that is rural, F_a, is $1 - F_u$. Arrangement of equation 2-8 as an expression for F_u gives as the fraction of the population that is urban $F_u = (\dot{N} - \dot{N}_a) / (\dot{N}_u - \dot{N}_a)$, the ratio between the excess of total population growth over nonurban population growth and the excess of urban over nonurban population growth. This measure is quite close to the simple average of the 1960 and 1980 values for the fraction of the population that is urban, and in all cases it lies between those values. The method just described for calculating F_u in conformance with equation 2-8, along with the method described above for calculating the growth of nonlabor income sources $\dot{A}$ to conform to equations 2-3 and 2-4, ensures an internally consistent system of accounting in which the factors that explain urban population growth exactly add up to urban population growth. Although other procedures for defining variables might have given about the same results, the procedures used here have the advantage of eliminating idiosyncracies in definition as a perceived reason for differences in rate of urbanization. The analytic factors that explain urban population

Table 2-2. *Urban Population Change, Sixty-six Economies, 1960–80*

Economy	Annual proportionate change in urban population, $\dot{N}_u$ (1)	Urban share of population, 1980, F_u (2)	Annual proportionate growth in urban nonlabor sources of income, $\dot{A}_u$ (3)	Annual proportionate growth in nonurban nonlabor sources of income, $\dot{A}_a$ (4)	Components of change in urban population			Error of fit, $(\dot{A}_u - \dot{A}_a)/\frac{1}{2}(\dot{N}_u + \dot{N}_a)$ (8)
					Annual proportionate change in total population, $\dot{N}$ (5)	Urban productivity factor, $F_a\dot{A}_u/(1-\varepsilon)$ (6)	Nonurban productivity factor, $-F_a\dot{A}_a/(1-\varepsilon)$ (7)	
Bangladesh	0.066	0.076	0.006	−0.007	0.027	0.017	0.022	−0.413
Ethiopia	0.070	0.099	0.016	0.001	0.024	0.048	−0.002	−0.171
Mali	0.054	0.151	0.016	0.005	0.024	0.045	−0.015	0.196
Somalia	0.052	0.231	−0.025	−0.036	0.024	−0.065	0.093	1.527
Chad	0.067	0.118	−0.010	−0.026	0.020	−0.030	0.077	−1.101
Burma	0.039	0.228	0.019	0.012	0.022	0.048	−0.030	−1.193
Burkina Faso	0.045	0.068	−0.001	−0.010	0.016	−0.002	0.032	0.828
India	0.032	0.199	0.019	0.015	0.022	0.051	−0.041	0.567
Malawi	0.070	0.062	0.028	0.016	0.029	0.089	−0.049	−0.249
Rwanda	0.062	0.029	0.018	0.007	0.027	0.059	−0.024	−0.096
Sri Lanka	0.041	0.223	0.019	0.012	0.021	0.050	−0.030	−0.315
Guinea	0.061	0.141	0.013	0.002	0.029	0.038	−0.006	−0.190
Zaire	0.060	0.242	−0.006	−0.021	0.023	−0.016	0.053	−0.176
Niger	0.070	0.091	−0.001	−0.014	0.031	−0.003	0.042	−0.554
Benin	0.044	0.119	0.007	0.001	0.027	0.021	−0.004	0.633
Pakistan	0.041	0.249	0.030	0.025	0.029	0.074	−0.062	0.442
Tanzania	0.072	0.080	0.023	0.009	0.028	0.070	−0.026	0.004
Central African Republic	0.051	0.315	0.007	−0.005	0.022	0.017	0.012	−0.747
Haiti	0.055	0.247	0.004	−0.012	0.016	0.009	0.030	−1.060
Mauritania	0.128	0.102	0.009	−0.025	0.026	0.026	0.076	−0.313
Lesotho	0.067	0.033	0.039	0.025	0.021	0.126	−0.080	0.969
Uganda	0.077	0.080	0.006	−0.008	0.034	0.018	0.026	−0.724
Sudan	0.070	0.166	0.003	−0.013	0.024	0.009	0.037	−0.027
Togo	0.053	0.132	0.034	0.025	0.026	0.098	−0.071	0.671
Kenya	0.070	0.101	0.017	0.005	0.035	0.051	−0.016	−0.246
Senegal	0.029	0.240	0.010	0.008	0.025	0.025	−0.021	−0.538
Indonesia	0.035	0.174	0.037	0.031	0.020	0.101	−0.087	0.826
Egypt	0.031	0.415	0.037	0.033	0.022	0.073	−0.065	1.046
Ghana	0.049	0.292	−0.001	−0.011	0.026	−0.002	0.025	−0.735
Honduras	0.054	0.292	0.017	0.007	0.032	0.040	−0.017	−0.473
Zambia	0.054	0.301	0.019	0.008	0.029	0.045	−0.020	−1.449
Thailand	0.033	0.135	0.046	0.045	0.029	0.133	−0.129	1.101
Bolivia	0.042	0.284	0.025	0.018	0.026	0.059	−0.043	−0.030
Philippines	0.038	0.330	0.032	0.028	0.029	0.071	−0.062	0.009
Congo	0.028	0.350	0.004	0.001	0.023	0.008	−0.002	1.138
Nigeria	0.047	0.163	0.024	0.016	0.025	0.066	−0.045	1.500
El Salvador	0.036	0.395	0.022	0.020	0.033	0.043	−0.040	0.495
Morocco	0.044	0.348	0.021	0.013	0.027	0.045	−0.028	0.260
Peru	0.047	0.567	0.027	0.014	0.028	0.039	−0.020	−0.149
Côte d'Ivoire	0.080	0.278	0.032	0.018	0.045	0.077	−0.042	0.009
Nicaragua	0.043	0.470	0.041	0.034	0.031	0.073	−0.060	−0.494
Colombia	0.045	0.593	0.040	0.026	0.026	0.054	−0.035	−1.148
Paraguay	0.031	0.375	0.034	0.032	0.027	0.071	−0.067	0.077
Dominican Republic	0.055	0.402	0.032	0.019	0.029	0.064	−0.037	0.044
Guatemala	0.037	0.360	0.035	0.031	0.028	0.075	−0.066	−0.057
Syrian Arab Republic	0.047	0.434	0.048	0.040	0.032	0.091	−0.076	−0.384
Malaysia	0.036	0.270	0.042	0.039	0.028	0.103	−0.095	0.652
Jamaica	0.034	0.419	0.015	0.005	0.015	0.029	−0.010	−1.283
Korea, Republic of	0.056	0.410	0.064	0.047	0.022	0.125	−0.092	0.334

Table 2-2 (*continued*)

Economy	*Annual proportionate change in urban population,* $\dot{N}_u$ (1)	*Urban share of population, 1980,* F_u (2)	*Annual proportionate growth in urban nonlabor sources of income,* $\dot{A}_u$ (3)	*Annual proportionate growth in nonurban nonlabor sources of income,* $\dot{A}_a$ (4)	*Components of change in urban population*			*Error of fit,* $(\dot{A}_u - \dot{A}_a)/$ $\frac{1}{2}(\dot{N}_u + \dot{N}_a)$ (8)
					Annual proportionate change in total population, $\dot{N}$ (5)	*Urban productivity factor,* $F_a\dot{A}_u/(1-\varepsilon)$ (6)	*Nonurban productivity factor,* $-F_a\dot{A}_a/(1-\varepsilon)$ (7)	
Turkey	0.047	0.383	0.036	0.026	0.025	0.075	−0.053	0.301
Algeria	0.065	0.452	0.002	−0.017	0.030	0.004	0.031	−0.195
Mexico	0.046	0.592	0.029	0.018	0.033	0.039	−0.025	0.122
Panama	0.044	0.475	0.034	0.026	0.030	0.060	−0.046	0.012
Taiwan	0.038	0.680	0.057	0.044	0.024	0.061	−0.046	1.408
Chile	0.028	0.749	0.027	0.016	0.019	0.022	−0.014	−2.719
Costa Rica	0.038	0.400	0.033	0.039	0.030	0.067	−0.059	0.276
Brazil	0.046	0.556	0.042	0.030	0.028	0.062	−0.045	0.260
Uruguay	0.010	0.821	0.016	0.011	0.008	0.009	−0.007	−5.082
Argentina	0.019	0.782	0.029	0.022	0.014	0.021	−0.016	−0.914
Portugal	0.018	0.269	0.029	0.023	0.003	0.070	−0.055	5.940
Yugoslavia	0.030	0.348	0.042	0.033	0.010	0.091	−0.071	0.430
Venezuela	0.044	0.756	0.042	0.029	0.034	0.035	−0.024	−1.436
Hong Kong	0.023	0.895	0.044	0.042	0.023	0.015	−0.015	2.877
Greece	0.024	0.526	0.054	0.042	0.006	0.085	−0.066	−0.601
Spain	0.024	0.658	0.048	0.037	0.011	0.055	−0.042	0.894
Israel	0.039	0.836	0.050	0.037	0.031	0.027	−0.020	−0.642

Note: Economies are listed in increasing order of 1978 per capita income.

growth in fact add up exactly to measured urban population growth.

Columns 3 and 4 present measures of the average annual rate of growth of the sources of nonlabor urban and nonurban income $\dot{A}$, with the use of the purged income values, as described above.

The key columns are 5, 6, and 7. They show the decomposition of the annual proportionate urban population growth given in column 1 into the three terms in equation 2-9. Thus, column 5 is the annual proportionate overall population growth of the economy, which makes a direct and equal contribution to urban population growth. Column 6 is the urban productivity factor, which gives the effect of nonlabor urban income source growth on the rate of urban population growth. Column 6 is column 3 multiplied by the nonurban fraction of the population (calculable from the table as 1 minus the urban fraction in column 2) and divided by the share of income that accrues to factors of production other than labor, $1 - \varepsilon$ (in this case, $1 - 0.7$, or 0.3). Column 7, the nonurban productivity factor, is calculated from column 4 in the same way as the urban productivity factor is calculated from column 3, except that the sign is changed, since nonurban productivity acts in the opposite direction from urban productivity as an influence on the rate of urbanization.

Column 8 presents the error-of-fit measure for each economy. As discussed earlier, that measure is the difference between urban and nonurban average productivity change (based on observed income) divided by the average employment change in the two sectors. A positive sign indicates a greater urban than nonurban average increase in labor productivity, using observed measures of income; a negative sign indicates the reverse. A value of less than one in absolute terms indicates that relatively more of the employment changes are associated with the factors explained by the model than with failure to satisfy exactly the proportionate productivity condition. The effect of the error is smaller the closer is the value to zero.

Column 5, proportionate total population growth, shows, as expected, that total population growth accounts for a rate of urbanization that is generally on the order of 2 percent a year (0.020, as a decimal fraction, as expressed in the table). It ranges up to 3 percent in some cases and for certain economies, such as Yugoslavia, is very low. The direct effects of population growth thus cannot account for the high rates of urbanization—up to 7 percent—which are found in the table. Population growth could also cause pressure on limited agricultural land supplies and force growing numbers of people to seek work in urban areas. This effect would be

manifested in a resource scarcity situation in which supplies of nonlabor resources were more expansible in urban than in rural areas. If nonlabor resources were as scarce in urban as in rural areas, in the sense of having an elasticity of supply that is zero or equally small, nonlabor inputs would tend to increase by similar relative amounts in both rural and urban areas and there would be little impetus to urbanization. In a situation in which limited supplies of land provided the major impetus to urbanization, one would expect to see limited increases in nonlabor sources of income growth in rural areas, coupled with larger increases in labor inputs in urban areas as the supply of urban sites with associated infrastructure and other urban facilities expanded to accommodate people displaced from agriculture. These endogenous increases in urban nonlabor inputs would be greater than the increases in agricultural nonlabor inputs, but if the only important impetus to urbanization were displacement of agricultural labor, the increases in urban nonlabor inputs still might not be great, since in this depiction of the world more vigorous positive impetuses to economic development are lacking.

One might suppose that economies with less than 1 percent a year growth in agricultural nonlabor inputs may have a land scarcity situation. In table 2-2 twenty-five of the sixty-six economies have growth of nonlabor sources of nonurban income of less than 1 percent a year (or, as a decimal fraction, 0.010) as indicated in column 4. Of these, ten experienced negative rates of change in nonlabor sources of income, which indicates retrogression and other special factors not explained by the usual land scarcity situation. Note that land scarcity does not imply negative growth of nonlabor sources of income but rather no growth or a very small increase. The economies with low and negative growth for nonlabor sources of nonurban income tend to be among those with the lowest incomes, as indicated by their early appearance in the table. (Economies are ranked by 1978 per capita income.) It is also true that these economies generally have high urbanization rates. In the five lowest-income economies (Bangladesh, Ethiopia, Mali, Somalia, and Chad) rates of change for nonlabor sources of rural income are negative or less than 1 percent a year. Each had a rate of growth of urban population of over 5 percent a year (0.050, as a decimal). Of the twenty-five economies with low or negative growth of nonlabor sources of rural income, only three—Senegal, Congo and Jamaica—had an urban population growth of less than 4 percent a year. By contrast, in only twenty of the forty-one economies where growth of nonlabor sources of rural income was greater than 1 percent were annual rates of urban population growth more than 4 percent.

The apparent tendency for high rates of urbanization to be associated with low rates of growth of nonlabor rural income sources does not prove that land scarcity has been a highly important reason for rapid urbanization. A more likely explanation of the finding may be the general sluggishness of agriculture in the twenty-five economies and a general failure to advance knowledge or introduce new techniques—in short, a failure of nonland conventional and nonconventional inputs to increase, even though land supply may have been elastic. Lack of inputs other than land may have acted to depress the marginal productivity of labor and hence the demand for labor in rural areas. If so, it is a lack of effective economic development in agriculture and not a lack of land that helped to foster high urbanization rates among the countries that experienced low rates of growth of nonlabor rural income sources.

The interpretation of events in terms of a more general economic development perspective that goes beyond preoccupation with the role of agricultural land is strengthened by considering additional results in table 2-2. One of the striking relations in the table is the positive association between growth rates of urban and rural nonlabor sources of income, as revealed by looking down columns 3 and 4. The two series have a simple correlation coefficient (R^2) of 0.964. Two reasons may be noted for the positive association. First, the nonlabor income sources include capital, which is mobile between sectors. Increases in the capital stock of an economy will tend to be allocated among sectors so as to equalize the marginal returns to capital and impart changes in the same direction to nonlabor income sources in the different sectors. Second, and perhaps more important, the nonlabor income sources reflect more general economic development changes, in addition to conventional inputs, that act to increase the productivity of the conventional inputs. There is some tendency for the effects of economic development changes to be pervasive; for example, the influence of research, infrastructure, incentive structures, and institutions tends to be felt throughout an economy. Just as there is a tendency to equalize returns to conventional inputs among sectors, there is some tendency to equalize returns to deeper economic development efforts, even though the latter tendency may be less perfect. The fact that the economies in table 2-2 which have low rates of growth of nonlabor rural income sources also tend to have low rates of growth of nonlabor urban income sources suggests that general economic development differences, and not primarily agricultural land, are at work in explaining those economies' high rates of urbanization.

An ancillary finding in table 2-2 is that the growth in nonlabor sources of income tends to rise with the per capita income of the economy (which is to say, it rises as one looks down the table). The simple R^2 between the income rank of an economy (as indicated by its order in

the table) and the urban nonlabor income source growth rate in column 3 is 0.658. The simple R^2 between income rank and the rural nonlabor income source growth rate in column 4 is 0.642. The finding reflects the tendency among these economies for the more affluent among them to gain in relation to the less affluent.

To return to factors that affect the rate of urbanization, it is noteworthy that when columns 3 and 4 of table 2-2 are compared, for every one of the sixty-six economies the growth rate of urban nonlabor income sources is greater than that for rural nonlabor income sources. This finding is consistent with the hypothesis noted earlier, that the techniques of urban production are easier to transfer among economies than those of agricultural production. Since an excess of urban over rural nonlabor income source growth acts to foster urbanization in this model, the rate of urban population growth is greater than the rate of overall population growth for every one of the sixty-six economies.

A final consideration in interpreting table 2-2 is the role of the fraction of the population which is urban. If this fraction is small, any differential change between urban and rural nonlabor income source growth has a magnified effect on urban population. The reason is that a given absolute change has a greater percentage effect on a small number than on a large number. This effect is reflected in equation 2-9, in which the coefficient $F_a / (1 - \varepsilon)$ multiplies the growth rate of nonlabor income source to arrive at the urban and rural productivity factors. Thus, economies with large nonurban fractions in their populations tend to have greater urbanization rates. Since these economies generally have low per capita incomes, they are the ones that have predominantly experienced the highest urbanization rates.

Progressing down the table to increasingly higher-income economies, one finds that the difference between urban and rural nonlabor income source growth stays about the same or becomes larger, but the contributions of the urban and rural productivity factors decrease because of the declining value of the multiplier $F_a / (1 - \varepsilon)$. Since $F_a = 1 - F_u$, the multiplier will be greater than one if the fraction of the population that is urban is greater than the share of income that accrues to labor. The condition would be fulfilled for all but a handful of the economies, regardless of the value of ε, but the multiplier falls more and more toward one toward the bottom of the table. The rates of growth of urban population decline until they are not much greater than the rate of overall population growth. This is shown in equation 2-9, which gives an analytic explanation for the descriptive finding of the association between the fraction that is urban and the growth rate of urban population.

The analysis presented here of factors that affect urbanization was carried out for three other cases: a population analysis in which labor share, ε, is 0.5 instead of 0.7; and two labor force analyses that use nonagricultural labor force as a surrogate for urban labor force, with ε at 0.7 in one case and 0.5 in the other. The results were essentially similar to those presented here.

The existence of many variations from the general patterns that have been discussed indicates that conditions in individual economies play a part in urbanization. India and Burma are among the economies which stand out particularly as exceptions to some of the patterns in table 2-2. Both rank low in per capita income and have high nonurban proportions of population, yet unlike most other economies with these characteristics they have relatively low urbanization rates. Growth rates of urban and rural nonlabor income sources are largely offsetting in these two countries. The size of the Indian economy might influence the result, but this consideration would not apply to Burma.

India and Burma are only two examples that indicate the usefulness of more analytic work for understanding patterns of urbanization. For any one of the economies, more detailed analysis could be undertaken, with more refined identification of the factors that affect urbanization as an object.

Further comparative analytic work to contrast and understand differences among regions and different types of economies is recommended to strengthen the knowledge base for prediction and policy concerned with economic development. Further work should give attention to differences in industrial structure and to considerations that affect trade. Greater detail on types of goods could be included, as could allowance for price effects, age composition, education, dependency, and other considerations bearing on work participation. The assumption that the number of workers in urban areas goes hand in hand with the population of these areas would be modified.

Conclusion

This chapter suggests that the degree to which a country succeeds in fostering growth of urban productivity is likely to be the major determinant of its urbanization. Population growth will continue to be a source of both urban and nonurban growth. Countries that lag in growth of agricultural productivity will experience added urbanization pressures.

As important as these general findings is the usefulness of the framework of this chapter as a basis for quantifying the experience of individual countries. Prediction and planning are enhanced, and the economic factors that influence the effectiveness of policies concerned with urbanization can be better understood.

Bibliography

Armstrong, Harvey, and Jim Taylor. 1978. *Regional Economic Policy and Its Analysis*. Deddington, Oxford, U.K.: Philip Allan.

Arriaga, Edward. 1970. "A New Approach to the Measurement of Urbanization." *Economic Development and Cultural Change,* vol. 18, no. 2 (January), pp. 206–18.

Berry, Brian J. L. 1961. "City Size Distributions and Economic Development." *Economic Development and Cultural Change,* vol. 9, no. 4, pt. 1 (July), pp. 573–88.

Bourne, L. S., and J. W. Simmons, eds. 1978. *Systems of Cities: Readings on Structure, Growth, and Policy*. New York: Oxford University Press.

Breese, Gerald. 1966. *Urbanization in Newly Developing Countries.* Englewood Cliffs, N.J.: Prentice-Hall.

Chapin, Stuart F., Jr. 1971. "Selected Theories of Urban Growth and Structure." In L. S. Bourne, ed., *Internal Structure of the City: Readings on Space and Enwironment*. New York: Oxford University Press.

Colosio, Donaldo. 1979. *Urbanization and Economic Development in Mexico.* Working Paper 79-19. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Currie, L. 1975. "The Interrelation of Urban and National Economic Planning." *Urban Studies,* vol. 12, no. 1 (February), pp. 37–46.

Davis, Kingsley. 1965. "The Urbanization of the Human Population." *Scientific American*, vol. 213 (September), pp. 28, 40.

———. 1971. "The Role of Urbanization in the Development Process." In Raanan Weitz, ed., *Urbanization and the Developing Countries. Report on the Sixth Rehovot Conference*. Praeger Special Studies in International Economics and Development. New York: Praeger.

Felstehausen, H. 1971. "Planning Problems in Improving Colombian Roads and Highways." *Land Economics*, vol. 47, no. 1 (February), pp. 1–13.

Friedmann, J., and C. Weaver. 1979. *Territory and Function.* University of California Press.

Hansen, Niles M. 1969. "Regional Development and the Rural Poor." *Journal of Human Resources,* vol. 4, no. 2 (Spring), pp. 205–14.

Hansen, Niles M., ed. 1976. *Public Policy and Regional Economic Development: The Experience of Nine Western Countries.* Cambridge, Mass.: Ballinger.

Harberger, C. 1970. "Economic Policy Problems in Latin America: A Review." *Journal of Political Economy,* vol. 78, no. 4, pt. 2 (January–August), pp. 1007–16.

Henderson, J. V. 1980. "A Framework for International Comparisons of Systems of Cities." Urban and Regional Report 80-3, World Bank, Washington, D.C. Processed.

Holleb, D. B. 1976. "Mao's Legacy for Revolutionary Urban Development." Working Paper. University of Chicago, Center for Urban Studies. December.

Hoselitz, Bert. 1954. "Introduction; The Role of Cities in Economic Development and Cultural Change." *Economic Development and Cultural Change,* vol. 3, no. 1 (October), pp. 4–5.

———. 1957. "Urbanization and Economic Growth in Asia." *Economic Development and Cultural Change,* vol. 6, no. 1 (October), pp. 42–54.

Kelley, Allen C., and Jeffrey G. Williamson, 1979. *Modeling Urbanization and Economic Growth*. Working Paper 79-81, Laxenburg, Austria: International Institute for Applied Systems Analysis. September.

Lasvwn, J. R. 1973. "Urbanization and Development—The Temporal Interaction Between Geographical and Sectoral Cluster." *Urban Studies,* vol. 10, no. 2 (June), pp. 163–88.

Linn, J. F. 1979. "Automotive Taxation in the Cities of Developing Countries." *Nagarlok* (January).

Lipton, Michael. 1977. *Why Poor People Stay Poor: Urban Bias in World Development.* Cambridge, Mass.: Harvard University Press.

Miller, J. C. 1979. "Regional Development: A Review of the State of the Art." AID 20523. Agency for International Development, Washington, D.C. Processed.

Mills, Edwin. 1971. "City Sizes in Developing Economies." In Raanan Weitz, ed., *Urbanization and the Developing Countries. Report on the Sixth Rehovot Conference.* Praeger Special Studies in International Economics and Development. New York: Praeger.

———. 1972. "Welfare Aspects of National Policy toward City Sizes." *Urban Studies,* vol. 9, no. 1 (February), pp. 117–24.

Pascal, Anthony H. 1971. "Urban Growth and Development: Discussion." *American Economic Review,* vol. 61, no. 2 (May), pp. 357–59.

Renaud, Bertrand. 1981. *National Urbanization Policies in Developing Countries.* New York: Oxford University Press.

Reynolds, L. G. 1975. "China as a Less Developed Economy." *American Economic Review,* vol. 65, no. 3 (June), pp. 418–28.

Richardson, Harry W. 1977. *City Size and National Spatial Strategies in Developing Countries.* World Bank Staff Working Paper 252. Washington, D.C.

Rondinelly, Dennis A., and Kenneth Ruddle. 1978. *Urbanization and Rural Development: A Spatial Policy for Equitable Growth.* New York: Praeger.

Tolley, George S. 1974. "The Welfare Economics of City Bigness." *Journal of Urban Economics*, vol. 1, no. 3, pp. 324–45.

Tolley, G. S., and G. D. Gwyer. 1967. "International Trade in Agricultural Products in Relation to Economic Development." In Herman M. Southworth and Bruce F. Johnston, eds., *Agricultural Development and Economic Growth.* New York: Cornell University Press. Pp. 403–47.

Tolley, G. S., and G. K. Kripalani. 1974. "Stages of Development and Urbanization." In A. A. Brown, J. A. Licori, and E. Neuberger, eds., *Urban and Social Economics in Market and Planned Economies.* New York: Praeger.

Tolley, G. S., and S. Smidt. 1964. "Agriculture and the Secular Position of the U.S. Economy." *Econometrica,* vol. 32, no. 4 (October), pp. 554–75.

Tolley, G. S., and Barton Smith. 1975. "Social Costs and the Rural-Urban Balance." In Earl O. Heady and Larry R. Whiting, eds., *Externalities in the Transformation of Agriculture: Distribution of Benefits and Costs from Development*. Ames, Iowa: Iowa State University Press.

Tolley, George S., Philip E. Graves, and John L. Gardner, eds. 1979. *Urban Growth Policy in a Market Economy*. New York: Academic Press.

Tolley, G. S., R. J. Krumm, and P. Graves. "Design of Incentives for Spatial Intervention for Developing Countries." Working Paper. Chicago: University of Chicago.

Townroe, Peter M. 1979. *Employment Decentralization: Policy Instruments for Large Cities in Less Developed Countries*. Vol. 10, pt. 2, in D. R. Diamond and J. McLoughlin, eds., *Progress in Planning*. Elmsford, N.Y.: Pergamon.

Wheaton, W. C., and H. Shishido. 1979. "Urban Concentration, Agglomeration Economies, and the Level of Economic Development." Working Paper. Cambridge, Mass.: MIT.