Working Paper

RURAL-URBAN MIGRATION, URBANIZATION, AND ECONOMIC DEVELOPMENT

Jacques Ledent

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International Institute for Applied Systems Analysis
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FOREWORD

Roughly 1.6 billion people, 40 percent of the world's population, live in urban areas today. At the beginning of the last century, the urban population of the world totaled only 25 million. According to recent United Nations estimates, about 3.1 billion people, twice today's urban population, will be living in urban areas by the year 2000.

Scholars and policy makers often disagree when it comes to evaluating the desirability of current rapid rates of urban growth and urbanization in many parts of the globe. Some see this trend as fostering national processes of socioeconomic development, particularly in the poorer and rapidly urbanizing countries of the Third World; whereas others believe the consequences to be largely undesirable and argue that such urban growth should be slowed down.

This paper examines how rural-urban migration evolves with economic development. Carried out in quantitative terms, the analysis is applied to actual data: time-series as well as cross-sectional data. Among other results, it provides an estimation of the degree of development (proxied by per capita GNP) beyond which rural-urban migration rates tend to level off.

A list of the papers in the Population, Resources, and Growth Series appears at the end of this paper.

Andrei Rogers
Chairman
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ABSTRACT

This paper presents an analytical expression of the rural net outmigration rate compatible with a logistic evolution of the part of the population that is urban in a rural-urban population system. The formula obtained represents a function consistent with the mobility revolution hypothesis of Zelinsky (1971): the rural net migration rate first increases, then passes through a maximum, and finally decreases toward zero.

In addition, such a formula is used to determine the dates at which, in selected developing countries, the rural net outmigration rate will start to decline; and to estimate the degree of economic development beyond which the rural net outmigration rate levels off.

CONTENTS

RURAL-URBAN MIGRATION, URBANIZATION, AND ECONOMIC DEVELOPMENT

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 percent in 1800 to 40 percent in 1975.

Urbanization is a finite process experienced by all nations in their transition from an agrarian to an industrial society and thus, different urbanization levels reflect differing degrees of economic development. On the one hand, the countries that underwent the industrial revolution in the last century--i.e., those countries that comprise today's more developed parts of the world--had about 65 percent of their population 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 percentage of their population that was urban amounted to 28 percent. According to the latest U.N. population projections of the world as a whole and some of its major areas (United Nations Population Division 1979), 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 percent of their populations, respectively, will be living in urban areas (see Table 1).

Table 1. Actual and projected percent of population living in urban areas in major world regions: 1950, 1975, 2000.

Region	1950	1975	2000
WORLD	28.95	39.34	51.29
More Developed Regions	51.02	65.27	72.24
Less Developed Regions	16.97	28.42	36.90
Africa	14.54	25.67	35.70
Latin America	41.18	61.21	70.70
Northern America	63.84	71.99	77.20
East Asia	16.72	30.70	38.63
South Asia	15.65	22.02	29.10
Europe	53.70	66.43	73.25
Oceania	61.24	73.35	80.37
USSR	39.30	60.90	71.28

Source: United Nations Population Division (1979), Annex C.

From a demographic point of view, urbanization results from two factors, i.e., rural-urban increase differentials and the migration exchange between the rural and urban sectors. However, the impact of the first factor is, in most situations, much smaller than the impact of the second factor so that the continued urbanization of the world is to be attributed, for a large part, to the continuation of rural-urban migration, "which shows no signs of abating in most of the less developed world" (Rogers 1977, p. 9).

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 (Zelinsky 1971). For this purpose, observing that the evolution of urbanization levels can, in general, be depicted by S-shaped curves, such as a logistic, we derive here an analytical expression of the function describing the evolution of the rural net outmigration which is consistent with a logistic evolution of the urbanization index. The expression obtained indicates that in the case of the rural-urban natural increase differential being negligible, the ensuing rural net outmigration rate first increases, then passes through a maximum, and finally decreases. Such a result is shown to be barely affected by values of the rural-urban natural increase differentials typically observed.

This analytical expression of the rural net outmigration rate has been applied to several countries of the Third World with differing levels of development, to determine the date at which the rural net outmigration rate will start to decline. It has also been amended for use when economic development is measured by an objective index (per capita GNP) rather than by a proxy (time), thus allowing us to determine the degree of economic development beyond which the rural net outmigration rate levels off.

The paper consists of four sections. Section I, intended as a background section, discusses in qualitative terms, the relationship between rural-urban migration and economic development. Section II presents a mathematical treatment of the evolution of rural-urban migration based on the assumption of a logistic evolution for the urbanization level. Section III and IV propose the aforementioned applications of this mathematical treatment of time-series and cross-section data on urbanization levels.

I. RURAL-URBAN MIGRATION, URBANIZATION, AND DEVELOPMENT: GENERALITIES

Urbanization is a human settlement process which 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.*

Thus, a better understanding of the dynamics of urbanization requires a focus on the process of rural <u>and</u> urban population change. The problem is then one of examining the two components-of-change of these populations: natural increase and net migration. However, due to the differential nature of the concept of urbanization, the emphasis required lies not so much on the absolute growth of the urban and rural areas but rather on their relative growth. When adopting such a perspective, urbanization becomes a dynamic process generated by two factors only, 1) rural-urban differentials in natural increase levels, and 2) population exchange from rural to urban areas through internal migration. We shall look at both factors in turn.

Natural increase is the compound result of mortality and fertility which are generally lower in urban areas than in rural areas. United Nations estimates of urban and rural crude death rates around 1960 (Table 2) reveal that the rural death rate exceeds the urban death rate by 6 points in the less developed regions of the world, but only by about half a point in the more developed regions. Comparable estimates of urban and rural crude birth rates (Table 2) show that virtually everywhere the fertility of urban women is lower than that of rural women. Only in Northern America is the difference rather slight. In the other major regions of the world, the difference is more substantial: from 4 points (Europe) to 9 points (Latin America).

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*Urban growth and urbanization do not necessarily occur together although, historically, they have: "urban growth can occur without urbanization if the rural population increases at a rate equal to or greater than that of the urban population" (Rogers, 1977, p. 4).

Table 2. Component rates (per thousand) of rural and urban population change in the world and major regions: death, birth, and natural increase, 1960.

	Crude Death Rate			Crude Birth Rate			Natural Increase Rate		
Region	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	0.4	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	-0.1
Africa	25.1	18.0	7.1	47.8	41.6	6.2	22.7	23.6	-0.9
Northern America	9.3	8.9	0.4	24.8	24.2	0.6	15.5	15.3	0.2
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	0.5
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	-0.2	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: United Nations (1976b), pp. 51-2.

Consolidation of the 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, urban areas are growing much more rapidly than rural areas (Table 3): the urban growth rate of the major regions of the world exceeds its rural counterparts by 13 per thousand (in the case of Oceania) to 40 per thousand (in the case of East Asia). The conclusion here is that the <u>component of change fostering urbanization is the net transfer of population from rural to urban areas:</u> with the exception of Oceania, rural-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 rural-urban differential increases, has been illustrated above 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 (Zelinsky 1971).

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 evolution sequence parallel to that of the vital revolution as countries go through the process of modernization. The change in the mobility pattern occurring in the transition from the premodern society to the modern society is called (or) referred to as mobility revolution. According to Zelinsky, it consists of five phases, of which the intermediate ones are of greatest interest for the study of rural-urban migration.

Table 3. Total growth rate, natural increase and net migration rates (per thousand) in the world and major regions: 1960.

	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	-0.1	-5.9	23.0	28.9
Africa	18.0	44.8	26.8	22.7	23.6	-0.9	-4.7	21.2	25.9
Northern America	-1.2	24.3	25.5	15.5	15.3	0.2	-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	0.5	-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	-1.4	34.5	35.9	-19.5	20.2	39.7

Source: United Nations (1976b), pp. 51-2.

Initially (Premodern Traditional Society), there is little genuine migration even from the countryside to cities. In the second phase (Early Transitional Society--characterized by a decline in fertility), massive movements take place from rural to urban areas. They tend to slacken in the third phase (Late Traditional 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.

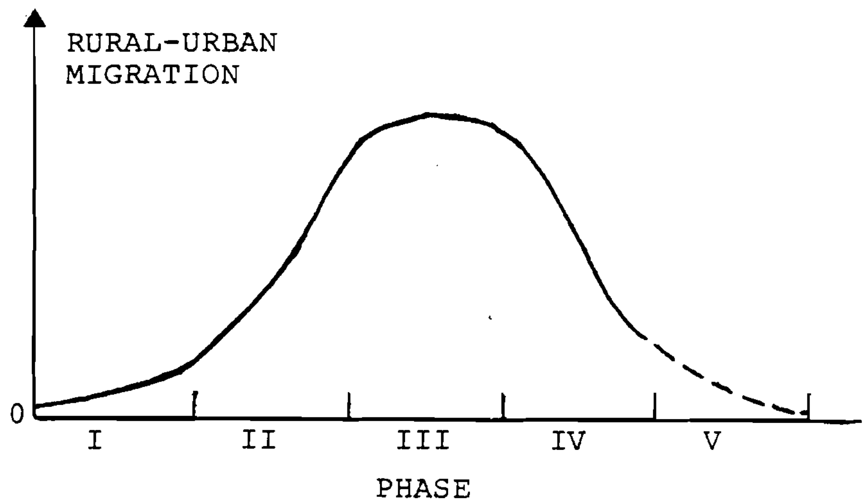

Figure 1. Changing level of the rural-urban migration through time.

Source: Zelinsky (1971), p. 233.

To summarize, the literature indicates the existence of patterned regularities in the evolution of rural-urban migration as societies experience the process of modernization. But, the evidence proposed has been more descriptive (qualitative) than quantitative. In fact, in view of the further increases in urbanization expected in the next quarter of the century, it is interesting to characterize in quantitative terms--even though they are approximate--the evolution of rural-urban net migration over time and its relationship with economic development.

For this purpose, we propose in this paper a method for estimating instantaneous rural-urban migration rates, taking advantage of the fact that rural-urban differentials in natural increase are generally small or even negligible.* In brief, this method relies on a simple analytical relationship (established in section II) which links the rural net outmigration rate with the percentage of the population that is urban. In effect, the existence of such a relationship suggests that to quantify the evolution of rural net outmigration rates, it is sufficient to have available a relationship linking the level of urbanization with economic development, proxied by time or an objective index such as GNP per capita.

As a matter of fact, the literature points to the existence of a strong association between urbanization and time (in descriptive analyses of the development of given countries) or between urbanization and GNP per capita (in cross-sectional analyses of several countries).

Such associations are generally represented by an S-shaped curve representing an upper asymptote. Figure 2 showing the evolution of the urban porportion in selected countries indicates that such a proportion rises rapidly for relatively low values of this proportion, slackens somewhat around fifty percent and tends to stabilize at levels above eighty percent. Figure 3, comparing the degree of urbanization of World Bank member-countries with their gross national product per capita (presented along the horizontal axis according to a logarithmic scale),

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*The method prpposed is germane to the method developed by Ledent and Rogers (1979) for estimating average rural net outmigration rates; however, it sharply differs in terms of data requirements: the necessary data relates to the part of the total population that is urban whereas the Ledent and Rogers method requires the knowledge of the population changes taking place in both the rural and urban sectors.

shows the existence of an association which can also be represented by an S-shaped curve.

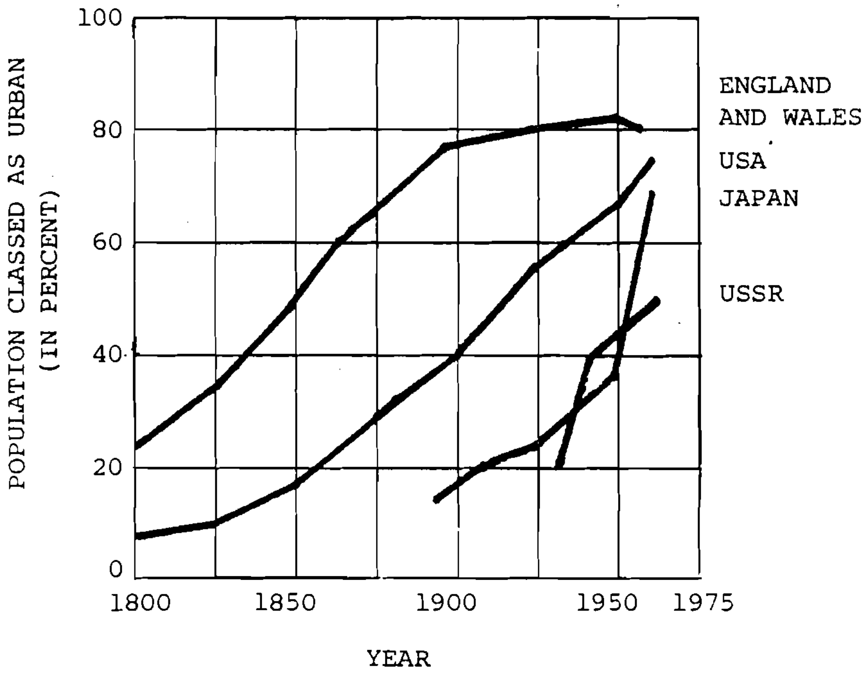

Figure 2. Historical evolution of population classed as urban.
Source: Davis (1965), p. 47.

Both results of Figures 2 and 3 suggest that the most appropriate type of function needed for an analysis of the urbanization process is a logistic function (Chenery and Syrquin 1975). Thus, in the next section, we first derive the general formula linking the rural net outmigration rate with the percentage that is urban and then find a precise analytical expression for the case where the urban percentage is given by a logistic curve.

II. RURAL-URBAN MIGRATION AND URBANIZATION: A MATHEMATICAL TREATMENT

The general formula depicting the impact of the level of urbanization on the level of the rural net outmigration rate is derived using a simple framework of urbanization dynamics (Keyfitz 1978).

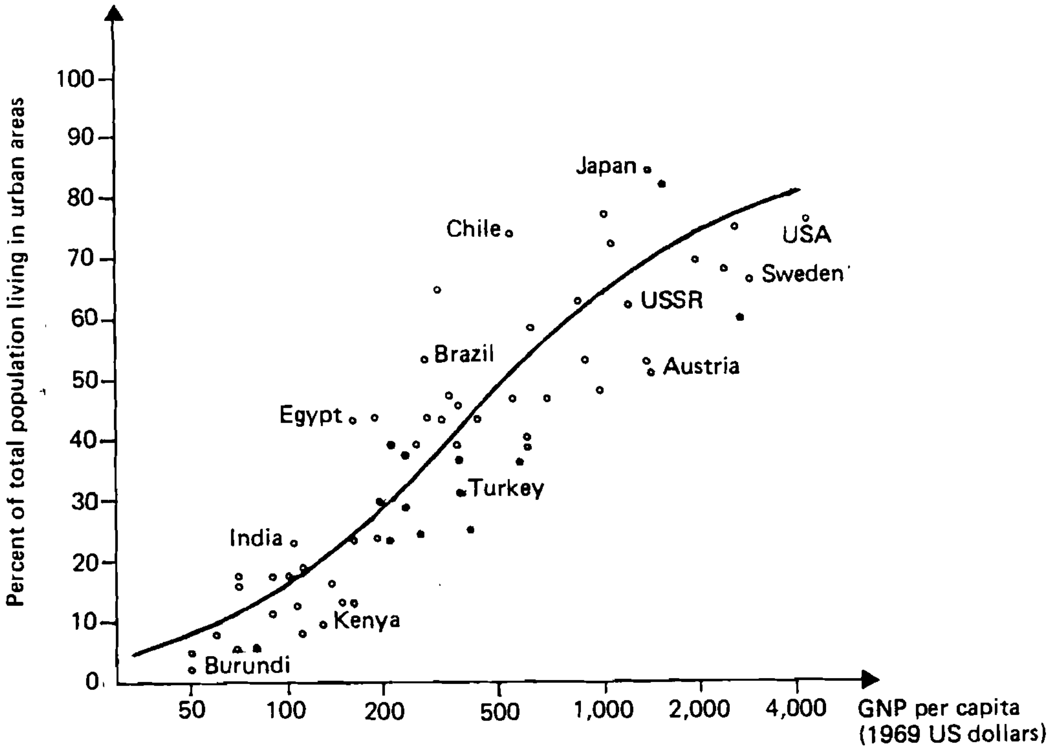

Figure 3. Degree of urbanization of World Bank member-countries compared with their gross national product per capita in 1970.

Source: Graph redrawn from Berry (1973), p. 75.

Let $P_r(t)$ and $P_u(t)$ denote the rural and urban populations, respectively, at time t. Thus, (Keyfitz 1978)

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

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 $\frac{P_u(t)}{P_r(t)}$ of the urban to rural population and differentiating with respect to time leads to

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

an equation which we interpret as follows: the "tempo"* of urbanization, measured by the growth rate in the urban to rural population ratio, is equal to the difference between the urban and rural population growth rates (United Nations Population Division (1979).

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 outmigration rate m(t). We obtain (Ledent 1979)

$$\frac{dS(t)}{S(t)dt} = \Delta(t) + m(t)\left(1 + \frac{1}{S(t)}\right) \quad . \tag{4}$$

This can be rewritten as

$$m(t) = \frac{S(t)}{1 + S(t)}\left[\frac{dS(t)}{S(t)dt} + \Delta(t)\right] \tag{5}$$

or, alternatively,

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

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*Note that our definition of the "tempo" of urbanization is slightly different from Arriaga's (1975) definition which considers the difference between the urban and <u>total</u> population growth rates.

where $\alpha(t) = \frac{S(t)}{1 + S(t)}$ is the proportion of the total population that is urban. It follows that the rural net outmigration rate is proportional to the urbanization level $\alpha(t)$ as well as to a term which is the sum of the "tempo" of urbanization and the rural-urban natural increase differential.

If the rural-urban natural increase differential is negligible, we have in the first approximation

$$m(t) \simeq \alpha(t) \frac{dS(t)}{S(t)dt} \quad , \tag{7}$$

a relationship showing that, in such circumstances, the rural net outmigration rate is approximately equal to the product of the level and "tempo" of urbanization.

Note that relationship (7) can be rewritten as

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

and, finally, as

$$m(t) \simeq - \frac{d[1 - \alpha(t)]}{[1 - \alpha(t)]dt} \quad . \tag{9}$$

Thus, in case of a negligible rural-urban natural increase differential, the rural net outmigration rate--which is also equal to minus the rate of change in the part of the population that is rural--is entirely determined by the knowledge of the function describing the evolution of the urbanization index $\alpha(t)$.

Next, we derive the functional form of the rural net outmigration rate which is consistent with a logistic evolution of the urbanization index (assuming still negligible rural-urban natural increase differential). Let

$$\alpha(t) = a + \frac{b}{1 + c\ e^{-ht}} \tag{10}$$

where b, c and h are positive constants and a is bounded from below and above by $-\frac{b}{1 + c}$ and $1 - b$, respectively.

[The variations of $\alpha(t)$ through time are depicted in Figure 4(a) in which it appears that the existence of a point of inflexion depends on the value of the constant c.]

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

$$1 - \alpha(t) = \frac{1 - (a+b) + c(1-a)\ e^{-ht}}{1 + c\ e^{-ht}} \quad . \tag{11}$$

Then letting $\bar{m}$ denote the rural net outmigration rate corresponding to a zero natural increase differential, we have from (9)

$$\bar{m}(t) = \frac{c(1-a)h\ e^{-ht}}{1 - (a+b) + c\ (1-a)\ e^{-ht}} - \frac{che^{-ht}}{1 + c\ e^{-ht}} \quad , \tag{12}$$

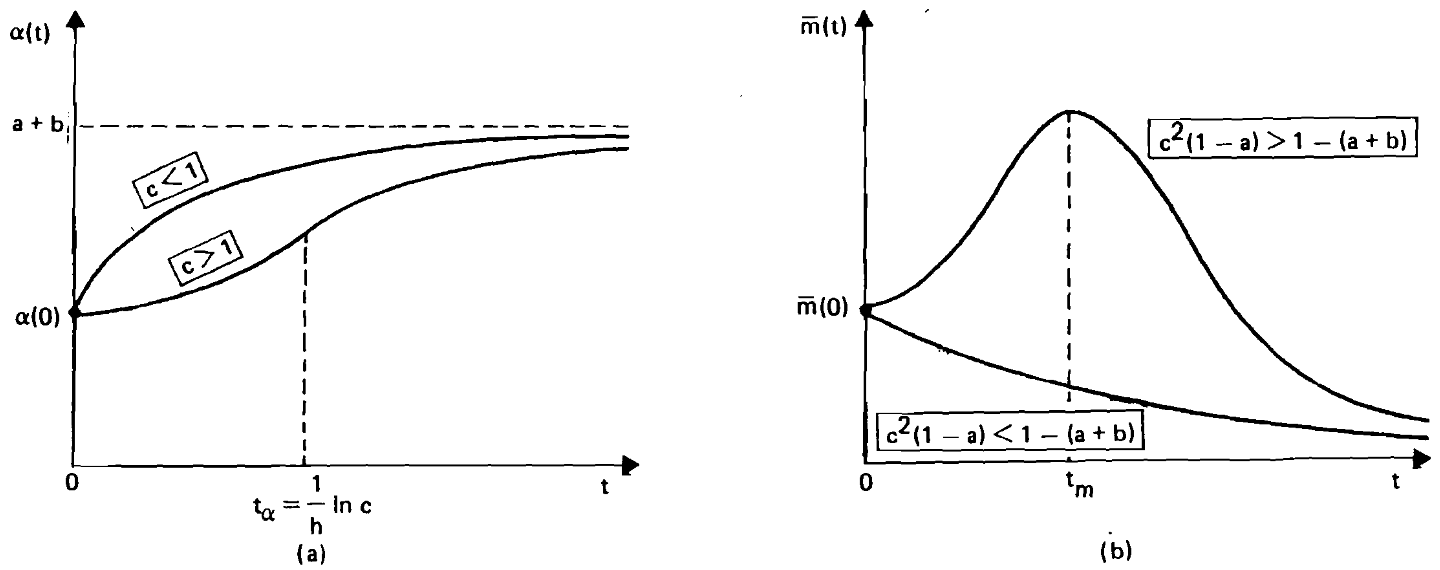
which reduces to

$$\bar{m}(t) = \frac{bch\ e^{-ht}}{[1-(a+b)+c(1-a)e^{-ht}](1 + c\ e^{-ht})} \quad . \tag{13}$$

It is readily established that the first derivative of this function has the sign of

$$x(t) = c^2(1 - a)h\ e^{-2ht} - h[1 - (a+b)] \quad , \tag{14}$$

an expression which is positive for all t less than



$$\alpha(0) = a + \frac{b}{1+c}$$

$$\bar{m}(0) = \frac{bch}{[1-(a+b)-c(1-a)](1+c)}$$

Figure 4. The evolution of the urbanization index and the rural net outmigration rate in the logistic curve.

$$t_m = \frac{1}{2h} \ln \frac{c^2(1 - a)}{1 - (a + b)} \quad . \tag{15}$$

Consequently, in case of a logistic evolution of the urbanization index, the rural net outmigration rate $\bar{m}(t)$

a) either monotonically decreases toward zero

b) or increases, passes through a maximum for $t = t_m$ and then decreases toward zero

according to the respective values of $c^2(1 - a)$ and $1 - (a + b)$ [Figure 4(b)].

Note that if $c > 1$, then $c^2(1 - a)$ is always greater than $1 - (a + b)$: $m(t)$ increases and then decreases in all cases. However, if $c < 1$, either one of the above two situations may occur but, for usual values of the coefficients involved in (10), situation (b) is typical.

In brief, if the rural-urban natural increase differential is negligible, a logistic evolution of the urbanization index $\alpha(t)$ leads to a rural net outmigration rate function whose evolution through time is consistent with the migration transition hypothesis of Zelinsky (1971).

But, what if the rural-urban natural increase differential is not negligible? Then, the rural net outmigration rate is clearly obtained from:

$$m(t) = \bar{m}(t) + \Delta(t)\ \alpha(t) \tag{16}$$

where $\bar{m}(t)$ and $\alpha(t)$ are given by (13) and (10).

The variations of $m(t)$ now depend on the evolution of $\Delta(t)$ but, since the evolution of this function is generally well-behaved, the evolution of the rural net outmigration rate is similar to the one obtained for negligible natural increase differentials.*

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*It is simple to analytically establish this result if $\Delta(t)$ is a constant or varies linearly with the proportion urban. Of course, with regard to the case of zero natural increase differentials, a positive (negative) value of $\Delta(t)$ leads to a maximum reached less (more) rapidly and taking on a larger (smaller) value.

Finally, note that the absolute error made by approximating $m(t)$ by $\overline{m}(t)$ 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 outmigration rate which is necessarily less than the actual rural-urban natural increase differential. Since, in many instances, this differential is of the magnitude of one-two per thousand, the approximation of $m(t)$ by $\overline{m}(t)$ is generally satisfactory.

III. THE EVOLUTION OF RURAL NET OUTMIGRATION RATES IN SELECTED DEVELOPING COUNTRIES

Clearly, the mathematical treatment of the relation between rural-urban migration and urbanization developed in section II allows one to appreciate--in quantitative terms--the temporal evolution of rural net outmigration rates for countries in which the urban proportion follows a logistic evolution.

Recalling that our interest is the temporal evolution of such rural net outmigration rates concerns the past as well as the future, we will quantify such an evolution using the urbanization levels for the period 1950-2000 recently estimated by the United Nations Population Division (1979) for most of the world's nations. However, we report here the results obtained for only a handful of countries because national data on fertility-mortality levels distinguishing between urban and rural residence are available for very few developing countries (United Nations 1975, 1976a). Note, in addition, that among those countries for which such data are available, we have selected three countries exhibiting negligible rural-urban natural increase differentials: India, Egypt and Mexico (which have achieved differing degrees of economic development) plus Nicaragua which exhibits a high rural-urban natural increase differential.

The methodology used in the case of each country starts with the fitting of a logistic curve to the urban proportions estimated by the U.N. for the period concerned.

Since, to estimate an equation including four parameters, such as (10), it is sufficient to have four observations, we retain the three U.N. observations for 1950, 1975, and 2000 and, in addition, assume that the upper limit for the urban proportion is 85 percent. As shown in Appendix 1, the estimation of the four parameters a, b, c, and h can be simply performed from the consideration of these sole data.

Table 4 displays the values of the parameters obtained, for each of the selected countries, from the U.N. estimates set out in Appendix 2.* Note that the corresponding evolutions of the urban proportion (Figure 5) present a point of inflexion in all cases and that a higher level of economic development hastens its occurrence (Table 4): the point of inflexion has been reached around 1964 in the case of Mexico and will not be reached in India before 2017.

The problem then is one of knowing whether the logistic curves fitted to the three UN observations reflect the evolution of the urban proportion or not in the four countries considered. Firstly, the numbers in Table 5 show that the urban percentages of the population that is calculated from the estimated logistic curves for each of the years not retained in the fitting process (1960, 1970, 1980, and 1990), are quite close to the "observed" percentages estimated by the United Nations. The discrepancies are negligible in all cases except for Egypt where they appear to be of a small magnitude.

Secondly, the comparison in Table 6 of the "observed" and calculated urban percentages for census years of the first half of the twentieth century, indicates that the estimated logistic curves simulate rather accurately the past evolution of the urbanization levels in two of these three countries (India being the exception).

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*The value of the coefficient c is consistent with the time origin set in 1950.

Table 4. Parameters of the logistic curve describing the part of the population that is urban and the year in which the point of inflection occurs: selected countries.

Country	a	b	c	h	T_α^*
India	0.1558	0.6942	56.126	0.0603	2017
Egypt	0.1713	0.6787	3.5874	0.0331	1989
Nicaragua	0.2132	0.6368	3.398	0.0414	1980
Mexico	0.2263	0.6237	2.115	0.0543	1964

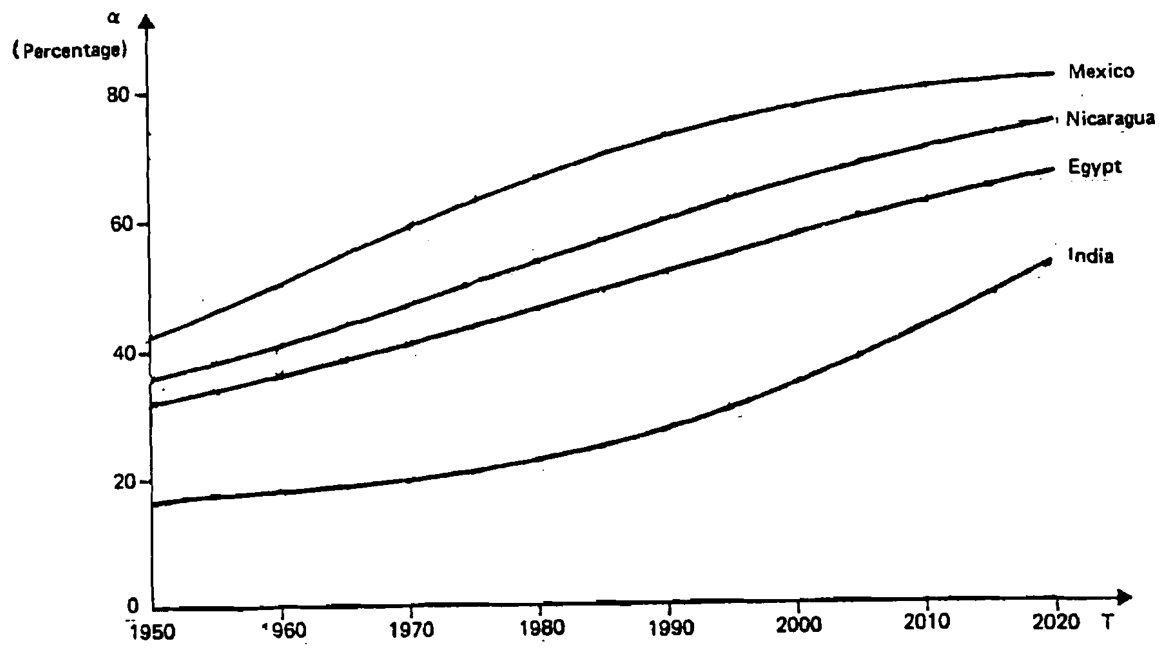


Figure 5. Evolution of the part of the population that is urban: selected countries 1950-2000.

Table 5. Evolution of the observed and calculated urban percentages: selected countries 1950-2000.

Year \ Country	India		Egypt		Nicaragua		Mexico	
	a	b	a	b	a	b	a	b
1950	16.79	16.79	31.92	31.92	35.80	35.80	42.65	42.65
1960	17.90	17.76	37.86	36.10	41.37	40.94	50.75	50.62
1970	19.70	19.47	42.25	40.93	47.21	46.95	59.04	59.03
1975	20.74	20.74	43.54	43.54	50.17	50.17	63.03	63.03
1980	22.26	22.38	45.37	46.25	53.31	53.46	66.69	66.73
1990	26.92	27.07	50.54	51.83	59.71	59.95	72.83	72.90
2000	34.05	34.05	57.36	57.36	65.89	65.89	77.35	77.35

Sources: a. United Nations Population Division 1979, Annex C.
b. Logistic curve based on parameters shown in Table 4.

Table 6. Evolution of the observed and calculated urban percentage: selected countries, 1900-1960.

	India		Egypt			Mexico		
Year	a	b	Year	a	b	Year	a	b
1901	10.8	15.64	1907	19	21.41	1900	28.4	24.52
1911	10.3	15.69	1917	21	22.94	1910	28.7	25.81
1921	11.2	15.79	1927	26	24.95	1921	31.1	28.19
1931	12.0	15.97	1937	28	27.55	1930	33.5	31.21
1941	13.8	16.29	1947	33	30.81	1940	30.0	36.07
1951	17.3	16.86	1960	37	36.10	1950	43.3	42.65

Sources: a. Bose (1974).
b. Khalifa (1974), p. 36.
c. Unikel (1975), pp. 497-8.
d. Logistic curve based on parameters shown in Table 4.

Thus, on the basis of the above evidence, we conclude that the logistic curves fitted to the U.N. data represent a fairly accurate picture of the evolution of urbanization in our four countries. We now go on to estimate the instantaneous rural net outmigration rates.

In a first step, we estimate from (13) the rural net outmigration rates that would prevail if there were no natural increase differentials.

The values of those rates obtained for the years 1950, 1975, and 2000 are shown in Table 7 whereas their overall evolution over the period 1950-2000 is depicted in Figure 6. First we note that on the basis of the rates thus obtained, all of the four countries exhibited an increasing rural net outmigration rate in the early seventies. But unlike the Mexican rate which was then increasing very slowly to its maximum value (21.1 per thousand in 1979), the rural net outmigration rate in the three other countries was increasing rather rapidly: in fact, the peak value of each one of these rates will not be reached before 2000 (Nicaragua) or even much later (2031 in the case of India).

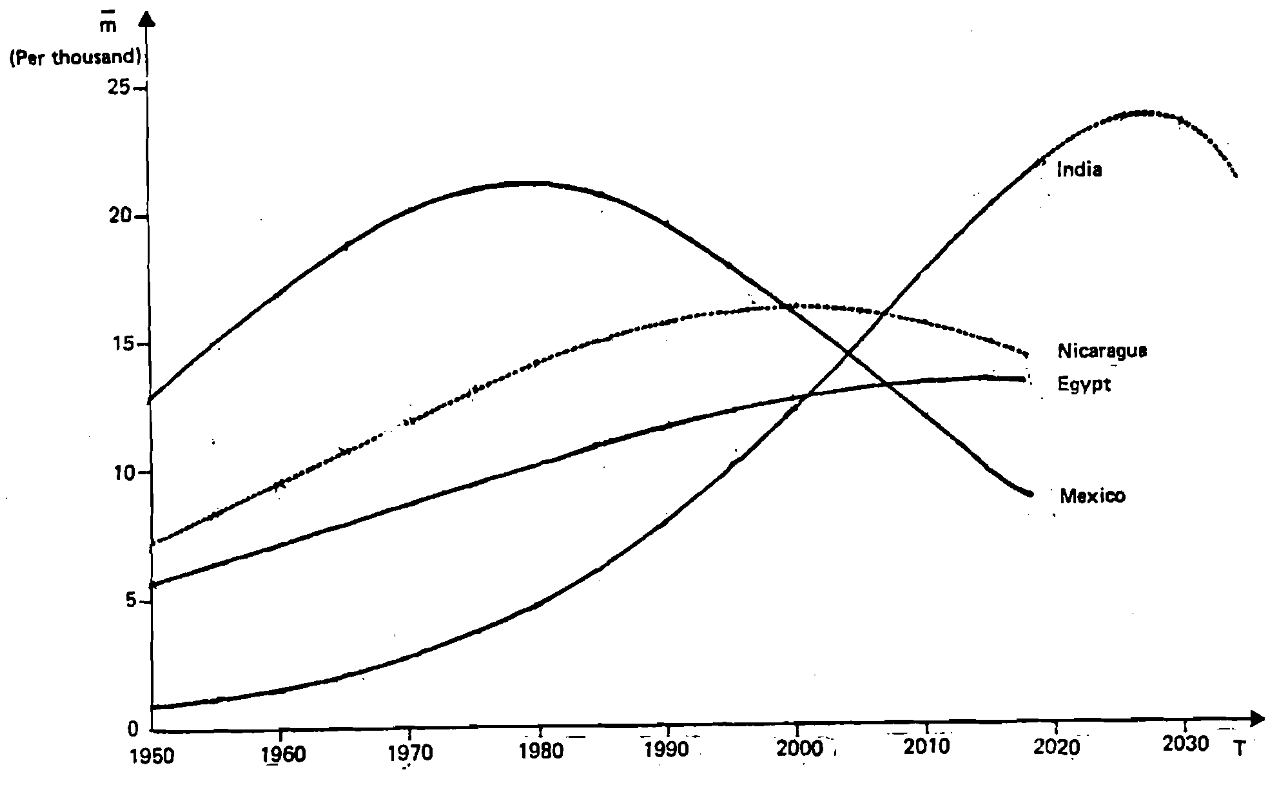
Second, we observe that until 1990, the ranking of the four countries according to increasing levels of the rural net outmigration rate (Figure 6) and of GNP per capita (Table 8) are identical: the higher the level of economic development, the higher the rural net outmigration rate. However, after 2000, when the urbanization process tends to slow down in the two most developed countries (Mexico, Nicaragua) and speed up in the other two (Egypt, India), net migration and economic development tends to reverse itself. All of this is perfectly consistent with Zelinsky's (1971) mobility revolution hypothesis examined in section I.

The curves showing the evolution of the rural net outmigration rates in our four countries look much the same as Zelinsky's illustrative curve (Figure 1), displaying a long plateau in all cases except for India. This allows one to conclude that

- -- Mexico is in the third phase approaching phase IV
- -- Nicaragua and Egypt are in the transitional stage leading from phase II to phase III
- -- India has just made it to phase II

Table 7. Approximate values of the rural net outmigration rates (per thousand) in selected years and at the maximum.

	1950	1975	2000	T_m	
India	0.9	3.6	12.4	24.5	(2031)*
Egypt	5.6	9.4	12.7	13.3	(2014)
Nicaragua	7.2	13.1	16.2	16.2	(2000)
Mexico	12.9	20.9	16.1	21.1	(1979)



*The figures between parentheses indicate the year in which the approximate rural net outmigration rate reaches its maximum.

Figure 6. Evolution of the approxmiate rural net outmigration rates $\bar{m}(t)$: selected countries 1950-2000.

Table 8. GNP per capita and annual growth rate of GDP per capita: selected countries.

	GNP per capita (dollars) (1973)	average annual rate (percent) of growth of GDP per capita 1950-60	1960-65	1965-75
India	120	2.3	1.7	1.2
Egypt	250	0.9	4.2	0.8
Nicaragua	540	2.5	7.1	1.4
Mexico	890	2.4	3.8	2.9

Source: IBRD (1976).

Note the remarkable evolution of the Indian rate which increases from 1 per thousand (in 1950) to 3.6 per thousand (in 1975) before increasing dramatically (8 per thousand in 1990, and 12.3 per thousand in 2000) to 24.5 per thousand in 2031.

How does the above evolution of the rural net outmigration rates for the four countries chosen compare with the estimates of the successive average net outmigration results which we would obtain by using the method suggested by Ledent and Rogers (1979)? For three of the four countries considered separately, in Figure 7 we show the curve displaying the evolution of $\bar{m}(t)$ over the period 1950-2000 as well as the point estimates of the average rates obtained with the Ledent and Rogers method for 6 time intervals during that period.* Clearly, the three diagrams show the compatibility of the instantaneous and average estimates obtained for all countries except for Egypt. This exception is hardly surprising in view of the earlier result that the fit of a logistic curve to the UN estimates of urban proportions was less successful for this country. The fact is

*In each time interval, the rural net outmigration rate is equal, in the first approximation, to the difference between the rates of increase of the total and rural populations. Estimates for our countries are easily obtained from the U.N. population estimates (United Nations Population Division 1979) shown in Appendix 2.

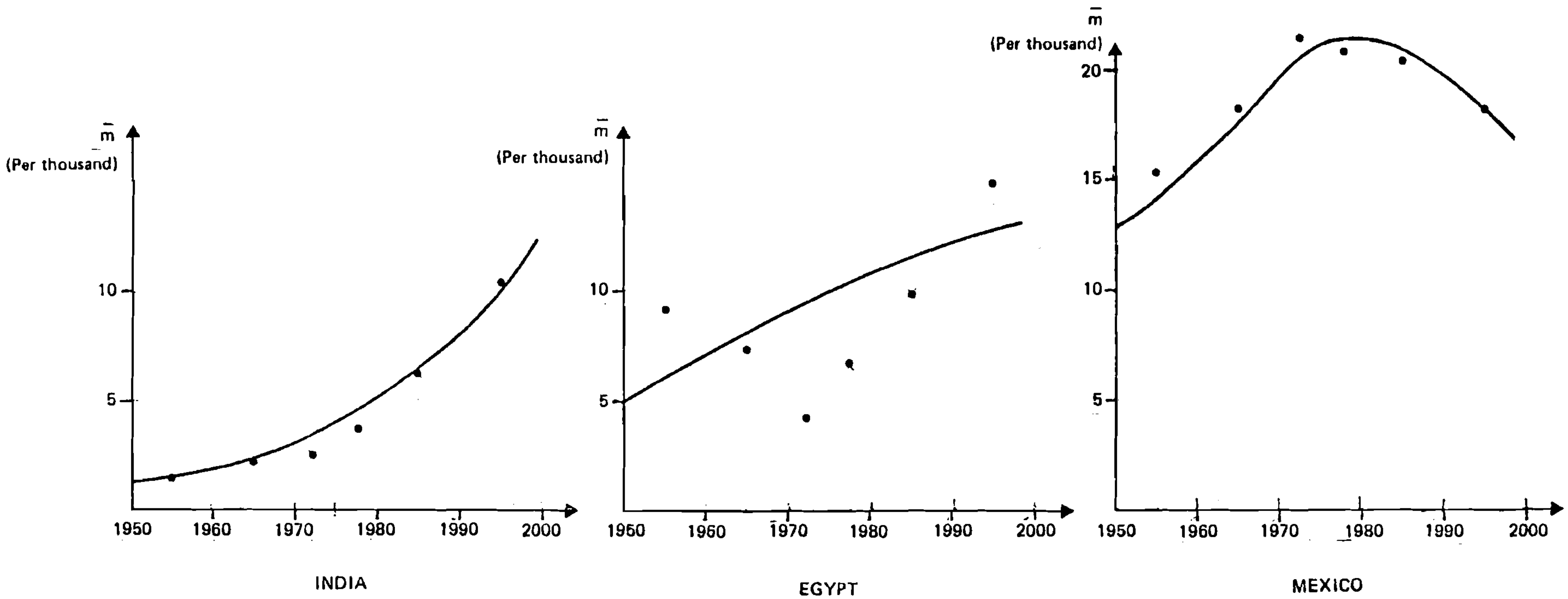


Figure 7. Instantaneous and average net migration rates contrasted: selected countries 1950-2000.

Source: Instantaneous rates: Figure 6.
Average rates: Appendix 2.

in Egypt, the rural exodus actually diminished in relative value between 1950 and 1975 and that the United Nations predicts a reversal of this trend after 1975.

Let us recall that the above results have been obtained by neglecting the possible existence of rural-urban differentials in natural increase. The figures set out in Table 8 indicate that the adoption of such an assumption is realistic for three of the four countries considered (Table 9). The exception is Nicaragua which, in the early seventies, exhibits substantially different urban and rural fertility-mortality levels: its urban natural increase rate (44.8 percent) is much higher than its rural natural increase rate (23.7 percent) whereas, in general, rural natural increase rates are slightly higher than urban natural increase rates (Table 3).

Table 9. Fertility, mortality, and natural increase rates (per thousand) in urban and rural areas: selected countries 1971 or 1972.

	b_u	b_r	d_u	d_r	u	r
India(1971)	30.1*	38.9*	9.7*	16.4**	20.4	22.5
Egypt(1971)	32.2*	36.2*	11.6**	14.1**	20.6	22.1
Nicaragua(1971)	54.2*	28.7*	9.4*	5.0*	44.8	23.7
Mexico(1972)	43.4*	46.8*	9.1*	9.0**	34.3	37.8

Source: *Demographic Yearbook 1975 (United Nations 1976a).
**Demographic Yearbook 1974 (United Nations 1975).

The availability of a measure of the natural increase differential in 1971 or 1972 [see column (2) of Table 10] makes it possible, by application of (16), to estimate for each country "exact" values of the rural net outmigration rates relating to such a year. As expected, the "exact" values are close to those obtained by assuming zero natural increase differentials, except in the Nicaraguan case (Table 10). The consideration of the natural increase differential causes the rural net outmigration rate to increase from 2.9 to 3.3 per thousand in the case of India, from 8.8 to 9.4 per thousand in the case of Egypt, and from 20.3 to 22.1 per thousand in the case of Mexico. Thus, ignoring the natural increase differentials, in the case of these three countries, leads to an under-estimation of the rural net outmigration by roughly 10 percent.

Table 10. Approximate and "exact" values of the rural net outmigration rates: selected countries 1971 (or 1972) (all figures per thousand).

	$\bar{m}$ (1)	Actual Δ (2)	$m - \bar{m}$ (3)	m (4)
India (1971)	2.91	2.1	.40	3.31
Egypt (1971)	8.81	1.5	.63	9.44
Nicaragua (1971)	12.43	-21.1	-10.18	2.25
Mexico (1972)	20.31	3.5	1.75	22.06

Source: Table 9 for column (2). All the other columns estimated by author.

In contrast to this, the consideration of the rural-urban natural increase differential in the Nicaraguan case causes the value of the rural net outmigration rate to take on a completely different magnitude: its "exact" value is equal to 2.3 per thousand versus 12.4 per thousand for the value calculated from a zero natural increase differential. Figure 8 shows the evolution of the rural net outmigration rate in Nicaragua between 1975 and 2000 on the basis of two alternative assumptions regarding the evolution of the natural increase differential: curve 3 corresponds to the case of a constant natural increase differential equal to the value observed in 1971 whereas curve 2 reflects the case of a natural increase differential vanishing over a 25-year period. (Curve 1 shows the evolution that would prevail in case of a zero natural increase differential.)

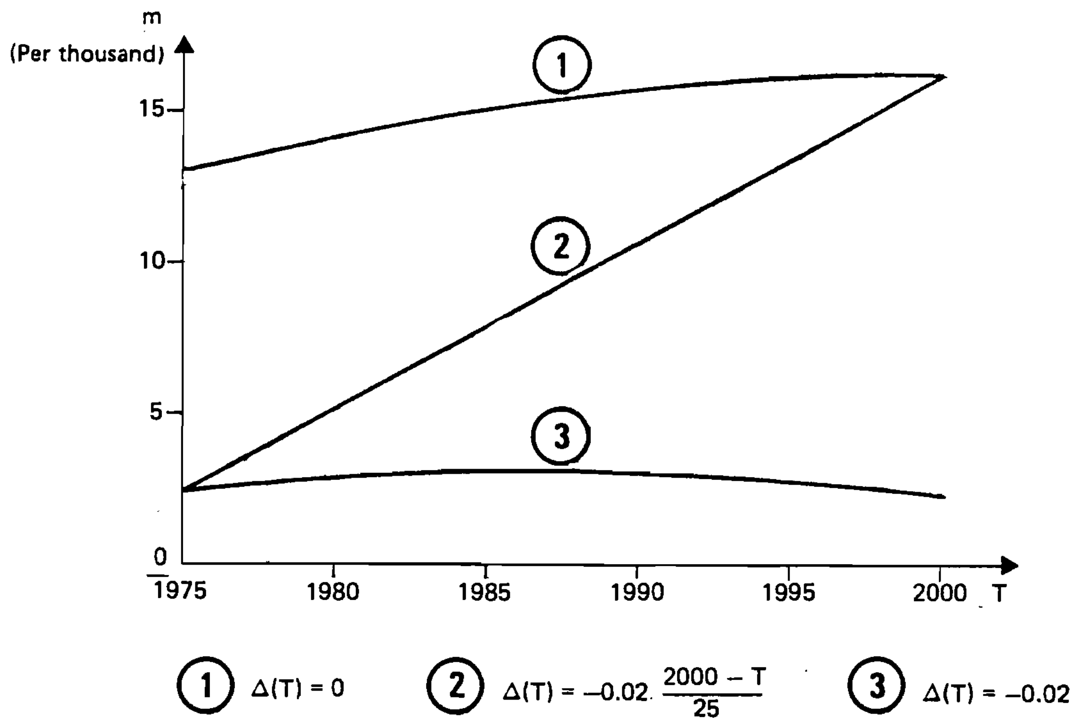


Figure 8. Impact of a substantial urban-rural natural increase differential on the rural net outmigration rate: Nicaragua 1975-2000.

Were the natural increase differential to remain constant throughout, the rural net outmigration rate would peak at a much earlier date than on the basis of a zero differential: 1988 rather than 2000 (see curve 3 in Figure 8). The maximal value then reached would be 3.1 per thousand.

In summary, the methodology described above allows one to quantify the evolution of the rural net outmigration rate from the simple knowledge of the degrees of urbanization at three points in time for any country. In general, a good approximation of such an evolution can be obtained by assuming zero rural-urban natural increase differentials but there exist a few exceptions (e.g., Nicaragua, where natural increase remains the main source of urban growth).

IV. RURAL-URBAN MIGRATION AND THE DEGREE OF ECONOMIC DEVELOPMENT

This paper has focused on the temporal evolution of rural net outmigration rates for a given country. Because intercountry comparisons play an essential part in understanding the processes of economic development, we will now adopt a larger perspective which broadly attempts to quantify the relationship between rural-urban migration and the degree of economic development.

The rationale here is the following: since there exists a strong association between degree of urbanization and GNP per capita, a methodology similar to the one used in sections II and III makes it possible to determine how rural net outmigration rates vary with an objective index of economic development, such as GNP per capita.

The scattered diagram of Figure 3 suggests that the degree of urbanization $\alpha(y)$ is a logistic function of the level y of GNP per capita, measured in logarithmic terms (IBRD 1972):

$$\alpha(y) = \frac{b'}{1 + c'e^{-h'\ln y}} \qquad (17)$$

where b', c' and d' are appropriate coefficients. In order to determine how the rural net outmigration rate evolves with y, we somehow need to link GNP per capita with time. Clearly, if y is an exponential function of time with growth rate k

$$y(t) = y_0\, e^{kt} \quad , \qquad (18)$$

we have by substitution in (17)

$$\alpha[y(t)] = \frac{b'}{1 + c'\, y_0^{-h'} e^{-h'kt}} \quad . \qquad (19)$$

Assuming a negligible rural-urban natural increase differential and recalling relationship (13) we have

$$\bar{m}[y(t)] = \frac{b'c'h'k\ y_0^{-h'}\ e^{-h'kt}}{(1 - b' + c'y_0^{-h'}\ e^{-h'kt})(1 + c'y_0^{-h'}\ e^{-h'kt})} \qquad (20)$$

and, finally, after substituting (19),

$$\bar{m}[y(t)] = k\ \frac{b'c'h'\ e^{-h'\ln y(t)}}{[1 - b' + c'e^{-h'\ln y(t)}][1 + c'\ e^{-h'\ln y(t)}]} \qquad (21)$$

This formula suggests that if the growth rate of per capita GNP is constant, the evolution of the rural net outmigration rate with the level of per capita GNP follows the pattern indicated in section II: it first increases, reaches a maximum and then decreases toward a zero value.

If the rural-urban natural increase $\Delta(y)$ is not negligible, we indeed obtain the "exact" rural net outmigration from

$$m[y(t)] = \bar{m}[y(t)] + \Delta(y)\ \alpha[y(t)] \qquad (22)$$

where $\bar{m}[y(t)]$ and $\alpha(y)$ are given by equations (21) and (17), respectively.

Observing what k stands for, we conclude that the hypothetical country whose pattern of urbanization follows the standard defined by the logistic function (17) exhibits an instantaneous net outmigration rate depending on the level and growth of its GNP per capita, but also its natural increase differential.

Fitting a logistic curve such as equation (17) to the observations appearing in the scattered diagram of Figure 3 leads to the following values of the coefficients concerned:

$$b' = 0.85; \quad c' = 586.1; \quad h' = 1.083 \quad .$$

[These particular coefficients were obtained by assuming 1) the maximum degree of urbanization of 85 percent and 2) degrees of urbanization equal to 17 and 50 percent for levels of GNP per capita equal to 100 and 500 dollars, respectively.]

The logistic curve thus estimated is shown in Figure 3* whereas Table 11 sets out the values of the proportion urban for selected values of y. Also shown in this table are the corresponding rural net outmigration rates calculated on the basis of a constant growth rate of GNP per capita equal to 0.03 and assuming further the existence of no natural increase differential. Figure 9 illustrates the evolution of the approximate rural net outmigration rate consistent with alternative constant GNP per capita growth rates.

In accordance with the observation made after deriving formula (21), each of the alternative curves follows the same pattern: $\bar{m}(y)$ increases, reaches a maximum for a value of y equal to

$$y_m = \left[\frac{c'}{\sqrt{1 - b'}}\right]^{1/h'} \qquad (24)^{**}$$

i.e., 864 dollars, and then decreases toward zero. The last column of Table 11 however indicates that, for a given value of k, $\bar{m}(y)$ is quasi-stationary for values of y. In addition, it suggests that the variations of m(y) remain relatively small as y increases from 400 to 2000 dollars.

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*Note that the estimated logistic curve in Figure 3 admits a point of inflection for $y = c'^{h'} \simeq 976$ dollars. By contrast, the curve showing the variations of the degree of urbanization with the level y of GNP per capita (and not its logarithm) admits a point of inflection for

$$y_1 = \left[\frac{c'(h' - 1)}{h' + 1}\right]^{1/h'} \qquad (23)$$

which amounts to about 40 dollars. We conclude that the pace of urbanization virtually decreases with economic development.

**The derivation of this formula follows immediately from formula (15).

Table 11. Degrees of urbanization and corresponding approximate rural net outmigration rates (k = 0.03) for selected values of GNP per capita.

y	$\alpha(y)$	$\bar{m}(y)$
0	0	0
50	8.97	2.86
100	17.00	5.32
200	29.43	8.86
300	38.34	11.09
400	44.94	12.50
500	50.00	13.38
750	58.57	14.28
1000	63.89	14.28
1500	70.07	13.36
2000	73.53	12.18
3000	77.23	10.07
4000	79.17	8.47

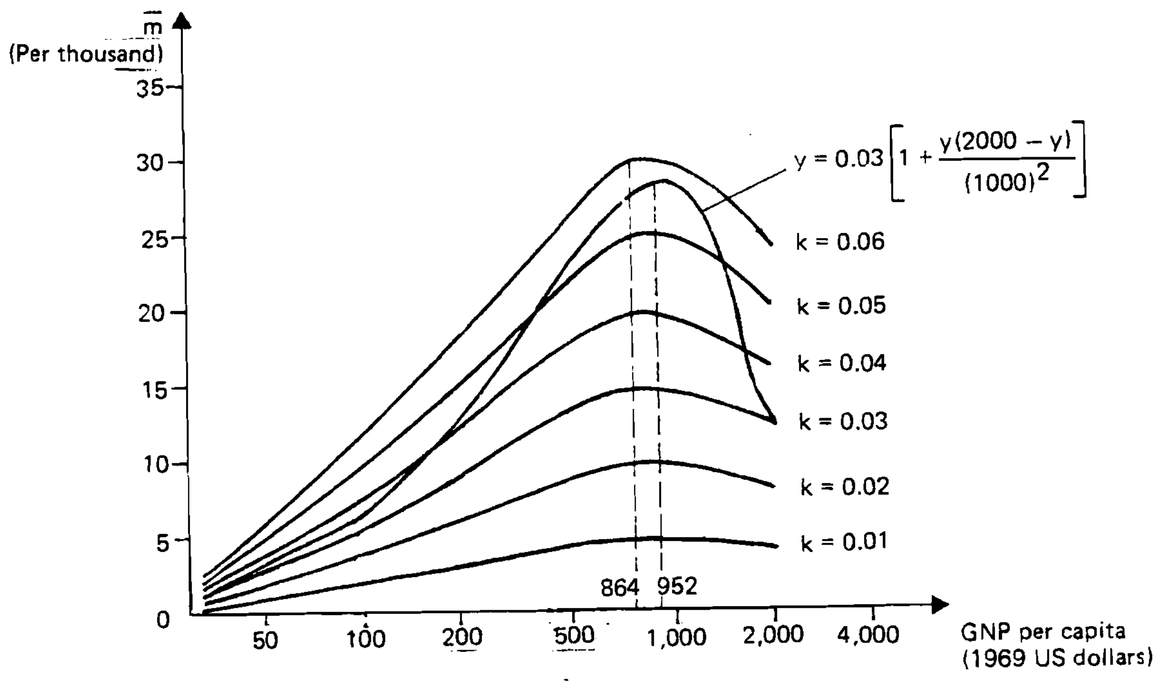

Figure 9. Evolution of the approximate rural net outmigration rate for selected values of the growth rate of GNP per capita.

In fact as a country develops, its growth rate of per capita GNP varies. For illustrative purposes, we now assume a growth rate which increases from three percent (for $y = 0$) to six percent (for $y = 1000$ dollars) and then decreases to three percent (for $y = 2000$ dollars). The corresponding evolution of the rural net outmigration rate is also shown in Figure 9: $\bar{m}(y)$ reaches a maximum for $y_m = 952$ dollars (the value of this maximum is virtually identical to the one obtained in the case $k = 0.006$) and then decreases. Indeed, the variations of $\bar{m}(y)$ around this maximum are much greater than in the case of constant growth rates of GNP per capita.

Abandoning the assumption of a zero rural-urban natural increase differential, we now display in Figure 10, the evolution of the rural net outmigration rate (assuming $k = 0.03$) for various assumptions regarding the rural-urban natural increase differential. The two extreme curves 2 and 3 correspond to the case of a constant natural increase differential of plus and minus 20 per thousand. The two curves 4 and 5 located on either side of curve 1 corresponding to a zero differential, have been obtained by assuming that the initial natural increase differential of plus and minus 20 per thousand varies linearly with the urban proportion while vanishing in the long run.

In fact, the values of the rural-urban natural increase differential are of such magnitude that the curve describing the evolution of $m(t)$ (for $k = 0.03$) is likely to be located in between curves 1 and 4. Such a curve reaches a maximum value of roughly 15 per thousand occurring for a GNP per capita of about 800 dollars. Thus, the impact of the rural-urban natural increase differential on the value of the rural net outmigration in a country whose GNP per capita grows exponentially is relatively modest: the pattern of the rural exodus broadly remains the same but the maximal value of $m(t)$ which is expected to be slightly higher is also reached slightly more rapidly.

An immediate consequence of the above results is that the evolution of the rural net outmigration rate in the hypothetical country experiencing the urbanization process suggested by the logistic curve of Figure 3

a) strongly depends on the evolution of the modernization process, i.e., the variations in the growth rate of the GNP per capita, and

b) is much less affected by the evolution of the rural-urban natural increase differential.

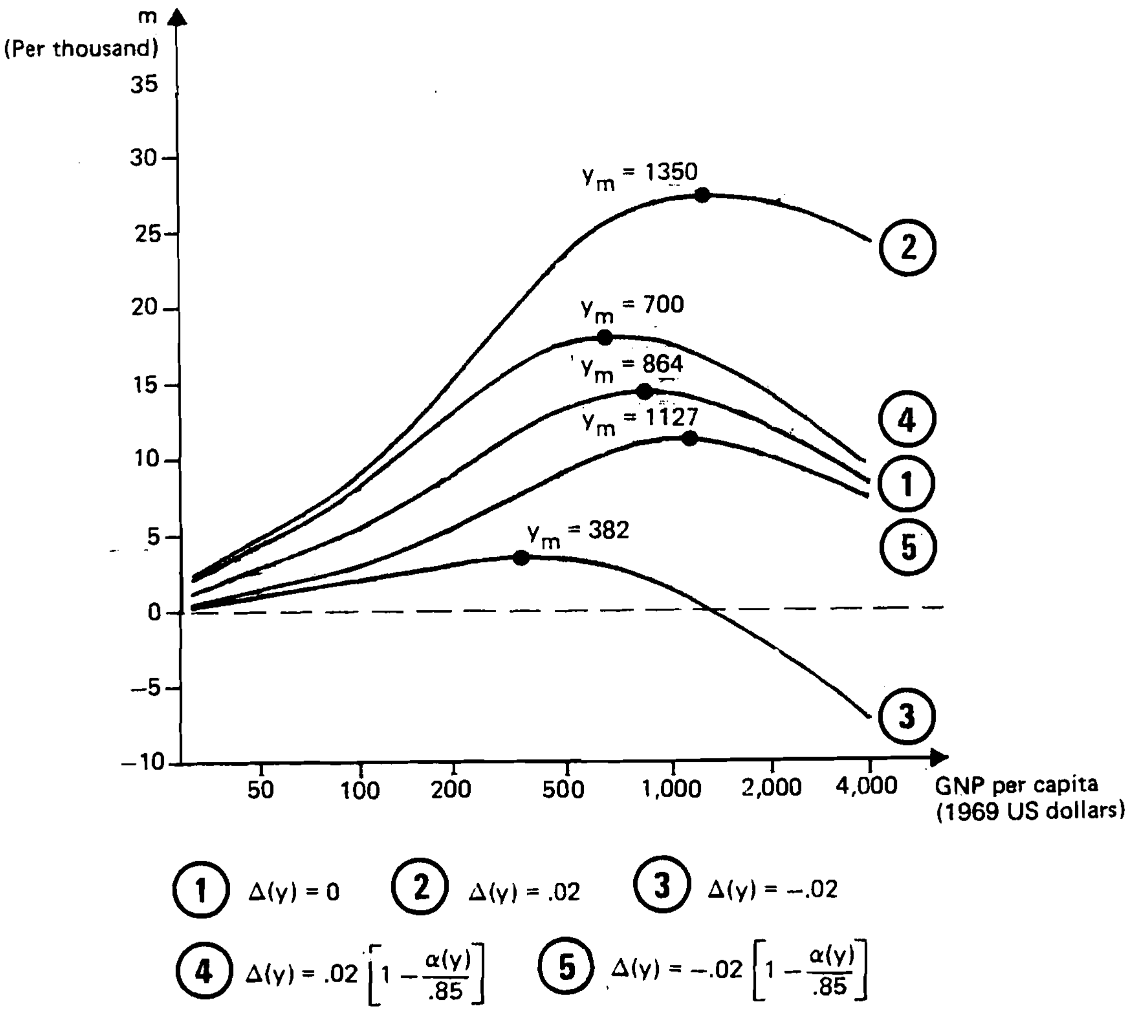

Figure 10. Evolution of the "exact" rural net outmigration rate (k = 0.03) for various assumptions regarding the rural-urban natural increase differential.

On the basis of the above analysis, it follows that developing countries--which commonly go through the modernization process at an uneven pace (i.e., have a GNP per capita varying in an irregular fashion)--are likely to have a rural net outmigration rate presenting irregular variations. In the real world, however, rural net outmigration rates vary in a smoother fashion (see section III) because the relationship between the rural net outmigration rate and the pace of economic development is much looser than implied by relation (21).

Nevertheless, the above analysis should allow us to roughly estimate the instantaneous rural net outmigration rate of any country from the knowledge of its level and annual growth rate of GNP per capita as well as its rural-urban natural increase differential.

In Table 12, we show the estimates of the 1973 rural net outmigration rates for the four countries examined in section III. (The 1973 levels of GNP per capita shown in Table 8 have been deflated to account for US inflation.) It turns out that, in all cases except for Egypt, the estimates obtained roughly replicate the observed estimates (even though the rate calculated for Nicaragua is negative, which in any case suggests that it takes on a small value).

In fact, this result is hardly surprising in view of the fact that the urban percentage calculated from the standard urbanization curve of Figure 3 is close to the observed value except for Egypt which is clearly overurbanized due to a particularly high rural net outmigration rate.

Table 12. Degree of urbanization (percent) and rural net outmigration rate (per thousand) for selected contrasted countries in 1973: calculated and "observed" values.

	Degree of Urbanization		Rural Net Outmigration Rate	
Country	Calculated from Standard	Observed	Calculated from Standard	Observed
India	19.87	20.19	2.56	3.65
Egypt	34.23	42.48	3.06	9.76
Nicaragua	51.70	48.87	-4.24	2.35
Mexico	61.83	61.46	15.90	22.41

CONCLUSION

In this paper, we have attempted to clarify our understanding of urbanization dynamics by analyzing <u>in broad quantitative terms</u> its key element, i.e., 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 rural net outmigration rates consistent with the course of the urbanization process commonly observed: the functional form of the rural net outmigration rate which we obtained was shown to be compatible with the migration revolution hypothesis of Zelinsky (1971). A rather straightforward application of this quantitative analysis was the prediction of the evolution of the rural net outmigration rate implied by the most recent U.N. projections of urban and rural populations for selected developing countries (United Nations Population Division 1979).

However, the sole consideration of the temporal evolution of rural net outmigration rates, 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 into that direction was made in section IV of this paper by building upon the methodology developed in the earlier sections. A rough quantification of the relationship between the urban-rural net outmigration rate on the one hand and the level and annual growth rate of GNP per capita on the other hand was proposed. The main drawback offered by this relationship appears to lie in a too rigid dependence of the rural net outmigration rate on the growth rate of GNP per capita. More work in the direction of a more realistic association between these two factors appears to be necessary.

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APPENDIX 1: METHODOLOGY USED TO FIT A LOGISTIC CURVE TO THE UNITED NATIONS DATA

The object of this Appendix is to detail the methodology used for determining the four constants a, b, c and h--entered in equation(10) describing the evolution of $\alpha(t)$--from the available data, i.e.,

i) the hypothesis that the equilibrium level of urbanization is

$$\alpha(\infty) = .85 \tag{A1}$$

ii) and the knowledge of the urbanization levels in years 1950, 1975, and 2000 (denoted by t = 0, 25, and 50) respectively.

Setting t equal to $+\infty$ in equation (10) yields

$$a + b = .85 \tag{A2}$$

while setting t equal to 0, 25, and 50 leads to

$$a + \frac{b}{1 + c} = \alpha(0) \tag{A3}$$

$$a + \frac{b}{1 + c\ e^{-25h}} = \alpha(25) \tag{A4}$$

$$a + \frac{b}{1 + c\ e^{-50h}} = \alpha(50) \tag{A5}$$

respectively.

From (A2) we draw

$$b = .85 - a \tag{A6}$$

while, from (A3), we obtain

$$c = \frac{.85 - \alpha(0)}{\alpha(0) - a} \quad . \tag{A7}$$

From (A4) and (A5), we immediately have

$$e^{-25h} = \left(\frac{b}{\alpha(25) - a} - 1\right) \frac{1}{c} \tag{A8}$$

and

$$e^{-50h} = \left(\frac{b}{\alpha(50) - a} - 1\right) \frac{1}{c} \tag{A9}$$

respectively.

Observing that $e^{-50h} = \left[e^{-25h}\right]^2$ and then substituting (A6) and (A7) into both (A8) and (A9), we obtain the following equation

$$\left[\frac{[.85 - \alpha(25)][\alpha(0) - a]}{[.85 - \alpha(0)][\alpha(25) - a]}\right]^2 = \frac{[.85 - \alpha(50)][\alpha(0) - a]}{[.85 - \alpha(0)]+[\alpha(50) - a]} \quad . \qquad \text{(A10)}$$

This can be rewritten as

$$B[\alpha(0) - a][\alpha(50) - a] = A[\alpha(25) - a]^2 \qquad \text{(A11)}$$

where $A = [.85 - \alpha(0)][.85 - \alpha(50)]$ (A12)

$B = [.85 - \alpha(25)]^2$ (A13)

and, finally, as

$$(B - A)a^2 + \{2A\alpha(25) - B[\alpha(0) + \alpha(50)]\} a + B\alpha(0)\alpha(50) - A\alpha(25)^2 = 0. \qquad \text{(A14)}$$

If this polynomial of the second order has a positive discriminant and if B is greater than A (which is generally the case), a is necessarily the smaller of the two roots of (A14). This follows from the fact that the left-hand side of (A14) is negative, for the higher bound of $a = \alpha(50)$ [it is equal to minus A times the square of the difference between $\alpha(50)$ and $\alpha(75)$], which indicates that $\alpha(50)$ is located between the two roots of (A14) and thus a is equal to the smaller root of (A14).

The values of b and c then follow from (A6) and (A7), respectively whereas h is obtained from

$$h = \frac{1}{25} \ln \left(\frac{[\alpha(25) - a][.85 - \alpha(0)]}{[\alpha(0) - a][.85 - \alpha(25)]}\right) \quad . \qquad \text{(A15)}$$

APPENDIX 2: POPULATION ESTIMATES AND PROJECTIONS: SELECTED COUNTRIES, URBAN AND RURAL 1950-2000

INDIA

	TOTAL Population (in thousands)	TOTAL Growth Rate (percent)	URBAN Population (in thousands)	URBAN Growth Rate (percent)	RURAL Population (in thousands)	RURAL Growth Rate (percent)	DEGREE OF URBANIZATION Percentage Urban	DEGREE OF URBANIZATION Annual Growth Rate (percent)
1950	352864		59247		293617		16.79	
		1.93		2.57		1.79		0.64
1960	427802		76575		351227		17.90	
		2.39		2.35		2.17		0.96
1970	543132		106994		436138		19.70	
		2.43		3.46		2.17		1.03
1975	613217		127177		486040		20.74	
		2.48		3.90		2.10		1.41
1980	694309		154524		539785		22.26	
		2.33		4.23		1.71		1.90
1990	876051		235837		640214		26.92	
		1.90		4.25		0.87		2.35
2000	1059429		360688		698741		34.05	

EGYPT

1950	20461		6532		13929		31.92	
		2.37		4.08		1.46		1.71
1960	25929		9818		16111		37.86	
		2.51		3.61		1.78		1.09
1970	33329		14080		19249		42.25	
		2.38		2.98		1.93		0.60
1975	37543		16346		21197		43.54	
		2.31		3.13		1.65		0.82
1980	42144		19119		23025		45.37	
		2.22		3.30		1.23		1.08
1990	52640		26604		26036		50.54	
		2.05		3.31		0.56		1.27
2000	64588		37048		27540		57.36	

NICARAGUA

	TOTAL Population (in thousands)	Growth Rate (percent)	URBAN Population (in thousands)	Growth Rate (percent)	RURAL Population (in thousands)	Growth Rate (percent)	DEGREE OF URBANIZATION Percentage Urban	Annual Growth Rate (percent)
1950	1109	2.83	397	4.28	712	1.92	35.80	1.45
1960	1472	2.91	609	4.23	863	1.87	41.37	1.32
1970	1970	3.25	930	4.47	1040	2.10	47.21	1.22
1975	2318	3.29	1163	4.51	1155	1.99	50.17	1.21
1980	2733	3.24	1457	4.37	1276	1.76	53.31	1.13
1990	3778	3.11	2256	4.09	1522	1.44	59.71	0.98
2000	5154		3396		1758		65.89	

MEXICO

1950	26606	3.13	11348	4.86	15258	1.60	42.65	1.74
1960	36369	3.25	18458	4.76	17911	1.40	50.75	1.51
1970	50313	3.25	29706	4.56	20607	1.20	59.04	1.31
1975	59204	3.34	37318	4.47	21886	1.26	63.03	1.13
1980	69965	3.33	46660	4.21	23305	1.29	66.69	0.88
1990	97585	3.04	71069	3.64	26516	1.22	72.83	0.60
2000	132244		102293		29951		77.35	

Source: United Nations Population Division (1979), Annexes A, B and C.

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