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SPATIAL POPULATION GROWTH IN
DEVELOPING COUNTRIES:

WITH A SPECIAL EMPHASIS ON THE IMPACT OF AGRICULTURE

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Spatial Population Growth in Developing Countries
with Special Emphasis on the Impact of Agricultural Change

In 1959, Dovring expressed what may be considered the basic assumption underlying the work of development economists in the fifties and the sixties:

"It has become almost axiomatic nowadays that a highly developed economy should have only a small proportion of its population engaged in agriculture. The relatively low demand elasticity of most foodstuffs and the advantages of specialization are now common knowledge, to the extent that it is regarded as self-evident that expanding secondary and tertiary sectors of the economy is a condition for economic progress. The facts seem to underscore this, since partially all the economically less-developed countries are predominantly agricultural and all the most highly developed ones have only a small sector of their population engaged in agriculture or depending upon it for their livelihood. (...) Many of them working in this field (development economics) seem to be convinced that one of the primary requisites for developing a less-developed country is to reduce its agricultural population." (Dovring, 1959, p. 1)

Higgins (1964, p. 120) needs only three words to describe the economic development problem, "too many peasants".

These propositions give to the simple covariance of economic development and declining share of agricultural population, observed in the history of most developed countries, a causality interpretation. We do not intend to examine whether this induction is justified, the fact is that it has shaped the perception of population distribution as an issue in agricultural and overall economic development. Rural to urban migration, which has frequently been considered conceptually identical to the shift of agricultural to non-agricultural activities, has been assumed to be inherent to economic development.

In the theory of development of a dual economy, emphasis is on the reallocation of labor, population, from the traditional agricultural sector to the modern non-agricultural sector.

Ranis and Fei define development as follows:

Development consists of the reallocation of surplus agricultural workers, whose contribution to output may have been zero or negligible, to industry where they become productive members of the labor force. (1964, p.182).

During the past decades, we have experienced massive outmigration from agriculture in developing countries. Economic progress, however, was less striking. The population redistribution did not automatically promote development. On the contrary, to the problems of rural unemployment and poverty, new problems have been added: urban unemployment and poverty. What went wrong? Why did agriculture not benefit from this population redistribution? What generated the large share of unproductive labour in urban industrial centres? These are the basic questions posed at the outset of this research.

Our aim is to formulate an answer by broadening our perspectives of development and by looking closer at the process underlying this population distribution; namely, migration and at the actors, the migrants.

The rationale for such a micro-approach is given by Hathaway:

"Much economic theory has an underlying assumption that units of resources are homogeneous and that, therefore, resource transfers are neutral as to the resultant character of that portion of the resource not transferred. We know, however, that human resources in agriculture are not homogeneous, so that who migrates from agriculture has an effect beyond the mere numbers involved upon both agriculture and the receiving sector of the economy." (1964, pp. 216-217)

This paper, which looks at the causes of spatial population growth, is organized in three parts. ⁽¹⁾

The first investigates how the growth of a multiregional (rural-urban) population system is determined by an interaction of the demographic components of fertility, mortality and migration.

(1) Spatial population growth of a system of rural and urban regions encompasses both urbanization and urban growth. Whereas urbanization is defined as the rise in the proportion of a total population that is concentrated in urban settlements, urban growth refers to an increase of the number of people living in urban areas.

It presents the basic ingredients of any demographic model of multiregional population growth and demonstrates observed regularities.

The second part studies the demographic component of migration in more detail. What forces determine the volume and direction of migration, and the decision-making of the individual migrant? Social, economic, cultural and ecological factors are analyzed in the framework of an extended migration theory.

Finally, the third part reviews some attempts to model the pattern of internal migration in developing countries. It must be stressed that the economic nature of most of these models should not be interpreted as demonstrating the economic nature of the migration process, but as an expression of the activities of economists in this field.

1. THE DEMOGRAPHY OF URBANIZATION

The proportional allocation of a multiregional population among its constituent regions and the age compositions of its regional populations are determined by the recent history of fertility, mortality and migration to which it has been subjected (Rogers and Willekens, 1976, p. 3-4). At any point in time, the crude rates of birth, death, migration and growth are all governed by the prevailing regional age-specific schedules of fertility, mortality, and migration, defining the regime of growth. The contribution of each schedule is weighted by the regional age compositions and regional shares of the population.

The age-specific schedules of the components of multi-regional population growth are remarkably stable over time and have a remarkably regular pattern in different regions and countries. To illustrate the empirical regularities, we consider each component separately.

1.1 Fertility

Age-specific rates of childbearing in human populations are shaped by both biological and social factors. The childbearing capacity generally begins at age x of about 15, attains a

maximum between ages 20-30 and declines then to end by age β which is normally close to 50. The precise form of the curve depends on the age at marriage, degree of contraception practised and other social and economic factors. Urban and rural fertility schedules for different countries are contained in Table 1. The general belief that urban fertility is below rural fertility does not always hold. Table 1 shows that for Zaire, the urban fertility is about 22% higher than rural fertility. The total fertility rate (TFR) of Lagos is 31% above the TFR of rural areas in Nigeria. In a fertility survey of French-speaking countries of Africa, Cohen (1967) distinguishes three patterns*:

- (i) Countries with higher urban than rural fertility:
Congo, Gabon, Upper Volta;
- (ii) Countries with roughly comparable urban and rural fertility: Chad and Senegal;
- (iii) Countries with lower urban than rural fertility:
Mali, Guinea, and Togo.

Zaire could be included in (i) and Ghana in (iii). Several explanations have been proposed for higher urban fertility: age at marriage and nuptiality differences (rural-urban difference in marital fertility levels is low in Zaire; in Ghana, the rural-urban differentials are almost entirely caused by delayed marriage), health conditions (better health care in urban areas reduces pathological sterility), sociological factors (relaxation of fertility restrictive practices such as postpartum sexual taboos) (for a detailed discussion of rural-urban fertility differences, see Page, (1975, pp. 53-55) and Morgan (1975, pp. 199-213).

Because of the observed regularities of fertility schedules, demographers have attempted to describe the curves by a limited set of parameters. Two parameters are shown to be sufficient to describe the fertility curve: the first represents the level of fertility and the second is a measure of the shape of the

* Cited in Page (1975, p. 53).

TABLE 1

Rural-Urban Age-Specific Fertility Rates
1.a. Zaire (1955-1957) and Ghana (1960)

Age Group	Z a i r e				G h a n a				
	A		B		A		U/R		
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	
15-19	0.121	0.211	0.244	0.289	0.284	0.295	0.148	0.096	0.65
20-24	0.264	0.292	0.290	0.301	0.302	0.311	0.265	0.230	0.87
25-29	0.229	0.258	0.246	0.273	0.263	0.280	0.277	0.234	0.85
30-34	0.164	0.209	0.184	0.223	0.198	0.230	0.247	0.221	0.89
35-39	0.077	0.108	0.088	0.131	0.101	0.132	0.289	0.264	0.87
40-44	0.016	0.020	0.022	0.031	0.026	0.026	0.106	0.094	0.89
45+	4.74	6.03	5.81	6.90	6.38	7.03	0.046	0.045	0.98
TFR							6.89	5.92	0.86

A = rates based on all women.

B = rates based on customarily or consensually married women only.

C = rates based on women in monogamous customary marriages only.

Source:

Page (1975, p. 54)

1.b Nigeria (1968, 1969), Ivory Coast (1963)

Age Group	Nigeria			Ivory Coast	
	Rural	Urban Oyo Ife	Urban Lagos	Rural	Urban Abidjan
10-14	0.014	--	--	--	--
15-19	0.181	0.070	0.098	0.192	0.206
20-24	0.266	0.276	0.218	0.289	0.230
25-29	0.233	0.264	0.262	0.264	0.215
30-34	0.172	0.213	0.239	0.226	0.196
35-39	0.123	0.131	0.179	0.158	0.125
40-44	0.068	0.058	0.117	0.102	0.067
45+	0.063	0.042	0.055	0.044	0.029
TFR	5.600	5.277	5.842	6.375	5.340

Source: Nigeria: Morgan, 1975, p. 196.
Ivory Coast: Rousset, 1975, p. 670.

1.c Columbia (Oct. 1972 - Oct. 1973)

Age Group	Rural	Semi-urban	Metropolitan	Bogota	Total
15-19	0.087	0.058	0.049	0.046	0.062
20-24	0.271	0.195	0.153	0.154	0.196
25-29	0.294	0.192	0.152	0.147	0.203
30-34	0.256	0.162	0.120	0.116	0.173
35-39	0.209	0.122	0.080	0.076	0.133
40-44	0.107	0.062	0.040	0.035	0.067
45-49	0.035	0.018	0.017	0.013	0.023
TFR	6.30	4.05	3.06	2.94	4.29

Source: Potter, Ordonez and Measham (1976, pp. 516 and 521).

fertility curve. The level of fertility is given by the area under the fertility curve. It is called the total fertility rate (TFR) if the schedule refers to live births of both sexes and the gross rate of reproduction (GRR) if to female births (or one-sex curve) only. The GRR is, therefore, the number of daughters a woman would have if the particular fertility schedule prevailed during her lifetime and mortality were ignored. A summary measure of the shape of the fertility curve is the mean age of the schedule \bar{m} . Populations with higher fertility at younger ages have lower values of \bar{m} .

1.2 Mortality

Even more than the fertility curve, the mortality schedule exhibits a regular pattern. Mortality is normally high immediately after birth, drops to a minimum between ages 10 to 15 and then increases thereafter first slowly and then rapidly. Table 2 illustrates some mortality schedules of urban and rural areas in developing countries.

The regular pattern of mortality schedules enables demographers to fully specify the schedule by its level only. Instead of summing the age-specific mortality rates directly to yield a gross mortality rate analogous to the GRR, a complex index is computed; namely, the expectation of life at birth $e(0)$. With each mortality schedule is associated a particular life expectancy (Table 2).

1.3 Migration

As in the case of fertility and mortality, schedules of age-specific migration rates show important regularities. The most prominent regularity is the high concentration of migration among young adults. The reason is simple. Young adults (15-25 years) are likely to enter the job market, to change jobs

TABLE 2
Rural-Urban Age-Specific Mortality Rates by sex
2a Liberia (1970)

<u>Ages</u>	<u>Urban</u>		<u>Rural</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
0	94.7	87.9	168.9	149.5
1- 4	14.0	12.1	19.3	20.2
5- 9	5.0	2.1	4.7	4.0
10-14	1.6	0.5	4.0	3.4
15-19	1.7	3.4	3.6	5.2
20-24	3.6	5.6	8.4	3.8
25-29	2.7	1.8	8.4	5.5
30-34	4.3	7.5	8.6	5.1
35-39	5.0	3.8	15.9	3.6
40-44	5.6	13.8	7.4	8.5
45-49	24.6	7.2	21.7	4.7
50-54	4.5	19.9	25.5	10.4
55-59	26.2	10.5	15.5	16.6
60-64	24.1	34.3	24.2	18.7
65+	141.5	107.3	43.6	38.3
All Ages	12.2	11.0	20.4	16.0

Source: United Nations (1974, pp. 690-691)

2b West Malaysia (1970)

<u>Ages</u>	<u>Urban</u>		<u>Rural</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
0	55.2	43.3	50.1	37.8
1- 4	3.1	3.1	4.8	4.8
5- 9	1.3	1.0	1.6	1.6
10-14	0.9	0.7	1.1	0.9
15- 19	1.3	0.9	1.6	1.3
20- 24	1.9	1.0	1.9	1.8
25- 29	2.4	1.5	1.9	2.3
30- 34	2.9	2.0	2.8	2.6
35- 39	3.9	2.8	3.4	3.1
40- 44	5.4	4.7	5.3	4.2
45- 49	9.7	6.0	7.9	6.4
50- 54	16.8	9.8	13.6	10.3
55- 59	24.9	14.8	20.2	15.0
60- 64	43.7	24.3	33.8	26.2
65- 69	61.6	32.5	48.3	37.7
70- 74	94.0	53.8	73.5	56.1
75- 79	126.4	75.7	104.8	78.3
80- 84	176.1	110.8	134.0	105.6
85- 89	180.5	166.3	146.2	141.9
All Ages	8.3	5.9	8.2	6.5

Source: United Nations (1974, pp. 690-694)

2e Pakistan (1968)

<u>Ages</u>	<u>Urban</u>		<u>Rural</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
0	184.5	129.1	200.0	179.8
1-4	10.1	16.8	19.2	18.0
5-9	2.5	2.5	4.2	1.7
10-14	1.9	4.2	1.7	2.0
15-19	---	---	3.3	3.7
20-24	---	1.4	4.2	5.6
25-29	0.9	3.1	0.8	7.6
30-34	1.4	3.3	---	6.4
35-39	1.6	7.7	3.7	1.4
40-44	7.0	8.0	2.7	2.9
45-49	6.0	9.7	1.8	10.0
50-54	5.8	3.1	14.0	12.0
55-59	5.4	18.2	12.0	7.6
60-64	15.4	12.8	34.3	11.7
65+	54.8	47.7	34.6	50.1
All Ages	9.2	10.4	13.1	12.6

Source : United Nations (1974, pp. 692-693)

and to get married. They are less constrained by ties to their families, by ownership of a home or a business and by children of school-age. A second concentration of migration is among infants, since they move with their parents.

Table 3 and Figure 1 show a number of migration schedules. Unlike that for fertility and mortality, age-specific migration rates are seldom published by statistical offices. Most age-specific data are obtained using sample surveys or estimates for specific migration studies. Table 3 presents annual age and sex-specific outmigration, immigration and net migration rates for 101 villages of Matlab Thana in South-Central Bangladesh. In 1972-73, 70% of the male outmigrants were less than 25 years old, and one third was between 10 and 20 years of age. For the female outmigrants, 82 % were under 25 years and almost one half between 10 and 20 years of age. The male outmigration rates are mostly above the female rates, which is as expected. The higher female outmigration rates for age-groups 10-14 and 15-19 is a consequence of migration due to a change in marital status: 60% of the girls between 10 and 20 years of age were married (median age at marriage for Bangalee is 14 years).

The curves of immigration rates have a peak at age group 25-29 for males and at 15-19 for females. The reason for the higher age of male immigrants may be that they comprise a considerable proportion of return migrants (Chaudhury and Curlin, 1975, p. 190). The location of the peak in the female immigration curve is closely related to the age at marriage, since marriage is the dominant reason for female migration (see below). Net migration rates are shown in Table 3c.

Another illustration of the age structure of net migration out of rural areas is given in Carrol and Sloboda (1976, p. 12) and shown in Figure 3. The same pattern is observed as in Bangladesh: the maximum female migration rates occur at younger ages than those of males. Both male and female migration profiles, however, are "older" than in the case of Bangladesh.⁽¹⁾

(1) A distinction between young and old profiles has been made by Rogers and Castro (1976).

TABLE 3

Migration Rates for 101 Villages of Matlab
 Thana by Age and Sex for Specific Years: 1968/69, 1969/70, 1970/71,
 1971/72 and 1972/73

3.a Outmigration Rates (per 100 Population) (1)

Age	1968/69		1969/70		1970/71		1971/72		1972/73	
	Male	Female								
0-4	2.73	2.52	2.32	2.38	2.50	2.38	2.06	2.16	2.23	2.44
5-9	1.98	2.03	1.85	1.75	1.71	1.86	1.63	1.77	2.57	2.53
10-14	4.66	5.64	3.97	5.99	2.18	7.39	2.36	4.16	3.64	6.76
15-19	8.92	9.31	7.10	10.08	3.41	5.15	3.20	6.71	5.75	8.12
20-24	10.91	4.65	7.17	3.89	3.20	3.24	3.75	3.93	6.39	6.26
25-29	8.02	2.94	6.48	2.71	2.78	2.22	5.09	2.95	5.39	3.41
30-34	7.05	1.73	3.59	1.49	2.05	1.55	3.73	1.68	4.44	2.28
35-39	4.92	1.53	2.98	1.16	1.77	0.95	3.51	1.43	3.34	1.81
40-44	3.82	1.59	2.34	1.06	0.99	1.04	1.88	1.11	2.76	1.10
45-49	3.08	1.16	1.66	1.30	1.46	0.64	1.97	1.19	1.81	0.92
50+	1.68	1.09	1.16	1.16	0.79	1.04	1.11	1.06	0.98	0.96
All										
Ages	4.36	3.17	3.24	3.17	2.09	2.86	2.44	2.73	3.32	3.65

(1) An outmigrant is defined as a person who left the study area of 101 villages, and did not return in the succeeding six months.

Source: Chaudhury and Curlin (1975, p. 189).

3.b Immigration Rates (per 100 Population)

Age	1968/69		1969/70		1970/71		1971/72		1972/73	
	Male	Female								
0-4	1.86	1.96	2.30	2.24	2.96	2.80	1.29	1.18	1.86	3.33
5-9	1.41	1.71	1.67	1.71	1.97	2.63	2.22	2.16	1.43	1.34
10-14	2.60	3.12	2.53	3.84	2.68	3.68	1.94	2.43	1.95	3.53
15-19	4.04	10.55	3.73	10.64	3.58	9.19	2.86	6.59	2.59	9.44
20-24	5.80	4.29	4.95	3.81	5.12	3.71	3.83	5.11	4.90	3.36
25-29	6.46	2.43	5.61	2.37	6.67	3.06	4.74	3.57	6.74	2.06
30-34	3.60	1.60	3.39	1.84	5.14	1.91	4.86	1.54	4.15	1.36
35-39	2.85	1.15	3.32	1.12	3.70	1.85	3.10	1.62	3.60	0.93
40-44	2.33	0.89	2.07	1.36	2.57	1.17	2.09	1.43	2.10	0.61
45-49	2.18	0.65	2.01	0.85	2.51	0.93	2.05	1.00	1.81	0.92
50+	1.16	1.19	1.16	1.12	1.52	1.88	1.39	1.15	0.90	0.93
All Ages	2.61	2.67	2.61	2.90	3.07	3.13	2.38	2.54	2.44	2.64

(1) An immigrant is defined as a person who moved into the study area and stayed there for six months.

Source: Chaudhury and Curlin (1975, p. 191).

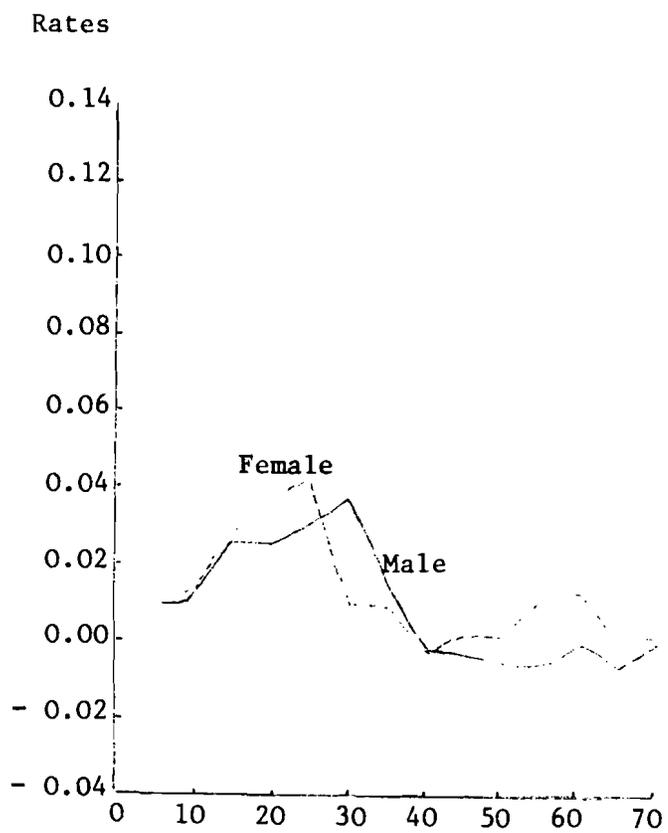
3.c Net Migration Rates (per 100 Population)
1971/72 and 1972/73

Age	1968/69		1969/70		1970/71		1971/72		1972/73	
	Male	Female								
0-4	-.87	-.56	-.02	-.14	.47	.42	-.77	-.97	-.36	-.60
5-9	-.56	-.32	-.18	-.04	.26	.76	.58	.39	-1.14	-1.19
10-14	-2.05	-2.51	-1.03	-2.15	.49	-3.70	-.42	-1.72	-1.69	-3.23
15-19	-4.87	1.24	-3.37	.55	.16	4.03	-.34	-.12	-3.16	1.32
20-24	-5.11	-.36	-2.22	-.07	1.72	.46	.07	1.18	-1.49	-2.90
25-29	-1.55	-.50	-.87	-.34	3.88	.83	-.35	.61	1.35	-1.35
30-34	-3.44	-.12	-.19	.35	3.09	.36	1.12	-.13	-.29	-.93
35-39	-2.06	-.38	.34	-.03	1.93	.89	-.40	.19	.25	-.87
40-44	-1.49	-.70	-.27	.31	1.58	.12	.21	.31	-.66	-.49
45-49	-.90	-.50	.34	-.45	1.04	.29	.08	-.19	-.07	-0.03
50+	-.52	0.10	-.05	-0.03	0.73	0.01	0.28	-0.09		
All Ages	-1.74	-.50	-.63	-.28	.98	.27	-.06	-.18	-.88	-1.00

Source: Chaudhury and Curlin (1975, p. 193).

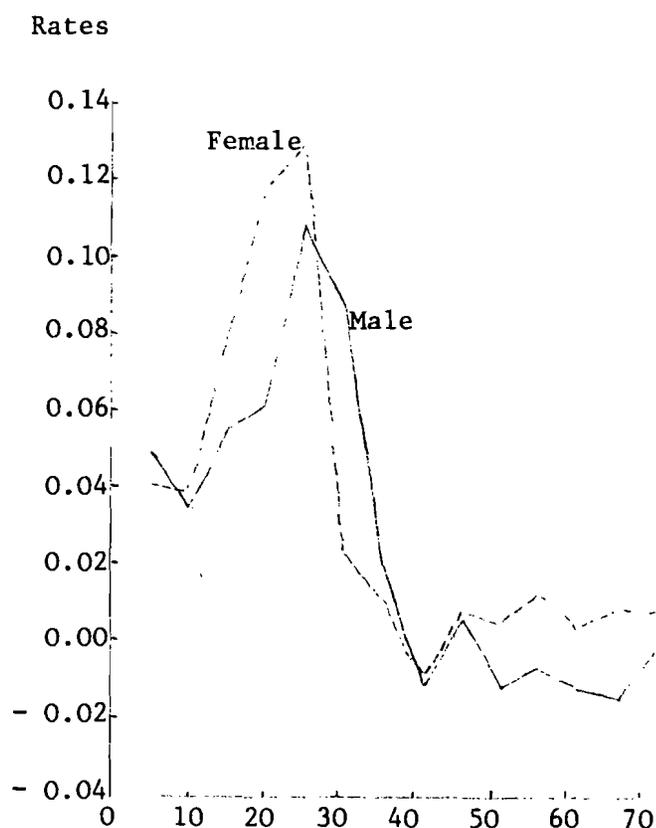
Figure 1

Average Annual net off-farm migration rates, by sex, Republic of Korea



Average Age of Cohort

3a Period 1960-1966



Average Age of Cohort

3b Period 1966-1970

Source: Carrol and Sloboda (1976, p. 12).

The empirical regularities in migration schedules show a way to describe the curves by a limited set of parameters. Two alternative ways of formally specifying the level of migration have been proposed (Rogers, 1975b; Rogers and Willekens, 1976, p. 9). The first adopts the fertility point of view and defines the migration from region i to region j in terms of the area under the migration schedule, called the gross migra-production rate GMR_{ij} . The second approach adopts a mortality perspective and defines the migration level in terms of the fraction of a person's life expectancy that is spent in another region. The migration level with respect to region j of individuals born in region i is

$$i^{\theta}_j = \frac{i^{e_j}(0)}{i^{e \cdot}(0)}$$

where $i^{e \cdot}(0)$ is the total life expectancy of an i -born individual, and $i^{e_j}(0)$ is the number of years expected to be lived in region j by a person born in i .

Analogously to fertility, a summary measure of the shape of the migration curve is the mean age of the schedule (Rogers and Castro (1976)). Migration that is highly concentrated in the young age groups, yields a low mean age of the migration schedule. Table 3 contains for each migration schedule the gross migra-production rate and the mean age.

1.4 Regional Age Compositions and Regional Shares

The discussion of fertility, mortality and migration this far did not include considerations of the population distribution by age and region. Parameters such as the GRR, GMR_{ij} , and the mean ages are distribution-free, i.e. they do not depend on the population distribution to which they are applied. However, the population distribution (by age and region) is determined by the recent histories of fertility, mortality and migration. As proposed at the beginning of this section, we maintain that the age structure of a population and its regional distribution

are the demographic consequences of recent histories of fertility, mortality and migration.

The crude birth, death and migration rates not only depend on the age-specific rates of fertility, mortality, and migration, but also on the population distribution. The relative age and regional distributions serve as weights in the consolidation process. A single set of age-specific migration rates, say, can produce quite different crude migration rates if combined with different sets of regional age compositions and regional shares. Therefore, crude birth, death and migration rates are not good indices of the actual level of fertility, mortality and migration since they confound the effect of the age-regional composition and the demographic components.

1.5 Illustration

This section on the demography of urbanization was devoted to the rural-urban differences in the basic determinants of spatial population growth; namely, age schedules of fertility, mortality and migration. A major problem in the study of multi-regional population dynamics in the developing countries is the lack of detailed data. However, missing data may be generated because of the regularities in fertility, mortality and migration schedules. So-called model-schedules may be derived from limited information on the components of demographic growth (United Nation, 1967; Rogers, 1976). The use of model schedules is now a common practice in demographic analysis with incomplete data.

To illustrate the analysis with incomplete data, we consider a two-region system of India, consisting of urban areas and rural areas. The urban and rural population by age group is given in Table 4. The published data on the demographic components fall short of the required data. Generally, only crude rates of birth, death and migration are known for the base year. To disaggregate these data by age, we need a reference schedule for each demographic component. This may be a schedule

of the same population at a time period not far apart from the base year, or a schedule of a population with similar demographic characteristics. To generate the age-specific fertility, mortality and migration rates for urban and rural India, the following procedures have been adopted:

(i) Fertility

The crude urban and rural birth rates in 1970 were 0.0297 and 0.0388 respectively (Registrar General, 1972). Age-specific rates are unknown. The reference schedule used is the fertility age profile of the female population, published by Ambannavar (1975, p. 110). The sum of the age-specific fertility rates is 0.5335, implying a GRR is 2.6675. Dividing the reference rates by the GRR yields a fertility schedule with unit GRR, unitary schedule. The problem now is to derive a set of age-specific fertility rates which are consistent with the published crude birth rates. We will assume that the sought fertility schedule and the reference and unitary schedules have the same shape (which implies an identical mean age of the schedule). The problem therefore reduces to finding a GRR which is consistent with the observed crude birth rates.

The crude birth rate of region i , b_i is the weighted sum of the age-specific fertility rates, the weight being the age-structure of the population:

$$b_i = \sum_x F_i(x)K_i(x) \quad , \quad (1)$$

where $F_i(x)$ is the fertility rate of age group x to $x + 4$ in region i , and

$K_i(x)$ is the number of people in age group x to $x + 4$ in i . Equation (1) may be rewritten as:

$$b_i = GRR_i \sum_x F_i^u(x)K_i(x) \quad , \quad (2)$$

where $F_i^u(x)$ represents the unitary fertility schedule of region i . Assume b_i and $K_i(x)$ are known values and $F_i^u(x)$ is equal to the reference schedule which is scaled to unit GRR, i.e. $F_R^u(x)$. The GRR which is consistent with the crude birth rate is:

$$GRR_i = \frac{b_i}{\sum_x F_R^u(x) K_i(x)} \quad . \quad (3)$$

The derived urban and rural GRR's are 1.8939 and 2.8476 respectively. The adjusted age-specific fertility rates are given in Table 4.

(ii) Mortality

The crude death rates for urban and rural areas in 1970 were 0.0102 and 0.0173 respectively. These have been disaggregated using as reference schedule the age-specific death rates of India, published by the Registrar General (1972, p. 101). The procedure is analogous to the one described above. The results are shown in Table 4.

(iii) Migration

According to Bose (1973, p. 146) the crude annual outmigration rates for urban and rural areas in 1970 were 0.0100 and 0.0068 respectively, To disaggregate these rates into age-specific outmigration rates, we assumed an age composition of the migrants given by Rogers (1976, p. 10). The GMR's are 0.6863 and 0.4784 respectively.

Table 4 contains the necessary data to perform a demographic analysis of the urban-rural system of India. The appropriate analytical apparatus is provided by multi-regional mathematical demography, which is pioneered by Rogers (1975). Relevant algorithms and computer programs are given by Willekens and Rogers (1976, 1977). The analysis itself is beyond the scope of this paper. The purpose of this section was to demonstrate the fundamental regularities observed in fertility, mortality and migration

TABLE 4

Demographic Data for Urban
and
Rural India (1)

4a. Urban India

Age	Population (in thousands)	Age-Specific Rates		
		Fertility	Mortality	Outmigration
0-4	14,140.2	-	0.038248	0.009325
5-9	14,798.3	-	0.003938	0.006652
10-14	13,637.5	-	0.001730	0.005181
15-19	10,944.9	0.033001	0.001850	0.013881
20-24	10,454.9	0.088304	0.002804	0.024243
25-29	8,955.7	0.089994	0.002745	0.012268
30-34	7,612.4	0.076198	0.003103	0.008376
35-39	6,881.5	0.053371	0.003759	0.006367
40-44	5,714.3	0.025972	0.004833	0.005641
45-49	4,476.5	0.011950	0.006802	0.005327
50-54	3,810.3	-	0.010442	0.004193
55-59	2,223.4	-	0.014559	0.008101
60-64	2,389.9	-	0.024703	0.009386
65-69	1,129.4	-	0.033534	0.018322
70+	1,907.8	-	0.072915	0.000000
Total	109,077.0	0.378790	0.225965	0.137264

TABLE 4

4b. Rural India

	Population (in thousands)	Age-Specific Rates		
		Fertility	Mortality	Outmigration
0-4	64,966.8	-	0.057712	0.005552
5-9	68,071.5	-	0.005942	0.003956
10-14	54,639.7	-	0.002611	0.003537
15-19	36,502.0	0.049619	0.002791	0.011384
20-24	32,627.5	0.132768	0.004232	0.021248
25-29	31,843.6	0.135309	0.004142	0.009438
30-34	28,551.7	0.114567	0.004682	0.006108
35-39	26,011.9	0.080246	0.005672	0.004607
40-44	22,648.4	0.039050	0.007293	0.003893
45-49	18,315.9	0.017967	0.010264	0.003561
50-54	16,879.8	-	0.015756	0.002589
55-59	10,432.0	-	0.021968	0.004723
60-64	11,944.3	-	0.037274	0.005137
65-69	5,691.8	-	0.050599	0.009944
70+	9,629.6	-	0.110021	0.000000
Total	438,756.5	0.569526	0.340957	0.095677

(1) The population data are for April 1, 1971. The other data refer to 1970.

Source:

Population: United Nations (1973, pp. 154-155)

Age-Specific Rates: see text

and to show how these regularities may facilitate the task of data gathering for the study of multiregional demographic systems.

2. THE ECONOMIC, ECOLOGICAL AND SOCIAL FACTORS OF MIGRATION

In the first section we looked at the empirical regularities of rural out- and immigration schedules. This section goes a step further. Its purpose is to present, in a coherent way, an overview of plausible causes of rural-urban migration. Why are the migration rates of young adults so high? Is there any relationship between outmigration and immigration rates? If so, how may it be explained?

During the past two decades, scientists of several disciplines have been attracted by the phenomena of distribution and redistribution of people over space, and have sought for explanations. Planners, demographers, economists, geographers and sociologists have addressed migration-related questions. Who migrates? Why do people move? What are the patterns of flows and direction of migration? What are the consequences of migration? (Mangalam, 1968, p. 15). The different orientations and inclinations of scholars have resulted in a great diversity of migration studies, which has not yet been integrated into a unique interdisciplinary approach. Demographers have typically looked upon migration as a component of population change; economists have examined it as a mechanism enabling an individual to adjust to new situations and enabling the labor market to adjust when disturbed from its equilibrium position; geographers have been primarily interested in the description and explanation of the spatial patterns of mobility; and sociologists have focused on the study of motivation, of the relation between migration and social structure, and of the assimilation of migrants in new communities. ⁽¹⁾.

In contrast to the extensive enquiry on internal migration, which was mainly empirically oriented, little effort has been

(1) A feeling for the state-of-the-art is given by the recent surveys and bibliographies of Welch (1970), Byerlee (1972), Gould (1974), Greenwood (1975), Price and Sikes (1975), and Todaro (1976). A list of earlier bibliographies is provided by Kosinski and Prothero (1975, pp. 381-383).

devoted to the synthesis of this fragmentary knowledge into a general migration theory. Two basic approaches have been followed in the construction of a migration theory (Willekens, 1976, pp. 9-16). The first, inductive, approach attempts to build up a migration theory from empirical observations. The second, deductive, approach starts from a general theoretical construction and collects empirical evidence to prove its applicability. It is not surprising that most researchers have followed the inductive approach. Recently, under the stimulus of economists, the deductive approach seems to be gaining in importance. In this section on socio-economic determinants of migration, we use the theoretical paradigm based on the inductive approach. First, however, we review some of the research leading to this paradigm, (anatomy of the migration factors) and extend it by including some theoretical considerations on the individual migration decision (anatomy of the migration decision).

2.1 Migration Theory

2.1.1 Anatomy of the migration factors.

The first attempt at formulating a migration theory dates back almost a century. Following an empirical study on population movements, first in Britain and later in twenty countries, Ravenstein (1885 and 1889) formulated the observed empirical regularities as "Laws of Migration". These came as a reaction to an earlier study of Farr (1876), which claimed that migration was random. The gravity type laws formulated a crude answer to the questions why people migrate, what the migrants' characteristics are, and what the pattern of internal migration is.

The Ravenstein work has been extended along two paths:

- (i) extension and reformulation of the list of empirical regularities;
- (ii) expression of the regularities in gravity type models.

Along the first path, Bogue (1959, pp. 499-501) came up with extensive lists of situations affecting migration. He explicitly stated that the lists

are nothing more than a framework for migration analysis, and should not be interpreted as laws or theory. Bogue identifies three groups of variables: socio-economic conditions (investments, technological change, migration regulations etc.), migration stimulating situations (graduation, marriage, etc.), and factors instrumental in choosing a destination (cost of moving, presence of relatives and friends, special employment opportunities, etc.). Lee (1966) provides a more explicit attempt at theory formulation. Migration is the result of a decision-making process. Lee classifies the factors entering directly into the decision-making, into four sets:

- (i) Push factors: factors associated with the area of origin;
- (ii) Pull factors: factors associated with the area of destination;
- (iii) Intervening factors: obstacles associated with the movement itself;
- (iv) Personal factors: characteristics of the potential migrant, that determine the way in which he perceives and evaluates migration as a personal project.

These factors constitute the context, or motivational structure, as Taylor (1969; p. 132) calls it, out of which the decision to migrate finally crystallizes. Lee uses this structure to formulate nineteen hypotheses about the volume of migration, the migration directions and the characteristics of the migrants. Central to many of these hypotheses is the observation that migration is an adjustment to changes in personal and economic conditions. A sample of the most important of these hypotheses are given below (Lee, 1966, pp. 53-57; see also Todaro, 1976 pp. 18-19 and Kosinski and Prothero 1975, pp. 9-10).

Volume of Migration

- (1) The volume of migration within a given territory varies directly with the degree of diversity of areas included in that territory.
- (2) The volume of migration varies directly with the diversity of people.

- (3) The volume of migration is inversely related to the difficulty of surmounting the intervening obstacles.
- (4) Unless severe checks are imposed, both the volume and the rate of migration tend to increase with time.

Stream and Counterstream

- (5) Migration tends to take place largely within well defined streams (e.g. from a variety of rural regions to regional towns and then towards the major cities).
- (6) For every major migration stream, a counterstream develops (i.e. there will always be return migrants who find that their initial perceptions did not accord with reality or who simply failed to achieve their objectives).
- (7) The magnitude of the "net" stream (i.e. stream minus counterstream) will be directly related to the preponderance of minus factors at origin--i.e. origin "push" factors are relatively more important than destination "pull" factors.

Characteristics of migrants

- (8) Migration is selective, i.e. migrants are not random samples of the population at the origin.
- (9) Migrants responding primarily to plus factors at destination tend to be "positively" selected, i.e. they are of a higher "quality" (more educated, healthier, more ambitious, etc.) than the origin population at large.
- (10) Migrants responding primarily to minus factors at origin tend to be "negatively" selected, e.g. most European migrants to North America in the nineteenth and early twentieth century were unskilled rural peasants driven off the land by economic hardship, political and/or religious persecution, etc.
- (11) The degree of "positive" selection increases with the

difficulty of the intervening variables, i.e. the more educated are willing to travel longer distances to find suitable employment opportunities.

Several of these generalities have already been formulated by Ravenstein and Bogue. They provide an interesting background for the review of the determinants of rural-urban migration flows in developing countries, which we will consider later in this paper.

2.1.2 Anatomy of the migration decision.

The research reviewed above deals uniquely with the determinants of migration and with some empirical regularities. However, migration is the result of a decision-making process. This process is complex, involving many single but interdependent decisions. The analysis of migration and its causes may benefit from the distinction of three decisions, each of which has its own character. They are:

- (a) the decision to move;
- (b) the locational decision
- (c) the decision to stay.

Usually the three decisions will be carried out in sequence, although this is not a requirement. For most future migrants, there is the realization that they eventually will migrate, but some precipitating event determines the time of migration and the destination (Price and Sikes, 1975, p. 14).

(a) Decision to move

Why do people want to move? I think it is safe to say that any free movement, independent of the direction, involves a dissatisfaction with the current place of residence or work.⁽¹⁾ The distinction between free and enforced moves is important. A considerable part of the world population changes residence for reasons beyond their control: earthquake, war, flood, drought, fire, political or ethnic oppression.

(1) The dissatisfaction hypothesis is also endorsed by Beals, Levy and Moses (1967, p. 482) and Knight (1972, p. 220).

Migrations following natural or man-made disasters are beyond the scope of this paper because their causes are uncontrollable or cannot be accepted as instruments of a population distribution policy (see also Shaw, 1975, p. 8).

It is not easy to draw a line between free and enforced migrations. In some cases, man creates the causes enforcing himself to move. For example, the cut-and-burn cultivation in primitive societies reduces drastically the carrying capacity of the land. The only way to survive under this technology is to move periodically to new places.⁽¹⁾ Migration is, therefore, part of this technology (hence the term "shifting cultivation"). More recently, premature mechanization and large scale agricultural production systems as part of the Green Revolution have been mentioned as important push factors. Several other examples involving erosion, pollution and so on, may be given. On the other hand, enforced migration (caused by political violence and such like) is a major cause of rapid urbanization in some parts of the world. For example, the alarming growth of Calcutta has been due largely to the influx of displaced persons from East Pakistan (now Bangladesh) through the fifties and the sixties (Batacharjee, 1974, p. 257). The population of Karachi increased from 350,000 in 1941 to nearly 1.5 million, ten years later. The greatest share of the immigrants was made up from refugees from India. Finally, Kinshasa grew from 400,000 people in 1960 to one million at the end of 1962. Unrest in the country pushed people to the capital city.

The dissatisfaction with the current place of residence or work involves most frequently economic and job-related factors. Next are family reasons, that is, people moving because

(1) Migration in search for cultivable land is still practiced. Manshard (1961) presents the case of the Lobi farmers in the Ivory Coast and Ghana. Other examples are given by Mabogunje (1975, pp. 154-155).

the head of the family is moving or as a result of change in marital status, and so on. Illustrations will be given later.

(b) Locational decision

Where do people go? The potential migrant, i.e. someone considering moving, chooses his destination based on the characteristics of the destination area (pull factors), as compared with alternative destination areas. Two points should be stressed. First, not all characteristics are equally relevant to all potential migrants. Some migrants are looking for employment opportunities; others for cultural, recreational or educational facilities, and others are joining their families. Second, all information is incomplete and inexact, i.e. the potential migrant has only limited information about the characteristics of the alternative destination areas. Moreover, he is able to consider only a limited number of alternative locations. Limited information is an important element in the migration theory of Wolpert (1965).

According to Wolpert, an individual assigns a "place utility" to his current place of residence which represents the social, economic, and other costs and benefits derived from that location. Alternative locations are also assigned utilities based on anticipated costs and benefits. The "place utility" concept measures the degree of satisfaction or dissatisfaction at a given location. However, unlike Sjaastad (1962) and others, Wolpert restricts the range of alternative locations to what he calls the migrant's "action space." The first condition for a place to be in the "action space" is that the migrant has sufficient information about it to assign "place utilities." The migrant then behaves according to the principle of utility maximization. He chooses the location which gives him the greatest "place utility," subject to the constraints imposed by the "action space". This approach has been used and extended by Brown and Moore (1971) and by Speare, Goldstein and Frey (1974, Chapter 7) for the study of migration patterns in the United States. It provides a useful paradigm for the analysis of locational decisions.

(c) Decision to stay

Migration is a risky activity. It is based on incomplete and inexact information available prior to the actual migration. Once the migrant arrives at the destination, he starts to feel the consequences of his act. A posteriori information allows him to reassess his expectations. If at this point the expected net benefits or place utility of the new area is found to be less than those of alternative areas, the migrant may consider to move again. This move is frequently back to his place of origin. The decision to stay is therefore an important element in the study of return migrations.

The decision not to stay in a particular area of immigration is not always a consequence of disillusion, such as the inability to find a job. Frequently and especially in developing countries, the migrant has a fairly clear idea of how long he wants to stay before he migrates again. A large part of migrants moving to cities do not maximize their lifetime income but only want to make enough money to set up their own business back in their own region of origin or to fulfill family obligations (making enough money to support the larger family). "Permanent migration, in the conventional use of the term, that is definite movements with no intention to return to home area, is relatively uncommon in tropical Africa, though this is less so now than was the case in the past." (Gould and Prothero, 1975, p. 43).

Another migration stream, where the decision of how long to stay is made before the actual migration takes place, consists of temporary migrations. Seasonal migrations are important in several areas of the developing world, e.g. in the savanna lands of West Africa. They take place during the dry season and cover a period of four to six months (Prothero, 1965)

Because a migration can only be considered to be completed if the migrant stays in his new area for a prolonged period of time, the decision to stay must be treated as a component of

the complex migration decision.⁽¹⁾

2.2 Migration: Empirical Evidences

The theoretical framework developed in the previous section enables us to collect empirical evidences in a systematic manner. The evidences reported here are largely based on secondary information sources. Over the past few years a large body of descriptive migration literature for developing countries has accumulated. For a sample of this type of literature, see the Amin (1974) and Caldwell (1975) volumes. Comprehensive surveys of descriptive migration literature have been given by Brigg (1971 and 1973), Carynnyk-Sinclair (1974) and Connell et al. (1975).

In summarizing the findings of empirical migration research, we consider the three migration decisions separately.

2.2.1 Decision to move

The decision to migrate involves a dissatisfaction with the current place of residence or work. The reasons for dissatisfaction may be of a wide variety: lack of economic opportunities; lack of educational facilities; important social control mechanisms, which limit individual freedom etc. All may be classified as push factors. The way in which the push factors are perceived depends on the personal characteristics of the individual migrant. Whether a desire to migrate leads to an actual migration, i.e. the decision is implemented, is determined by intervening factors.

(1) According to Mabogunje (1970) the final stage of the migration process is the successful assimilation of the migrant in its new environment. Sociological aspects determine, therefore, the end of the process.

(a) Push factors

The single push factor which has received most attention in the literature is rural overpopulation. To define overpopulation is not a simple task. Great care must be taken in the interpretation of this concept. As Singer (1964, p. 243) sees it: "Such terms as 'underpopulation', 'overpopulation' or 'optimum population' make sense only in relation to a given or assumed economic structure, a given state of available resources, whether potential or actual, and a given state of market opportunities."

We consider two approaches to overpopulation:

- (i) overpopulation with respect to the food supply, i.e. the population exceeds the carrying capacity of the land;
- (ii) overpopulation with respect to the labour demand, i.e. the population exceeds the absorbing capacity of the agricultural labour market.

The first approach is typical for ecological studies, whereas the second approach represents the economist's viewpoint.

Ecologists define agriculture as man's intervention in the ecosystem in order to increase net (primary and community) production (Odum, 1971, p. 46). This manipulation of the ecosystem involves subsidies of several forms of energy, irrigation, fertilization, labour, insect control etc.

The organization of this auxiliary energy flow is what defines the level of agricultural technology, and what determines the carrying capacity of the land.⁽¹⁾

In traditional societies, population distribution is closely related to agricultural technology. In the most primitive food production schemes, man's only activity is the harvesting of

(1) The primary source of energy in agriculture is, of course, the sun. Green plants convert solar energy into food for man and other heterotrophic organisms.

the products of nature (man as consumer in ecosystem). The pre-agricultural man lives by hunting, fishing and gathering wild products. This requires large amounts of land. The factor determining the carrying capacity is the natural productivity of the ecosystem. As the population pressure increases, i.e. the land/man ratio drops, people are pushed to expand the productive land or to move to new areas.⁽¹⁾ This ecological push is very important in primitive societies. In India, for example, most outmigration from Ganga Plain and some other areas can be attributed to the high population density as compared to the agricultural productivity (Gosal and Krishan, 1975, p. 204). The depopulation of Nubia, Egypt, is also caused by the lack of arable land (Geiser, 1967, p. 172). The outmigration out of Eastern Nigeria is another illustration (Green, 1974, p. 290).

A variant of the ecological push is the modern seasonal migrations in savanna areas. The pattern is usually as follows: men leave their villages at the beginning of the dry season after completing the harvest of the food crops, and return for the onset of the wet season to plant (Prothero, 1965; Goddard, 1974, p. 269). The volume of seasonal migration is considerable, in particular in West Africa. Mabogunje (1975, p. 157-159) estimates that about two million people are involved in this movement in West Africa and one million in Nigeria, causing a real north-south drift. About twenty five per cent of the latter come out of the Sokoto province. Goddard (1974, p. 267) found that from sixteen to sixty-six per cent of men of working age (15-49 years) participated in this type of migration in Sokoto, Nigeria. The highest percentage was found in remote villages.

(1) At the same time, population pressure induces a more intensive farming system: Boserup (1965) discusses in detail how in pre-industrial societies population pressure brings about a reduction of the length of fallow in shifting cultivation and leads to sedentary agriculture with multiple cropping. Weed control mechanization and the use of fertilizers are other factors of intensification (see e.g. Webster and Wilson, 1966, pp. 178-216 and Van de Walle, 1975, p. 142).

Of interest is that the movements are carefully organized not to conflict with the labour requirements for food production on their own farms. Therefore, seasonal migration is integrated into the annual cycle of activity.⁽¹⁾ For a more detailed discussion of seasonal migration or labour circulation within the framework of alternative strategies evolved by farmers in response to land shortages, see Goddard (1974). For a discussion of the relationship between population density, carrying capacity and agricultural practice, see Van de Walle (1975, pp. 142-145), and Goddard, Mortimore and Normann (1975). Seasonal migration is important to consider since, what starts out as seasonal migration may become a permanent residence (see for example, Hart, 1974, p. 330).

The economic analysis of overpopulation centers around the concept of absorbing capacity. This concept has been developed in investment theory to indicate the upper bound to the amount of efficient investment physically possible in an environment of limited natural resources, labour, technical and managerial skills, entre-preneurial capacity and other complementary inputs (Hirschmann, 1958, pp. 34-38). The overpopulation in the economic sense refers to the number of people not efficiently employed. In general it means the fraction of the labour force in agriculture with a marginal productivity (MP) below the MP in the modern or industrial sector.

(1) Seasonal migration is enhanced by improved transport networks (Ng, 1975, p. 184).

This is frequently referred to as disguised unemployment, although this term has received various interpretations⁽¹⁾.

Is unemployment in rural areas, whether it is disguised or open, a push factor in rural outmigration? There is evidence for a positive answer. In a study on the growth and employment problem in Djakarta, Sethuraman (1975, p. 198) states "By far the most important factor (of migration towards Djakarta) is the unusually high un-employment prevailing in the neighbouring regions.... In the case of West Java, at least, seasonal unemployment appears to be a very important factor in inducing out-migration." Other studies point in the same direction. However, unemployment should not be considered in isolation. Unemployment is closely related to age. Most unemployed migrants are young people, with primary education, and are looking for their first job. Once they are committed to farming, they will be reluctant to leave for a long time period. As a consequence, farmers are under-represented among rural outmigrants, and the outmigration of members of farm households largely consists of young adults not yet committed to agriculture. (Carroll and Sloboda, 1976, p. 2, Harris and Steer, 1968, p. 406). An indication of unemployment as a push factor is the share of the unemployed in the total rural out-migration stream.

Recently, the rural economic overpopulation problem has received a new dimension. A number of agricultural policies of developing countries (and foreign aid policies of donor countries) tend to aggravate rural unemployment and to stimulate outmigration. The most important is the premature industrialization of agriculture, including excessive mechanization. In the early sixties, Nicholls (1964) gave a warning about the restructuring of traditional agriculture too rapidly. A study of Western economic history led him to conclude:

(1) For a review of the definitions of disguised unemployment, see Kao, Anshel and Eicher (1964).

"The third lesson (from the Western experience) is that too rapid a restructuring of a small-scale peasant agriculture into large-scale, mechanized farming units is likely to create a surplus labour force not easily absorbed into non-agricultural employment, a pathological rate of urbanization, the reappearance of a feudal agriculture in new forms, and even conscious policies of mass murder or starvation of the people squeezed out of agriculture."
(Nicholls, 1964, p. 25).

His warning did not prevent heavy mechanization of agriculture, often associated with the introduction of highly productive varieties and of fertilizers in the context of the Green Revolution. Johnston and Cowrie (1969), found that government subsidization of premature tractor mechanization schemes has often contributed to a reduction of per acre labour requirements and hence to a decline in the absorptive capacity of agriculture. Today, some authors speak of a "second generation" problem created by the new agriculture (Marden, 1974, p. 86). The observed emphasis on heavily, capital-intensive agricultural development projects leads Todaro to conclude:

"By overemphasizing direct government production schemes that are heavily capital-intensive, including state farms, land settlement, and irrigation projects, policy-makers have failed to recognize the tremendous potential absorptive capacity of the agricultural sector for its own rapidly expanding rural work force. (...) As the population grows and large-scale mechanized farming schemes are indiscriminately promoted, more and more peasants stand to lose their land, and be pushed out of any participation in the rural economy."
(Todaro, 1974, pp. 162 and 164).

Although there seems to be a general concensus among people dealing with agricultural transformation that the Green Revolution enhances outmigration and rapid urbanization, no detailed study of this interaction has been made yet.

Ecological and economic overpopulation are important push factors in the migration out of rural areas in developing

countries. However, they are by no means exclusive. The decision to move may also be influenced by cultural factors. Several young adults, in particular the better educated, see outmigration as a way of escaping from traditional social norms (Caldwell, 1969; Imoagene, 1969).

A special category of migrants form the female migrants. They usually do not respond to ecological or economic pressures. Their migration is predominantly caused by change in marital status. Female outmigration from rural areas in Bangladesh, for example, are concentrated in age groups 10-14 and 15-19, which coincides with the ages of marriage (Chaudhury and Curlin, 1975, p. 188). Other evidences may be found in Bose, (1973, p. 101) for India.

(b) Migrant characteristics

The treatment of overpopulation in migration analysis may answer the question why people move out of rural areas. But knowing why people move is not enough. It is equally important to know who moves. The potential migrants are not randomly distributed among the rural population, but have certain specific characteristics, and constitute therefore, a well definable subset of the population. Three groups of characteristics picture the typical migrant: demographic, educational and economic.

(i) Demographic characteristics

Some demographic characteristics of the migrants have been discussed in section 1. The typical migrant is single, male and 15 to 25 years old (see, for example, Caldwell, 1969; Byerlee, 1972 and 1974; Brigg, 1971; Yap, 1975; Connell et al., 1975). He moves out of rural areas in search for employment opportunities. Female migrants on the other hand are more likely to move as dependents or to join their prospective husbands. Their age is usually lower than for male migrants. ⁽¹⁾

(1) This is also the case in rural outmigration in the United States. (Price and Sikes, 1975, p. 6).

Sex and age differences in the causes of outmigration are illustrated in Table 5. This migration pattern dominated by single males, which prevails in Africa and Asia, does not seem to apply to Latin America. There, migration streams are dominated by married men with their families and by single women (Brigg, 1971; Herrick, 1971).

TABLE 5

Reason-par-excellence for outmigration from 101 villages of Thana, Bangladesh, by age and sex, 1968/69 and 1972/73.

Age	1968/69		1972/73	
	Male	Female	Male	Female
0-4	Dependent	Dependent	Dependent	Dependent
5-9	Dependent	Dependent	Dependent	Dependent
10-14	Occupational opportunities	Marriage	Dependent	Marriage
15-19	As above	Marriage	Occupational opportunities	Marriage
20-24	As above	Dependent	As above	Dependent
25-29	As above	As above	As above	As above
30-34	As above	As above	As above	As above
35-39	As above	As above	Better living	As above
40-44	As above	As above	Occupational opportunities	As above
45-49	As above	As above	As above	*
50 +	As above	As above	Better living	Dependent

* Frequency cell is less than 10

Source: Chaudhury and Curlin (1975, pp. 202 - 203).

(ii) Educational characteristics

There is a clear correlation between the level of education and the propensity to outmigrate from rural areas. The reason is that the more educated are less likely to be satisfied with an agricultural job and with the social control mechanisms existing in traditional societies.^{(1) (2)} Although he may also have a higher chance of finding a job in urban areas, I do not think that this is a primary reason for outmigration. Education creates aspirations to move up in the social stratification and at the same time makes the achievements of these aspirations feasible. To realize them, however, geographical mobility or migration is often necessary. Opportunities that fit the higher expectations do not exist in rural areas. In Africa, the phenomenon of migrant "school leavers" is widespread. A survey of middle school leavers in Ghana revealed that of these who had been in school in rural areas in 1965 and whose location was known in 1967, some 41 per cent had moved to urban areas (Knight, 1972, p. 218; see also Caldwell, 1969). The same survey showed that the educated are anxious to leave the agricultural sector. Only 7 per cent of the children from farming households, who graduated from middle school in 1965 were engaged in farming in 1967. The preference for farming and manual work declines with education while the attraction of white-collar jobs increases (see also Barnum and Sabot (1976)). A study on the effect of the introduction of free primary education in Western Nigeria revealed that in 1963, seven years after the introduction, about half of the graduates had migrated to the towns because they were unable to find suitable jobs in the rural areas (Makinwa, 1975, p. 173). Contrary to the African case, most migrants in Asia are unskilled landless peasants.

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- 1) For a more detailed treatment of education, dissatisfaction and migration, see Beals, Levy and Moses, (1967, p. 482).
 - 2) Frequently the decision to leave agriculture is made before the decision to get an education. Mellor (1966, p. 346) points out that farmers are likely to give first priority to educating the children who will leave agriculture and at best, second priority to those who will take over farming. In the farmers view, education and nonfarm occupation are almost identical (see also Von Blanckenburg (1967, p. 420)).

(iii) Economic characteristics

Migration is a response to a lack of opportunities in the region of residence. Economic considerations play, therefore, an important role. How a potential migrant perceives the economic differences between his place of residence and alternative destination areas depends on his economic situation. For a given economy in an urban area, say, poor people in rural areas have a higher propensity to move since they may expect the greatest benefit. The same holds for the unemployed.

These theoretical considerations are not always supported by empirical evidences. The fact is that migration involves a cost. This cost may be quite high for long distance migration and for migration to urban areas with tight labour markets and no friends or relatives to support the migrant. Consequently, the very poor have a low propensity to outmigrate.⁽¹⁾ In a study of rural-urban migration in Ghana, Caldwell (1969, p. 83) found that the richer the rural households the more likely are the members to migrate. In Jamaica, Harris and Steer (1968, p. 406) observed that members of farm families tend to move to the city faster when the farm is larger and probably give them more resources.

Not only the income level, but also the occupational status affects the migration propensity. In a study of rural outmigration in Korea, Carroll and Soboda (1976, p. 2) found that farmers are underrepresented among rural outmigrants. Young unemployed persons, on the contrary, make up the bulk of male outmigration. A reference to U.S. farmers by Clawson (1963, p. 27) applies here!⁽²⁾

"Men do not withdraw from farming, even under considerable provocation, they simply refuse to enter it when prospects are not good. This is further evidence that the salvage value is lower for a farmer whose education, training and dedication are to agriculture. Having made his choice and spent a major part of his adult life as a farmer, he is reluctant or unable to leave, even in the face of low returns. On the other hand, not yet having chosen or begun a life occupation, and with the prospects of hard work and low income staring him in the face, he leaves the farm for employment elsewhere."

(1) This is contrary to Lipton, quoted by Todaro (1976, p. 28)

(2) Quoted by Carroll and Sloboda (1976, p. 2)

Chaudhury and Curlin (1975, pp. 198-199) observed the following pattern of outmigration rates of rural areas by occupation in Bangladesh: the highest outmigration rate is found among domestic servants, followed by mill and office workers. The migration rates of unemployed persons and farmers are considerably lower. This result must be interpreted with care. People may take up a job in the rural area in order to pay for the travel or to gain some experience and then abandon their job to move to town.

(iv) Ethnic Characteristics

There is evidence that some ethnic groups have a higher propensity to migrate than other. In Nigeria for example, Ibos are the most migratory ethnic group, (Udo, 1975, p. 300). Interesting is that most of them do not settle in urban areas but migrate to rural areas. A survey of migrants into Ghana and Ivory Coast in 1958 - 1959 revealed that some 60 per cent of the migrants belonged to the Voltaic group (Mossi, Dagari, Lobi, Gurunsi, Kotokoli), and 13 per cent were members of the Mande group (Bambara, Malinke) (Mabogunje, 1975, p. 158). The Frafras of North East Ghana is another migratory group. In 1960, about 23 per cent of the total population and more than 50 per cent of the males were recorded to be away from home (Hart, 1974, p. 323). A survey in Upper Volta in 1960 revealed that 18 per cent of the population of the country were away from their homes. This means a total of almost 800,000 people (Songre et al., 1974, p. 391).

Some ethnic groups have institutionalized outmigration. Typical examples are the Nubian population, in Egypt (Geiser, 1967, p. 172), and the Zarma in Niger (Diarra, 1974, pp. 229-230). The latter group, who moves predominantly to the Coast areas of Ghana and Ivory Coast and to the capital Niamey, has several folk songs in which young males are invited to leave the villages at the beginning of the dry season. In 1963 32,310 migrants have been counted on a total of 500,000 people (Diarra, 1974, pp. 228-229).

2.2.2. Locational decision

The choice of destination depends largely on the characteristics of alternative destination areas in the action space of the migrant. To review the factors affecting the locational decision,

it is helpful to distinguish between active and passive migrants (Hägerstrand, 1967, p. 132). The first category selects a destination after an active search process in which the consideration of future prospects dominate. Passive migrants base their locational decision largely on convenience, such as the existence of a group of previous migrants. The constraints on the migration process, i.e. the information and budget constraint dominate their locational decision. The flow of passive migrants is initiated by active migrants.

(a) Pull factors

It is our belief that the migration decision originates in a dissatisfaction with the current place of residence or work. Where people go, once they decided to leave, depends on the alternative opportunities, available to them. Pull factors therefore cannot explain the volume of outmigration of rural areas. However, they shape the directions of the migration flows. This is an important point to keep in mind when modeling the migration process. Models incorporating solely pull factors are unable to explain the large rural outmigration. In a comment on the Todaro (1969) model, a pure pull model, Bhattacharjee points out:

"The point is that where the push factors are decisive in throwing out people from the rural areas the migration process may be said to have already started and the pull factors such as expectation of higher incomes and probability of getting jobs are relevant, perhaps, in decisions on where to go, as between small towns and large metropolitan areas". (1974, p. 257) (1).

Socio economic factors pulling active migrants to certain areas and promoting a flow of passive migrants are many. Most important, however, is employment. Employment centres are major attraction points of male rural migrants in developing countries. Two types of centres may be distinguished: urban employment

(1) In fairness to Todaro, one must say that his main interest was in the explanation of high urban unemployment levels, and not in rural outmigration, although he claims his model presents an economic theory of rural-urban migration (e.g. Todaro, 1976 a, p. 28).

centres (including industrial and mining complexes) and rural employment centres (usually plantations producing export crops).

All authors on migration in developing countries agree on the importance of economic considerations for the destination selection.⁽¹⁾ Less concensus exists on the measurement of the differential economic opportunities. Wage and income differentials have been proposed frequently (Todaro, 1969; Minami, 1967, p. 193).

However, other authors found that rural-urban wage differentials played only a minor role in inducing migration. For example, Sethuraman (1975, p. 198) found that the massive migration into Djakarta could not be explained by wage differentials, which were surprisingly small. Unemployment in rural and urban West Java and other regions, coupled with an important informal sector in Djakarta, are the major determinants of the migration flow.

(b) Personal characteristics

The locational choice is influenced by the migrant's characteristics. We consider demographic, educational and ethnic differences.

(i) Demographic characteristics

The sex differences in the causes of outmigration have been discussed in the previous section. Males move out predominantly for economic reasons, while females leave their villages to join their husbands. The locational choice is not independent of the different motives of outmigration. Male migrants usually move to employment centres: towns, mining areas and plantations. Therefore, their share in rural to urban migration is predominant. In the study on Bangladesh, Chaudhury and Curlin (1975, p. 209) found that in 1972 - 1973, 72.64 per cent of the male and 51.42 per cent of the female outmigrants of rural villages moved to urban areas (rural-urban migration rates of 0.0242 and 0.0188 respectively). Almost half of the females move therefore to

(1) A few studies support the frequently heard hypothesis that migrants are attracted by the "bright city lights" (Todaro, 1976a, p. 66).

rural areas (rural-rural migration). In India, the difference is even more apparent (table 6). About 84 % of the females leaving rural areas move to other rural places (versus 71 % of males) (table 4 b). Most of the rural to rural migrations are of course short distance migrations (Bose, 1973, p. 145) (1).

Therefore, urban migration is primarily a movement of males. Females also tend to migrate shorter distances than males. In India, for example, 63 % of the female migrants move within districts and only 11 % move between states. Male migration on the other hand, is 49 % within district and 20 % between states (table 6). A study of rural outmigration in Niger showed that 57 % of the males left Niger to find work in Ghana and Nigeria, while only 9 % of the females went abroad (Diarra, 1974, p. 231).

(ii) Educational characteristics

The educated has a higher propensity to move to cities, while the illiterate selects other rural areas as a destination (Udo, 1975, p. 301). Sada and Adegbola (1975, p. 5) state:

"Possibly the most important factor inducing migration to Lagos is education, especially formal schooling. This is because the attainment of a certain minimum level of education is required for most employment in Lagos and lack of such education will be a drawback in securing employment".

The authors found that the high migration from the southern states to Lagos may in fact be explained by the better educational system in the south.

The reason is of course the differential employment opportunities by educational level. When one considers the pattern of job search of the rural to urban migrants, one observes differences with the degree of education. In Nigeria, the educated seek employment in manufacturing, commerce, civil service, etc. and the unskilled seek employment as houseboys, messengers, apprentices and as beggars (Makinwa, 1975, p. 173).

(1) In some countries, as Chile the dominant migration stream is urban to urban. Rural to urban migration is only a fraction of the urban to urban flow (Herrick, 1965). Sahota (1968, p. 236) found a similar pattern in Brazil, although less apparent.

TABLE 6
Migration flows in India

6.a Life-Time Migration⁽¹⁾

Migration Stream	Absolute numbers			Percentage		
	Total	Male	Female	Total	Male	Female
Rural-rural	99,100	23,513	75,587	73.73	56.74	81.32
Rural-urban	19,680	10,633	9,047	14.64	25.66	9.73
Urban-urban	10,819	5,409	5,410	8.06	13.06	5.81
Urban-rural	4,815	1,885	2,930	3.57	4.54	3.14
Total	134,414	41,440	92,974	100.00	100.00	100.00

6.b Annual (1960-61) Migration⁽²⁾

Migration Stream	Absolute numbers			Percentage		
	Total	Male	Female	Total	Male	Female
Rural-rural	8,611	3,713	4,898	64.84	57.79	71.46
Rural-urban	2,443	1,507	936	18.40	23.45	13.66
Urban-urban	1,437	792	645	10.82	12.32	9.42
Urban-rural	789	413	376	5.94	6.44	5.46
Total	13,280	6,425	6,855	100.00	100.00	100.00

Source: Bose, 1973, pp. 144-145

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- (1) On the basis of the 1961 Census data on the population by place of birth and place of residence.
- (2) On the basis of the 1961 Census data on duration of residence of migrants. Annual migration is measured by the migrants with a duration of residence "less than one year"

(iii) Ethnic characteristics

Not only outmigration, but also the choice of destination depends on the ethnic characteristics. In Nigeria, for example, the Ibo are the most mobile group. However, their migration pattern is dominantly rural to rural. On the other hand, the Yaruba speaking population chooses Lagos as their destination. Between 1952 and 1963, 644,000 people moved to Lagos. Of these, about 79 per cent were Yaruba, and less than 16 per cent were Ibo (Green, 1974, p. 289).

Table 7 presents the destinations of migrants into Ghana and Ivory Coast by the ethnic group. The proportion of the people going to urban areas varies between 30 per cent (Kotokoli) and 85 per cent (Hausa).

The observation that the choice of destination depends in parts on ethnic characteristics has led writers to distinguish towns on the basis of tribal origin (Simms, 1965, p. 6). An example is the reference to the Yaruba towns of Western Nigeria.

Table 7
Urban/rural destinations of migrants into Ghana-Ivory Coast,
1958-1959 survey

Ethnic Group	Urban		Rural		Not Declared		Total No.
	No.	%	No.	%	No.	%	
Mossi	11,122	55.5	8,542	42.6	371	1.9	20,035
Bambara	1,874	43.9	2,195	51.4	200	4.7	4,269
Zerma	2,394	74.4	738	22.9	86	2.7	3,218
Senoufo	950	42.3	1,206	53.6	92	4.1	2,248
Kotokoli	718	29.6	1,705	70.2	7	0.2	2,430
Hausa	2,953	85.3	437	12.6	72	2.1	3,462
Fulani	2,040	68.3	860	28.8	86	2.9	2,986
Yoruba	1,484	77.1	425	22.1	17	0.8	1,926
Fon	286	42.3	390	57.6	1	0.1	677
Total	60,759	61.2	35,541	36.2	1,883	2.6	98,183

Source: Mabogunje (1975, p. 159)

(c) Intervening factors

The migrant behaves according to the principle of utility maximization under uncertainty. He chooses the location maximizing his utility subject to an information constraint and a budget constraint. The importance of a budget constraint has been demonstrated in the previous section. The information constraint limits the number of alternative destinations that can be evaluated by the migrant. Wolpert (1965) calls this subset of locations the migrant's action space. For a location to be in the action space, the migrant must have sufficient information about it to evaluate the place (assign a place utility). The major source of information about destination areas in developing countries consists of relatives and friends. Formal information channels such as the media, or channels set up by governmental and private agencies are very much restricted.

The information and budget constraints lead to the following migration patterns:

(i) The location selected by the migrant is usually the location of relatives and friends (chain migration). A considerable volume of the total migration flow in developing countries consists of so-called passive migrants. They base their locational decision largely on "convenience": the existence of a group of relatives and friends or of a known environment.⁽¹⁾

Relatives and friends living in cities or centres have an important role in reducing the uncertainty inherent in the migration process and therefore, promote migration. For example, Caldwell (1969, p. 81) compares rural households with no members in town with rural households with three or more members in town. He found that in the former group, 9 per cent of the males were planning a first migration to town, whereas

(1) Balandier (1956) refers to "family pull", as opposed to "financial pull" or economic opportunities.

it was 20 per cent of the second group. About 75 per cent of potential rural migrants could rely on urban dwellers upon arrival in town.

Relatives and friends provide information on opportunities in the destination area before migration takes place and assist the migrant upon arrival. The most common forms of assistance are temporary accommodation, food and job placement.

A symptom of the assistance in job search is the relation between the tribal origin and the occupation in the city. For example, Nubian migrants in Cairo are predominantly domestic servants (cooks, houseboys, waiters). This concentration in certain occupations is not new. In 1822, Burckhardt wrote about the Nubians that "...great numbers of them go to Cairo, where they generally act as porters and are preferred to the Egyptians, on account of their honesty." (see Geiser, 1967, p. 168). In Ibadan, Nigeria, Cohen quoted by Makinwa (1975, p. 188), found that begging is an important occupation among Hausa migrants. Several categories of beggars (blind, lame, leper) are highly organized. Further reports on the relationships between ethnicity and type of employment are: Udo (1975, p. 302) on rural and urban Nigeria; Bernus (1962) on Abidjan; and Little (1960) on Accra.

(ii) Lagged migration and step-migration

The existence of uncertainty and lack of money delay the actual migration in two ways: i) delay of migration of the principal agent. ii) delay of migration of the dependents.

The impact of budget limitations on migration has been discussed in Section 2.2.1. There is evidence that the migration propensity is low for the poorest people and that some potential migrants work to cover the travel costs. Not always is the necessary money collected before the migration takes place. Sometimes the money is made along the way. A typical illustration consists of the movement of Moslem pilgrims in West Africa.

"Until recently, it was a stage-by-stage affair in which the pilgrims gradually worked their way to Mecca,

stopping to work for months or years at different places on the way." (Mabogunje, 1975, p. 153) (1).

The question of whether budget constraint and uncertainty postpone the migration of dependents is not solved adequately. There is a general belief that married men migrating to urban areas tend to leave their wives at home until they find accommodation. Udo (1975, p. 301) does not support this belief. Of married migrants in Lagos, about 89 per cent live with their wives (see also Sethuraman, 1975, p. 197). Different is the picture when rural areas are chosen as destinations. In Africa, migrants to rural areas generally depend on family labour supplied by their wives. Therefore, most married migrants are accompanied by their dependents.

As with lagged migration, step-migration is a frequently mentioned but a little studied phenomenon. Sethuraman (1975, p. 197) found that the majority of the migrants into Djakarta did not follow a step-wise pattern, but came directly to the city. Addo (1975, p. 392) found evidence of step-migration in Ghana. He suggests that a part of urban to urban migration may be attributed to step-migration. On the other hand, the observation that educated migrants generally migrate over larger distances than the unskilled, may be attributed to the lack of step-migration.

2.2.3 Decision to stay

A large part of the migrants consists of the so-called chronic movers, i.e. people that can never settle for long, and of return migrants. - Because of the importance of the latter category, return movements should be considered conceptually as part of the migration process (Price and Sikes, 1975, p. 29). In fact, a considerable proportion of the migrants never intend to stay indefinitely. The lack of permanence of the migrant

(1)

In 1956, 75 per cent of the 250,000 immigrants into the Republic of Sudan were pilgrims.

population is a major characteristic of rural-urban migration (Simms, 1965, p. 15). Seasonal migrants, which are particularly important in West Africa, never stay beyond the end of the dry season. The cash made during this period is mainly used to pay taxes and to buy clothes (Goddard, 1974, p. 270). Even more "permanent" migrants will eventually return home. Several want to make money to set up their own business in their own region of origin or to assure a better living for themselves and their families. The question then is how long does it take to accumulate enough savings. There is no single answer. The average time spent by a return migrant in the city differs from one country to another and changes over time. Studies of Nubia, a typical migrant population expecting young males to move to Cairo and other Egyptian cities to work, revealed that in the 17th century, they returned after about two years; in the 19th century, the stay was six to eight years; and in the middle of this century, most males returned to the villages at retirement age (Geiser, 1967, pp. 168 and 175).⁽¹⁾

The Chaudhury and Curlin (1975, p. 211) study on rural Bangladesh shows that between 1968 and 1973 an average of 22 per cent of the male urban to rural migrants are return migrants. Female urban to rural migrants contained about 9 per cent of return migrants.

Barnes (1975, p. 5) interviewed the population of a migrant neighbourhood in Lagos. No more than a sixth of the male residents expect to stay permanently. The migrant who has assured an income in the early stages of his residence may stay between ten and sixteen years. This means that they are returning home in their thirties, which is reflected in the age composition of Lagos' population. The age group of 20-29 contains 33 per cent of the male and 24 per cent of the female

(1) The Nubian population can no longer return to their place of origin. The land along the Nile is flooded since the construction of the Aswan Dam.

population. The age group 30-39 contains 14 and 12 per cent respectively (Barnes, 1975, p. 8)

In Lusanshya, Zambia, migrants tend to remain for an average of eight years. In Kampala, the average duration is less (Barnes, 1975, p. 5).

Because the desire to return to the villages, migrants in urban areas maintain close ties with their families. Frequent visits, remittance of money and the care for family members arriving in town are expressions of this. (For a detailed case study of rural-urban ties, see Adepoju, 1974).

The situation is different when the decision to stay or not to stay is based on dissatisfactions with the migration. If the net benefits of the new area are less than expected, the migrant may consider to return to his place of origin. The same phenomenon is true in the developed world. For example, of the migrants returning to eastern Kentucky, 30 per cent had been laid off their jobs and 50 per cent were dissatisfied with the urban area (Sanders, 1969). Relatives and friends play an important role in the decision to stay. Because they provide shelter and food, the newly arrived are protected against failure and dissatisfaction. A survey of urban in-migrants in South-West Nigeria revealed that 50 per cent of the migrants stayed with relatives and friends on their first arrival (Adepoju, 1974, p. 129). Of the persons staying with relatives, one third were less than 25 years old. Older migrants tended to stay alone or with friends.

How long a migrant can stay with relatives or friends depends on their hospitality.

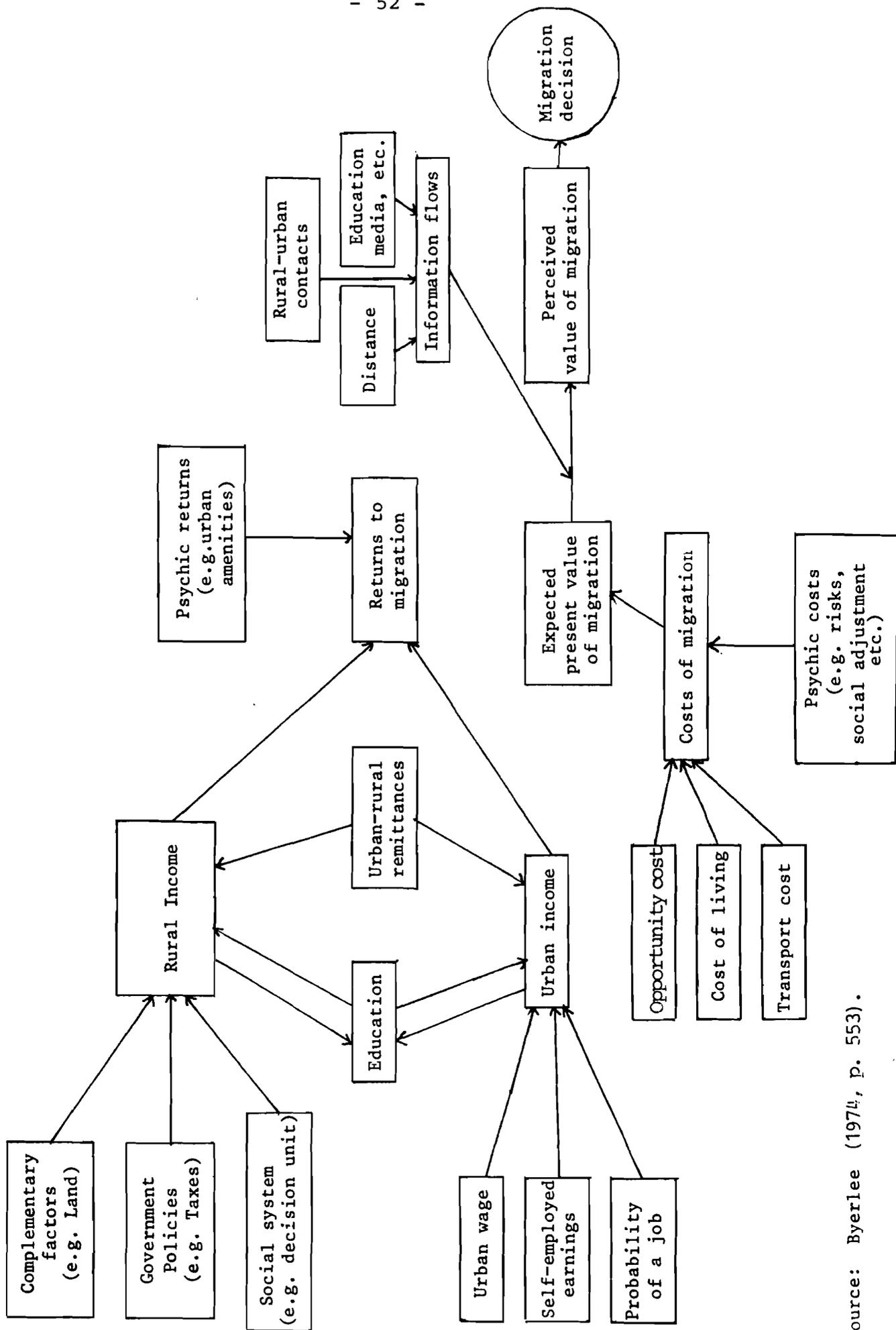
3. THE ECONOMETRIC MODELLING OF MIGRATION

The second part of this paper reviewed the factors that influence the migration decisions: economic, social, cultural and ecological. A clear understanding of the causes and determinants of migration enables the analyst to isolate the so-called target group of potential migrants, i.e. the subset of the rural population which is particularly open to migration. Migrants are not a random sample of the population at origin. Empirical evidences show that the primary migration decisions are made by young adult males with some education. Females and children are generally passive migrants, i.e. they follow the head of the family. Furthermore, migrants to cities usually do not intend to stay forever. They move back to the rural villages shortly after arrival (less than one year) OR after ten to fifteen years. A consequence is the high urban to rural migration of 30 - 39 year old males and their families.

These empirical regularities can be explained by socio-economic and other factors, forming the motivational structure of the migrant. This structure comprises the socio-economic characteristics of the migrant, the set of opportunities in both origin and destination, and the intervening factors. According to Todaro (1976a, p. 48) the identification of the key elements of the motivational structure is the first out of five tasks of econometric migration research. The five tasks are:

- i. to identify the nature of the socio-economic characteristics of the migrant population and of the opportunities;
- ii. to devise appropriate measures of both characteristics and opportunities (derive proxy-variables);
- iii. to specify appropriate relationships between personal characteristics, alternative economic opportunities and propensities to migrate on the basis of well formulated and plausible theoretical models in a micro- or macro-framework;
- iv. to estimate the relative quantitative significance of different factors influencing either the propensity of individuals to migrate or the aggregate rate of migration;

FIGURE 2. A Framework for the Analysis of the Decision to Migrate



Source: Byerlee (1974, p. 553).

- v. to be able to devise quantitative predictive estimates of the impact of alternative policy approaches designed to influence the magnitude of one or more of the independent variables identified as significant factors affecting the decision to migrate in a particular country or region.

A list of variables collected in migration surveys is given in Table 8. How the economic variables relate to each other is illustrated in Figure 2.

Within the framework of Figure 2, several types of migration models have been designed for applied analysis. We limit ourselves to single-equation models, especially constructed for migration in developing countries. Two classification schemes are adopted. The first is Todaro's (1976a, pp. 48-49) classification of migration models in micro- and macro-functions. The second schemes divides migration models in pure push, pure pull and push-pull models.

3.1 Micro- and Macro-Migration Functions

This classification scheme is based on the aggregation level considered in the models. We look at both groups separately.

3.1.1 Micro-migration functions

The micro-economic approach to estimating focuses on the individual and his decision making behaviour. The dependent variable of the model is the probability or propensity that an individual will migrate from region i to region j. The independent variables consist of a selection of migration determinents reviewed in the previous section. Among the personal characteristics usually considered are: age, sex, educational level, level of skills, marital status, ethnic or tribal affiliation. Economic opportunities in origin and destination areas are usually measured by the following proxy-variables: wage levels in the farm and non-farm sectors, employment rates etc. A typical example of the micro-approach is Hay's (1974) study of migration in Tunisia. The migration function is estimated from a sample-survey of 300 households, 220 with migrants and 80 without any.

TABLE 8 Lists of variables commonly collected, with both rural and urban components, in most migration surveys

Sex

Age

Ethnicity

Status in Household

Marital status

Number of children

Education

Variables collected by the urban components

Region of birth

Age on arrival in receiving area

Principal reason for moving

Year of arrival in town

Economic activity prior to migration

Income prior to migration

Intention to remain in receiving area

Expected reasons for leaving

Other migrants in family

Source of information regarding receiving area

Cost of transportation from source area

Source of finance for journey

Means of support on first arrival

Type of help from family and friends

Length of time to establish an independent source of income

Marital status on arrival

Location of wife and children at time of migration

Frequency of visits to source area

Current assets in source area

Value of remittances to source area

Current employment status

Type of employer

Occupation

Size of firm

Wage income received

Supplementary benefits

TABLE 8 (continued)

Year joined firm
Hours worked
Job-search procedure
Past employment experience
Self-employment income
Value of assets
Number of employees
Length of time in activity
Barriers to entry

Variables collected by the rural components

Income from self-employment
Non-monetary income
Value of equipment
Size of plot
Wage income
Employment history
Mobility history
Intention to move
Perceptions of opportunities elsewhere

Source: Sabot (1975, p.7) repeated in Todaro (1976a, pp. 52-53)

3.1.2 Macro-migration functions.

The macro-approach to econometric migration research is the estimation of aggregate migration functions. The dependent variable is the gross or net rate of migration, m_{ij} , expressed as the fraction of population K_i , i.e.

$$m_{ij} = \frac{M_{ij}}{K_i} \quad (4)$$

where M_{ij} is the total number of persons migrating from i to j .

The independent variables include proxy-variables of economic opportunities in origin and destination areas such as: population, urbanization level, employment or unemployment rates. Proxy-variables for intervening factors are distance between i and j (measure of cost of migration and of degree of uncertainty involved), size of the population living in j but born in i (the so-called migrant stock, measuring the stock in j of relatives and friends of i -residents (Greenwood, 1970)).

Macro-functions are estimated primarily from aggregate census data or combined survey-census data.

3.2 Pure Push, Pure Pull and Push-Pull models

The migration models may be divided in pure push, pure pull and push-pull models, depending on the independent variables which are emphasized.

3.2.1 Pure-push models

Pure-push models are in fact supply models. The number of migrants is completely determined by the characteristics of the area of origin. It is assumed that the demand for immigrants (absorptive capacity) is perfectly elastic.

In the simplest push model, the migration from i to j only depends on the population in region i . If the number of migrants is a constant fraction of the population, we have

$$M_{ij}(x) = m_{ij}(x) K_i(x), \quad (5)$$

where $K_i(x)$ is the population of category x in region i , and $m_{ij}(x)$ is the migration rate of category x . The coefficient $m_{ij}(x)$ is in fact, a product of two terms: the total outmigration rate of people in region i and category x , $m_i(x)$, and the allocation coefficient, $a_{ij}(x)$, denoting the fraction of the outmigration of i in category x that move to region j . The total outmigration rate results from the decision to move of the individual, whereas the allocation coefficient is related to the locational decision.

The migration models incorporated in the multiregional demographic growth models are of this type. The number of migrants of age-group x in a given time interval and the destination are uniquely determined by the number of people in the region of origin (Rogers, 1975a pp. 63-64). The age-specific migration rates are the parameters of the migration function. They are assumed to be fixed, or to change exogenously in simulation experiments (Rogers, 1977, pp. 47-57).⁽¹⁾

3.2.2 Pure pull models

The opposite of pure push models are pure pull models. The migration flow is completely determined by the features of the area of destination. It is a pure demand model in which the supply of migrants is perfectly elastic. One of the first models of rural to urban migration developed in economics is of this type. The model of a dual economy, derived by Lewis (1954) and formalized and extended by Fei and Ranis (1961 and 1964) assumes a perfectly elastic supply of labour in the rural sector.⁽²⁾ Agriculture is viewed as containing a large pool of essentially

(1) This approach has been labelled the "policy parameter approach" (Carroll and Sloboda, 1976, p. 6) and the scenario approach.

(2) Note that although labour surplus in rural areas is a push factor, the Lewis-Fei-Ranis model does not consider it as such. The migration volume is independent of the rural labour force or of the level of the disguised and open unemployment, but depends only on the labour requirements for industrialization. This is consistent with the development literature in the sixties that stressed the role of agriculture as a supplier of labour to industry (e.g. Mellor, 1968, p. 24, Johnston and Mellor, 1970, p. 364).

unproductive labour that may be withdrawn without a significant decline in output. The urban or industrial sector can draw on a reserve army of rural labour force at a fixed institutional wage rate in the urban sector, which is above the subsistence wage rate in the rural sector. The volume of rural to urban migration is completely determined by the absorptive capacity of the urban sector; wage differentials are assumed to remain constant (in the early stages of development in which most developing countries seem to be at least) and full employment in the urban sector is maintained. (1) (2)

Todaro (1969) criticized the simple migration theory underlying the dualistic models. The high unemployment rates observed in urban areas in developing nations cannot be handled by these models and the simple wage differential approach. Instead of full employment in urban areas, Todaro considers the existence of a large traditional or informal sector in the cities which supplies the modern sector with labour at a given institutional wage. (3)

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- (1) These models of a dual economy make no distinction between sectoral migration (from agriculture to industry) and spatial migration (from rural to urban areas). The implied assumption is that rural areas are fully specialized in traditional agriculture, while urban areas have only industry.
 - (2) In practice the transfer of labour from agriculture to industry does not work so smoothly as this model suggests. Unlimited supply of rural labour may coexist with regional labour shortages in some industrial centres. (Umemura, 1970, pp. 194-196). The point is that labour is not a homogeneous product.
 - (3) This idea is remarkably similar to the theoretical construct developed by Dankedar (1970) in a completely different context. In a comment on Schultz's book *Transforming Traditional Agriculture* (1964), Dankedar criticizes the author's assumption of full employment of production factors, in particular labour. He proposes a division of traditional agriculture in two sectors: an economically efficient sector that produces a surplus over subsistence of its population; and another sector with excessive population pressure. The impact of population growth on both sectors is unequal:

"The surplus producing sector admits population only to the extent where it maximises the surplus of that sector; the other sector must accommodate all the residual population, irrespective of its marginal productivity" (Dankedar, 1970, p. 373)

As the informal sector in Todaro's model, the second sector of Dankedar bears the whole burden of population growth.

Again labour supply is perfectly elastic. Labour is available in unlimited amounts both in the informal urban sector and in the rural sector. It is assumed that the migrant passes through the informal sector before getting a job in the modern sector. The migration propensity of a rural resident not only depends on the wage differential but also on the size of the informal sector relative to the number of available jobs. The essence of the Todaro argument is that the creation of job opportunities in urban areas leads to higher unemployment levels (or greater share of the traditional urban sector).

Formally, the rate of growth of the urban population as a result of migration is:

$$i_u = \pi(t) F[\alpha(t)] \quad (6)$$

where $\alpha(t)$ is the percentage urban-rural real income differential

$F[\alpha(t)]$ is a function such that $dF/d\alpha > 0$, and

$\pi(t)$ is the probability of being selected from the pool of urban traditional workers during period t if the worker is a member of that pool at time t .

In the original Todaro article the probability $\pi(t)$ is set equal to the ratio of new modern sector employment openings in the period t relative to the number of accumulated job seekers in the urban traditional sector at time t , i.e.

$$\pi(t) = \frac{\gamma L(t)}{K_u(t) - L(t)} \quad (7)$$

where $K_u(t)$ is the urban population at t ,

$L(t)$ is the modern sector employment at t , and

γ is the rate of job creation (given exogenously),

i.e. $\gamma L(t)$ is the number of new jobs created in time period t .

In a later article, and for reasons not mentioned explicitly, equation (7) is replaced by a simpler one (Harris and Todaro, 1971, p. 129; see also Todaro, 1976a p.34; 1976b p.373):

$$\pi(t) = \frac{L(t)}{K_u(t)} \quad . \quad (8)$$

The obvious reason for replacing (7) is that it does not allow for full employment. The probability of finding a job equal one at an employment level below full employment. A creation of jobs in time period t equal to the number of people in the sector, i.e $\pi(t) = 1$ or

$$\gamma L(t) = K_u(t) - L(t),$$

does not imply full employment, but an employment ratio of

$$\frac{L(t)}{K_u(t)} = \frac{1}{1 + \gamma} \quad .$$

Several other writers also have used the formulation (8) instead of (7) (see for example Fields (1975); Yap (1976, p. 126)⁽¹⁾). The expected wage differential becomes very simple under equation (8). Let W_m denote the institutional wage rate in the modern sector and let W_r be the rural wage rate. The expected wage differential is then

$$W_m \frac{L(t)}{K_u(t)} - W_r \quad , \quad (9)$$

(1) The dependent variable in Yap's model is the rural outmigration rate instead of the urban immigration rate. The outmigration rate has also been used by Todaro (1976 a, p.34).

which is simply the difference between the average urban wage rate and the rural wage rate (Harris and Todaro, 1971, p. 129).

All the factors determining rural-urban migration are related to the urban area. Hence the Todaro migration function is a pure pull model. For a given differential between rural (subsistence) wage and urban (institutional) wage, the unique driving force of migration is the rate of job creation in the urban sector. The basic cause of migration is therefore identical to the one in the Lewis-Fei-Ranis model.

A fundamental assumption underlying the dualistic models described above is that the growth of the urban economy solely determines the rural to urban migration. Some recent migration models take the same perspective. For example, Minami (1967, pp. 188-189) formulated a simple model of migration away from agriculture in Japan. The net migration rate m out of agriculture is a simple function of the growth rate g of the gross domestic product (GDP):

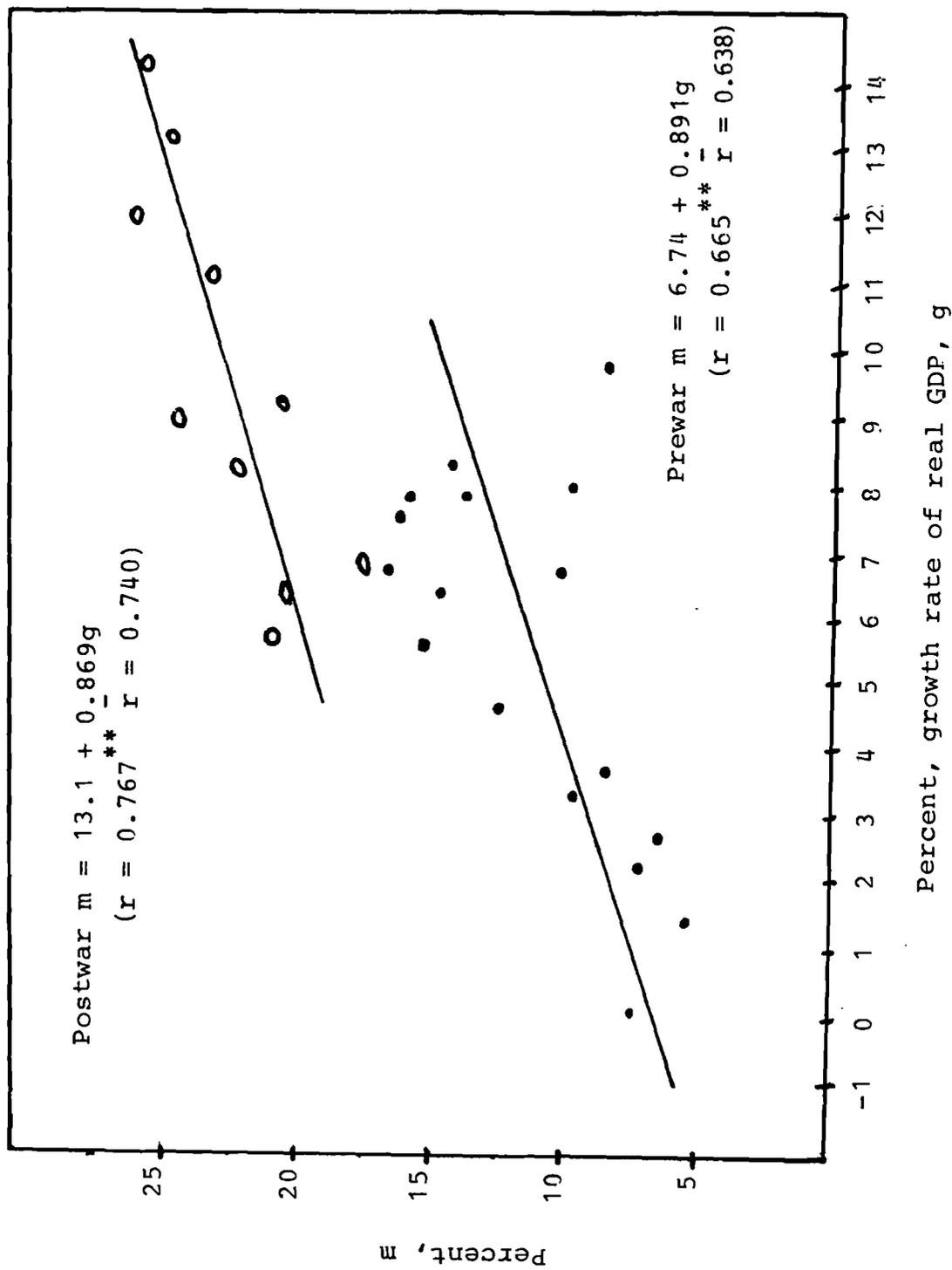
$$m = a + bg \tag{10}$$

The migration function is illustrated in Figure 3. The differences in the intercept between the pre- and postwar period is due to the rapid increase of the wage differentials between the agricultural and the non-agricultural sectors after the second World War. The low values of the correlation coefficients r show that the migration out of agriculture can not be explained by a change in the general level of economic activity alone. The separate consideration of the growth rate of non-agriculture does not improve the explanatory power much.

The Carroll-Sloboda (1976) model of off-farm migration in Korea is another illustration of a pure pull model. The number of off-farm migrants by age and sex at time t is

$$M_t(x) = m_t(x) K_t^f(x) \tag{11}$$

FIGURE 3
Relation between net migration rate out of agriculture and the growth rate of GDP
(Japan)



where $M_t(x)$ is the net number of off-farm migrants of age-sex category x during time period t to $t+1$,

$K_t^f(x)$ is the farm population of age-sex category x at time t , and,

$m_t(x)$ is the net age-sex specific migration rate in period t to $t+1$.

The migration rate $m_t(x)$ is completely determined by pull factors. It is a direct function of the non-agricultural labour demand and an exogenously given urban and rural unemployment rate. The model is therefore closely related to the Lewis-Fei-Ranis model discussed above.

3.2.3 Push-Pull Models

The migration models discussed above are of a very simple nature. They limit the causes of migration to the area of origin or destination. Intervening factors are not considered and also personal factors are omitted except for age and sex in the Carroll-Sloboda model.

The complete migration model contains push and pull factors, intervening factors and personal factors in the set of explanatory variables.

The general formulation of a single-equation migration model is

$$m_{ij}(x) = f[z_i, z_j, d_{ij}, h(x)], \quad (12)$$

where $m_{ij}(x)$ denotes the migration of persons of category x from region i to region j ,
 z_i, z_j denote the characteristics of the areas of origin and destination respectively,
 d_{ij} represents the friction or intervening factors, and
 $h(x)$ is an expression for the personal characteristics of the migrants of category x .

All single equation push-pull migration models fit the basic format (12). Yap (1975) provides an extensive review of the econometric literature on internal migration in developing countries. (see also Todaro, 1976a, pp. 67-74 and 83-87). The comparison of migration models gives rise to several important issues related to the variables used.

a. The definition of a "migrant"

Migration models try to explain the volume or the rate of the migration between two regions. There are considerable differences in the definition of a "migrant", due to the availability of statistical data. Basically, two approaches may be distinguished. In the first approach, a migrant is a person who moved within a well-defined time interval (period-migrant). The migration volume $M_{ij}(x)$ denotes the number of people of category x who migrated from i to j in a specified time interval. For example, in the Huntington (1974) model of rural-urban migration in Kenya, migrant is defined as a person enumerated in urban area j in 1968 who had moved during the 1964-1968 period.

Speare (1971, p. 120), in a study on immigration into Taichung City, Taiwan, defines a migrant as a person who had moved to Taichung City and who has been registered in 1966-67. The data source was a file of migration records, arranged by date of registration.

Data on migration during a specific time interval by place of origin and destination are very rare. Therefore in most studies on internal migration in developing countries, the second approach to the definition of a "migrant" is adopted. In this a "migrant" is typically a person who is born in i and is living in j (lifetime migrant). The choice of this definition of "migrant" is purely for practical reasons. Census data contain usually only information on the population by place of residence and place of birth. Information on recent moves are normally not available. Few census questionnaires contain a question such as "where were you five years ago?" For example, in a study on internal migration in Ghana, Beals, Levy and Moses (1967) define a migrant

as a person residing in one region but born in another. This definition fits the data available in the 1960 census. An identical approach has been followed by Sahota (1968, p. 222) and Yap (1972) in studies on internal migration in Brazil based on the 1950 census, by Knowles and Anker (1975) in an analysis of rural-urban migration in Kenya and by Gosal and Krishan (1975) for India. A similar definition is adopted by Barnum and Sabot who was born in the countryside and who moved from region i to j after the age of 13 years. Note that here the place of origin is not necessarily the place of birth.

The disadvantage of this migration measure is that it lumps together temporary and permanent, old and new migrants, and so on. To remedy this situation one must take into account the duration of residence in the area of destination. In countries where the census contains information on the number of years of residence in the destination area, researchers may use this additional knowledge. In his paper on interstate migration in India, Greenwood (1971) defines a migrant as a person born in state i and who has been living in state j for less than one year (see also Table 4 in section 2.2). The data source was the 1961 census. A similar definition is retained by Levy and Wadycki (1972) for the study of interstate migration in Venezuela based on the 1961 census.

b. Choice of the dependent variable

The dependent variable is some measure of the volume of migration or of the migration rate. Nearly all econometric migration models do not intend to explain the total flow but only a subset of it, usually the male migrants and frequently males in the active age groups, the studies of Greenwood (1971), Barnum and Sabot (1975), Huntington (1974), Levy and Wadycki (1972), Speare (1971), Sahota (1968), Beals, Levy and Moses, (1967) among others all are confined to males or adult males. It is those migrants who are most responsive to economic opportunities and who are most likely to be the active migrants. It is, therefore, not surprising that most econometric migration models find a high correlation between migration flows and regional differences in

economic conditions. The reader should be aware that this conclusion is only valid for a subset of migrants and that economic variables lose importance if all the migrants are considered. This is consistent with the conclusions of the second section of this paper, that females have a completely different motivational structure than males. ⁽¹⁾

Some authors subdivide the male population further in more homogeneous categories and estimate migration functions for each. For example, Sahota (1968) considers two age groups: young (15-29 years) and middle-aged (30-50 years). There is a remarkable contrast between the responses of the two age groups to given stimuli. Barnum and Sabot (1975) divide the male migrants in age groups and education categories (see also Gunning, 1977, p. 27).

After the realization that the dependent variable generally does not cover the total number of migrants, we may investigate the specific forms of the variables used. Four types of migration measures may be distinguished: migration volume or absolute number of migrants M_{ij} [e.g. Sahota (1968), Greenwood (1971), Gunning (1977)], the outmigration rate i.e. $m_{ij} = \frac{M_{ij}}{K_i}$. [e.g.

Barnum and Sabot (1975), Levy and Wadycki (1972), Yap (1972), Beals, Levy and Moses (1967)], the ratio of the number of migrants to the product of the population at origin and destination (Huntington, 1974), i.e.

$$m_{ij} = \frac{M_{ij}}{P_i \cdot P_j} \quad (13)$$

and finally, a dummy variable. In the latter type, the dependent variable is 1 for migrants and 0 for non-migrants [e.g. Knowles and Anker (1975), Speare (1971)].

(1) The Knowles-Anker migration model, which includes migrants of both sexes, has a R^2 of only 0.075!

c. Choice of independent variables

The independent variables of migration models are proxy-measures of the main causes of migration. As most models intend to explain the migration of adult males, the independent variables are generally economic in nature. Of these, income or wage differentials are of predominant importance. Wages in origin and in destination areas have been used by Greenwood (1971), Huntington, (1974), Barnum and Sabot (1972), Levy and Wadycki, (1972), Beals, Levy and Moses, (1967), Sahota (1968) and Speare, (1971) among others. Lin and Ottaviani-Carra (1975, p. 37) use labour productivity differentials. In general marginal labour productivity is not equal to the wage rate since perfect competition is inexistant. In the Sandee (1970, p. 224) model of a dual economy, migration is simply proportional to the urban-rural difference in per capita consumption levels.

Most writers also include a measure of the likelihood of getting a job in the areas of origin and destination. This measure may be the number of job openings as a proportion of the unemployed [Barnum and Sabot, 1975], the unemployment rate [Levy and Wadycki, 1972], the employment level [Yap, 1972], or rural and urban population pressure [Lin and Ottaviani-Carra, 1975, p.38).

Distance is frequently used as a proxy for the cost of migration or the friction between origin and destination. Linear distance, is used by Barnum and Sabot (1975), road distance by Huntington(1974), Sahota (1968), and by Levy and Wadycki (1972), and rail distance by Greenwood (1971).

Other non-economic variables are educational level (literary rate in both origin and destination; school enrollment, etc.), age (Knowles and Anker, 1975), urbanization level (Greenwood, 1971, Levy and Wadycki, 1972, Beals, Levy and Moses, 1967, Sahota, 1968)]. Some models also have recognized the importance of a migrants's stock, i.e. the existence of friends and relatives in the area of destination. Huntington (1974), uses an index of the ethnic composition of the urban area j , weighted by the ethnic composition in the rural province i .

4. CONCLUSION

The purpose of this paper has been to investigate the impact of agricultural technology and agricultural change on spatial population growth, and in particular, on migration in developing countries.

The first section presents some basic notions on the demography of urbanization. The three components of multiregional population growth are considered: fertility, mortality and migration. It points out the empirical regularities found in age schedules of fertility mortality and migration. Those regularities greatly facilitate the demographic modelling if population data are incomplete such as in developing countries. An illustration of a data generation that uses these regularities is given for India.

The second section augments the purely demographic analysis with a theoretical and an empirical investigation of the volatile component of spatial population growth; namely, migration. Basically, the theory presented treats migration as a process of decision-making under uncertainty. The migration decision consists of three individual decisions: the decision to move, the locational decision and the decision to stay. Each decision is affected by quite different factors. A large part of the confusion in the migration literature may be attributed to an emphasis on the determinants of migration, i.e. the factors entering the decision, without a systematic investigation of the decision process itself.

The decision to move is closely related to a dissatisfaction with the present place of work or residence. This dissatisfaction may be caused by lack of opportunities or resources or by socio-cultural constraints on personal development. The locational decision is determined by the characteristics of alternative destination areas in the action space. Usually, the action space is very limited. The average migrant in developing countries lacks the necessary information to evaluate several alternative destinations and generally depends on family and friends for it. There is widespread evidence that migrants in developing countries do not move for indefinite durations. The actual duration is, of course, affected by intervening factors.

After presenting the extended migration theory, we summarize empirical knowledge on the determinants of migration. The focus is on those factors of the motivational structure related to agricultural practice and agricultural change. It is shown which factors underly the observed differences in migrant's age, sex, educational level, etc. The purpose of investigating the causes of migration is to delineate the subset of the population that is particularly open to migration. The rationale is that any migration policy, in order to be effective, must focus on this target group, which consists only of about 30 to 40 percent of the population.

The third section addresses the problem of econometric modelling of migration. Each modelling effort starts out with the identification of key elements in the motivational structure, to be entered in the model and with the definition of proxy variables. A review of the econometric migration models reveals the variety of elements of the motivational structure considered, and the divergence in proxy-variables to represent a same element of the motivational structure. Another important observation is that nearly all migration models do not explain the overall migration flow, but only the migration of a fraction of the population; such as males or males in active age groups. This is an expression of the fact that economists, who developed most of those models, are inclined to reduce migration to an economic phenomenon. The selection of this subset largely explains the economic nature of the independent variables entering the model. Economic variables are less important when the total migration flows are considered. People do not move for economic reasons alone. The complexity of migration is not well understood and appreciated. Only interdisciplinary analysis of migration flows and migration decisions can bring an important addition to our knowledge.

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