MIGRATION AND SETTLEMENT:
12. BULGARIA

Dimiter Philipov
International Institute for Applied Systems Analysis

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FOREWORD

Interest in human settlement systems and policies has been a central part of urban-related work at the International Institute for Applied Systems Analysis (IIASA) from the outset. From 1975 through 1978 this interest was manifested in the work of the Migration and Settlement Task, which was formally concluded in November 1978. Since then, attention has turned to dissemination of the Task's results and to the conclusion of its comparative study, which, under the leadership of Dr. Frans Willekens, is focusing on a comparative quantitative assessment of recent migration patterns and spatial population dynamics in all of IIASA's 17 National Member Organization countries.

The comparative analysis of national patterns of interregional migration and spatial population growth is being carried out by an international network of scholars who are using methodology and computer programs developed at IIASA.

In this report, Dimiter Philipov analyzes recent changes in Bulgaria's patterns of population redistribution and studies in detail the demographic dynamics of seven economic planning regions.

Reports summarizing previous work on migration and settlement at IIASA are listed at the end of this report.

Andrei Rogers
Chairman
Human Settlements
and Services Area

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CONTENTS

1 INTRODUCTION*

For many years demographers throughout the world have fixed their attention primarily on the patterns of fertility and mortality, neglecting to some extent migration within a given population. The main reasons for this have been a lack of efficient mathematical models and poor statistical data on migration. During the last decade these difficulties have been eased; new models have been created both for the study of migration and for the improvement of incomplete data. For the analysis of the spatial dynamics of a given population, the most useful models are those that analyze the joint evolution of fertility, mortality, and migration patterns in a multiregional perspective.

This case study of Bulgaria presents an analysis of a multiregional demographic system. To carry out the investigation, models and computer programs were used that were elaborated at IIASA and presented in a series of IIASA papers. The data base for the application of these models is 1975 data.

Section 2 of this report describes demographic changes of the Bulgarian population up to 1975. Section 3 deals with the preparation of the data to fit the needs of the multiregional analysis. It presents the results of the models – the multiregional life table, the population projection, the stable equivalent population – and demonstrates the use of the models in the study of spatial fertility, mortality, and migration patterns. These are examined together with other observed demographic characteristics to give a full picture of the structure of the Bulgarian population in 1975 and of its implications for future change. Section 4 discusses demographic policy in Bulgaria and possible implementations of the multiregional approach to policy problems.

*This is a revised and expanded version of a paper that appeared in *Environment and Planning A* 10:593–617.

2 OVERVIEW OF THE DEMOGRAPHIC HISTORY OF BULGARIA

The results obtained from the multiregional analysis of Bulgaria are more understandable when one has some background information on current population patterns. In its demographic development, each nation passes through several stages that are closely connected with the social and economic history of the nation. Population studies in Bulgaria (Stefanov *et al.* 1974, Naoumov *et al.* 1974) identify three stages that have affected the present demographic structure:

(1) the period until 1920–1925
(2) the period between 1920–1925 and 1945 (the end of the Second World War)
(3) the period after 1945

This study begins with a brief description of the changes in fertility, mortality, and migration patterns in Bulgaria.

2.1 Fertility

Except for the years of the Balkan War and the First World War, the first stage of Bulgaria's demographic development was characterized by high annual crude birth rates (CBRs), ranging from 39 to 42 births per thousand population (Figure 1). These high numbers are typical of a population that has not yet started its demographic transition. During the last year of this period, 1925, the CBR was 36.9, thus marking the beginning of the transition that took place during the second stage. This stage was characterized by the first steps of industrialization and urbanization in the country; the CBRs leveled off and reached a low of 22 per thousand during the Second World War.

The last stage, the period after the Second World War, was distinguished by the remarkable social and economic changes that took place in the country. After 1944, development began in land reform, socialistic industrialization, collectivization and mechanization of agriculture, emancipation of women, improved health care, and urbanization. Some basic characteristics of economic development in Bulgaria between 1950 and 1975 are shown in Table 1.*

Rapid economic growth brought changes to the basic structure of the economy (Table 2), which in turn caused a large proportion of the labor force to move from agriculture to other branches of the economy, mainly to industry and nonmaterial spheres.** These structural changes called for an increase in

*The author is grateful to Professor Naoumov for suggesting Tables 1 and 2 and providing the statistics for them.

**In Bulgaria, the economy is divided into two main spheres of production: material and nonmaterial. The material sphere includes not only industry and agriculture but also construction, transportation, forestry, etc. Nonmaterial production includes commerce, education, culture, sports, etc.

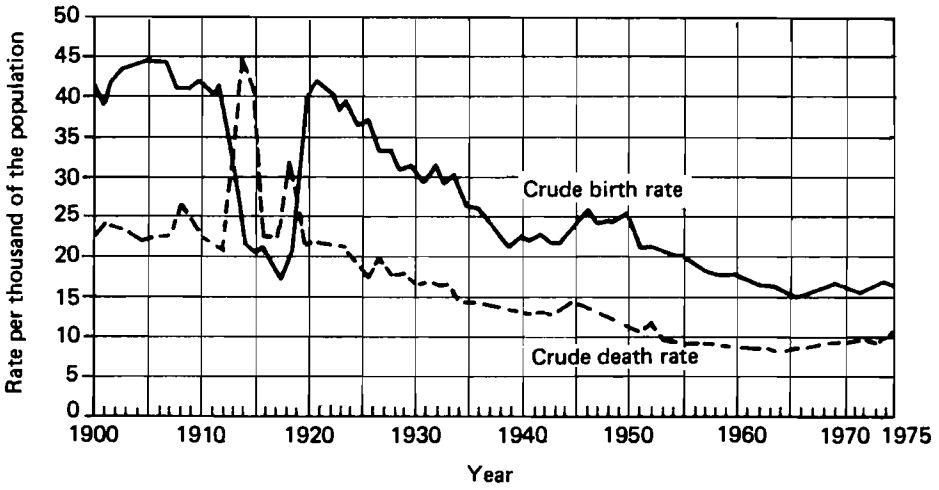

FIGURE 1 Crude birth and death rates for Bulgaria. Source: Central Bureau of Statistics (1974), readjusted for 1975.

TABLE 1 Several economic indices for Bulgaria, 1950–1975.

	Year				
Indices	1950	1960	1965	1970	1975
National income	100.0	239.2	353.6	561.0	761.4
National income per capita	100.0[a]	220.4	312.3	478.8	632.4
Real working salary	100.0[a]	195.0	215.0	278.0	321.0

[a]In 1952.

TABLE 2 Percent of labor force in the economic sectors in Bulgaria, 1948–1975.

	Year			
Sectors	1948	1960	1965	1975
Agriculture	81.8	54.7	44.9	22.5
Industry	7.9	21.9	26.3	34.6
Total material production	95.6	90.8	89.2	80.6
Total nonmaterial production	4.4	9.2	10.8	19.4
Total production	100.0	100.0	100.0	100.0

TABLE 3 Net reproduction rates for the female population of Bulgaria, 1965–1975.

Year	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
NRR	0.969	0.943	0.946	1.064	1.078	1.030	0.967	0.963	1.017	1.084	1.055

the quality of the labor force, which led directly to a widening of education in the country. According to the 1975 census, there were no illiterate people over 7 years of age, 20.2 percent had a secondary education, and 4.1 percent of the total literate population had a higher education.

After the fertility compensation period following the war, there appeared a decrease in natality (Figure 1). The lowest CBR observed was during 1966 (14.9) and the net reproduction rates (NRRs) for 1965–1967 were less than 1.0, i.e., below replacement level (Table 3). (The NRR is the number of babies born per person in a lifetime, taking mortality into account.) This trend was a consequence of socioeconomic changes in Bulgaria, such as the clearly identifiable movement of laborers to urban areas, where industrialization was growing rapidly. A much improved standard of living and quality of life plus the emancipation of women, who subsequently had greater social and economic occupation, were factors that led to the diminishing number of children born in a given family. It must also be mentioned that, according to Bulgarian tradition, children were added working hands in an agricultural household but were not so important in an urban household.

The decrease in fertility and the increase in the average life expectancy led to an aging of the population. To counteract this, in the fall of 1967 the government adopted laws for the encouragement of childbearing. As a result, fertility has increased since 1968. The temporary fall of the CBR and NRR in 1971 and 1972 can be attributed to the effect of the Second World War on the 20–27 age group.

The fertility pattern for Bulgaria as a whole, however, differs from that of its internal regions. Since 1956 Bulgaria has been divided into 28 administrative districts, although the statistical data for this regional delineation have existed since 1947. This allows for a regional comparison of the levels of fertility during the third demographic stage (since 1945).

At the beginning of the third stage, and after the postwar compensation period (around 1950), the fertility rate differed greatly among the districts, ranging between 14 and 36 per thousand (Figure 2). After 1951 fertility decreased in all the districts, and the decrease was highest for districts with a previously high level of fertility. For instance, the district of Kurdzhali, in the southernmost part of Bulgaria, exhibited the highest levels of fertility in 1951 and 1975, but the decrease has been significant: from 35.0 down to 22.3. The other extreme

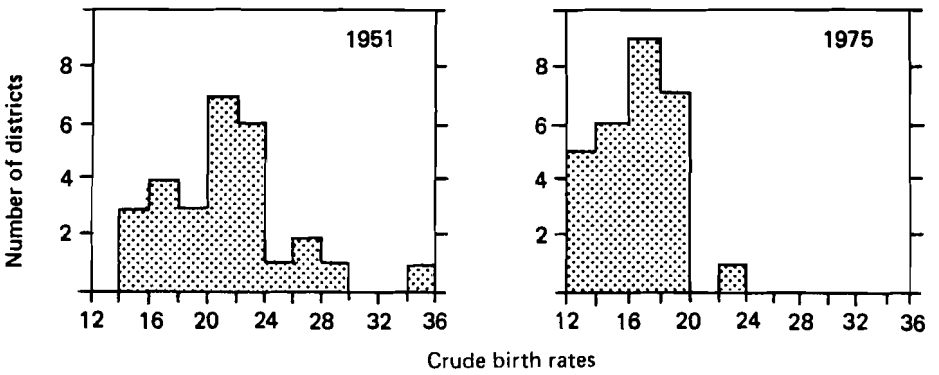

FIGURE 2 Frequency distribution of the 28 administrative districts of Bulgaria according to the level of natality. Source: Stefanov *et al.* (1974), readjusted for 1975.

is the district of Vidin in the extreme northwest, which exhibited the lowest level of natality in 1951 (14.0–16.0) and in 1975 (12.6).

Although districts with a high level of fertility in the beginning of the third stage still had a relatively high level at the end, the regional differences between the high and low levels became less pronounced. (Those districts with a low level of fertility at the beginning of the stage also had a low level at the end.) It should be observed, however, that the higher the level of fertility in 1951, the larger its decrease in 1975. So, greater uniformity among the districts was achieved – in 1975 their CBRs were in the 12 to 24 range. The pronatalist policy adopted in 1967 has brought a uniform increase of the fertility levels in all the districts, with the exception of one district (Kurdzhali), which was not influenced at all.

It is clear from the above that the traditions in fertility patterns, which have been historically established in separate districts, still remain in 1975 in Bulgaria. It is expected that the difference between the high and low levels of regional fertility will continue to diminish during the next 5 to 10 years. The socialistic development and the planned territorial distribution of the productive forces bring further equalization of the economic and cultural quality of life among the districts of the country. With the decline of religious, ethnic, and other influences comes the elimination of differences in fertility levels among the regions of the state.

2.2 Mortality

Until the end (1920–1925) of the first stage of demographic development, mortality in Bulgaria was high, with a crude death rate (CDR) of approximately 23 deaths per thousand population per year (Figure 1). By the end of this stage and during the second stage, mortality fell together with fertility, the CDR in 1941–1945 having dropped to 13.4. An unusual feature of the Bulgarian

demographic transition was the lack of any lag between the fall in fertility and the fall in mortality; the transitional population growth usually occurring in countries in which a decline in mortality appears before a decline in fertility did not occur in Bulgaria.

After the Second World War, as a result of the new conditions of living, the decline in mortality continued. Until 1965 the fall in mortality, together with the fall in fertility, led to the aging of the population structure, causing a slight increase of the CDR after 1965.

The *expectation of life* gives a better picture of the mortality level than the CDR, because it is not influenced by the age composition of the real population. It is common also to say that life expectancy is an indicator of economic development and the standard of living. Table 4 shows that this has been the case for the Bulgarian population. Life expectancy at birth has been much higher during the period after 1945 than before. This is a result of the improvement of the health care system, as well as of the previously mentioned socioeconomic changes that have taken place since the Second World War. Life expectancy in 1969–1971 was 71.1 years and was approximately the same in 1975.

TABLE 4 Life expectancy for the population of Bulgaria, 1900–1974.

	Year									
Sex	1900–1905	1921–1925	1927–1934	1935–1939	1946–1947	1956–1957	1960–1962	1965–1967	1969–1971	1973–1974
Males	42.1	44.4	47.8	51.0	53.3	64.2	67.8	68.8	68.6	68.9
Females	42.2	45.0	49.1	52.6	56.4	67.7	71.4	72.7	73.9	73.6
Total	–	44.6	48.4	51.8	54.9	65.9	69.6	70.7	71.1	–

SOURCE: Central Bureau of Statistics (1975).

Life expectancies for Bulgaria's 28 districts are unavailable, but Table 5 presents the frequency distribution of the CDRs across districts during the third demographic stage. At the beginning of the period, when mortality was higher, the CDRs varied considerably. In the middle of the period (1960–1965) the range of the CDRs was narrow, and their magnitude was lower. During the last decade of the period (1965–1975) a rise of the CDR appeared in several districts. This rise was a result of the aging of the population structure in some districts in northern and especially in northwestern Bulgaria, caused by out-migrations during the first two decades of the third stage. Therefore it can be stated that, during the entire third stage, mortality fell (as depicted by the life expectancy for the total population) and that the age structure of the population has caused the rise of some CDRs during the last 10 years. It is expected that, with the rapid but uniform social and economic development of the country, the level

TABLE 5 Frequency distribution of the crude death rates across districts, 1950–1975.

Crude death rates	Year					
	1950	1955	1960	1965	1970	1975
5.0–6.9	–	1	2	4	2	2
7.0–8.9	1	13	20	16	10	2
9.0–10.9	20	10	6	8	11	13
11.0–12.9	6	3	–	–	5	6
13.0–14.9	–	1	–	–	–	4
15.0–16.9	1	–	–	–	–	1

SOURCE: Stefanov *et al.* (1974), readjusted for 1975.

of mortality (if measured by age-specific rates and expressed in life expectancy terms) will continue to fall in the long run in all the 28 districts, whereas the CDR, which depends on the peculiarities of the population's age structure, may continue to increase.

Accordingly, it cannot be stated that a high or low CDR in 1950 would lead to a high or low CDR in 1975, as was the case for the CBR. On the contrary, one district (Kurdzhali) had the highest CDR in 1947 (26.9) and the lowest one in 1975 (6.3)! There is no other measure available for Bulgaria for the level of regional mortality than the CDR over this period of time, but it is clear that this measure is not representative because of the effect of the age structure.

2.3 Migrations and Territorial Structure

In any country, internal migrations are generated mainly by social and economic factors, but geographical, personal, and ethnic factors are also of importance. In Bulgaria, migration rates before 1944 were low because industrial development was slow, and agriculture was more developed than industry. Some urbanization trends were observed, but they were still not well depicted. For instance, the urban population of the country in 1900 was 19.9 percent of the total and in 1934 it was 21.4 percent.

Table 6 gives the total number of migrations and their number per thousand population (migration rates) over the period 1947–1975. As a result of social, economic, and cultural changes after 1944, the intensity of migration began to increase. The economic factors – the most important motivation for migration – caused the younger part of the active population, together with pupils and students, to migrate. Because of the collectivization and the mechanization of agriculture, a large mass of the labor force moved to urban areas where there was a

TABLE 6 Total numbers of migrations and migration rates for Bulgaria, 1947–1975.

Year	Migrants[a] (in thousands)	Migration rate (per thousand)
1947–1950	117.8	16.4
1951–1955	138.9	18.9
1956–1960	158.1	20.5
1961–1965	160.4	19.9
1966–1968	156.8	18.9
1969	152.3	18.1
1970	155.7	18.4
1971	155.6	18.3
1972	151.1	17.7
1973	170.0	19.8
1974	142.1	16.4
1975	124.1	14.2

[a]A migrant refers to a person who crosses municipality (obshtina) boundaries.
SOURCE: Stefanov *et al.* (1974) and Central Bureau of Statistics (1972; 1973; 1974; 1975).

need for workers in newly developed heavy industries. Therefore the change in territorial structures can best be observed in the rural–urban patterns that result from the territorial changes in the social and labor structure.

The urban population was 24.7 percent of the total in 1946, 46.5 percent in 1965, and 58.7 percent in 1975. This was the first time that such intensive growth appeared in the demographic history of Bulgaria. Urbanization arose as a result of three main factors: migration to urban areas, higher fertility in the urban population (insofar as its age structure was younger than that of the rural population), and the administrative reclassification of villages into towns or parts of towns. (Such reclassification involved 283 villages during the period 1945–1971, and transferred 764,000 people from rural to urban status.)

The migration flow from rural to urban areas was most intensive after the Second World War until the late sixties. Later it decreased somewhat because the urban population had increased and the rural one had diminished. In fact the absolute number of migrants slightly diminished in the period between 1960 and 1975. (In 1973 a temporary rise was registered as a result of the people's response to certain governmental orders. These affected predominantly the city of Plovdiv, the second largest city in Bulgaria. Its net migration rose from 1,500 in 1971 to about 20,000 in 1973.) This overall decrease in migration was due mainly to the direct and indirect policies of the Bulgarian government. Because of the uniform economic development of all districts within the country

and because of the equalization of the conditions of living in towns and villages, it is expected that in the next 5 or 10 years the migration rate will drop to a lower level and will then remain constant.

When migrations are considered between districts instead of between rural and urban areas, only 5 districts have a positive net migration (the city of Sofia, Varna, Gabrovo, Ruse, and Stara Zagora), negative flows appear for 16 districts, and a mixture of positive and negative net migrations appear for the remaining 7 districts. Most of the last 7 districts exhibit a positive flow until 1960–1965 and a negative one afterward. Since 1965 the intensity of the flows has been decreasing or has remained constant for most of the districts. Interregional migrations are studied in greater detail in the following sections.

2.4 Age structure of the Population

The age structures of the rural, urban, and total populations at the end of 1975 are shown in Figure 3. They result from changes in the fertility, mortality, and migration patterns that were briefly explained above. Inferences that might be made from these results are given below.

- The relatively low number of people in the 55–59 age group was caused by World War I (stage 1); the drop in the 30–39 age group was caused by World War II (stage 2). The relatively low numbers in the 5–14 age group was due both to the low fertility level in the 1960–1969 period and to the low number of people of fertile age (stages 1 and 2).
- The size of the urban population at ages up to 55 was higher than that of the rural population due to the strong migration flow from rural to urban areas (stage 3). The size of the rural population was larger for the older ages; the urban population had a young age structure and the rural population had an old age structure.

The age distributions of urban and rural populations differ substantially, and therefore crude rates give an ambiguous interpretation to demographic phenomena. For example, in 1975 the urban CBR was 19.1 per thousand and the rural was 13.0 per thousand, although now Stefanov *et al.* (1974) and Naoumov *et al.* (1974) show that fertility is actually lower in urban areas, as one might expect.

3 THE MULTIREGIONAL POPULATION ANALYSIS

3.1 Regional Divisions

As previously mentioned, since 1956 Bulgaria has been divided into 28 administrative districts. They form the regional basis for the future planning of economic

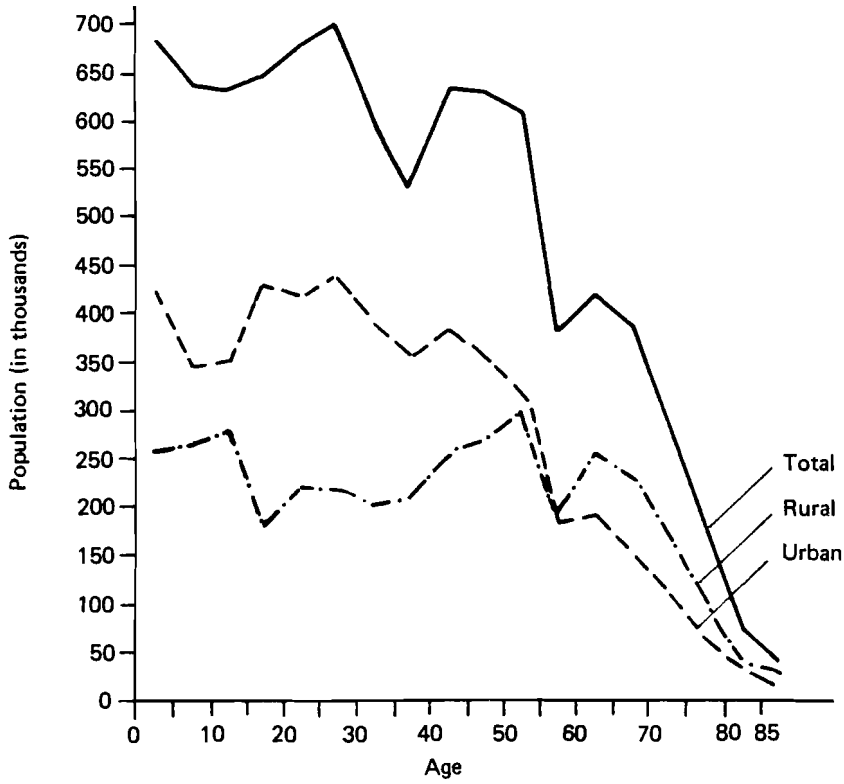

FIGURE 3 Age structures of the rural, urban, and total populations of Bulgaria at the end of 1975.

development, and they are the smallest regional unit for which published demographic data are available.

For administrative and planning purposes, the 28 districts have been aggregated into six geographic–economic regions. The population system studied in this report, however, consists of seven regions, but it differs only slightly from the six-region division of the country. For the seven regions (Figure 4) the following changes were introduced:

- The city of Sofia was separated from the southwestern region to form the seventh region. This was done because it is an urban area and the in- and out-migration flows are highly specific.
- The district of Russe was aggregated with the North region, and not with the Northeastern region, because its economic development and demographic patterns are much closer to the districts in the north than in the northeast.

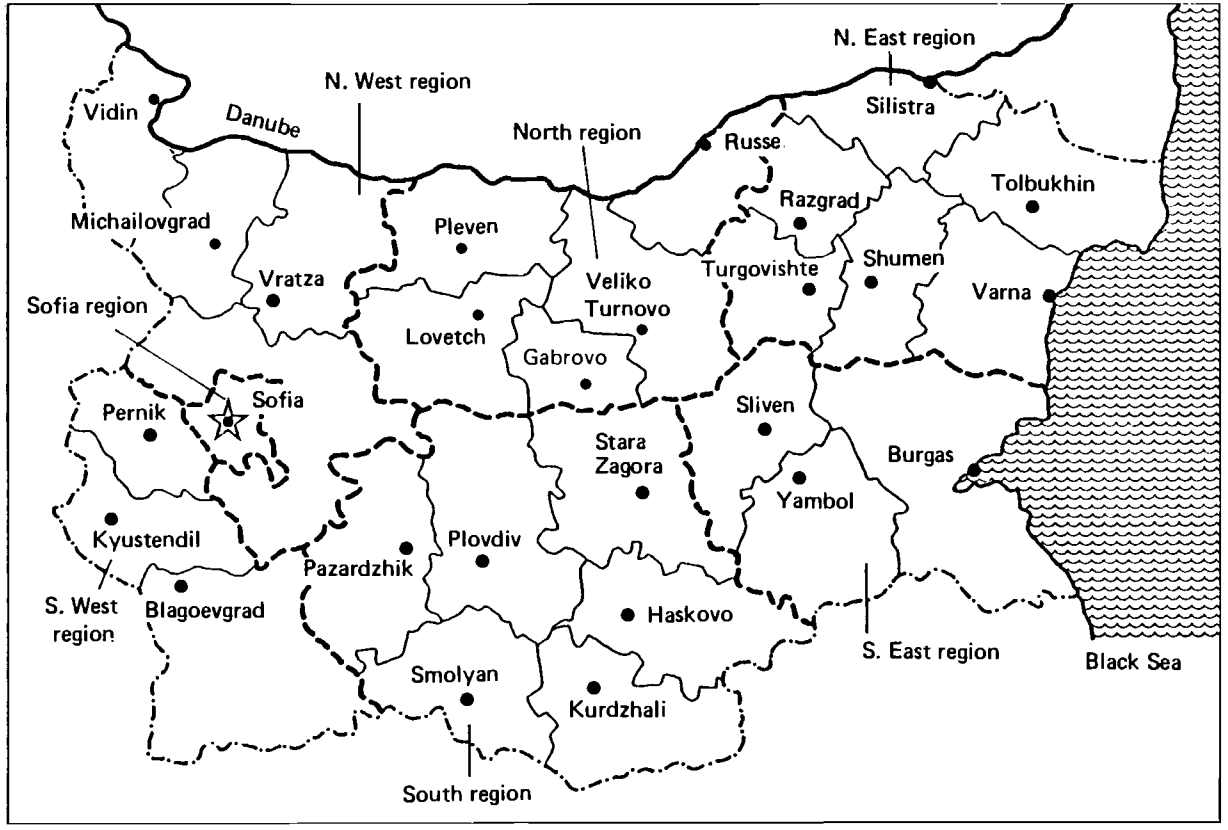

FIGURE 4 Map of Bulgaria showing the 28 districts and seven regions of Bulgaria. Source: Central Bureau of Statistics (1975).

- For similar reasons the Sofia district (which does not include the city of Sofia) was aggregated with northwestern Bulgaria instead of with southwestern Bulgaria.

Thus the seven regions used in this multiregional analysis are:

Region 1 Northwestern Bulgaria (henceforth referred to as the N.West region) is made up of four districts: Vidin, Michailovgrad, Vratza, and the Sofia district. The latter, however, is to be distinguished from the city of Sofia, which is an entirely different administrative district: Sofia (district) surrounds Sofia (city). Sofia (district) is included in the N.West region because it has much the same demographic characteristics as the other three districts.

Region 2 Northern Bulgaria (the North region) includes five administrative districts: Pleven, Lovetch, Gabrovo, Veliko Turnovo, and Russe.

Region 3 Northeastern Bulgaria (the N.East region) consists of Silistra, Razgrad, Turgovishte, Tolbukhin, Shumen, and Varna.

Region 4 Southwestern Bulgaria (the S.West region) includes Pernik, Kyustendil, and Blagoevgrad.

Region 5 Southern Bulgaria (the South region) is made up of Pazardzhik, Plovdiv, Smolyan, Stara Zagora, Haskovo, and Kurdzhali.

Region 6 Southeastern Bulgaria (the S.East region) consists of Sliven, Yambol, and Burgas.

Region 7 Sofia (city) (the Sofia region) forms a separate region because of its specific demographic significance. Sofia (city) has a population of about 1 million; the total population of Bulgaria is about 8.5 million. It is obvious that the migration flow toward that region is strong.

3.2 Data Preparation

The data requirements for a multiregional analysis are population by age and region, births by age of mother and by region, deaths by age and region, and number of migrants by age and by region of origin and destination. In some situations not all these data are available and inferences must be made.

The data for the population by age groups (both sexes for the 28 districts) at the end of 1975, and the data for the departures and arrivals by age groups (total and for each district separately) during 1975, were taken from the Central Bureau of Statistics in Sofia (personal communication). The data for the population at the end of 1974 were taken from the Central Bureau of Statistics (1975). The data for births, deaths, and the 28 × 28 migration flow matrix for 1975 were from the Central Bureau of Statistics (1976).

To derive the required data from the available data, some estimations were carried out. Data on population were available for each of the 28 districts by

5-year age groups (the last one being 60+) for the end of the years 1974 and 1975, which yield the necessary midyear 1975 population. For the analysis the population age structure was extrapolated up to 85+. This was done by following the age structure of the national population until 100+. (Polynomial extrapolations were experimented with for different polynomial degrees but none of them was appropriate because of the low numbers in the 55–59 age group, due to the First World War and the preceding Balkan War.) It was supposed that the use of the national percentage distribution would not cause a large bias because the wars had affected uniformly the population throughout the country. It should be noted that the extrapolation, which uses the percentage distribution, gives identical results using an entropy estimation procedure. This is because of the bidimensionality of the problem of estimating the elements in the cells of a matrix whose row and column sums are given. (The age groups of the national population are the row sums, and the population in the last age group, 60+, for each region are the column sums.) For more details on entropy estimations, the reader is referred to Willekens, Pőr, and Raquillet (1979).

Regional data for births by age of mother are available by 5-year age groups. The original data were not changed at all since they fitted exactly the needs of our analysis.

At the district level, data on deaths were available by 5-year age groups up to 20 years of age and by 10-year age groups up to 70 years and over. It was necessary to disaggregate each 10-year age group to two 5-year age groups. This was done again by following the percentage distribution of the total deaths in the country. (Interpolation programs were also tried, but the results received were poor for the 50–59 age groups because the total number of deaths in the 50–54 age group exceeded the number of deaths in the 55–59 age group.

Adjustment of the data on migration was most important to our analysis because the original data differed significantly from the input data used for the analysis. Vital statistics in Bulgaria annually record permanent moves only. A permanent move is defined as a permanent change of residence from one dwelling to another. Data are gathered through statistical forms that are completed by the migrant when a change of permanent residence occurs. The forms are filled in at the place of destination, but the place of origin is also indicated. They are then gathered in the Central Statistical Office (now named the Committee for the Unified System of Social Information) and processed there.

Statistical forms are filled in by persons over 16 years of age (except pupils). Children are registered by their parents and pupils by the school administration. Hence the registration system refers to moves and not to migrants. If a person changes his permanent address twice in one year, he will fill in two lists, therefore two moves will be recorded. When studying migration statistics, and in particular age composition, one observes a relatively high number of moves in the 10–14 and 15–19 age groups. This is due to peculiarities in defining and registering the migration of pupils. In Bulgaria, students may select from any number of specialized professional schools in which to further their education,

but must frequently change their legal residence to do so – thus the high migration level of teenagers.

As a result of this system of registration, available data for internal migration in Bulgaria consist of departures and arrivals for each district (given by 5-year age groups up to the age of 70), and the flow matrix (given only in total numbers) of migrations between regions. *Any* departure or arrival is taken into account whether the move is across district boundaries or not. What is in fact necessary for the analysis is the interregional flow matrix for each 5-year age group. In the original data the total number of departures for each age group was usually less than the total number of arrivals for the same age group, because of the failure of some migrants to indicate their place of origin on the form. (This is true especially of pupils and children.) Because of this, priority was given to arrival data, which were assumed to be true, and departure data were adjusted accordingly (following the percentage distribution). Table 7 presents the departures and arrivals after this adjustment was carried out and after the 28 districts were aggregated into seven regions. Table 8 gives the flow matrix for the interdistrict migrations aggregated by region.

The total number of interdistrict moves, 60,782 (Table 8), is considerably less than the total number of departures or arrivals, 124,105 (Table 7). This is because the flow matrix excludes intradistrict migrations,* whereas the departure and arrival calculations do not. In order to transfer the age-structure information of departures and of arrivals to the interregional flow matrix it is necessary that the totals be made equal. For this purpose the numbers of departures and of arrivals were decreased to equal the number of interregional moves, 60,782. This was done by taking into account the percentage distribution of the age groups. For example, total departures from the N.West region were decreased from 15,857 (Table 7) to 7,928 (Table 8) by multiplying every number from the second column of Table 7 by the proportion 7,928:15,857. The numbers given in Table 9 were obtained in this way. These numbers, however, were still not correct for our analysis because the total number of departures did not equal the total number of arrivals for each age group. For their equalization a biproportional adjustment procedure, frequently referred to as RAS, was used. Priority was given to the arrivals; the departure matrix in Table 9 was changed so that the row sums became equal to the corresponding arrival totals, whereas the column totals remained unchanged (Table 10).

The data in Table 10 were used to disaggregate the numbers in the flow matrix (Table 8) into age groups. This was done by using a three-dimensional RAS method, documented in Willekens *et al* (1979). After the total origin–destination-specific migration matrix was decomposed into age-specific matrices, the migrants aged 70+ were allocated to 5-year age groups 70–74, 75–79, 80–84, and 85+. This disaggregation was based on the age composition of the arrivals as a whole. The input data are set out in Appendix A.

*The flow matrix, however, *does* include interdistrict intraregional migrations on its main diagonal.

TABLE 7 All departures and arrivals by age, aggregated for the seven regions of Bulgaria with departures equalized to arrivals, 1975.

	Departures from:								Arrivals to:							
	Region								Region							
Age	N.West	North	N.East	S.West	South	S.East	Sofia	Total	N.West	North	N.East	S.West	South	S.East	Sofia	Total
0–4	1,265	1,478	1,731	555	2,264	1,069	709	9,071	1,331	1,704	1,672	376	2,231	962	795	9,071
5–9	857	1,573	1,589	490	1,758	904	393	7,564	925	1,729	1,553	314	1,745	804	494	7,564
10–14	2,373	3,974	4,208	2,578	5,451	2,230	377	21,191	2,453	4,250	3,792	2,368	5,547	2,070	711	21,191
15–19	5,344	5,957	8,204	3,746	10,993	4,669	592	39,505	4,159	6,786	7,032	2,724	11,622	3,281	3,901	39,505
20–24	2,478	3,162	3,616	1,323	5,382	2,184	900	19,045	1,880	3,100	3,590	689	5,021	1,491	3,274	19,045
25–29	1,513	1,918	1,836	678	2,857	1,129	1,049	10,980	1,499	2,014	1,928	479	2,925	926	1,209	10,980
30–34	654	842	969	312	1,369	635	369	5,150	705	886	973	215	1,317	486	568	5,150
35–39	365	496	603	269	923	366	415	3,437	494	502	655	136	889	334	427	3,437
40–44	294	392	427	200	684	264	301	2,562	379	394	416	117	710	250	296	2,562
45–49	210	266	273	125	457	189	222	1,742	268	217	278	72	501	192	214	1,742
50–54	147	185	197	78	289	110	141	1,147	201	163	171	31	330	120	131	1,147
55–59	83	106	115	46	162	56	79	647	88	91	122	16	185	45	100	647
60–64	82	109	132	47	159	56	70	655	67	96	127	16	167	34	148	655
65–69	78	87	93	46	150	51	68	573	44	93	87	15	159	34	141	573
70+	114	207	135	68	195	88	29	836	56	154	79	9	211	30	297	836
Total	15,857	20,752	24,128	10,561	33,093	14,000	5,714	124,105	14,549	22,179	22,475	7,577	33,560	11,059	12,706	124,105

TABLE 8 Interregional flow matrix of the total number of migrations (excluding intradistrict moves) among the seven regions of Bulgaria, 1975.

Region of destination	Region of origin 1	2	3	4	5	6	7	Totals
1 N.West	1,896	1,042	411	539	1,261	271	1,673	7,093
2 North	1,175	4,152	2,764	292	1,427	559	747	11,116
3 N.East	471	1,524	4,642	220	983	994	492	9,326
4 S.West	268	146	122	823	298	67	310	2,034
5 South	854	1,107	759	813	9,766	2,500	1,039	16,838
6 S.East	110	249	502	103	919	1,685	259	3,827
7 Sofia	3,154	1,446	833	1,987	2,264	864	0	10,548
Totals	7,928	9,666	10,033	4,777	16,918	6,940	4,520	60,782

SOURCE: Aggregated from 28 x 28 migration flow matrix from Central Bureau of Statistics (1976).

3.3 Analysis of Observed Regional Characteristics

In this section, some observed characteristics of the regional populations within Bulgaria will be examined – characteristics that are directly derived from the observed data and do not rely on a demographic model. One such feature is the mean age, i.e., mean ages of the population, of childbearing, at death, and of migration.

The study of mean ages makes it possible to follow the effect of the age composition on observed rates. Table 11 gives the mean ages of observed population characteristics, computed from

$$\overline{m}_i = \sum_x (x + 2.5)c_i(x)/100 \qquad (1)$$

where $c_i(x)$ is the percentage distribution of the population, births, and deaths in region i ($i = 1, 2, 3, \ldots, 7$) or migrations from i to j at age x, and 2.5 is the average of the age interval (5 years). The mean age, therefore, depends on the particular age structure of the regional population.

It can be seen that, reflecting their older age structures, the mean ages of the populations of the N.West and North regions are much higher than those of the other five regions. The mean ages of dying are also higher for the same two regions, reflecting again the older age structures of their populations.

The population age structure during the reproductive ages is similar in all the Bulgarian regions, which is why the mean age of childbearing is at the same level in six regions. In the Sofia region it is a little higher because almost the entire population of this region is urban.

The right-hand part of Table 11 shows the mean ages of out-migrants. These ages are highest for moves to and from the Sofia region. The lowest mean ages for all moves can be observed in the S.West region.

TABLE 9 Departures and arrivals for the seven regions of Bulgaria, diminished by percentage distribution.[a]

	Departures from:								Arrivals to:							
	Region								Region							
Age	N.West	North	N.East	S.West	South	S.East	Sofia	Total	N.West	North	N.East	S.West	South	S.East	Sofia	Total
0–4	633	688	720	251	1,157	530	561	4,540	649	854	694	101	1,119	333	660	4,410
5–9	429	733	661	222	899	448	311	3,703	451	867	644	84	875	278	410	3,609
10–14	1,187	1,851	1,748	1,166	2,787	1,105	298	10,142	1,196	2,130	1,573	637	2,783	716	590	9,625
15–19	2,668	2,775	3,411	1,694	5,620	2,314	468	18,950	2,026	3,400	2,918	731	5,830	1,135	3,237	19,279
20–24	1,239	1,473	1,504	598	2,750	1,082	712	9,368	917	1,554	1,489	185	2,519	516	2,718	9,898
25–29	757	893	763	307	1,460	560	830	5,570	731	1,009	800	129	1,467	320	1,004	5,460
30–34	327	392	403	141	700	315	292	2,570	344	444	404	58	661	168	472	2,551
35–39	183	231	251	122	472	181	328	1,768	241	252	272	37	446	116	354	1,718
40–44	147	183	178	90	350	131	238	1,317	185	197	173	31	356	87	246	1,275
45–49	105	124	114	57	234	94	176	904	131	109	115	19	251	66	178	869
50–54	74	86	82	35	148	55	112	592	98	82	71	8	166	42	109	576
55–59	42	49	48	21	83	28	62	333	43	46	51	4	93	16	83	336
60–64	41	51	55	21	81	28	55	332	33	48	53	4	84	12	123	357
65–69	39	41	39	21	77	25	54	296	21	47	36	4	80	12	117	317
70+	57	96	56	31	100	44	23	407	27	77	33	2	106	10	247	502
Total	7,928	9,666	10,033	4,777	16,918	6,940	4,520	60,782	7,095	11,117	9,326	2,033	16,837	3,828	10,550	60,782

[a]Rounding errors not removed.

TABLE 10 Departures and arrivals by age (excluding intradistrict moves) for the seven regions of Bulgaria, 1975.

	Departures from:								Arrivals to:							
	Region								Region							
Age	N.West	North	N.East	S.West	South	S.East	Sofia	Total	N.West	North	N.East	S.West	South	S.East	Sofia	Total
0–4	614	669	699	244	1,122	514	548	4,410	649	854	694	101	1,119	333	660	4,410
5–9	417	715	644	217	875	436	305	3,609	451	867	644	84	875	278	410	3,609
10–14	1,125	1,758	1,660	1,110	2,640	1,048	284	9,625	1,196	2,130	1,573	637	2,783	716	590	9,625
15–19	2,712	2,827	3,468	1,729	5,712	2,352	479	19,279	2,026	3,400	2,918	731	5,832	1,135	3,237	19,279
20–24	1,306	1,560	1,591	634	2,906	1,144	757	9,898	917	1,554	1,489	185	2,519	516	2,718	9,898
25–29	740	876	748	302	1,429	548	817	5,460	731	1,009	800	129	1,467	320	1,004	5,460
30–34	324	389	400	141	694	312	291	2,551	344	444	404	58	661	168	472	2,551
35–39	177	225	244	119	457	176	320	1,718	241	252	272	37	446	116	354	1,718
40–44	142	177	172	87	338	128	231	1,275	185	197	173	31	356	87	246	1,275
45–49	101	119	109	55	225	90	170	869	131	109	115	19	251	66	178	869
50–54	72	84	80	34	144	53	109	576	98	82	71	8	166	42	109	576
55–59	42	49	48	21	84	28	64	336	43	46	51	4	93	16	83	336
60–64	44	55	59	23	87	30	59	357	33	48	53	4	84	12	123	357
65–69	42	44	42	23	82	27	57	317	21	47	36	4	80	12	117	317
70+	70	119	69	38	123	54	29	502	27	77	33	2	106	10	247	502
Total	7,928	9,666	10,033	4,777	16,918	6,940	4,520	60,782	7,093	11,116	9,326	2,034	16,838	3,827	10,548	60,782

TABLE 11 Mean ages[a] of populations, births, deaths, and out-migrations for the seven regions of Bulgaria, 1975.

Region of residence	Mean age of									
				Out-migration (Region of destination)						
	Population	Births	Deaths	1	2	3	4	5	6	7
1 N.West	38.97	24.04	69.04	–	18.21	18.75	17.05	19.23	17.91	23.07
2 North	37.87	24.22	69.00	19.20	–	19.52	17.12	20.08	19.09	25.30
3 N.East	33.81	24.32	65.32	19.11	18.95	–	17.25	19.96	18.98	24.50
4 S.West	34.19	24.37	66.15	17.73	17.55	17.71	–	18.25	17.21	22.50
5 South	33.60	24.17	65.76	19.35	19.08	19.65	17.50	–	19.20	24.29
6 S.East	34.33	24.23	65.73	18.98	18.90	19.36	17.19	19.80	–	24.08
7 Sofia	34.37	25.35	64.71	24.93	24.49	25.30	22.68	26.53	25.15	–

[a]Equation (1) was used for these calculations.
SOURCE: Appendix A.

The comparatively young mean ages of the out-migrants in most regions can be explained by the educational system. In Bulgaria students finishing their primary education can choose to continue with their obligatory secondary education in a number of specialized professional schools. In order to do this they must often change their place of residence, which also explains the high number of moves in the 10–14 and 15–19 age groups.

Appendix B gives the observed age-specific, gross, and crude fertility, mortality, and out-migration rates for the seven regions of Bulgaria. The mean ages here are computed from

$$\bar{m}_i = \frac{\sum_x (x + 2.5) f_i(x)}{\sum_x f_i(x)} \qquad (2)$$

where $f_i(x)$ are the age-specific rates for region i. These mean ages are shown in Table 12.

Because eq. (2) deals with age-specific rates, the effect of the age structure does not affect the mean ages, which are weighted averages of the schedules. The mean ages computed with eq. (1) are denoted by $\bar{m}_i(1)$, and those calculated with eq. (2) by $\bar{m}_i(2)$. A comparison of $\bar{m}_i(1)$ with $\bar{m}_i(2)$ reveals the effects of age composition. For example, when $\bar{m}_i(2)$ is much greater than $\bar{m}_i(1)$, the age structure is very young. This comparison is also useful in the analyses of mortality schedules. For example, it can be inferred that the N.West region has a slightly higher mortality level and the Sofia region a slightly lower one than previously indicated.

For fertility data $\bar{m}_i(1)$ and $\bar{m}_i(2)$ are almost the same. For migrations, however, $\bar{m}_i(2)$ is much higher than $\bar{m}_i(1)$ in the Sofia region. The population of Sofia is young, and the mean ages of the fertility and migration schedules are high. The reason for the higher mean age of childbearing in Sofia is delayed childbearing; its age-specific fertility rates for the 30–49 age groups are the highest among all the regions. The mean ages of migrations to Sofia are the highest in Bulgaria because of the large number of movers in the age groups over 20 – moves caused by such factors as change of job or school.

A comparison of crude rates (Appendix B) among the regions shows some of the features that have been outlined above: high CDRs and low CBRs in the N.West and North regions, reflecting their older age structure; and a low CDR in the Sofia region, reflecting its comparatively young age structure. Crude rates are weighted averages of the population's age composition and in this respect are similar to the mean ages $\bar{m}_i(1)$. The gross rates, on the other hand, are weighted averages of the schedules; hence they resemble $\bar{m}_i(2)$. The difference between crude rates and gross rates is the same as the difference between $\bar{m}_i(1)$ and $\bar{m}_i(2)$.

The gross death rate (GDR) (which is the sum of the age-specific death rates) for Sofia is very high because of the higher age-specific death rates for

TABLE 12 Mean ages[a] of fertility, mortality, and out-migration schedules for the seven regions of Bulgaria, 1975.

Region of residence	Mean age of								
	Fertility schedule	Mortality schedule	Out-migration schedule (Region of destination)						
			1	2	3	4	5	6	7
1 N.West	24.06	77.89	–	18.65	18.96	17.12	19.72	17.93	24.08
2 North	24.25	78.44	19.46	–	19.74	16.89	20.69	19.06	28.67
3 N.East	24.43	78.72	20.56	20.89	–	17.47	22.18	19.94	30.65
4 S.West	24.60	79.11	18.60	18.61	18.41	–	20.05	17.69	26.33
5 South	24.45	79.18	21.04	20.87	21.55	17.81	–	20.27	29.83
6 S.East	24.36	78.88	19.84	21.05	20.87	17.39	21.69	–	29.29
7 Sofia	25.44	80.04	26.73	27.20	27.04	22.93	30.46	26.12	–

[a]Equation (2) was used for these calculations.
SOURCE: Appendix B.

the ages above 70. The GDRs are very low for the N.West and North regions because of the low age-specific death rates for the older part of the population.

The gross fertility rate (GFR) is the sum of the age-specific fertility rates. When multiplied by five (the age-group interval), this rate becomes the gross reproduction rate (GRR). The GRR must be greater than 1.05 in order to ensure population replacement. It is evident from Appendix B that the GRR is below replacement level in the North region (1.01) and in Sofia (0.96) but is high in the N.East and S.East regions (that is, in eastern Bulgaria). The GFR for the total national population is equal to 0.22 (i.e., GRR = 1.1), which shows that the lower fertility in the North and Sofia regions is compensated for nationally by the other five regions.

The gross migration rate is the sum of the age-specific migration rates. When this sum is multiplied by five, one obtains the gross migraproduction rate (GMR): a rate that is analogous to fertility's GRR. These rates for Bulgaria in 1975 are given in Table 13. A rough comparison with several other countries shows that the total GMRs for each region are rather low. The average rate for the German Democratic Republic was 0.44 (Mohs 1980) and in the Netherlands (Drewe 1980) and Sweden (Andersson and Holmberg 1980) was 1.0. The average GMR for Bulgaria was only 0.31. When comparing these figures, however, it must be remembered that the size of the regions used for each case study has a strong influence on the results; the total number of migrants between districts in Bulgaria was 124,105, whereas the number of migrants between regions was only 37,818 in 1975 (estimated from Appendix A by excluding intraregional moves).

TABLE 13 Gross migraproduction rates for the seven regions of Bulgaria, 1975.

Region of destination	Region of out-migration						
	1	2	3	4	5	6	7
1 N.West	–	0.056	0.018	0.050	0.038	0.021	0.106
2 North	0.089	–	0.125	0.027	0.043	0.044	0.048
3 N.East	0.036	0.082	–	0.020	0.030	0.078	0.031
4 S.West	0.020	0.008	0.005	–	0.009	0.005	0.020
5 South	0.065	0.059	0.035	0.077	–	0.198	0.068
6 S.East	0.008	0.013	0.022	0.009	0.027	–	0.016
7 Sofia	0.244	0.080	0.042	0.201	0.075	0.074	–
Total	0.461	0.298	0.248	0.385	0.221	0.420	0.290

In spite of the low migration level in Bulgaria, there exist well-exhibited patterns. There was more out-migration from the N.West region than from any other region and twice as much as from the South region (Table 13). The S.West and S.East regions also experienced high GMRs. The level of out-migration from the Sofia and North regions was close to the average for the country as a whole. The only pattern that was common to all regions in 1975 was the preference to migrate to a neighboring region (except out-migrants from the South, who mainly preferred Sofia), thus demonstrating the well-known relation between migration and distance. The strongest regional preferences were exhibited by moves from the N.West and S.West regions, more than half of which were directly to the city of Sofia. Around one half of the migrations from the N.East region were toward the North region and the same is true for the migration from the S.East to the South. The smallest regional differentiation was shown by out-migrations from the North region. Probably the distance factor is again of importance here: the South and North regions are in the central parts of the country. The fact that they are more economically developed is also important: an explanation that can be attributed to the preference to migrate to Sofia as well, in spite of the distance.

The lowest values for interregional GMRs are observed between regions situated far from each other. Once again the importance of the distance factor becomes evident. Thus migrations from N.West and North to S.East, as well as from N.East and S.East to S.West, are almost negligible.

3.4 The Multiregional Life Table

The life table is a basic concept in demography. Such tables describe the evolution of a hypothetical cohort of babies born at a particular point in time. This

evolution is expressed in a number of statistics: probabilities of dying and surviving, number of survivors, number of years to be lived, and expectations of life. The life table may be treated also as presenting a stationary population, one in which the number of births is equal to the number of deaths. This makes the life table a useful tool for the study of mortality.

The main difference between the single-region life table and the multiregional life table is that whereas the former is built for a single-region population exposed to a given set of mortality rates and closed to migration, the latter focuses on several regions, and both mortality and migration schedules are accounted for. The region of residence is taken into consideration, giving the life table a spatial dimension.

In order to build a multiregional life table, one needs observed regional age-specific rates for dying and migrating. These can be computed by dividing the regional annual number of events for a given age group by the midyear population of the region in that age group. In the life table, these rates are converted into probabilities, from which all the above mentioned life table statistics may be derived. For details regarding the construction of the multiregional life table, the reader may refer to Rogers (1975a) or Willekens and Rogers (1978).

Appendix B gives the regional age-specific rates for fertility, death, and out-migration for the seven regions. Appendix C gives the most important characteristics of the seven-region life table for Bulgaria. The discussion of these characteristics is the topic of this section.

3.4.1 LIFE TABLE PROBABILITIES

Probabilities are the basic elements of any life table. In principle, several types of probabilities may be defined, each associated with a specific point of interest. What is the probability that a person born in region 1 will survive to age 20 and be in region 5 at that time? What is the probability that a person residing in region 5 at the age of 20 will be in region 2 at the age of 25? These are two different probability measures. The first is an unconditional probability; the second is conditional on the individual having survived up to a given age.

Table 14 shows the conditional probabilities of dying and migrating for 20-year-old people in Bulgaria in 1975. Consider the first seven rows. The elements on the main diagonal represent probabilities that a person at exact age 20 in a given region will survive 5 years later in the same region; they are high for an individual in Sofia and low in the N.West and S.East regions. These low rates for the last two regions are due to the unfavorable job opportunities for 20-year-olds compared with the rest of the country.

The off-diagonal elements represent the probability of surviving 5 years later in a different region. They are generally larger for neighboring regions, thus illustrating that the number of migrations decreases with an increase in distance. The attractiveness of Sofia is easily seen (seventh row).

TABLE 14 Probabilities of migrating and of dying at age 20 for the seven regions of Bulgaria, 1975.

Region of destination	Region of origin						
	1	2	3	4	5	6	7
1 N.West	0.91147	0.00647	0.00224	0.00425	0.00508	0.00286	0.01195
2 North	0.01035	0.94810	0.01575	0.00258	0.00627	0.00624	0.00603
3 N.East	0.00489	0.01170	0.95971	0.00218	0.00494	0.01226	0.00429
4 S.West	0.00169	0.00075	0.00051	0.93924	0.00094	0.00055	0.00230
5 South	0.00794	0.00778	0.00456	0.00707	0.95549	0.02767	0.00847
6 S.East	0.00096	0.00156	0.00264	0.00079	0.00365	0.92710	0.00184
7 Sofia	0.05708	0.01952	0.00963	0.03866	0.01929	0.01862	0.96160
Subtotal	0.99439	0.99588	0.99504	0.99477	0.99566	0.99529	0.99648
Death	0.00561	0.00412	0.00496	0.00523	0.00434	0.00471	0.00352
Total	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

SOURCE: Appendix C.

The elements in the ninth row of Table 14 give, by region, the probability of dying between ages 20 and 25. It is lowest for Sofia and highest for the N.West and S.West regions.

The probabilities of dying and migrating at exact ages 0, 5, . . . , 85 are given in Appendix C. They are 5-year transition probabilities and ought to be interpreted in the same way as Table 14. Two important inferences can be made from the Appendix. Beginning around age 60, the probabilities of migrating become much smaller than in earlier ages. This shows that the amount of inter-regional migration after retirement decreases rapidly, at least in the regional disaggregation given here. The second observation found in Appendix C is that the probabilities of dying for a person in the Sofia region are generally less for younger ages (up to 40 and 45) and more for older ages. As mentioned above this pattern of dying is specific for urbanized areas.

The probabilities discussed here refer to individuals who have survived to exact age x (20, say) in a specific region. It is the place of residence at exact age x that is considered and not the place of birth. The probabilities are therefore conditional to the survival of the individual until the age x and to the region in which he is living.

Unconditional probabilities of a similar type can be derived by associating the region of residence at age x with the region of birth. Consider the 100,000 babies that were born simultaneously in the Sofia region. Of these, 97,361 will be alive 5 years later; 94,119 of them will have remained in the same region, 1,283 will have moved to the N.West region, 559 to the North region, etc. (Expected number of survivors at exact age x, Appendix C.) Five years later, the initial cohort will diminish to 97,152, and only 91,788 will be in Sofia, 2,048

TABLE 15 Probabilities of surviving to exact age 20 in the same region.

Region	N.West	North	N.East	S.West	South	S.East	Sofia
Probability	0.744	0.814	0.826	0.765	0.860	0.754	0.868

will be living in the N.West, etc. Twenty years later, 96,669 will have remained alive, and 86,767 of them will be living in Sofia. The probability that a person born in Sofia will reside in the capital at the age of 20 is 0.86767.

The probabilities of babies being born in a region and being in the same region at age 20 are given in Table 15. Note that these probabilities are high for the Sofia and South regions, and low for the N.West, S.East, and S.West regions. This suggests that the young populations of the last three regions tend to leave the region of birth before entering the labor force, whereas the natives of Sofia and the South prefer to take up employment in the same region.

Each column from the tables of expected number of survivors in Appendix C denotes how many members of a birth cohort are still alive at a given age by region of residence. From this information, the age composition and regional distribution of a life-table population may be derived. The procedure is simple. It is assumed that the number of people in the age group x to $x + 4$ is a linear combination of the number of people at exact ages x and age $x + 5$.

The first age–region distribution table in Appendix C shows the age structure and regional distribution of the N.West-born population. Note that the relative distribution is expressed in terms of unit-birth cohorts (obtained by dividing the number of people by the cohort size). The population consists of "natives" and aliens." Natives are persons living in their region of birth; aliens are people who live in another region. In the table, aliens represent the N.West-born people who inhabit other regions. It can be seen that the number of N.West-born aliens in Sofia in all age groups is much higher than any other group of aliens, whereas the number of aliens in the S.East region is very low.

The number of natives in each region declines with age, whereas the number of aliens increases during the first half of the life span and subsequently declines. The rate of accumulation of aliens is determined by the in- and out-migration age profile; hence statistics regarding aliens allow for an assessment of migrations combined with the level of dying in the region of destination. This assessment may be carried out in absolute and in relative terms.

Consider for example Sofia-born aliens (Appendix C, age–region distribution, initial region of cohort, Sofia). The highest number of Sofia-born residents of the other six regions are seen in the 45–49 and 50–54 age groups; non-Sofia-born residents of Sofia, on the other hand, have highest numbers in the 35–39 and 40–44 age groups. (These numbers are given in the last column of the age–region distribution tables in Appendix C, excluding the table for the Sofia region.) Hence it can be expected that aliens living in Sofia are younger than the

Sofia-born aliens in other regions. Note that the native–alien interpretation of the regional life-table population allows for a cohort-type of analysis of migrations, while inferences made directly from the age composition of observed migration schedules are periodic in character.

When a direct comparison of magnitudes is made one should consider only populations in a longitudinal perspective, i.e., by place of origin. For instance, the number of Sofia-born aliens in the N.West region is around two-thirds higher than in the South region and twice as high as in the North region. There are only a few aliens in the other three regions. It is not possible to compare the size of the above mentioned populations with the number of aliens in Sofia, because of the differences in cohort sizes. (The number of births differs substantially.)

The distinction between natives and aliens in this report is only illustrative. Because of lack of data, in our study native and alien residents of a given region have equal demographic behavior. They have, for instance, identical probabilities of out-migrating and of choosing a particular region. In reality, alien residents are more likely to return to their region of origin. The native–alien distinction, therefore, gains in significance when migration flow data are available by place of birth as well as by place of residence (PRPB). The distinction would then allow for a study of return migration. Ledent (1980) has analyzed the life-table construction and Philipov and Rogers (1980) the population projection on the basis of PRPB data.

3.4.2 EXPECTATIONS OF LIFE

The concept of life expectancy is very important in the single-region life table, but it is perhaps even more important in the multiregional life table. The life expectancies at birth (Table 16) provide a number of interesting items of information. For example, considering again the Sofia region, the life expectancy of a baby born in this region is 70.62 years, of which 59.49 years will be lived in the same region, 3.80 years in the N.West, etc. For the South region, the life expectancy is 70.63 years, of which 61.24 years will be lived in the same region, a much higher proportion than in the N.West region, for example.

The totals in Table 16 show that the life expectancy does not differ substantially among the seven regions, the amplitude being 1.3 years. For a comparison, the single-region life expectancies at birth are also given. Recall that these are calculated from the mortality schedule of the given region only, and therefore could be interpreted as the life expectancy of a person who never migrates (region is closed to migration). Their amplitude is 1.8 years, which is not much higher than the multiregional equivalent, showing quantitatively that the mortality patterns in 1975 in Bulgaria were regionally equalized.

The decrease in magnitude from 1.8 to 1.3 is due to migration, which subjects each individual to different regional mortality patterns because of the

TABLE 16 Life expectancies at birth for the seven regions and the single region of Bulgaria, 1975.

Region of residence	Region of birth 1	2	3	4	5	6	7
1 N.West	52.98	2.32	0.92	2.27	1.64	1.06	3.80
2 North	3.83	58.57	5.19	1.45	1.98	2.08	2.01
3 N.East	1.70	3.46	59.37	1.06	1.38	3.18	1.30
4 S.West	0.87	0.38	0.26	54.98	0.40	0.26	0.79
5 South	2.97	2.69	1.69	3.44	61.24	7.71	2.60
6 S.East	0.43	0.60	0.92	0.47	1.11	53.43	0.63
7 Sofia	8.62	3.15	1.74	7.22	2.88	2.80	59.49
Total	71.40	71.17	70.09	70.89	70.63	70.52	70.62
Single region	71.79	71.37	69.94	71.02	70.61	70.56	70.40

assumption that a person experiences the mortality pattern of the region he is in. Consider the expectation of life at birth for the S.West region. An individual born in this region is expected to spend 7.22 years in Sofia: the longest stay outside of the region of birth. Since mortality in Sofia is high on the average, this S.West individual's single-regional life expectancy at birth must decrease in the multiregional case, because he is expected to spend a considerably shorter period of time in regions with lower mortality (N.West and North). The decrease is only 0.1 years. It is obvious that with the increase (decrease) of migrations from S.West to Sofia, the individual's life expectancy will decrease (increase). Generally, if migrations increase for the whole country, the spatial totals will become more uniform. This principle is characteristic for systems composed of interdependent subsystems, and it resembles the regression toward the mean principle of econometrics. It is applied to the British population in Rees (1979).

Appendix C gives for each age the expectation of life by place of birth and by place of residence. The expectation of life by place of residence is a good measure of the level of migration. We shall refer to the spatial migration level at birth ${}_i\theta_j$ (0) as the proportion of the total lifetime that i-born persons spend in j. These quantities are given in Table 17.

The numbers in the main diagonal of Table 17 represent the proportion of the lifetime spent in the region of birth. They are lowest for the N.West, S.West, and S. East regions and highest for the South, the N.East, and the Sofia regions. Note that the region of Sofia does not have the lowest out-migration level, contrary to what might be expected. Its relatively high out-migration level, however, is compensated for by an even higher in-migration level.

The table also shows that a N.West-born individual will spend 26 percent of his life out of the region of birth and nearly half of that (12 percent of the

TABLE 17 Spatial migration levels at birth for the seven regions of Bulgaria, 1975.

Region of residence	Region of birth 1	2	3	4	5	6	7
1 N.West	0.742	0.033	0.013	0.032	0.023	0.015	0.054
2 North	0.054	0.823	0.074	0.020	0.028	0.030	0.029
3 N.East	0.023	0.049	0.847	0.015	0.019	0.045	0.018
4 S.West	0.012	0.005	0.004	0.775	0.006	0.004	0.011
5 South	0.042	0.038	0.024	0.049	0.867	0.108	0.037
6 S.East	0.006	0.008	0.013	0.007	0.016	0.758	0.009
7 Sofia	0.121	0.044	0.025	0.102	0.041	0.040	0.842
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE 18 Levels of non-migration for 20-year-old residents $[{}_i\theta_i(20)]$ of the seven regions of Bulgaria, 1975.

Region	N.West	North	N.East	S.West	South	S.East	Sofia
${}_i\theta_i(20)$	0.864	0.915	0.934	0.899	0.929	0.880	0.890

total) in Sofia. Thus in terms of the duration of residence, N.West-born individuals prefer Sofia to any other region. The same preference is also shown by S.West-born individuals, and to some extent by those born in the South region.

By its essence, ${}_i\theta_j(0)$ is an accumulative measure of migrations. The migration level can be defined for any other age x as ${}_i\theta_j(x)$: the proportion of the lifetime beyond age x that is spent in region j by a person living in region i at this age. Consider for example the age of 20 as the age of entering the labor force. The values of ${}_i\theta_j(20)$ can be estimated from the expectation of life by place of residence tables in Appendix C. They are not exhibited here because the spatial patterns that they reveal do not differ substantially from those revealed by ${}_i\theta_j(0)$.

Table 18 gives the level of non-migration that can be expected of individuals aged 20 in a given region $[{}_i\theta_i(20)]$. A comparison of Table 18 with the main diagonal of Table 17 reveals the expected general increase in the level of non-migration. (Since ${}_i\theta_j(x)$ is an accumulative measure of migration, the larger the x, the smaller the effect of migration.)

This increase in the level of non-migration varies from region to region. The older out-migration profile of Sofia contributes to the smallest increase of ${}_7\theta_7(20)$ by only 5 percent. At the other end of the scale, in the N.West, S.West, and S.East regions the increase is around 12 percent. Thus for the 20-year-old

residents of the Bulgarian regions, the difference in the migrants' age profiles causes a difference of 7 percent in the increase of the non-migration level, given that the regional mortality differentials are insignificant. Therefore, if a certain policy contributes to a change in the migration age profile, it will indirectly change the amount of labor force in the regions. For example, if the older age migration profile for the flow from Sofia to the N.West region is exchanged with the younger age profile for the counterflow, ${}_1\theta_1(20)$ will be around 0.77 and ${}_7\theta_7(20)$ around 0.91, thus decreasing still further the expected duration of life in the N.West region.

The multiregional life table is used here to study the patterns of migrating and dying in the seven Bulgarian regions. Whereas the differences in the regional mortality levels are found to be insignificant, the migration patterns are quite diverse. In general, the peripheral regions of the N.West, S.West, and S.East show similar behavior. Out-migrations are predominant from these regions – from the first two regions to Sofia, and from the S.East to the South (where Plovdiv, the second largest city in Bulgaria, is situated).

It should be noted that the probabilities of dying and migrating at age 20 reveal migration patterns that are quite similar to the patterns revealed by ${}_i\theta_j(0)$ (*cf.* Tables 14 and 17). The same can be said for the other age groups. It shows, therefore, that the migration structure or regional preference does not change much with age except in the Sofia region.

3.4.3 ANALYSIS OF SPATIAL FERTILITY AND MIGRATION PATTERNS

Until now, the study of fertility has been carried out on the basis of the age-specific and gross fertility rates. By using the multiregional life table it is possible to analyze spatial fertility levels with more refined measures, such as spatial net reproduction rates and allocations.

The spatial net reproduction rate is the weighted sum of region- and age-specific fertility rates, the weights being the population size in each age/region combination in the multiregional life table. It is formally defined as follows (Rogers 1975b):

$$ {}_iNRR_j = \sum_{x=0}^{n} {}_iL_j(x)F_j(x) \tag{3} $$

where ${}_iL_j$ denotes the number of persons from the multiregional life table population in region j that were born in region i (Rogers 1975a) and $F_j(x)$ denotes the observed age-specific birth rate in region j. Equation (3) gives the number of births in region j to an i-born individual who is subject to mortality and out-migration in the region of residence. It is important to note that ${}_iL_j$ is estimated on the basis of a unit-birth cohort in region i; hence it is independent of the initial birth cohort in region j. Equation (3) shows that the value of ${}_iNRR_j$

and the sum $\sum_j {}_iNRR_j$ do not depend on the births outside of region i. Therefore, it is incorrect to compare the values for ${}_iNRR_j$ for different values of i unless additional assumptions are introduced.

This gives rise to two different sets of spatial NRRs. One is based on the independence of the births in one region from another, and the other is based on the assumption that the birth cohorts in the regions are related to each other according to a given pattern. The two sets of NRRs will be analyzed separately.

a. Radix-independent spatial NRRs. The estimation of these NRRs assumes a unit-birth cohort in every region; i.e., a uniform spatial distribution of births. This spatial NRR is described in Rogers (1975b) and in Willekens and Rogers (1978).

The radix-independent spatial NRR is a cohort measure that describes the fertility behavior of an individual born in a certain region and subject to mortality and migration. Through migrations, the individual is exposed to different levels of fertility and mortality. This also affects the total ${}_iNRR$, which represents the number of babies born to an i-born individual. The estimated NRRs for the seven regions of Bulgaria are given in Table 19.

TABLE 19 Radix-independent spatial net reproduction rates for the seven regions and the single region of Bulgaria, 1975.

Region of residence[a]	Region of birth of parent						
	1	2	3	4	5	6	7
1 N.West	0.778	0.034	0.013	0.034	0.023	0.015	0.044
2 North	0.054	0.798	0.074	0.020	0.027	0.028	0.023
3 N.East	0.028	0.058	0.972	0.018	0.022	0.053	0.017
4 S.West	0.015	0.006	0.004	0.820	0.006	0.004	0.011
5 South	0.046	0.042	0.026	0.056	0.945	0.123	0.032
6 S.East	0.007	0.010	0.016	0.008	0.018	0.881	0.008
7 Sofia	0.118	0.041	0.023	0.099	0.037	0.036	0.804
Total	1.045	0.990	1.127	1.054	1.078	1.140	0.938
Single region	1.053	0.971	1.149	1.067	1.084	1.164	0.926

[a]Region of residence of parent at time of birth of child.

The total spatial NRRs and their single-region equivalents are given in the last two rows of the table. It can be seen that the migration effect incorporated in the estimation of the spatial totals has brought about the decrease of interregional differences. For example, the highest single-regional NRRs in the S.East region (1.164) and in the N.East region (1.149) drop to 1.140 and 1.127 in the multiregional case. The larger the number of out-migrations from these regions, the larger the decrease. The lowest single-region NRRs of Sofia (0.926)

and the North region (0.971) rise to 0.938 and 0.990, respectively, but these two regions are the only ones below replacement level. Note that the replacement level here refers to natives of a given region, with their children born anywhere in the country. Hence the radix-independent spatial NRR is a cohort measure because it refers to an individual born in a given region who may have migrated to another region. This is useful for micro-demographic studies, which focus on the behavior of an individual, but is less applicable to macro-demographic studies where aggregations of individuals are considered.

In order to better understand the spatial distribution of the radix-independent NRRs, net reproduction allocations ${}_i\rho_j$ are used. The latter are given in Table 20 and are calculated by

$$ {}_i\rho_j = {}_iNRR_j / {}_iNRR \tag{4}$$

The table shows that the numbers in the main diagonal are high for the South, N.East, and Sofia regions, low for S.West and S.East, and especially low for the N.West region. This shows that a person who was born in one of the first three regions mentioned is more likely to give birth in the same region than a person born in one of the remaining four regions. For example, a person from the N.West region would have only 74.4 percent of his total number of children born in the N.West region, whereas a person from the South would expect 87.6 percent of his children to be born in the same region.

Note that much the same inferences were made when the levels of migration, ${}_i\theta_j$, were analyzed. This shows that the patterns for spatial distribution of childbearing as determined by migration follow the patterns of migrating among the regions, so that the spatial allocations of births are only a result of migration. The effect of spatial fertility differentials seems to be less important.

TABLE 20 Radix-independent net reproduction allocations for the seven regions of Bulgaria, 1975.

Region of residence	Region of birth						
	1	2	3	4	5	6	7
1 N.West	0.744	0.035	0.012	0.032	0.021	0.013	0.046
2 North	0.052	0.806	0.065	0.019	0.025	0.025	0.024
3 N.East	0.027	0.059	0.862	0.017	0.020	0.046	0.018
4 S.West	0.014	0.006	0.004	0.778	0.006	0.004	0.012
5 South	0.044	0.043	0.023	0.053	0.876	0.108	0.034
6 S.East	0.007	0.010	0.014	0.007	0.017	0.772	0.009
7 Sofia	0.113	0.042	0.020	0.094	0.034	0.032	0.857
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000

The impact of migration on fertility is seen in the age interval 15–49, which is the reproductive period (with a few exceptions for ages below 15). Recall that the mean age of childbearing is 24–25 years of age and that the largest age-specific fertility rates are those in the age interval 20–30. The impact of migration on fertility occurs mainly during these ages. Since there is no special trend for moves during the childbearing years, the differences in the magnitudes of the fertility schedules follow the differences in the magnitudes of the migration schedules. For example, in the urbanized region of Sofia, the fertility schedule depicts older ages of childbearing. Migrations are also "delayed," but the magnitude of the delay between fertility and migration is not significantly different. Therefore, the pattern of the attractiveness of a region exhibited by the values for ${}_{7}\theta_{j}(0)$ and ${}_{i}\theta_{7}(0)$ is similar to the one exhibited by ${}_{7}\rho_{j}$ and ${}_{i}\rho_{7}$.

b. Radix-dependent spatial NRRs. It was pointed out that the estimations of the radix-independent NRRs are based on equal initial birth cohorts among the regions. Therefore, the value 0.034 (in the first row of Table 19) represents the births *per person born in the North region* that took place in the N.West region, and 0.013 is the contribution of a N.East-born individual to the births in the N.West. It is evident that the sum of 0.034 and 0.013 gives the birth contribution to the N.West region of two persons born in two different regions. When all seven values are added across the first row of Table 19, we have the number of births in the N.West region for seven persons born in the seven regions of the country.

This figure, however, does not give an accurate impression. Difficulties stem from the assumption that the initial birth cohorts are equal (to unity) for all regions. Thus it is implicitly assumed that the spatial distribution of the observed births or of the population is uniform, which is far from actuality for the seven Bulgarian regions. For example, the population of the South region is twice that of Sofia (Appendix A). Given the approximately equal crude birth rates of 17.3 per thousand in these two regions (Appendix B), it can be expected that for every birth in Sofia there should be approximately two corresponding births in the South region. Therefore, the contribution of migrations from the South to Sofia should be estimated on the basis of an approximately 2:1 initial birth cohorts. The value for ${}_{5}NRR_{7}$ from Table 19, therefore, must be increased from 0.037 to around 0.074.

These considerations show that it makes sense to scale the initial radices somehow in order to account for the observed distribution of population characteristics. There is no strict theoretical method to determine exactly the population characteristic that should be used. For example, it is possible to use the size of the observed population, its stationary or stable equivalent, or the number of births to one of the three populations. It seems more plausible to use births instead of population numbers because the life-table radices are also considered as births, and because the age composition of the observed population may be peculiar. This report considers the births to the observed population.

The computational procedures are straightforward. The life-table population ${}_iL_j$ from eq. (3) must be estimated by putting the initial birth cohort in region i equal to B_i/B_j, where B_i denotes the observed births in region i and B_j the observed births in region j. Note that the value for ${}_iL_i$ remains unchanged. In this way we incorporate into the estimation the spatial distribution of the observed population.

The spatial NRR received in this way will be referred to as the radix-dependent ${}_iNRR_j$ and will be denoted by a bar (${}_i\overline{NRR}_j$). Whereas the radix-independent ${}_iNRR_j$ gives the number of children to be born in region j to one individual born in region i, the radix-dependent ${}_i\overline{NRR}_j$ gives the number of children to be born in region j to region i-born individuals *whose number is consistent with the ratio of the observed births in region i to those in j*. Hence the radix-dependent ${}_i\overline{NRR}_j$ gives the contribution of region i to the number of births in region j. Obviously, the increase of the native population in region j depends not only on its population but also on both the size of the population of the other regions and the level of in-migration. Note that the effect of out-migration from region j is incorporated in the estimation of ${}_i\overline{NRR}_j$.

Table 21 gives the values of the ${}_i\overline{NRR}_j$. They have been derived by multiplying the elements from the ith column and the jth row of Table 19 with the ratio $B_i:B_j$. The values for B_i and B_j were taken from Appendix A. Note that the diagonal elements in both Tables 19 and 21 remain the same.

TABLE 21 Radix-dependent spatial net reproduction rates for the seven regions of Bulgaria, 1975.

Region of residence		Region of birth							Total
		1	2	3	4	5	6	7	
1	N.West	0.778	0.049	0.025	0.027	0.061	0.016	0.057	1.013
2	North	0.038	0.798	0.101	0.011	0.050	0.022	0.021	1.041
3	N.East	0.014	0.042	0.972	0.007	0.030	0.030	0.011	1.107
4	S.West	0.018	0.011	0.010	0.820	0.021	0.006	0.018	0.905
5	South	0.018	0.023	0.019	0.017	0.945	0.051	0.016	1.088
6	S.East	0.006	0.013	0.027	0.006	0.044	0.881	0.010	0.987
7	Sofia	0.090	0.045	0.034	0.061	0.074	0.031	0.804	1.138

The construction of the matrix in Table 21 shows that it is not practical to consider the column sums. Tables 19 and 21 give different information on regional levels of fertility and their dependence on migrations.

Now consider the total column of Table 21, which gives the sums of ${}_i\overline{NRR}_j$ over i. Each sum is a measure of the reproduction potential of the residential

population of region j, where reproduction is incremented by in-migration and decremented by out-migration. Hence it may be understood as a longitudinal concept with respect to a *resident* of the region, whereas the radix-independent sum ${}_iNRR$ is a longitudinal concept referring to an individual *born* in the region. The residents now are subject to in-migration, scaled according to the multiregional distribution of the births.

The sum $\overline{NRR}_j$ is lower than unity for the S.West and S.East regions, very high for Sofia and N.East, and slightly above replacement for the remaining three regions. Recalling that the radix-independent NRRs showed the North and Sofia regions to be below replacement, it can be seen that the in-migrations to these two regions contribute to the positive growth of their natives.

Therefore, the radix-dependent $\overline{NRR}_j$ may also be treated as a measure of the growth of a regional population subject to mortality, in-, and out-migration and be such that the share of the births in the multiregional system remains constant. Figure 5 gives these $\overline{\text{NRR}}$s plotted against the growth ratios, λ, 50 years

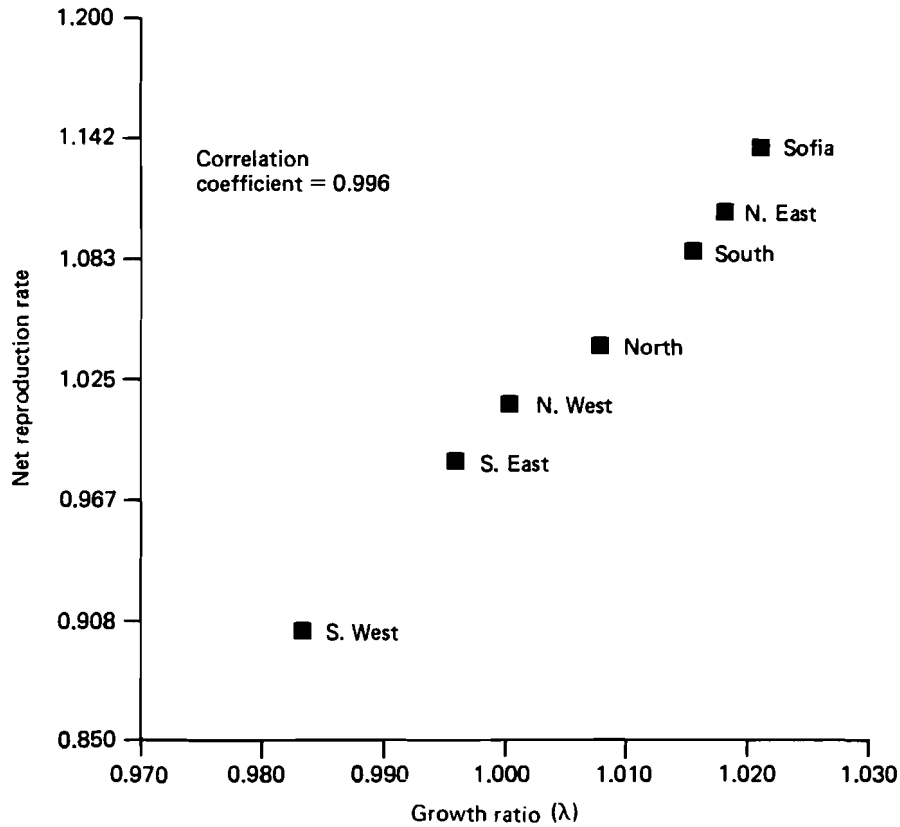

FIGURE 5 Values for the growth ratio λ in 2025 and the radix-dependent spatial net reproduction allocations for the seven regions of Bulgaria, 1975.

after the year of observation (multiregional population projections, Appendix D, year 2025), when the effect of the initial age composition has decreased, but the spatial distribution of the population is still closer to the observed than to the stable population. Figure 5 shows that the patterns revealed by the $\overline{\text{NRR}}$s are much the same as those of the λs. Due to the waves existing during this period of population projection it may be expected that the fit between the two population characteristics will be even better in 2020 or 2030, say.

The dependency between λ_j in the year 2025 and $\overline{NRR}_j$ arises because both are measures of growth of region j's population. The information revealed by the $\overline{\text{NRR}}$s is preferable because it does not depend on the age structure (hence on population waves). In this respect the radix-dependent $\overline{NRR}_j$ is the only such measure given by the multiregional methods and is, therefore, useful for population policy issues, which will be discussed in section 6.

The off-diagonal elements of Table 21 make it possible to assess the effect of in-migrations to the growth of the population of a given region. For this purpose it is better to make use of the radix-dependent net reproduction allocations (Table 22), which are estimated using eq. (4) with $\overline{\text{NRR}}$s.

TABLE 22 Radix-dependent net reproduction allocations for the seven regions of Bulgaria, 1975.

Region of residence	Region of birth							
	1	2	3	4	5	6	7	Total
1 N.West	0.768	0.048	0.025	0.026	0.060	0.016	0.056	1.000
2 North	0.037	0.767	0.097	0.011	0.048	0.021	0.020	1.000
3 N.East	0.013	0.038	0.878	0.007	0.027	0.027	0.010	1.000
4 S.West	0.020	0.012	0.012	0.906	0.024	0.006	0.020	1.000
5 South	0.016	0.021	0.018	0.016	0.868	0.047	0.015	1.000
6 S.East	0.006	0.013	0.028	0.006	0.045	0.892	0.010	1.000
7 Sofia	0.079	0.039	0.029	0.053	0.065	0.027	0.706	1.000

The main-diagonal elements of Table 22 show the percentage of births to natives in a given region. The low numbers of the Sofia, N.West, and North regions are due to the high in-migration to these regions. Sofia benefits mainly from the neighboring N.West region, and also from the South. (Because of its large population, the South region is one of the main contributors to every region.) Analogously, every region benefits from a neighboring region and from the South. Most pronounced is the neighboring effect for the North region (which gains from the N.East) and the South (which gains from the S.East).

The effect of certain population policy measures may bring about a substantial decrease in some migration flows. If this decrease does not significantly affect the age profile of the migrants, the change in the reproduction potential of each regional population may be assessed from the above table. First, it is evident that the decrease of migration flows to Sofia must be large in order for its reproduction level to fall below replacement, which is the case with the single-regional NRR. Also, a plausible decrease of in-migration to the N.West and North may lead to a fall in the fertility level below replacement. This is likely to happen in the near future.

The fertility level in the S.West and S.East regions is below replacement because of the high out-migration and low in-migration. Hence this level can be increased by appropriately changing the migration flows. It ought to be noted that a change in the magnitude of a specific migration flow causes changes in fertility levels not only directly in the two regions but also indirectly in other regions. This kind of diverse change is typical in a multiregional system. Thus a decrease in the migration flow from the South to the N.West will result in a lower fertility in Sofia; a decrease of the contribution of South aliens to births in the N.West lowers the population size of the latter region, hence its contribution to the Sofia region will also decrease.

The allocation of regional life expectancy ${}_i\theta_j(x)$ is a measure of the *duration* – the number of years to be lived in a particular region. But migration, like childbearing, is also a *recurrent event*, in that one person may migrate several times during a lifetime. A measure of the recurrence of migration can be derived in a way similar to the NRR. This is the net migraproduction rate (NMR), which is computed from the following equation (Rogers 1975b)

$$ {}_iNMR_j = \sum_{x=0}^{z} {}_iL_j(x)M_j(x) $$

where ${}_iL_j$ is the stationary life-table population aged x to $x + 4$, living in region j and born in region i, and $M_j(x)$ is the age-specific out-migration rate in region j. The values for ${}_iL_j$ are estimated on the basis of a unit-birth cohort in each region, i.e., ${}_iNMR_j$ is radix-independent. Its radix-independent equivalent may be computed analogously to the NRRs but is omitted in this report.

The net migraproduction matrix for Bulgaria's regions is presented in Table 23. The numbers in the last row show the total number of migrations per person born in a given region during his lifetime with the effect of mortality included. The highest number of moves is to be expected for a person born in the N.West region and the lowest for a person born in the South and N.East regions. The net migraproduction allocations given in Table 24 define each region's share of the total net migraproduction rates.

A comparison of GMRs, NMRs, and spatial life expectancies exhibits a low migration level for the N.East region, thus delineating it from the general

TABLE 23 Spatial net migraproduction rates for the seven regions of Bulgaria, 1975.

Region of residence		Region of birth						
		1	2	3	4	5	6	7
1	N.West	0.355	0.011	0.004	0.011	0.007	0.005	0.015
2	North	0.011	0.245	0.015	0.004	0.006	0.006	0.005
3	N.East	0.004	0.009	0.206	0.003	0.003	0.008	0.003
4	S.West	0.004	0.002	0.001	0.302	0.002	0.001	0.003
5	South	0.007	0.006	0.004	0.008	0.186	0.018	0.005
6	S.East	0.002	0.003	0.004	0.002	0.005	0.323	0.002
7	Sofia	0.027	0.010	0.005	0.023	0.009	0.009	0.237
	Total	0.409	0.285	0.239	0.352	0.217	0.369	0.271

TABLE 24 Net migraproduction allocations for the seven regions of Bulgaria, 1975.

Region of residence		Region of birth						
		1	2	3	4	5	6	7
1	N.West	0.867	0.039	0.017	0.031	0.034	0.012	0.057
2	North	0.028	0.860	0.064	0.012	0.026	0.016	0.019
3	N.East	0.010	0.030	0.861	0.007	0.015	0.021	0.010
4	S.West	0.009	0.005	0.004	0.857	0.007	0.003	0.011
5	South	0.016	0.022	0.015	0.023	0.857	0.048	0.019
6	S.East	0.004	0.009	0.017	0.006	0.022	0.877	0.009
7	Sofia	0.066	0.034	0.022	0.064	0.040	0.023	0.875
	Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Bulgarian migration characteristics. This can be explained by its historical development as an agricultural region. The Dobrudja area in the N.East region, known as the "granary" of Bulgaria, is situated here. Industry is developed mainly in the Varna district, and it is quite possible that if this district were not included in the region, the migration levels would be lower still.

The patterns exhibited by GMRs, θ, and NMRs can be explained in the following way. Sofia is the largest city in Bulgaria, with a population of about one million. It is a highly urbanized area, and a center of social, cultural, and educational life. The South region, on the other hand, is attractive mainly because of the city of Plovdiv and the government planning that accelerated industrialization

and social development in the southern Rhodope area. The N.West and S.West regions exhibit a high level of out-migration because of their low industrial development. New industrialization in these regions is planned and has already begun (for instance, a large electropower station is under construction on the Danube in the N.West), but its effect by 1975 was small. The comparatively high level of migration from the S.East region to the N.East region is due mainly to the city of Varna, where the maritime industry is developed, and to the sea resorts around it. Migration levels are low for the North and N.East regions, reflecting their historically important agricultural role in the economic development of Bulgaria.

3.5 Population Projection and Stability

If a population that is closed to migration is exposed to an unchanging regime of fertility and mortality, it will reach a stable age structure that has a constant rate of natural increase through time. The achievement of stability has the property of "forgetting" the initial age distribution, i.e., the stabilization of a closed population is an ergodic process. The same is true when a multiregional population is *in addition* subjected to unchanging age-specific migration rates. This is the case of a multiregional population projected to stability. The theory behind this can be found in Rogers (1975a).

Appendix D gives population projections for the seven regions of Bulgaria to the year 2025 and the stable equivalents of the 1975 populations. In this projection, fertility, mortality, and migration rates are kept constant at the 1975 level. The details of such computations are explained in Willekens and Rogers (1978).

Table 25 presents some characteristics of the initial (1975) Bulgarian population, the projected population in 2025, and the stable equivalent population. They are considered separately below.

3.5.1 MEAN AGES

The values for the mean ages show that the projection brings greater uniformity among the seven regions: the difference between the highest and the lowest mean ages in 1975 is 5.37 years, in 2025 it is 2.95 years, and under stability it is 1.95 years. The greatest changes are to be observed in the S.West and Sofia regions. In the S.West region, over the 50 years of projection, the mean age will rise by 4 years because of the high level of out-migration. (Note that the mortality levels do not differ much for different regions.) This will lead to the aging of its population and a rise in the CDRs.

In Sofia the mean age will rise continuously, because of the low level of fertility and older ages of childbearing. The older populations of the N.West

TABLE 25 Characteristics for the initial populations, the projected populations to 2025, and the stable equivalents (SE) of the 1975 populations for the seven regions of Bulgaria.

			Region						
Variable	Population	Total	N.West	North	N.East	S.West	South	S.East	Sofia
Total	initial	8,727	1,043	1,400	1,487	696	2,164	867	1,070
number	2025	10,107	981	1,492	1,873	653	2,718	881	1,510
(thousands)	SE	8,748	741	1,355	2,123	247	2,333	559	1,389
Mean age	initial	35.18	38.97	37.87	33.81	34.19	33.60	34.33	34.37
	2025	36.55	37.81	37.68	35.19	38.14	35.90	36.37	36.88
	SE	36.42	37.37	37.46	35.51	36.36	36.09	35.51	37.23
Regional share	initial	100.00	11.95	16.04	17.04	7.98	24.80	9.93	12.26
of national	2025	100.00	9.71	14.76	18.53	6.46	26.89	8.71	14.94
population	SE	100.00	8.47	15.49	24.26	2.83	26.67	6.39	15.88
Growth	2025	1.0105	1.0006	1.0080	1.0184	0.9837	1.0154	0.9963	1.0212
ratio (λ)	SE	1.0119							

SOURCE: Appendix D.

and North regions yield high CDRs. Their mean age will drop slightly. The mean ages in the remaining three regions rise together with the rise in the total population.

The mean age is a crude measure of the age composition of the population. Therefore, its changes indicate certain changes in the age structure; its rise during the projection period corresponds to the aging of the population. Mean ages do not reflect all changes in the age composition, however. Consider, for instance, the division of each regional population into three groups: young dependents (0–15 years of age), labor force participants (15–65), and aged dependents (65+). Whereas in 1975 the labor force participants in Sofia were around 73 percent of the total regional population, 25 years later they will drop to 68 percent, and another 25 years later to 67 percent. This drop will be due to the increase of aged dependents: from 8 percent in 1975 to 13 percent in 2025. The percentage of young dependents will remain about the same.

Such analyses are important for policy-making purposes. In the above case of Sofia, the proportion of the percentage distribution of investments to young dependents would not need to change, e.g., day-care centers and schools. This would not be the case for the aged dependents, however. Investments in public facilities for the elderly ought to grow more rapidly than those for the total population, therefore leading to a decrease in the proportion of the investments in facilities for the 15–65 age group. Table 26 gives the three-age-group division

TABLE 26 Projections for the percentage distribution of three age groups of the population for the seven regions of Bulgaria, 1975.

Year	Age group	Region						
		N.West	North	N.East	S.West	South	S.East	Sofia
1975	0–15	19.9	19.3	24.4	24.3	24.2	23.5	19.2
	15–65	64.1	66.4	65.7	65.6	66.5	66.6	73.1
	65+	16.0	14.3	9.9	10.1	9.3	9.9	7.7
2000	0–15	20.6	20.0	23.9	21.6	22.9	22.8	19.5
	15–65	61.0	64.2	63.9	63.5	64.5	62.5	68.2
	65+	18.4	15.8	12.2	14.9	12.6	14.7	12.3
2025	0–15	21.5	20.5	24.1	21.2	22.8	23.4	19.9
	15–65	63.0	64.6	63.6	63.1	64.4	62.5	66.9
	65+	15.5	14.9	12.3	15.7	12.8	14.1	13.2
SE[a]	0–15	21.8	20.6	23.8	22.4	22.7	24.1	19.8
	15–65	63.5	65.2	63.7	64.2	64.4	63.2	67.1
	65+	14.7	14.2	12.5	13.4	12.9	12.7	13.1

[a]Stability.

for the seven regions of Bulgaria. Note that the percentage distribution varies among regions.

The results in the table are computed from Appendix D. They show that the preferred policy indicated for Sofia also holds for the S.East and N.East regions. In the South and S.West the increase of the aged dependents is due to a decrease in the other two groups. Finally, in the North and N.West the results are diverse. The proportion of young dependents is slowly but continuously increasing, whereas that of aged dependents increases during the first 25 years and decreases afterwards.

3.5.2 REGIONAL SHARES

Changes in the regional shares are not very large over the 50-year projection period. They increase for the N.East (to end in 2025 with a rise of 1.5 percent), the South (2.09 percent), and Sofia (2.7 percent), and decrease for the remaining four regions. The largest decrease, 2.24 percent, is exhibited in the N.West.

Under stability, the regional shares are strikingly different for the N.East and S.West regions. The high fertility level and the low in- and out-migration flows for the N.East contribute to the large increase in its regional share in the long run. (Although over the 50-year projection period this increase is quite small, it increases to nearly 25 percent of the total at stability.) At the other extreme is the S.West, whose strong out-migration leads to a diminished share in the long run, down to less than 3 percent of the total.

The increase of the regional share for Sofia is a very important one. Sofia has a fertility rate below replacement level, but in-migration leads to an increase in the population.

3.5.3 GROWTH RATIO

In 2025 the growth ratio λ will be less than 1.0 for the S.West and S.East regions, which means that their populations would decrease between 2020 and 2025. The population projections for the regions show that, during the 50-year period, the growth ratio is usually below 1.0 for the N.West (high mortality and high out-migration) and S.West (high out-migration) regions.

The growth ratio for the stable population is 1.0119. It is the dominant eigenvalue of the growth matrix and can be used to derive the spatial intrinsic growth rate, $r = 1/5 \ln \lambda = 2.37$ per thousand. The value of λ is quite close to the growth ratio of the total population in 2025. This is not the case for each individual region, however. In 2025 each region appears to be far from stable because of the peculiarities already mentioned: different levels of fertility, young or aged population structures, and large differences in the migration flows.

3.5.4 STABLE EQUIVALENT OF THE OBSERVED POPULATION

The stable equivalent is the population that, if distributed as the stable population and growing at the stable ratio λ, would in the long run yield the same result as the projection of the observed population (Willekens and Rogers 1978). This means that the major difference between the stable equivalent population and the observed population is the removal of the effect of the age structure and regional distribution from the growth of the former.

Figure 6 shows the age distributions of the observed and of the stable equivalent populations of Sofia. Note that the stable equivalent population is larger than the observed population (as is shown by the larger area under the "stable" curve), and that the dips for the 30–34 and 55–59 age groups are missing in the stable equivalent population.

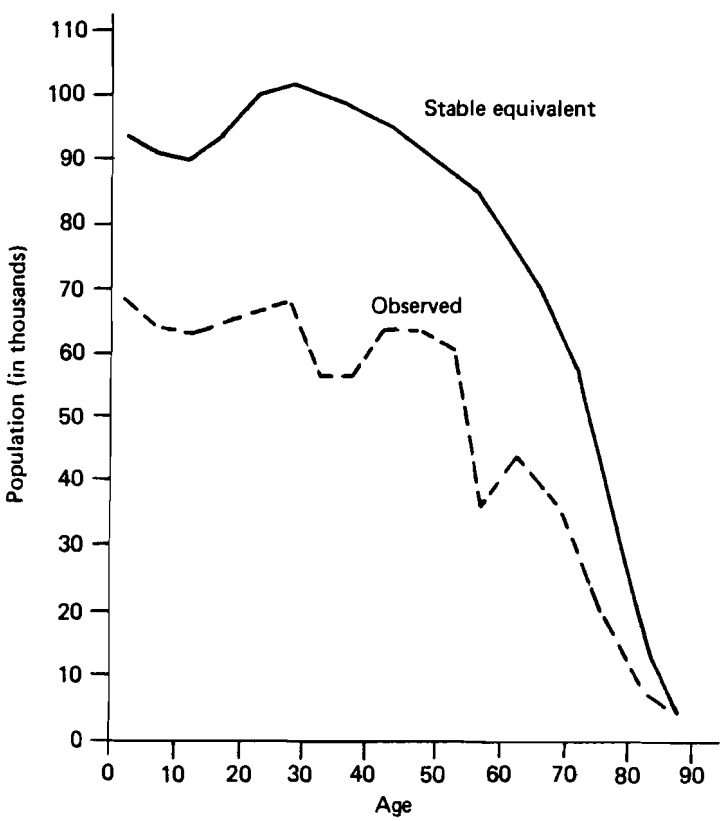

FIGURE 6 Number of people in each age group of the observed and stable equivalent populations for the Sofia region, 1975.

The curve for Sofia's stable equivalent population is not like the one that would have been obtained by a single-region analysis. There is a peak for the 25–29 age group, which is due to the strong in-migration flow to Sofia of the younger age groups, especially of migrants aged 15–29. Note that the shapes of the curves illustrating the age composition of the observed population and its stable equivalent for Sofia would be very similar if the effect of the two world wars were disregarded in the former. Therefore, it cannot be stated that the local peak in the 0–5 age group is because of the pronatal policy adopted in 1967. Rather this peak is a response to the long-lasting effect of in- and out-migration. Indeed, the age-specific rates for migration (Appendix B) show that in-migration to Sofia is "labor-dominant,"* i.e., the initial infants' peak is much lower than the high labor-force peak. Although the schedules of out-migration from Sofia are "child-dependent" their effect on the age composition is strongly decreased because of the strong dominance of the in-migration flow. Thus it is the labor-dominant in-migration that through accumulation, brings about the inflation of the population age composition beyond age 15.

A comparison of the number of people in the observed population with its stable equivalent reveals additional features of the observed age and regional composition of Bulgaria (Appendix D). For the stable equivalent of 8.748 million the regional composition is fixed, so population growth is determined only by the demographic parameters: fertility, mortality, and migration. The observed population of 8.727 million, on the other hand, changes because of its age and regional distribution in 1975. Hence the difference of 21,000 shows that the initial conditions are favorable to the growth of the observed population for the first few decades after 1975.

In order to understand this comparison better, suppose that an instantaneous change in 1975 is entered in the projection process such that a zero population growth (ZPG)** will occur sometime in the future, at which point the (projected) stable equivalent will become stationary: 9.428 million (ZPG1) or 9.272 million (ZPG2). The number of the observed population will increase, however, until it reaches the value of the stationary population and then will remain constant. Its change from 8.727 million to 9.428 or 9.272 million determines the "momentum" of population growth caused by the observed age and regional distribution.

The momentum is much stronger if each of the seven regions is considered separately or if migration is considered instead of natural increase. Note the smaller stable equivalent for the N.West, S.West, and S.East regions. The initial conditions in these three regions contribute to a slowing of their growth and even to a decrease in the N.West.

*This terminology was introduced by Castro and Rogers (1979).

**Rogers and Willekens (1976) and Willekens and Rogers (1978) discuss two different alternatives of ZPG in the multiregional case. In the case of ZPG alternative 1 (ZPG1) each region's population has a zero growth, hence the same is true for the national population. In the case of ZPG2, the regional populations do not necessarily have zero growth but the national population does.

The above results are very important for policy making. Whereas observed migration patterns can be controlled by certain policy instruments, age composition cannot. Hence changes in a regional population that are due to the observed age composition are uncontrollable; those due to spatial redistribution may be controlled. For example, consider a policy that had as its objective a population increase for each region in Bulgaria. It would not be necessary to intervene in the growth of the population of the N.East because its natural increase and initial conditions more than compensate for unfavorable migrations. The converse holds for the N.West region.

The population policy implementation in Sofia is at a level at which it is possible to believe that further control will be ineffective. Hence a comparison of the observed population with its stable equivalent shows what should be expected in the medium and long run – an increase of the population to around 1.5 million.

From what has been said about the multiregional population projection and its stable growth, the following inferences can be made:

1. The populations of the seven regions of Bulgaria are far from stability, because of the different levels of fertility, the differences in the age structure, and the differences in the migration flows.
2. The national population is tending to concentrate in the N.East, South, and Sofia regions, and to leave the N.West, S.East, and especially S.West regions.
3. Despite a low fertility level, the population of Sofia has a high growth rate because of the high in-migration flow.
4. During the next 50 years the regional share will decrease for the N.West and North regions and increase in the South and the Sofia regions. It can be inferred that in the last two regions the labor force will also increase.
5. During the next 50 years the mean age in the S.West region will increase strongly, i.e., the population will be aging rapidly. (In 1975 it was one of the youngest.)

4 DEMOGRAPHIC POLICY IN BULGARIA

Demographic policy in Bulgaria is carried out in accordance with the socioeconomic policy of the state. This means that both demographic growth and the quality of labor resources are regulated by that socioeconomic policy. The main goals of the population policy are:

- to maintain a moderate and stable population growth
- to care for the individual's health and life
- to improve job opportunities and living conditions

- to improve the spatial distribution of the population by regional development

4.1 Fertility

The aim of Bulgaria's fertility policy is not to obtain a high fertility rate but rather to create a social, economic, and psychological atmosphere suitable for two or three children in a family. This is in fact the criterion for a moderate, stabilized growth of population. Of course, the parents themselves choose the number of children and time of birth. One main characteristic of Bulgaria's fertility policy is that society accepts a greater share of the family's responsibilities to the child, e.g., summer camps and school meals as well as giving advantages to young families who need housing.

The normative state documents, which concern marriage and the family, provide the following benefits. A marriage requires only the agreement of the prospective husband and wife (provided of course, that they are not close relatives or too young) and their decision need not take into account nationality, religion, social, or ethnic positions. In the family, both partners have equal rights and ownership. Divorces are possible only through judicial procedures, and if there are children involved, they are given to the parent who is able to maintain their material and educational conditions of living. Often in such cases, or in the case of death, the children receive pensions from the state. The government also considers nonmarital and marital births equal before the law and families with three or more children are given special advantages.

In Bulgaria, motherhood is considered a basic social function, and therefore labor that might damage reproduction is forbidden for women. Also, during pregnancy a woman is temporarily given another job if what she ordinarily does is considered dangerous to her pregnancy. Because one of the main causes of low marital fertility is women holding jobs, special measures have been taken to increase the number of day-care centers.

The fertility policy benefits the family directly in several ways. First, for each birth the family receives a certain premium, which increases the desire of having a second and third child. (A fourth child receives the premium as if it were the first.) Second, for each child under 16 years of age the family receives monthly payments, according to the number of children. Third, if the mother is alone and does not work, she receives a minimum working salary for two years after the birth of her child. The same is true for mothers who are students. Women are allowed a paid "mother's leave," which lasts 10, 12, or 14 months for the first, second, or third child, respectively. Leave without pay for three years is also possible. All the above regulations also hold for adopted children. Abortions are permitted, except for married women aged 18–40 who have no children or only one child, although even in these cases abortions are allowed for health and other such reasons. These measures are changed periodically,

according to the economic development in the country. Usually any changes made by the government, however, provide an increase in premiums and leave time. Documents that make the fertility policy official were adopted in 1967 (September), 1971 (December), and 1973 (March) by different governmental bodies.

4.2 Health Care

One of the basic directions of social policy in Bulgaria is the continuous advancement of health care systems and medical services. Complex programs for improvement in labor conditions are incorporated in every institution and are under the control of the health care system. Accident prevention measures are implemented on a large scale, and special attention is given to the more serious diseases that affect an individual's life and activity.

Pregnant women are required to register during their third month of pregnancy. They are then subject to systematic medical visits and, when necessary, to education regarding the prenatal and postnatal periods. From the first day of life until adulthood, children are subject to systematic medical examinations. Because of these measures, the mortality rate has decreased, and the expectation of life has increased.

4.3 Migration

In Bulgaria each person has the right to choose his permanent place of residence. In some of the big cities, like Sofia, Plovdiv, and Varna, however, permanent arrivals are subject to certain restrictions. This is a consequence of the sudden urban growth in these cities – a rapid concentration of people, which causes problems of housing, services, supplies, etc. These restrictions refer to nonmotivated moves, i.e., when no reason for the application of citizenship in the city is available. Some migrants that move for a specific reason are only guaranteed a temporary citizenship, which, if held for a certain period of time (usually 5 years), becomes permanent. Examples of motives for moving are: changing place of work, education, marriage, and usage of health care services.

Restrictions also make it possible to conduct more efficiently the occupational allocation of the labor force. Workers of certain categories, for instance, construction, transportation, and some services, are given priority in achieving citizenship. It is well recognized that this type of in-migration to the big cities is one of the main constituents of the urbanization flow. Thus well beyond 100,000 workers have achieved Sofia citizenship by working for some years in the closely situated, large metallurgical industries of Cremikovitzi.

Shortages of labor supply are found in many Bulgarian regions, especially in the above-mentioned categories. In order to decrease, if not to remove these

shortages, some other policies are implemented. The most typical one is the assurance of wages or salaries higher than the national average. Housing is a second, important instrument used to attract migrants. Another form of attraction is the advantage provided by certain services or educational facilities.

In Bulgaria all the above are considered direct policies, although in some other countries they are classified as indirect. The organization and implementation of the direct policies is usually carried out on the local level (regions or cities) in accordance with the national internal social and economic policy.

The main regulator of internal migration is the territorial distribution of productive forces. It is carried out by central planning organs that take into account a number of constraints, such as resource allocation, transportation costs, and labor force availability. Its effect on population redistribution is indirect; therefore, it is referred to as an indirect policy. If there are large shortages of labor in a certain region, production forces are directed to that region, since this will ease the implementation of the above-mentioned direct migration policies. It may also happen that other constraints on the usage of some productive forces are stronger than the availability of labor, in which case even stronger direct policies would be implemented in order to attract people.

An example of this is the construction of an atomic power station on the Danube, near the town of Kozlodui in the N.West region. The site was chosen because of the availability of a large river flow. A labor force, however, was practically unavailable, but through the implementation of a number of direct policy instruments workers were attracted from all over Bulgaria. In this way the attractiveness of the N.West region increased. It should be recalled that this region was previously pointed out as being unfavorable from the point of view of migration and demographic development. Analogous examples can be given for other less-developed Bulgarian regions; it has already been declared by policy makers that new plants will be constructed in the S.West and S.East regions.

Another form of an indirect policy is the spatial distribution of nonproduction assets. In certain regions out-migration is caused by "push" factors, such as lower quality of services or cultural facilities. The effect of most of these push factors can be decreased by a well-designed regional investment policy. This is the case, for instance, with the mountainous district of Smoljan (the South region), where old traditions in applied arts, everyday life, and folklore are revived, and the infrastructure of towns and villages is substantially improved. Today it is a fashionable resort area and problems caused by out-migration are significantly lessened.

Although the migration policies have been successful, they have only recently been specified in governmental documents. In March 1979 it was decided to establish a new spatial population distribution. As a result, Bulgaria was separated into roughly 280 settlement systems. A migration policy was then designed to diminish as much as possible the migrations among settlement systems by implementing both direct and indirect policies as described above. The basic assumption was that further urbanization or any concentration of population in certain regions at the expense of other regions would cause undesirable difficulties.

The socioeconomic development of the state does not call for intensive international migration because of the desire for total employment of the national population. After the Second World War there were many emigrants from the country. These consisted mainly of people originally from other nationalities, and their moves reflected international agreements.

Planning in the socialist economy is a way of regulating its economic growth according to the labor forces available. Some foreign labor, however, is attracted for work in certain economic fields. The development of the socialistic economic integration among nations has given birth to a new type of economic migration, which is characteristic of the East European socialist states. The creation of international enterprises requires the movement of labor forces from one state to another. This type of international migration will increase in the future and will be regulated by interstate agreements. (It is not considered the same as permanent departure and arrival movements.)

4.4 Problems and Perspectives of the Population Policy

Currently, the population growth of Bulgaria does not correspond to the social and economic development of the state, and its possible improvement can be found in the increase in fertility and the decrease of mortality and migration.

One of the main problems to be solved is the *rational* use of the available labor force. This would be possible with an increase of qualifications, an optimization of labor force structure, and a minimization of losses due to morbidity and mortality. If the available labor forces are to be used more rationally, it is necessary to implement improved migration regulations by appropriately distributing the productive forces and building a set of settlement systems that focus on the improvement of social systems.

Another problem is that of housing and day-care centers, especially in some of the large cities. The future of the population policy lies within the framework of the social policy of the state and in the national program for the improvement of living conditions. One of the most important achievements toward this goal will be the transfer to the state of expenses for the raising of children.

4.5 Use of Multiregional Demography for the Quantitative Assessment of Demographic Policy

In order to assess the fulfillment of the main population policy goals as formulated in the beginning of this section, it is necessary to quantify the changes in the population's characteristics. Single-region methods of quantification are used in Bulgaria, but it is preferable to apply multiregional methods instead, since these enable one to trace the effect of changes in one characteristic upon another. To accomplish this, consider the following illustrations. The value of ${}_5GMR_1$

(from the South to the N.West region) in 1975 is 0.038 (Table 13). If this number is doubled, a 50-year multiregional projection will give a population for Sofia of only 10,000 persons more than the projection without this change. If the values for ${}_jGMR_1$ are doubled for each j, 25 years later Sofia will have 35,000 *fewer* people and 50 years later it will have 60,000 *fewer* people than the projection without any change. The last case illustrates a sudden rise in the attractiveness of the N.West region.

The above examples point out the necessity of studying regional populations simultaneously in a *system*. They also show that the multiregional approach is applicable to the assessment of the population policy.

4.5.1 ASSESSMENT OF POPULATION GROWTH AT THE REGIONAL LEVEL

For the time being, the most important aspect of population policy is its implementation with respect to the rise of fertility. Yet its first goal, as previously mentioned, is the maintenance of a moderate and stable population growth. At the national level, this qualitative statement is assessed quantitatively by making use of single-regional methods. At the regional level, though, the multiregional methods are preferable, because the growth of a regional population is determined both by fertility and migration.

For this purpose use will be made of the radix-independent and the radix-dependent NRRs. Their observed values are given in Tables 19 and 21, respectively. The dominant eigenvalue λ of the 7 X 7 matrix in each of the tables is the NRR for the whole system, i.e., the national population (Rogers and Willekens 1976). It is equal to 1.060 and is the same for the two sets of NNRs, as shown by the construction of the radix-dependent NRRs. Since the value of the NRR must be unity for zero-population growth, it can be stated that in 1975 the level of fertility in Bulgaria caused a moderate population growth. The figures in Table 3 show that the female single-regional NRRs fluctuate over the years and at certain times are below 1.0. (Note that the female NRRs in Table 3 and the λ discussed here are not the same thing. Their values are close, however, and therefore can be used for comparison. The single-region NRR for the total population of Bulgaria in 1975 was 1.058.) This, in fact, justifies the need for a policy.

The discussion in section 4.1 suggests that the fertility policy is not regionally differentiated. In spite of this, it is hard to believe that its consequences will be spatially uniform. Housing, for example, is an instrument that is effective in large cities but is completely ineffective in villages. As a result of policy action over the last 7–8 years, regional fertility patterns in 1975 are reflected in the totals from the eighth row of Table 19. The policy has not yet been as effective as it should be in the Sofia and North regions; it should also be strengthened in the western regions and the South, whereas in the two eastern regions no pronatal policy is necessary.

What quantitative changes are necessary in order to bring the fertility level in Sofia and the North above replacement? An answer to such a question can be given by making use of the fertility adjustment factors that ensure ZPG alternative 1 (Willekens and Rogers 1978). According to this alternative, an increase or decrease of fertility in a given region by a certain factor will ensure a regional ZPG. For Sofia and the North these factors are equal to 1.09 and 1.03. Hence the policy should aim to increase the fertility level by at least these factors. It should be noted that the fertility adjustment factors apply to births.Therefore, if for a certain period of time the age-specific birth rates in Sofia, for example, happen to be 1.09 times higher than those exhibited in 1975, it may be stated that the fertility policy has been effective over this period.

The N.West, S.West, and South regions exhibit fertility levels just above bare replacement, which would be reached if births were decreased by factors of 0.94, 0.94, and 0.92, respectively. Therefore, if birth rates over a certain period of time are lower when they have been decreased by these factors than the rates observed in 1975, the fertility policy must be augmented.

Finally, the fertility adjustment factors for the N.East and S.East regions are 0.87 and 0.86; such decreased values have little credibility, at least in the near future.

Policy makers should keep in mind that a rise in the fertility level will lead to a rise in the growth of the regional population. Since in some regions a decrease of the growth, and not an increase, is desired, it becomes obvious that two different population policies may counteract each other. Quantitative assessment may be provided by the radix-dependent NRRs. Recall that the sum $\overline{NRR}_j$ expresses the joint effect of fertility, mortality, in-, and out-migration, and as such can be treated as a cross-sectional measure of the growth of the regional population in the short or medium run. For example, this is the case when the changes in the regional shares are not yet significant. These changes can become significant only in the long run (Rogers 1976, Willekens and Philipov 1981).

Consider the region of Sofia. Its radix-independent total, ${}_7NRR$, is equal to 0.93 and the radix-dependent is 1.14. The difference is due to in-migration. If fertility were to rise to the level of ${}_7NRR = 1.00$, then the growth would rise to 1.24 (1.14 multiplied by 1.09, the fertility adjustment factor). Consequently, roughly a 10 percent decrease of in-migration would compensate for the 9 percent increase of fertility.

If fertility were to decrease to replacement level in the western regions and in the South, the consequences would be especially undesirable for the S.West region, whose radix-dependent $\overline{NRR}_4$ would fall to 0.85. The decrease in fertility in the N.West would also be below replacement (0.95), whereas almost bare replacement (1.002) would be achieved for the South. It is instructive also to trace the effect of a ZPG1 in the remaining two regions. In the N.East region the radix-dependent $\overline{NRR}_3$ would fall below replacement to 0.96 and in the S.East region to 0.84.

TABLE 27 Values for radix-independent (RI) and radix-dependent (RD) spatial total NRRs, ZPG2, for the seven regions of Bulgaria, 1975.

	Region						
Radix	N.West	North	N.East	S.West	South	S.East	Sofia
(RI) $_i\overline{NRR}$	0.987	0.934	1.064	0.995	1.017	1.076	0.886
(RD) $\overline{NRR_j}$	0.956	0.982	1.045	0.854	1.027	0.931	1.074

The ZPG alternative 2 at the national level alone can also be used. For purposes of illustration, Table 27 gives the ZPG2 values for the radix-dependent and the radix-independent total NRRs. They are obtained by dividing their observed equivalents by the factor 1.060 – the dominant eigenvalue mentioned above.

Table 27 gives an idea of regional growth provided the fertility policy brings about a decrease to bare replacement uniformly over the whole country. Then the regions of Sofia, the N.East, and the South will have a positive growth because of the remaining four regions where growth will be negative (Table 27. second row). (The long run is not considered in this section.) Hence a moderate growth can be achieved if fertility is such that the values for radix-dependent NRRs or radix-independent NRRs are higher than those exhibited in Table 25. Obviously, such results from the policy are unlikely.

The above analysis shows that the radix-independent and the radix-dependent spatial NRRs can effectively be used together with the ZPG alternatives to assess quantitatively the population policy. For this, time-series analyses of spatial NRRs would be useful in order to study the stability of population growth.

4.5.2 USE OF SIMULATED MULTIREGIONAL POPULATION PROJECTIONS

Multiregional demography provides other measures that can be useful to the quantitative analysis of population policy. For example, the GMRs and NMRs can successfully be used to study migrations. Their usage can be substantially enriched when their values are available over a sequence of years. If such a sequence is not available, simulations of population projections can be carried out, and thus the effect of certain changes can be quantitatively assessed. This topic will be discussed in detail below.

Simulated population projections have been carried out in Bulgaria at the national level (Stefanov *et al.* 1974) and at the regional level (Cholakov *et al.* 1975) using single-region methods – populations closed to migrations. The following hypotheses were used based on 1970 data and projected to the year 2000:

Mortality: Infant mortality at the national level would decrease from the 1970 observed level of 27.8 per thousand to 14 per thousand. Additionally,

the expectation of life would rise 3–3.5 years, thus reaching the level exhibited around 1970 in Sweden.

Fertility:

- No changes in fertility would be introduced; it would stay at the observed level of 62 per thousand.
- The general fertility rate (number of babies per 1,000 women at the age of fertility 15–49) would rise 5 per thousand, thus becoming 67 per thousand.
- The general fertility rate would rise 10 per thousand (to 72 per thousand).
- The general fertility rate would rise 15 per thousand (to 77 per thousand).

In Cholakov *et al.* (1975), appropriate corrections were introduced for each of the 28 Bulgarian districts. The changes were to take place until the end of the period of projection, following a logistic curve: slow changes in the beginning and end of the period and fast changes in the middle.

Population prognoses are widely used in Bulgaria. They are necessary to the planning of every economic or social sector whose future development must agree with the availability of consumers and labor force. Examples are easy to find: construction of plants or roads, housing, and development of systems such as health care, education, and transportation.

It is important to note that the population prognosis is a necessity and not just a complement to the planning process. That is why its accuracy is of extreme importance, and a measure of its plausibility is appreciated by the experts deciding on population policy. As time passes, experiences can be compared with the prognoses and the degree of plausibility can be reassessed.

There is no doubt that the inclusion of the effect of migration in a prognosis will increase its accuracy if adequate scientific theories are employed. Some attempts have been made to introduce net migrations into single-region projections, but the results were distrustfully received because net migrations were treated as artificial deaths. The use of multiregional methods obviously increases the accuracy of population prognoses. The results that it yields are theoretically more plausible than those given by the single-region methods, whether or not migrations are included in the latter. The advantage of a multiregional approach is that it looks upon the populations as a *system* with interacting links (Rogers and Philipov 1979).

In order to illustrate the use of multiregional methods, several simulated population projections are considered here. The period of projection starts in 1975 and ends in 2000. The changes are linear over this 25-year period. After the year 2000, the projection continues until 2025 under the assumption that the patterns achieved in the year 2000 will remain constant. In all hypotheses the changes in mortality are analogous to those described above: a uniform increase throughout the country of the expectation of life of 3 to 3.5 years and

a decrease of mortality in the 0–4 age group of 35 percent. (In the previous hypothesis a decrease of almost 50 percent in the 0–1 age group was discussed.) Where only changes in mortality are considered, the hypothesis will be named MORT.

An increase of the expectation of life of 3 to 3.5 years, given the supplementary decrease of infant mortality, corresponds to a decrease in the gross death rate (in this case estimated by excluding the 0–4 age group) by almost 20 percent. The 35 percent decrease of mortality in the 0–4 age group which is considered here, leads to a 1-year rise in the life expectancy; the remaining increase is due to the decrease of the gross death rate.

Three hypotheses for fertility changes are suggested below. For their construction we use the national fertility rates that were suggested by Stefanov *et al.* (1974) for the year 2000 (67, 72, and 77 per thousand). Note that the GFR rose from 62 per thousand in 1970 to 66 per thousand in 1975, and therefore the first hypothesis of Stefanov *et al.*, which stated that there will be no change in fertility, is obviously implausible. To the remaining three estimates of national fertility levels we submit the following three hypotheses. In each one mortality changes have been included.

F1: Fertility at the national level remains unchanged. There are changes, however, at the regional level such that the difference between a regional and the national GRR decreases by half. Thus the regions with GRRs lower than the national level will exhibit an increase in fertility, whereas those in the other regions will fall. Also, the largest difference between regional fertility levels (S.East and Sofia) will be halved. In this way, the process of equalization of the fertility levels throughout the country, which was discussed in the first section, should continue.

F2: The national GRR is increased by a ratio of 72:67. Note that an increase of the GFR from 67 per thousand to 72 per thousand implies an increase of the births, which raises the value of the GRR by the above ratio. The regional GRRs also increase, according to the shrinking procedure explained in F1 (i.e., the regional GRRs used in F1 are increased by the 72:67 ratio).

F3: The national GRR increases by a ratio of 77:67. The regional GRRs change analogously to the changes described in F1 and in addition increase by the 77:67 ratio.

The above hypotheses yield regional and national GRRs exhibited in Table 28. The observed 1975 regional levels are given in Appendix B.

There are two hypotheses for migration changes considered here: M1 and M2. In both of them the changes in mortality were introduced.

M1: The values for ${}_iGMR_j$ for any i or j (Table 13) were decreased by half. This is the most optimistic perspective of a migration policy that is not regionally differentiated. This is, for instance, the case where policy instruments work equally well in all regions and therefore do not change the regional attractiveness. If they work well the propensity to migrate will substantially decrease. Hence reasons for migrating will remain that are not of an economic but of a social or psychological character.

TABLE 28 Regional and national GRRs from the hypotheses F1, F2, and F3.

Hypothesis	Region							Total
	N.West	North	N.East	S.West	South	S.East	Sofia	
F1	1.100	1.057	1.154	1.108	1.117	1.160	1.033	1.104
F2	1.144	1.102	1.198	1.152	1.161	1.204	1.077	1.192
F3	1.188	1.146	1.242	1.196	1.206	1.249	1.122	1.281

M2: Only certain ${}_iGMR_j$ decrease, and this decrease is by a factor of 1/4. This is the case of a regionally differentiated effect on the migration policy. The decrease favors the N.West, S.West, and S.East regions, whose in-migrations decrease by 1/4. The migration flows between the Sofia, North, and South regions also decrease by 1/4. The N.East region is supposed to remain with unchanged in- and out-migrations. The matrix of multipliers is given in Table 26. The ${}_iGMR_j$ in this hypothesis were obtained by multiplying ${}_iGMR_j$ from Table 13 by the multiplier from the i, j position in Table 29.

The simulated multiregional population projection allows one to combine different hypotheses. For example, a hypothesis F2M1 will denote the F2 changes in fertility and M1 changes in migration. In this way six additional hypotheses are constructed and discussed here, each one representing a combination of one fertility and one migration hypothesis.

A very compact way to analyze population development under the assumptions of a certain hypothesis is to use the radix-dependent spatial $\overline{NRR}_j$. Over the 25-year period every NRR_j will change linearly until it reaches a value that will remain constant beyond the year 2000. Those values can also be obtained by simulating instantaneous changes in 1975 (Table 30).

The totals (each one being the dominant eigenvalue of the corresponding matrix) show that the equalization of regional fertility levels* decreases the national one; 1.069 is the NRR value for hypothesis F1 and 1.077 is for MORT. A decrease in migration, either M1 or M2, leads to an increase in the national fertility level. This should be expected, because the dominating migration flows are directed from regions with higher fertility to regions with lower fertility, hence their decrease leaves more people exposed to a higher level of fertility. The NRRs give a quantitative expression of this fact. It is then once again proved that the effect of migration on fertility is significant enough, and hence the population's fertility and migration policies should not be developed independently of one another.

*Recall that since the national NRR is an eigenvalue, it is independent of the radix problem. It measures either fertility level or population growth.

TABLE 29 Multipliers to the GMRs that yield hypothesis M2.

Region of destination	Region of origin 1	2	3	4	5	6	7
1 N.West	–	1	1	1	1	1	1
2 North	3/4	–	1	3/4	3/4	3/4	3/4
3 N.East	1	1	–	1	1	1	1
4 S.West	1	1	1	–	1	1	1
5 South	3/4	3/4	1	3/4	–	3/4	3/4
6 S.East	1	1	1	1	1	–	1
7 Sofia	3/4	3/4	1	3/4	3/4	3/4	–

TABLE 30 Radix-dependent spatial $\widetilde{NRR}_j$ for the observed 1975 population and the simulated population projections to the year 2000 for the seven regions of Bulgaria.

	Region N.West	North	N.East	S.West	South	S.East	Sofia	Total
Observed	1.013	1.041	1.107	0.905	1.088	0.987	1.138	1.060
Hypotheses								
MORT[a]	1.035	1.066	1.119	0.932	1.092	1.016	1.141	1.077
F1	1.042	1.097	1.080	0.930	1.080	0.974	1.196	1.069
F2	1.084	1.142	1.121	0.967	1.123	1.012	1.247	1.112
F3	1.126	1.187	1.163	1.004	1.166	1.049	1.298	1.155
M1	1.046	1.033	1.141	0.999	1.099	1.090	1.066	1.102
M2	1.082	1.059	1.120	0.962	1.084	1.062	1.098	1.082
F1M1	1.052	1.070	1.097	0.996	1.086	1.042	1.127	1.076
F1M2	1.089	1.090	1.081	0.960	1.071	1.018	1.155	1.071
F2M1	1.094	1.115	1.139	1.036	1.129	1.082	1.175	1.119
F2M2	1.133	1.135	1.122	0.999	1.113	1.057	1.204	1.114
F3M1	1.137	1.159	1.182	1.076	1.172	1.122	1.223	1.162
F3M2	1.177	1.180	1.165	1.037	1.156	1.096	1.253	1.157

[a]MORT considers *only* changes in mortality in the simulation; mortality is also included in the remaining 11 hypotheses.

A combination of F1 and M1 or M2 hypotheses gives values for the national NRRs that are substantially lower than those for M1 or M2 alone but are close to the F1 value. Similarly, if the F2 or F3 hypothesis is combined with one of

the migration hypotheses, the NRR values change only a little when compared with the changes of the NRRs induced by M1 or M2 alone. It can be deduced that changes in fertility tend to overshadow changes caused by migrations.

The regional totals of the radix-dependent NRRs allow for a number of interesting inferences. First, the effect of the M hypotheses on the regional population growth is much more pronounced than at the national level. The only exception is the South region. Second, the fertility effect on growth is found to be especially strong in regions with a high attractiveness – Sofia, North – as can be expected and less strong in the S.East, S.West, and N.East regions. It is important to note the rather strong rise of the growth in the N.West. Third, adding the M to the F hypotheses results in an increase of population growth in the N.West, S.West, and S.East regions. It slows down substantially the growth of Sofia. Fourth, the S.East region achieves a positive growth under the assumptions of any of the hypotheses with the exception of F1. For the S.West region, this is true only for F3 combined with any M hypothesis and for F2M1. M1, F1M1, and F2M2 give values for NRR that are very close to unity. Finally, a comparison of the growth of different regional populations shows that Sofia always achieves the highest growth, with the exception of M1 and M2 where the lead is transferred to the N.East. The lowest growth is registered in the S.West region. The difference between the highest and the lowest level of growth is lower than the observed one with the exception of the F hypotheses. The M1 hypothesis brings about a very low difference in the level of growth.

Many other inferences can be derived from Table 28, but they will not be discussed here. The above analysis was carried out primarily to show the advantages of the simulated multiregional population projection.

The analysis of other population characteristics are also not dealt with in this report. It will only be mentioned that in the multiregional approach at least two characteristics have to be studied: the changes in the age composition and the changes in the regional shares. For the purposes of illustration, the regional shares in 2025 of certain hypotheses are given in Table 31. The MORT hypothesis

TABLE 31 Regional shares in the year 2025 derived from various hypotheses, for the seven regions of Bulgaria.

	Region							
Hypothesis	N.West	North	N.East	S.West	South	S.East	Sofia	Total
F3	9.8	15.2	18.0	6.4	26.6	8.4	15.6	100
M1	9.9	14.2	18.9	7.1	27.0	9.6	13.4	100
M2	10.4	14.6	18.6	6.8	26.5	9.3	13.9	100
F1M1	9.9	14.7	18.3	7.1	26.8	9.2	14.0	100
F1M2	10.4	15.0	18.0	6.7	26.3	8.9	14.5	100

TABLE 32 Population projections for the seven regions of Bulgaria to the year 2000, total numbers (in thousands).

Hypothesis	Region							Total
	N.West	North	N.East	S.West	South	S.East	Sofia	
None	1,003	1,447	1,705	703	2,502	902	1,335	9,596
MORT	1,032	1,483	1,742	719	2,554	923	1,361	9,815
F1	1,033	1,496	1,725	718	2,547	914	1,380	9,813
F2	1,042	1,509	1,741	724	2,570	921	1,393	9,901
F3	1,050	1,523	1,757	731	2,594	929	1,406	9,990
M1	1,039	1,467	1,752	742	2,558	952	1,309	9,819
M2	1,055	1,479	1,743	729	2,551	941	1,327	9,817
F1M1	1,040	1,480	1,734	741	2,551	941	1,327	9,816
F2M2	1,056	1,492	1,726	728	2,536	931	1,345	9,814
F2M1	1,049	1,493	1,750	748	2,575	950	1,339	9,904
F2M2	1,065	1,505	1,741	735	2,559	939	1,358	9,903
F3M1	1,058	1,507	1,766	755	2,598	958	1,352	9,993
F3M2	1,074	1,518	1,757	741	2,853	947	1,370	9,992

gives the same regional shares as the projection under a constant regime. The hypotheses F1, F2, and F3 give insignificant changes; therefore only F3 is represented in the table. Analogously, F1M1 represents F2M1 and F3M1, whereas F1M2 represents F2M2 and F3M2. The table shows that the changes are moderate, with the exception of the Sofia region, but are not always negligible.

Table 32 gives the projected population for the year 2000. Since prognoses are used for long-term investment policies, the projections for the year 2025 are also given (Table 33). These tables will be useful to policy makers who are interested in population prognoses. Attention should be paid to the fact that the hypotheses introduced in this report were illustrative of a population policy that is perceived to be more or less effective. The question whether the policy is self-defeating (i.e., the results achieved are contrary to what should be expected) or is strongly catalytic (i.e., the changes happen to be in the expected direction but are much stronger) remains open.

5 CONCLUSION

The number of migrations in Bulgaria is quite low, but they are directed predominantly to specific regions of high attractiveness. This leads to an undesirably high concentration of people in certain areas while other areas remain undesirably underpopulated. Besides economic consequences, these changes affect the demographic development of the Bulgarian population; fertility decreases at the

TABLE 33 Population projections for the seven regions of Bulgaria to the year 2025, total numbers (in thousands).

Hypothesis	Region							Total
	N.West	North	N.East	S.West	South	S.East	Sofia	
None	981	1,492	1,873	653	2,718	881	1,510	10,108
MORT	1,025	1,555	1,951	681	2,823	191	1,565	10,519
F1	1,030	1,595	1,892	679	2,797	888	1,631	10,511
F2	1,063	1,647	1,953	700	2,888	915	1,686	10,851
F3	1,097	1,702	2,015	721	2,982	943	1,743	11,203
M1	1,043	1,500	1,991	748	2,843	1,009	1,409	10,542
M2	1,093	1,542	1,953	710	2,791	975	1,467	10,530
F1M1	1,047	1,543	1,926	746	2,816	972	1,474	10,523
F1M2	1,098	1,581	1,893	709	2,764	941	1,530	10,517
F2M1	1,081	1,594	1,988	769	2,908	1,002	1,523	10,864
F2M2	1,134	1,634	1,954	731	2,854	970	1,582	10,858
F3M1	1,115	1,647	2,052	793	3,002	1,033	1,573	11,216
F3M2	1,170	1,688	2,017	753	2,947	1,000	1,635	11,210

national level because people migrate from regions of higher fertility to regions of lower fertility; aging of the population is rather rapid in certain regions; the growth rate of some regions is too high.

Demographic processes of this kind were analyzed in this report by making use of multiregional demographic methodology. In some cases this made quantitative single-region inferences more precise, in others it contributed to the discussion of phenomena that otherwise could only qualitatively be stated. In addition, multiregional methods provide numerous characteristics that do not exist in the single-regional approach or are extensions that reveal additional information.

The main advantage of multiregional theory is its *systems approach* to the study of multiregional populations. This is especially important to economic planning in Bulgaria. Today the systems approach is widely used in the construction of economic and other models that describe the development of a nation as a whole or of a specific region. In both cases a demographic model should be included in the system. There is no doubt that migrations strongly influence the development of a region; they must be included in a model if the system is to be described more accurately.

At present, a system of models is being created for the district of Silistra, situated in the N.East region of Bulgaria. The multiregional models have been applied to the study of the Silistra population for simulated projections of the biregional populations of Silistra and the rest of Bulgaria (Philipov 1979). The multiregional simulated population projection model is included as a submodel in the population subsystem (Mihailov and Assa, forthcoming; Andersson 1980).

This system is supposed to be transferred later to other regions, hence the scope of the analysis will grow.

In section 4 of this report it was pointed out that the design of the population policy will benefit from the application of multiregional theory. The quantitative restatement of the policy and its effectiveness could then be enriched and become more accurate. Even more important, fertility and migration were shown to be interdependent, which calls for a systems approach to the construction of their policies.

One of the main problems facing multiregional demographers is the unavailability or the incompleteness of data. In the case of Bulgaria, multiproportional methods were used to adjust the data on migration by age from region i to region j. This information is available in statistical form but is not processed. Hence this data problem is an organizational issue. Moreover, the availability of automatized systems of information eases the processing.

The advantage of international comparisons is well recognized in Bulgaria. Many publications (for example, Stefanov *et al.* 1974, Naoumov *et al.* 1974) contain such comparisons, which usually focus on European countries. Statistical yearbooks for Bulgaria also provide some international data. Both studies and data refer mainly to fertility, mortality, and other demographic characteristics but exclude migrations. Because of the Migration and Settlement studies at IIASA, it is now possible to look at migration as a subject for international comparisons as well (Philipov 1980). This is especially important for designing a migration policy. For example, it can be checked whether the intensity of a migration flow is analogous or will be analogous to that in another country. Then perspectives of future change (in accordance with socioeconomic changes) can be designed more easily.

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APPENDIXES

Appendix A

OBSERVED POPULATION, NUMBERS OF BIRTHS, DEATHS, AND MIGRANTS BY AGE AND REGION AND THEIR PERCENTAGE DISTRIBUTIONS, 1975

APPENDIX A

Observed population characteristics.

region n.west

age	population	births	deaths	migration from n.west	north	n.west to n.east	s.west	south	s.east	sofia
0	70735.	0.	374.	166.	98.	39.	14.	61.	10.	226.
5	68705.	0.	35.	115.	85.	32.	11.	44.	8.	122.
10	67596.	12.	26.	374.	241.	88.	79.	156.	24.	164.
15	65875.	2587.	50.	675.	401.	157.	112.	326.	35.	1005.
20	63065.	6513.	72.	205.	137.	63.	22.	103.	12.	765.
25	69433.	3659.	85.	160.	105.	43.	15.	74.	9.	335.
30	56989.	988.	73.	78.	43.	19.	7.	30.	4.	144.
35	62510.	321.	119.	35.	19.	10.	3.	15.	2.	92.
40	75297.	88.	197.	31.	16.	7.	3.	14.	2.	69.
45	80024.	8.	391.	21.	9.	5.	2.	10.	2.	52.
50	85561.	0.	565.	18.	7.	3.	1.	8.	1.	34.
55	49280.	0.	489.	7.	4.	2.	0.	4.	0.	25.
60	60716.	0.	1060.	4.	3.	2.	0.	3.	0.	32.
65	52595.	0.	1739.	2.	3.	1.	0.	3.	0.	32.
70	56418.	0.	2343.	2.	2.	1.	0.	2.	0.	27.
75	33591.	0.	2361.	1.	1.	0.	0.	1.	0.	17.
80	14839.	0.	1721.	1.	1.	0.	0.	1.	0.	8.
85	9574.	0.	1700.	0.	0.	0.	0.	0.	0.	4.
total	1042803.	14176.	13400.	1895.	1175.	472.	269.	855.	109.	3153.

region north

age	population	births	deaths	migration from n.west	north	north to n.east	s.west	south	s.east	sofia
0	94489.	0.	531.	80.	299.	109.	7.	69.	20.	86.
5	88645.	0.	52.	76.	358.	121.	7.	69.	21.	64.
10	87050.	27.	36.	212.	873.	291.	45.	209.	55.	73.
15	96363.	3302.	57.	320.	1213.	434.	54.	363.	68.	375.
20	99415.	9258.	82.	135.	578.	242.	15.	159.	32.	399.
25	107113.	5346.	103.	89.	373.	139.	9.	97.	21.	147.
30	87569.	1675.	112.	45.	159.	64.	4.	41.	10.	66.
35	85446.	384.	154.	24.	81.	40.	2.	24.	6.	48.
40	101386.	93.	265.	20.	67.	27.	2.	21.	5.	35.
45	102018.	7.	432.	14.	38.	19.	1.	16.	4.	27.
50	107536.	0.	711.	11.	29.	12.	0.	12.	3.	17.
55	64098.	0.	612.	4.	16.	8.	0.	6.	1.	13.
60	78998.	0.	1379.	3.	16.	8.	0.	5.	1.	21.
65	68375.	0.	2292.	2.	14.	5.	0.	4.	1.	18.
70	64896.	0.	3050.	2.	15.	3.	0.	4.	1.	20.
75	38639.	0.	3072.	2.	11.	2.	0.	3.	0.	17.
80	17069.	0.	2239.	1.	7.	1.	0.	2.	0.	13.
85	11012.	0.	2212.	1.	3.	1.	0.	2.	0.	8.
total	1400117.	20096.	17191.	1041.	4150.	1526.	146.	1106.	249.	1447.

region n.east

age	population	births	deaths	migration from n.west	north	n.east to n.east	s.west	south	s.east	sofia
0	128208.	0.	837.	31.	198.	329.	5.	47.	40.	49.
5	119420.	0.	66.	25.	200.	309.	5.	39.	35.	31.
10	114858.	60.	42.	74.	513.	781.	33.	125.	98.	37.
15	110758.	4490.	92.	150.	968.	1580.	53.	295.	166.	257.
20	117401.	12420.	117.	53.	386.	737.	12.	108.	65.	228.
25	117679.	7423.	140.	29.	205.	349.	6.	54.	35.	69.
30	102594.	2349.	132.	17.	104.	191.	3.	27.	20.	37.
35	95274.	593.	197.	9.	55.	121.	2.	16.	13.	28.
40	104962.	159.	274.	7.	43.	78.	1.	14.	10.	19.
45	101531.	16.	489.	5.	22.	50.	1.	10.	7.	14.
50	96852.	0.	640.	4.	19.	34.	0.	8.	6.	9.
55	58489.	0.	694.	2.	10.	23.	0.	4.	2.	7.
60	72057.	0.	1258.	1.	12.	26.	0.	4.	2.	13.
65	62408.	0.	2105.	1.	10.	16.	0.	3.	1.	11.
70	41530.	0.	2297.	1.	8.	7.	0.	2.	1.	11.
75	24727.	0.	2314.	1.	5.	5.	0.	2.	0.	6.
80	10924.	0.	1687.	0.	3.	3.	0.	1.	0.	5.
85	7047.	0.	1667.	0.	2.	2.	0.	1.	0.	3.
total	1486719.	27510.	15048.	410.	2763.	4641.	121.	760.	501.	834.

region s.west

age	population	births	deaths	migration from n.west	north	s.west to n.east	s.west	south	s.east	sofia
0	54841.	0.	317.	32.	16.	12.	26.	40.	6.	110.
5	56775.	0.	25.	30.	19.	14.	28.	39.	7.	81.
10	57325.	12.	15.	164.	92.	64.	343.	231.	34.	181.
15	54790.	1921.	39.	190.	98.	74.	313.	309.	32.	713.
20	51104.	5127.	54.	44.	26.	22.	47.	74.	8.	413.
25	51062.	2874.	65.	30.	17.	13.	29.	47.	6.	160.
30	44287.	946.	57.	16.	8.	6.	14.	20.	3.	74.
35	46536.	337.	94.	11.	5.	5.	8.	16.	2.	71.
40	51672.	92.	135.	9.	4.	3.	7.	13.	2.	49.
45	48194.	8.	194.	5.	2.	2.	4.	9.	1.	32.
50	45676.	0.	302.	4.	1.	1.	2.	6.	1.	19.
55	28663.	0.	283.	2.	1.	1.	1.	3.	0.	14.
60	35308.	0.	616.	1.	1.	1.	1.	2.	0.	18.
65	30594.	0.	699.	1.	1.	0.	1.	2.	0.	19.
70	19544.	0.	1071.	1.	1.	0.	0.	1.	0.	14.
75	11647.	0.	1079.	0.	0.	0.	0.	1.	0.	8.
80	5141.	0.	786.	0.	0.	0.	0.	1.	0.	6.
85	3317.	0.	777.	0.	0.	0.	0.	0.	0.	4.
total	696466.	11317.	6608.	540.	292.	218.	824.	819.	102.	1986.

APPENDIX A *Continued.*

region south

age	population	births	deaths	migration from n.west	north	south to n.east	s.west	south	s.east	sofia
0	176623.	0.	1006.	98.	106.	71.	14.	622.	76.	135.
5	172151.	0.	91.	74.	100.	63.	12.	486.	62.	79.
10	174996.	75.	93.	227.	267.	166.	82.	1619.	180.	100.
15	179789.	6425.	125.	424.	459.	306.	120.	3493.	278.	634.
20	167740.	17361.	146.	177.	216.	169.	32.	1517.	129.	665.
25	163737.	9527.	169.	103.	122.	85.	17.	811.	75.	216.
30	140672.	2832.	181.	58.	58.	44.	9.	378.	39.	108.
35	146625.	946.	242.	33.	32.	29.	4.	245.	27.	86.
40	160455.	250.	419.	25.	24.	18.	4.	193.	20.	55.
45	152826.	16.	600.	16.	12.	11.	2.	131.	14.	39.
50	138376.	0.	915.	12.	9.	6.	1.	86.	9.	22.
55	84676.	0.	854.	5.	5.	5.	0.	48.	3.	18.
60	104357.	0.	1822.	4.	5.	4.	0.	42.	2.	29.
65	90368.	0.	2682.	2.	5.	3.	0.	40.	3.	29.
70	54575.	0.	3147.	2.	3.	1.	0.	25.	2.	20.
75	32494.	0.	3171.	1.	2.	1.	0.	16.	0.	15.
80	14355.	0.	2319.	1.	1.	1.	0.	10.	0.	9.
85	9261.	0.	2283.	0.	1.	0.	0.	5.	0.	7.
total	2164076.	37432.	20257.	1262.	1427.	983.	297.	9767.	919.	2266.

region s.east

age	population	births	deaths	migration from n.west	north	s.east to n.east	s.west	south	s.east	sofia
0	71533.	0.	448.	22.	44.	76.	3.	168.	146.	54.
5	65419.	0.	23.	18.	44.	71.	3.	139.	127.	34.
10	66863.	37.	37.	45.	97.	157.	17.	387.	309.	36.
15	65342.	2813.	50.	95.	187.	323.	28.	933.	532.	253.
20	64351.	6820.	61.	37.	82.	165.	7.	376.	230.	247.
25	65928.	4176.	74.	21.	45.	80.	3.	194.	128.	77.
30	55426.	1212.	71.	13.	24.	47.	2.	104.	77.	44.
35	59787.	413.	109.	6.	11.	27.	1.	56.	45.	30.
40	67050.	106.	175.	5.	9.	16.	1.	45.	33.	19.
45	66486.	6.	252.	3.	5.	11.	0.	32.	25.	14.
50	57404.	0.	379.	2.	3.	6.	0.	20.	15.	8.
55	33938.	0.	341.	1.	2.	4.	0.	10.	5.	6.
60	41830.	0.	730.	1.	2.	4.	0.	10.	4.	10.
65	36223.	0.	1140.	0.	2.	3.	0.	9.	4.	9.
70	24286.	0.	1321.	1.	1.	1.	0.	7.	2.	10.
75	14459.	0.	1331.	0.	1.	1.	0.	5.	1.	7.
80	6388.	0.	970.	0.	1.	1.	0.	3.	1.	4.
85	4121.	0.	958.	0.	0.	0.	0.	2.	0.	3.
total	866834.	15583.	8470.	270.	560.	993.	65.	2500.	1684.	865.

region sofia

age	population	births	deaths	migration from n.west	north	sofia to n.east	s.west	south	s.east	sofia
0	80672.	0.	431.	219.	94.	58.	32.	111.	35.	0.
5	65741.	0.	28.	113.	60.	35.	19.	59.	19.	0.
10	58883.	15.	25.	100.	47.	26.	38.	57.	16.	0.
15	75198.	1986.	42.	172.	74.	45.	51.	114.	23.	0.
20	104390.	7812.	73.	265.	129.	91.	50.	182.	40.	0.
25	105771.	5762.	94.	299.	142.	90.	51.	190.	45.	0.
30	83074.	2132.	107.	117.	47.	32.	19.	61.	16.	0.
35	72132.	655.	105.	122.	48.	40.	17.	73.	21.	0.
40	78424.	126.	205.	89.	34.	23.	14.	56.	15.	0.
45	85100.	10.	339.	67.	21.	17.	9.	44.	12.	0.
50	81807.	0.	541.	47.	14.	9.	4.	28.	8.	0.
55	43266.	0.	455.	23.	9.	8.	2.	18.	3.	0.
60	53297.	0.	930.	19.	10.	8.	2.	17.	3.	0.
65	46147.	0.	966.	13.	12.	7.	2.	19.	3.	0.
70	17787.	0.	1278.	4.	3.	1.	1.	4.	1.	0.
75	10590.	0.	1287.	3.	1.	1.	0.	3.	0.	0.
80	4678.	0.	938.	1.	1.	0.	0.	2.	0.	0.
85	3018.	0.	927.	1.	1.	0.	0.	1.	0.	0.
total	1069975.	18498.	8771.	1674.	747.	491.	311.	1039.	260.	0.

Percentage Distribution.

region n.west

age	population	births	deaths	migration from n.west	north	n.west to n.east	s.west	south	s.east	sofia
0	6.7832	0.0000	2.7910	8.7599	8.3404	8.2627	5.2045	7.1395	9.1743	7.1678
5	6.5885	0.0000	0.2612	6.0686	7.2340	6.7797	4.0892	5.1462	7.3394	3.8693
10	6.4821	0.0847	0.1940	19.7361	20.5106	18.6441	29.3680	18.2456	22.0183	5.2014
15	6.3171	18.2492	0.3731	35.6201	34.1277	33.2627	41.6357	38.1287	32.1101	31.8744
20	6.0476	45.9438	0.5373	10.8179	11.6596	13.3475	8.1784	12.0468	11.0092	24.2626
25	6.6583	25.8112	0.6343	8.4433	8.9362	9.1102	5.5762	8.6550	8.2569	10.6248
30	5.4650	6.9695	0.5448	4.1161	3.6596	4.0254	2.6022	3.5088	3.6697	4.5671
35	5.9944	2.2644	0.8881	1.8470	1.6170	2.1186	1.1152	1.7544	1.8349	2.9179
40	7.2206	0.6208	1.4701	1.6359	1.3617	1.4831	1.1152	1.6374	1.8349	2.1884
45	7.6739	0.0564	2.9179	1.1082	0.7660	1.0593	0.7435	1.1696	1.8349	1.6492
50	8.2049	0.0000	4.2164	0.9499	0.5957	0.6356	0.3717	0.9357	0.9174	1.0783
55	4.7257	0.0000	3.6493	0.3694	0.3404	0.4237	0.0000	0.4678	0.0000	0.7929
60	5.8224	0.0000	7.9104	0.2111	0.2553	0.4237	0.0000	0.3509	0.0000	1.0149
65	5.0436	0.0000	12.9776	0.1055	0.2553	0.2119	0.0000	0.3509	0.0000	1.0149
70	5.4102	0.0000	17.4851	0.1055	0.1702	0.2119	0.0000	0.2339	0.0000	0.8563
75	3.2212	0.0000	17.6194	0.0528	0.0851	0.0000	0.0000	0.1170	0.0000	0.5392
80	1.4230	0.0000	12.8433	0.0528	0.0851	0.0000	0.0000	0.1170	0.0000	0.2537
85	0.9181	0.0000	12.6866	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1269
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.age	38.9736	24.0845	69.0392	18.4578	18.2064	18.7500	17.0539	19.2310	17.9128	23.0709

APPENDIX A *Continued.*

region north

age	population	births	deaths	migration from north to n.west	north	n.east	s.west	south	s.east	sofia
0	6.7487	0.0000	3.0533	7.6849	7.2048	7.1429	4.7945	6.2387	8.0321	5.9433
5	6.3313	0.0000	0.2990	7.3007	8.6265	7.9292	4.7945	6.2387	8.4337	4.4229
10	6.2173	0.1344	0.2070	20.3650	21.0361	19.0695	30.8219	18.8969	22.0884	5.0449
15	6.8825	16.4344	0.3278	30.7397	29.2289	28.4404	36.9863	32.8210	27.3092	25.9157
20	7.1005	46.0780	0.4715	12.9683	13.9277	15.8585	10.2740	14.3761	12.8514	27.5743
25	7.6503	26.6076	0.5923	8.5495	8.9880	9.1088	6.1644	8.7703	8.4337	10.1589
30	6.2544	8.3367	0.6440	4.3228	3.8313	4.1940	2.7397	3.7071	4.0161	4.5612
35	6.1028	1.9112	0.8855	2.3055	1.9518	2.6212	1.3699	2.1700	2.4096	3.3172
40	7.2413	0.4629	1.5238	1.9212	1.6145	1.7693	1.3699	1.8987	2.0080	2.4188
45	7.2864	0.0348	2.4840	1.3449	0.9157	1.2451	0.6849	1.4467	1.6064	1.8659
50	7.6805	0.0000	4.0883	1.0567	0.6988	0.7864	0.0000	1.0850	1.2048	1.1748
55	4.5780	0.0000	3.5191	0.3842	0.3855	0.5242	0.0000	0.5425	0.4016	0.8984
60	5.6422	0.0000	7.9294	0.2882	0.3855	0.5242	0.0000	0.4521	0.4016	1.4513
65	4.8835	0.0000	13.1792	0.1921	0.3373	0.3277	0.0000	0.3617	0.4016	1.2440
70	4.6350	0.0000	17.5378	0.1921	0.3614	0.1966	0.0000	0.3617	0.4016	1.3822
75	2.7597	0.0000	17.6643	0.1921	0.2651	0.1311	0.0000	0.2712	0.0000	1.1748
80	1.2191	0.0000	12.8745	0.0961	0.1687	0.0655	0.0000	0.1808	0.0000	0.8984
85	0.7865	0.0000	12.7192	0.0961	0.0723	0.0655	0.0000	0.1808	0.0000	0.5529
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.age	37.8669	24.2169	68.9970	19.1955	19.0024	19.5151	17.1233	20.0769	19.0863	25.3024

region n.east

age	population	births	deaths	migration from n.east to n.west	north	n.east	s.west	south	s.east	sofia
0	8.6236	0.0000	5.5622	7.5610	7.1661	7.0890	4.1322	6.1842	7.9840	5.8753
5	8.0325	0.0000	0.4386	6.0976	7.2385	6.6580	4.1322	5.1316	6.9860	3.7170
10	7.7256	0.2181	0.2791	18.0488	18.5668	16.8283	27.2727	16.4474	19.5609	4.4365
15	7.4498	16.3213	0.6114	36.5854	35.0344	34.0444	43.8017	38.8158	33.1337	30.8153
20	7.8967	45.1472	0.7775	12.9268	13.9703	15.8802	9.9174	14.2105	12.9741	27.3381
25	7.9153	26.9829	0.9304	7.0732	7.4195	7.5199	4.9587	7.1053	6.9860	8.2734
30	6.9007	8.5387	0.8772	4.1463	3.7640	4.1155	2.4793	3.5526	3.9920	4.4365
35	6.4083	2.1556	1.3091	2.1951	1.9906	2.6072	1.6529	2.1053	2.5948	3.3573
40	7.0600	0.5780	1.8208	1.7073	1.5563	1.6807	0.8264	1.8421	1.9960	2.2782
45	6.8292	0.0582	3.2496	1.2195	0.7962	1.0774	0.8264	1.3158	1.3972	1.6787
50	6.5145	0.0000	4.2531	0.9756	0.6877	0.7326	0.0000	1.0526	1.1976	1.0791
55	3.9341	0.0000	4.6119	0.4878	0.3619	0.4956	0.0000	0.5263	0.3992	0.8393
60	4.8467	0.0000	8.3599	0.2439	0.4343	0.5602	0.0000	0.5263	0.3992	1.5588
65	4.1977	0.0000	13.9886	0.2439	0.3619	0.3448	0.0000	0.3947	0.1996	1.3189
70	2.7934	0.0000	15.2645	0.2439	0.2895	0.1508	0.0000	0.2632	0.1996	1.3189
75	1.6632	0.0000	15.3775	0.2439	0.1810	0.1077	0.0000	0.2632	0.0000	0.7194
80	0.7348	0.0000	11.2108	0.0000	0.1086	0.0646	0.0000	0.1316	0.0000	0.5995
85	0.4740	0.0000	11.0779	0.0000	0.0724	0.0431	0.0000	0.1316	0.0000	0.3597
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.age	33.8111	24.3186	65.3163	19.1098	18.9549	19.4565	17.2521	19.9605	18.9770	24.5024

region s.west

age	population	births	deaths	migration from s.west to n.west	north	n.east	s.west	south	s.east	sofia
0	7.8742	0.0000	4.7972	5.9259	5.4795	5.5046	3.1551	4.9140	5.8824	5.5388
5	8.1519	0.0000	0.3783	5.5556	6.5068	6.4220	3.3981	4.7912	6.8627	4.0785
10	8.2308	0.1060	0.2270	30.3704	31.5068	29.3578	41.6262	28.3784	33.3333	9.1138
15	7.8669	16.9745	0.5902	35.1852	33.5616	33.9450	37.9854	37.9607	31.3725	35.9013
20	7.3376	45.3035	0.8172	8.1481	8.9041	10.0917	5.7039	9.0909	7.8431	20.7956
25	7.3316	25.3954	0.9837	5.5556	5.8219	5.9633	3.5194	5.7740	5.8824	8.0564
30	6.3588	8.3591	0.8626	2.9630	2.7397	2.7523	1.6990	2.4570	2.9412	3.7261
35	6.6817	2.9778	1.4225	2.0370	1.7123	2.2936	0.9709	1.9656	1.9608	3.5750
40	7.4192	0.8129	2.0430	1.6667	1.3699	1.3761	0.8495	1.5971	1.9608	2.4673
45	6.9198	0.0707	2.9358	0.9259	0.6849	0.9174	0.4854	1.1057	0.9804	1.6113
50	6.5583	0.0000	4.5702	0.7407	0.3425	0.4587	0.2427	0.7371	0.9804	0.9567
55	4.1155	0.0000	4.2827	0.3704	0.3425	0.4587	0.1214	0.3686	0.0000	0.7049
60	5.0696	0.0000	9.3220	0.1852	0.3425	0.4587	0.1214	0.2457	0.0000	0.9063
65	4.3927	0.0000	10.5781	0.1852	0.3425	0.0000	0.1214	0.2457	0.0000	0.9567
70	2.8062	0.0000	16.2076	0.1852	0.3425	0.0000	0.0000	0.1229	0.0000	0.7049
75	1.6709	0.0000	16.3287	0.0000	0.0000	0.0000	0.0000	0.1229	0.0000	0.4028
80	0.7382	0.0000	11.8947	0.0000	0.0000	0.0000	0.0000	0.1229	0.0000	0.3021
85	0.4763	0.0000	11.7585	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2014
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.age	34.1915	24.3733	66.1463	17.7315	17.5514	17.7064	16.2985	18.2494	17.2059	22.4950

region south

age	population	births	deaths	migration from south to n.west	north	n.east	s.west	south	s.east	sofia
0	8.1616	0.0000	4.9662	7.7655	7.4282	7.2228	4.7138	6.3684	8.2699	5.9576
5	7.9549	0.0000	0.4492	5.8637	7.0077	6.4090	4.0404	4.9759	6.7465	3.4863
10	8.0864	0.2004	0.4591	17.9873	18.7106	16.8871	27.6094	16.5762	19.5865	4.4131
15	8.3079	17.1645	0.6171	33.5975	32.1654	31.1292	40.4040	35.7633	30.2503	27.9788
20	7.7511	46.3801	0.7207	14.0258	15.1367	17.1923	10.7744	15.5319	14.0370	29.3469
25	7.5661	25.4515	0.8343	8.1616	8.5494	8.6470	5.7239	8.3035	8.1610	9.5322
30	6.5003	7.5657	0.8935	4.5959	4.0645	4.4761	3.0303	3.8702	4.2437	4.7661
35	6.7754	2.5272	1.1946	2.6149	2.2425	2.9502	1.3468	2.5084	2.9380	3.7952
40	7.4145	0.6679	2.0684	1.9810	1.6819	1.8311	1.3468	1.9760	2.1763	2.4272
45	7.0620	0.0427	2.9619	1.2678	0.8409	1.1190	0.6734	1.3413	1.5234	1.7211
50	6.3942	0.0000	4.5170	0.9509	0.6307	0.6104	0.3367	0.8805	0.9793	0.9709
55	3.9128	0.0000	4.2158	0.3962	0.3504	0.5086	0.0000	0.4915	0.3264	0.7944
60	4.8222	0.0000	8.9944	0.3170	0.3504	0.4069	0.0000	0.4300	0.2176	1.2798
65	4.1758	0.0000	13.2399	0.1585	0.3504	0.3052	0.0000	0.4095	0.3264	1.2798
70	2.5219	0.0000	15.5354	0.1585	0.2102	0.1017	0.0000	0.2560	0.2176	0.8826
75	1.5015	0.0000	15.6538	0.0792	0.1402	0.1017	0.0000	0.1638	0.0000	0.6620
80	0.6633	0.0000	11.4084	0.0792	0.0701	0.1017	0.0000	0.1024	0.0000	0.3972
85	0.4279	0.0000	11.2702	0.0000	0.0701	0.0000	0.0000	0.0512	0.0000	0.3089
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.age	33.6021	24.1742	65.7613	19.3542	19.0802	19.6465	17.5000	20.0484	19.2029	24.2851

APPENDIX A *Continued.*

region s.east

age	population	births	deaths	migration from s.east to n.west	north	n.east	s.west	south	s.east	sofia
0	8.2522	0.0000	5.2893	8.1481	7.8571	7.6536	4.6154	6.7200	8.6698	6.2428
5	7.5469	0.0000	0.2715	6.6667	7.8571	7.1501	4.6154	5.5600	7.5416	3.9306
10	7.7135	0.2374	0.4368	16.6667	17.3214	15.8107	26.1538	15.4800	18.3492	4.1618
15	7.5380	18.0517	0.5903	35.1852	33.3929	32.5277	43.0769	37.3200	31.5914	29.2486
20	7.4237	43.7656	0.7202	13.7037	14.6429	16.6163	10.7692	15.0400	13.6580	28.5549
25	7.6056	26.7984	0.8737	7.7778	8.0357	8.0564	4.6154	7.7600	7.6010	8.9017
30	6.3941	7.7777	0.8383	4.8148	4.2857	4.7331	3.0769	4.1600	4.5724	5.0867
35	6.8972	2.6503	1.2869	2.2222	1.9643	2.7190	1.5385	2.2400	2.6722	3.4682
40	7.7350	0.6802	2.0661	1.8519	1.6071	1.6113	1.5385	1.8000	1.9596	2.1965
45	7.6700	0.0385	2.9752	1.1111	0.8929	1.1078	0.0000	1.2800	1.4846	1.6185
50	6.6223	0.0000	4.4746	0.7407	0.5357	0.6042	0.0000	0.8000	0.8907	0.9249
55	3.9152	0.0000	4.0260	0.3704	0.3571	0.4028	0.0000	0.4000	0.2969	0.6936
60	4.8256	0.0000	8.6187	0.3704	0.3571	0.4028	0.0000	0.4000	0.2375	1.1561
65	4.1788	0.0000	13.4593	0.0000	0.3571	0.3021	0.0000	0.3600	0.2375	1.0405
70	2.8017	0.0000	15.5962	0.3704	0.1786	0.1007	0.0000	0.2800	0.1188	1.1561
75	1.6680	0.0000	15.7143	0.0000	0.1786	0.1007	0.0000	0.2000	0.0594	0.8092
80	0.7369	0.0000	11.4522	0.0000	0.1786	0.1007	0.0000	0.1200	0.0594	0.4624
85	0.4754	0.0000	11.3105	0.0000	0.0000	0.0000	0.0000	0.0800	0.0000	0.3468
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.age	34.3252	24.2346	65.7255	18.9815	18.9018	19.3580	17.1923	19.8040	18.9222	24.0780

region sofia

age	population	births	deaths	migration from sofia to n.west	north	n.east	s.west	south	s.east	sofia
0	7.5396	0.0000	4.9139	13.0824	12.5837	11.8126	10.2894	10.6833	13.4615	0.0000
5	6.1442	0.0000	0.3192	6.7503	8.0321	7.1283	6.1093	5.6785	7.3077	0.0000
10	5.5032	0.0811	0.2850	5.9737	6.2918	5.2953	12.2186	5.4860	6.1538	0.0000
15	7.0280	10.7363	0.4789	10.2748	9.9063	9.1650	16.3987	10.9721	8.8462	0.0000
20	9.7563	42.2316	0.8323	15.8303	17.2691	18.5336	16.0772	17.5168	15.3846	0.0000
25	9.8854	31.1493	1.0717	17.8614	19.0094	18.3299	16.3987	18.2868	17.3077	0.0000
30	7.7641	11.5256	1.2199	6.9892	6.2918	6.5173	6.1093	5.8710	6.1538	0.0000
35	6.7415	3.5409	1.1971	7.2879	6.4257	8.1466	5.4662	7.0260	8.0769	0.0000
40	7.3295	0.6812	2.3372	5.3166	4.5515	4.6843	4.5016	5.3898	5.7692	0.0000
45	7.9535	0.0541	3.8650	4.0024	2.8112	3.4623	2.8939	4.2348	4.6154	0.0000
50	7.6457	0.0000	6.1681	2.8076	1.8742	1.8330	1.2862	2.6949	3.0769	0.0000
55	4.0436	0.0000	5.1876	1.3740	1.2048	1.6293	0.6431	1.7324	1.1538	0.0000
60	4.9811	0.0000	10.6031	1.1350	1.3387	1.6293	0.6431	1.6362	1.1538	0.0000
65	4.3129	0.0000	11.0136	0.7766	1.6064	1.4257	0.6431	1.8287	1.1538	0.0000
70	1.6624	0.0000	14.5707	0.2389	0.4016	0.2037	0.3215	0.3850	0.3846	0.0000
75	0.9897	0.0000	14.6734	0.1792	0.1339	0.2037	0.0000	0.2887	0.0000	0.0000
80	0.4372	0.0000	10.6943	0.0597	0.1339	0.0000	0.0000	0.1925	0.0000	0.0000
85	0.2821	0.0000	10.5689	0.0597	0.1339	0.0000	0.0000	0.0962	0.0000	0.0000
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000
m.age	34.3684	25.3460	64.7113	24.9283	24.4946	25.3004	22.6769	26.5279	25.1538	0.0000

Appendix B

OBSERVED DEMOGRAPHIC RATES, 1975

APPENDIX B

Mortality rates.

age	n.west	north	n.east	s.west	south	s.east	sofia
0	0.005287	0.005620	0.006528	0.005780	0.005696	0.006263	0.005343
5	0.000509	0.000587	0.000553	0.000440	0.000529	0.000352	0.000426
10	0.000385	0.000414	0.000366	0.000262	0.000531	0.000553	0.000425
15	0.000759	0.000592	0.000831	0.000712	0.000695	0.000765	0.000559
20	0.001142	0.000825	0.000997	0.001057	0.000870	0.000948	0.000699
25	0.001224	0.000962	0.001190	0.001273	0.001032	0.001122	0.000889
30	0.001281	0.001279	0.001287	0.001287	0.001287	0.001281	0.001288
35	0.001904	0.001802	0.002068	0.002020	0.001650	0.001823	0.001456
40	0.002616	0.002614	0.002610	0.002613	0.002611	0.002610	0.002614
45	0.004886	0.004235	0.004816	0.004025	0.003926	0.003799	0.003984
50	0.006603	0.006612	0.006608	0.006612	0.006612	0.006602	0.006613
55	0.009923	0.009548	0.011865	0.009873	0.010086	0.010048	0.010516
60	0.017458	0.017456	0.017458	0.017446	0.017459	0.017452	0.017449
65	0.033064	0.033521	0.033730	0.022848	0.029679	0.031472	0.020933
70	0.041529	0.046998	0.055309	0.054799	0.057664	0.054393	0.071850
75	0.070287	0.079505	0.093582	0.092721	0.097587	0.092053	0.121530
80	0.115978	0.131173	0.154431	0.152889	0.160989	0.151847	0.200513
85	0.177564	0.200872	0.236555	0.234248	0.246518	0.232468	0.307157
gross	2.462002	2.723064	3.153914	3.054527	3.227109	3.079215	3.871215
crude	0.012850	0.012421	0.010122	0.009488	0.009361	0.009771	0.008197
m.age	77.8922	78.4360	78.7156	79.1095	79.1781	78.8792	80.0398

Fertility rates.

age	n.west	north	n.east	s.west	south	s.east	sofia
0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10	0.000178	0.000310	0.000522	0.000209	0.000429	0.000553	0.000255
15	0.039271	0.034266	0.040539	0.035061	0.035736	0.043050	0.026410
20	0.103274	0.093125	0.105791	0.100325	0.103499	0.105981	0.074835
25	0.052698	0.049910	0.063078	0.056285	0.058185	0.063342	0.054476
30	0.017337	0.019128	0.022896	0.021361	0.020132	0.021867	0.025664
35	0.005135	0.004494	0.006224	0.007242	0.006452	0.006908	0.009081
40	0.001169	0.000917	0.001515	0.001780	0.001558	0.001581	0.001607
45	0.000100	0.000069	0.000158	0.000166	0.000105	0.000090	0.000118
50	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
55	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
65	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
70	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
80	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
85	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
gross	1.095810	1.011094	1.203618	1.112143	1.130479	1.216864	0.962223
crude	0.013594	0.014350	0.018504	0.016249	0.017297	0.017977	0.017288
m.age	24.0588	24.2499	24.4277	24.5951	24.4453	24.3576	25.4395

Out-migration rates.

	migration from n.west to						
age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.008680	0.002347	0.001385	0.000551	0.000198	0.000862	0.000141	0.003195
5	0.006069	0.001674	0.001237	0.000466	0.000160	0.000640	0.000116	0.001776
10	0.016658	0.005533	0.003565	0.001302	0.001169	0.002308	0.000355	0.002426
15	0.041154	0.010247	0.006087	0.002383	0.001700	0.004949	0.000531	0.015256
20	0.020725	0.003251	0.002172	0.000999	0.000349	0.001633	0.000190	0.012130
25	0.010672	0.002304	0.001512	0.000619	0.000216	0.001066	0.000130	0.004825
30	0.005703	0.001369	0.000755	0.000333	0.000123	0.000526	0.000070	0.002527
35	0.002816	0.000560	0.000304	0.000160	0.000048	0.000240	0.000032	0.001472
40	0.001886	0.000412	0.000212	0.000093	0.000040	0.000186	0.000027	0.000916
45	0.001262	0.000262	0.000112	0.000062	0.000025	0.000125	0.000025	0.000650
50	0.000842	0.000210	0.000082	0.000035	0.000012	0.000094	0.000012	0.000397
55	0.000852	0.000142	0.000081	0.000041	0.000000	0.000081	0.000000	0.000507
60	0.000725	0.000066	0.000049	0.000033	0.000000	0.000049	0.000000	0.000527
65	0.000780	0.000038	0.000057	0.000019	0.000000	0.000057	0.000000	0.000608
70	0.000603	0.000035	0.000035	0.000018	0.000000	0.000035	0.000000	0.000479
75	0.000595	0.000030	0.000030	0.000000	0.000000	0.000030	0.000000	0.000506
80	0.000741	0.000067	0.000067	0.000000	0.000000	0.000067	0.000000	0.000539
85	0.000418	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000418
gross	0.605898	0.142734	0.088727	0.035573	0.020196	0.064747	0.008147	0.245773
crude	0.007603	0.001817	0.001127	0.000453	0.000258	0.000820	0.000105	0.003024
m.age	21.1677	18.7475	18.6490	18.9629	17.1159	19.7201	17.9314	24.6232

	migration from north to						
age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.007091	0.000847	0.003164	0.001154	0.000074	0.000730	0.000212	0.000910
5	0.008077	0.000857	0.004039	0.001365	0.000079	0.000778	0.000237	0.000722
10	0.020195	0.002435	0.010029	0.003343	0.000517	0.002401	0.000632	0.000839
15	0.029337	0.003321	0.012588	0.004504	0.000560	0.003767	0.000706	0.003892
20	0.015692	0.001358	0.005814	0.002434	0.000151	0.001599	0.000322	0.004013
25	0.008169	0.000831	0.003482	0.001298	0.000084	0.000906	0.000196	0.001372
30	0.004442	0.000514	0.001816	0.000731	0.000046	0.000468	0.000114	0.000754
35	0.002633	0.000281	0.000948	0.000468	0.000023	0.000281	0.000070	0.000562
40	0.001746	0.000197	0.000661	0.000266	0.000020	0.000207	0.000049	0.000345
45	0.001166	0.000137	0.000372	0.000186	0.000010	0.000157	0.000039	0.000265
50	0.000781	0.000102	0.000270	0.000112	0.000000	0.000112	0.000028	0.000158
55	0.000749	0.000062	0.000250	0.000125	0.000000	0.000094	0.000016	0.000203
60	0.000684	0.000038	0.000203	0.000101	0.000000	0.000063	0.000013	0.000266
65	0.000644	0.000029	0.000205	0.000073	0.000000	0.000059	0.000015	0.000263
70	0.000693	0.000031	0.000231	0.000046	0.000000	0.000062	0.000015	0.000308
75	0.000906	0.000052	0.000285	0.000052	0.000000	0.000078	0.000000	0.000440
80	0.001406	0.000059	0.000410	0.000059	0.000000	0.000117	0.000000	0.000762
85	0.001362	0.000091	0.000272	0.000091	0.000000	0.000182	0.000000	0.000726
gross	0.528866	0.056211	0.225189	0.082035	0.007819	0.060298	0.013316	0.083998
crude	0.006903	0.000744	0.002964	0.001090	0.000104	0.000790	0.000178	0.001033
m.age	21.9381	20.0116	20.0331	20.1193	16.8923	21.6988	19.0554	31.2094

APPENDIX B *Continued.*

migration from n.east to

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.005452	0.000242	0.001544	0.002566	0.000039	0.000367	0.000312	0.000382
5	0.005393	0.000209	0.001675	0.002588	0.000042	0.000327	0.000293	0.000260
10	0.014461	0.000644	0.004466	0.006800	0.000287	0.001088	0.000853	0.000322
15	0.031321	0.001354	0.008740	0.014265	0.000479	0.002663	0.001499	0.002320
20	0.013535	0.000451	0.003288	0.006278	0.000102	0.000920	0.000554	0.001942
25	0.006148	0.000246	0.001742	0.002966	0.000051	0.000459	0.000297	0.000586
30	0.003889	0.000166	0.001014	0.001862	0.000029	0.000263	0.000195	0.000361
35	0.002561	0.000094	0.000577	0.001270	0.000021	0.000168	0.000136	0.000294
40	0.001639	0.000067	0.000410	0.000743	0.000010	0.000133	0.000095	0.000181
45	0.001074	0.000049	0.000217	0.000492	0.000010	0.000098	0.000069	0.000138
50	0.000826	0.000041	0.000196	0.000351	0.000000	0.000083	0.000062	0.000093
55	0.000821	0.000034	0.000171	0.000393	0.000000	0.000068	0.000034	0.000120
60	0.000805	0.000014	0.000167	0.000361	0.000000	0.000056	0.000028	0.000180
65	0.000673	0.000016	0.000160	0.000256	0.000000	0.000048	0.000016	0.000176
70	0.000722	0.000024	0.000193	0.000169	0.000000	0.000048	0.000024	0.000265
75	0.000768	0.000040	0.000202	0.000202	0.000000	0.000081	0.000000	0.000243
80	0.001098	0.000000	0.000275	0.000275	0.000000	0.000092	0.000000	0.000458
85	0.001135	0.000000	0.000284	0.000284	0.000000	0.000142	0.000000	0.000426
gross	0.462604	0.018468	0.126599	0.210600	0.005348	0.035519	0.022339	0.043732
crude	0.006746	0.000276	0.001858	0.003122	0.000081	0.000511	0.000337	0.000561
m.age	22.6251	20.5564	21.6376	21.4304	17.4746	23.4815	19.9351	33.4189

migration from s.west to

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.004413	0.000584	0.000292	0.000219	0.000474	0.000729	0.000109	0.002006
5	0.003840	0.000528	0.000335	0.000247	0.000493	0.000687	0.000123	0.001427
10	0.019346	0.002861	0.001605	0.001116	0.005983	0.004030	0.000593	0.003157
15	0.031557	0.003468	0.001789	0.001351	0.005713	0.005640	0.000584	0.013013
20	0.012406	0.000861	0.000509	0.000430	0.000920	0.001448	0.000157	0.008082
25	0.005914	0.000588	0.000333	0.000255	0.000568	0.000920	0.000118	0.003133
30	0.003184	0.000361	0.000181	0.000135	0.000316	0.000452	0.000068	0.001671
35	0.002536	0.000236	0.000107	0.000107	0.000172	0.000344	0.000043	0.001526
40	0.001684	0.000174	0.000077	0.000058	0.000135	0.000252	0.000039	0.000948
45	0.001141	0.000104	0.000041	0.000041	0.000083	0.000187	0.000021	0.000664
50	0.000744	0.000088	0.000022	0.000022	0.000044	0.000131	0.000022	0.000416
55	0.000768	0.000070	0.000035	0.000035	0.000035	0.000105	0.000000	0.000488
60	0.000680	0.000028	0.000028	0.000028	0.000028	0.000057	0.000000	0.000510
65	0.000784	0.000033	0.000033	0.000000	0.000033	0.000065	0.000000	0.000621
70	0.000870	0.000051	0.000051	0.000000	0.000000	0.000051	0.000000	0.000716
75	0.000773	0.000000	0.000000	0.000000	0.000000	0.000086	0.000000	0.000687
80	0.001362	0.000000	0.000000	0.000000	0.000000	0.000195	0.000000	0.001167
85	0.001206	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001206
gross	0.466034	0.050171	0.027188	0.020226	0.074986	0.076888	0.009380	0.207196
crude	0.006857	0.000775	0.000419	0.000313	0.001183	0.001169	0.000146	0.002852
m.age	22.7398	18.5994	18.6125	18.4102	16.7139	20.0520	17.6867	28.1135

migration from south to

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.006353	0.000555	0.000600	0.000402	0.000079	0.003522	0.000430	0.000764
5	0.005089	0.000430	0.000581	0.000366	0.000070	0.002823	0.000360	0.000459
10	0.015092	0.001297	0.001526	0.000949	0.000469	0.009252	0.001029	0.000571
15	0.031782	0.002358	0.002553	0.001702	0.000667	0.019428	0.001546	0.003526
20	0.017318	0.001055	0.001288	0.001008	0.000191	0.009044	0.000769	0.003964
25	0.008727	0.000629	0.000745	0.000519	0.000104	0.004953	0.000458	0.001319
30	0.004933	0.000412	0.000412	0.000313	0.000064	0.002687	0.000277	0.000768
35	0.003110	0.000225	0.000218	0.000198	0.000027	0.001671	0.000184	0.000587
40	0.002113	0.000156	0.000150	0.000112	0.000035	0.001203	0.000125	0.000343
45	0.001472	0.000105	0.000079	0.000072	0.000013	0.000857	0.000092	0.000255
50	0.001048	0.000087	0.000065	0.000043	0.000007	0.000621	0.000065	0.000159
55	0.000992	0.000059	0.000059	0.000059	0.000000	0.000567	0.000035	0.000213
60	0.000824	0.000038	0.000048	0.000038	0.000000	0.000402	0.000019	0.000278
65	0.000907	0.000022	0.000055	0.000033	0.000000	0.000443	0.000033	0.000321
70	0.000971	0.000037	0.000055	0.000018	0.000000	0.000458	0.000037	0.000366
75	0.001077	0.000031	0.000062	0.000031	0.000000	0.000492	0.000000	0.000462
80	0.001533	0.000070	0.000070	0.000070	0.000000	0.000697	0.000000	0.000627
85	0.001404	0.000000	0.000108	0.000000	0.000000	0.000540	0.000000	0.000756
gross	0.523724	0.037828	0.043364	0.029663	0.008581	0.298300	0.027298	0.078691
crude	0.007819	0.000583	0.000659	0.000454	0.000137	0.004513	0.000425	0.001047
m.age	23.8025	21.0423	21.7038	21.5546	17.8130	22.8542	20.2776	32.6039

migration from s.east to

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.007172	0.000308	0.000615	0.001062	0.000042	0.002349	0.002041	0.000755
5	0.006665	0.000275	0.000673	0.001085	0.000046	0.002125	0.001941	0.000520
10	0.015674	0.000673	0.001451	0.002348	0.000254	0.005788	0.004621	0.000538
15	0.035980	0.001454	0.002862	0.004943	0.000429	0.014279	0.008142	0.003872
20	0.017778	0.000575	0.001274	0.002564	0.000109	0.005843	0.003574	0.003838
25	0.008312	0.000319	0.000683	0.001213	0.000046	0.002943	0.001942	0.001168
30	0.005611	0.000235	0.000433	0.000848	0.000036	0.001876	0.001389	0.000794
35	0.002944	0.000100	0.000184	0.000452	0.000017	0.000937	0.000753	0.000502
40	0.001909	0.000075	0.000134	0.000239	0.000015	0.000671	0.000492	0.000283
45	0.001354	0.000045	0.000075	0.000165	0.000000	0.000481	0.000376	0.000211
50	0.000941	0.000035	0.000052	0.000105	0.000000	0.000348	0.000261	0.000139
55	0.000825	0.000029	0.000059	0.000118	0.000000	0.000295	0.000147	0.000177
60	0.000741	0.000024	0.000048	0.000096	0.000000	0.000239	0.000096	0.000239
65	0.000745	0.000000	0.000055	0.000083	0.000000	0.000248	0.000110	0.000248
70	0.000906	0.000041	0.000041	0.000041	0.000000	0.000288	0.000082	0.000412
75	0.001037	0.000000	0.000069	0.000069	0.000000	0.000346	0.000069	0.000484
80	0.001565	0.000000	0.000157	0.000157	0.000000	0.000470	0.000157	0.000626
85	0.001213	0.000000	0.000000	0.000000	0.000000	0.000485	0.000000	0.000728
gross	0.556857	0.020935	0.044323	0.077940	0.004963	0.200053	0.130970	0.077673
crude	0.008003	0.000311	0.000646	0.001146	0.000075	0.002884	0.001943	0.000998
m.age	22.7625	19.8434	21.0496	20.8688	17.3878	22.4882	20.0710	32.0152

APPENDIX B *Continued.*

	migration from sofia to						
age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.006805	0.002715	0.001165	0.000719	0.000397	0.001376	0.000434	0.000000
5	0.004639	0.001719	0.000913	0.000532	0.000289	0.000897	0.000289	0.000000
10	0.004823	0.001698	0.000798	0.000442	0.000645	0.000968	0.000272	0.000000
15	0.006370	0.002287	0.000984	0.000598	0.000678	0.001516	0.000306	0.000000
20	0.007252	0.002539	0.001236	0.000872	0.000479	0.001743	0.000383	0.000000
25	0.007724	0.002827	0.001343	0.000851	0.000482	0.001796	0.000425	0.000000
30	0.003515	0.001408	0.000566	0.000385	0.000229	0.000734	0.000193	0.000000
35	0.004450	0.001691	0.000665	0.000555	0.000236	0.001012	0.000291	0.000000
40	0.002946	0.001135	0.000434	0.000293	0.000179	0.000714	0.000191	0.000000
45	0.001998	0.000787	0.000247	0.000200	0.000106	0.000517	0.000141	0.000000
50	0.001345	0.000575	0.000171	0.000110	0.000049	0.000342	0.000098	0.000000
55	0.001456	0.000532	0.000208	0.000185	0.000046	0.000416	0.000069	0.000000
60	0.001107	0.000356	0.000188	0.000150	0.000038	0.000319	0.000056	0.000000
65	0.001214	0.000282	0.000260	0.000152	0.000043	0.000412	0.000065	0.000000
70	0.000787	0.000225	0.000169	0.000056	0.000056	0.000225	0.000056	0.000000
75	0.000755	0.000283	0.000094	0.000094	0.000000	0.000283	0.000000	0.000000
80	0.000855	0.000214	0.000214	0.000000	0.000000	0.000428	0.000000	0.000000
85	0.000994	0.000331	0.000331	0.000000	0.000000	0.000331	0.000000	0.000000
gross	0.295174	0.108020	0.049025	0.030970	0.019756	0.070153	0.016349	0.000000
crude	0.004226	0.001565	0.000698	0.000459	0.000291	0.000971	0.000243	0.000000
m.age	28.4390	27.6582	29.2008	27.0395	22.9256	31.8083	26.1274	0.0000

Total population.

Bulgaria

age	population number	- % -	births number	- % -	deaths number	- % -	arrivals number	- % -	departures number	- % -	observed rates (x 1000) birth	death	inmig	outmig	net mig
0	67710.	7.76	0.	0.00	3944.	4.38	4409.	7.25	4409.	7.25	0.000	5.825	6.512	6.512	0.000
5	636856.	7.30	0.	0.00	320.	0.36	3612.	5.94	3612.	5.94	0.000	0.502	5.672	5.672	0.000
10	627571.	7.19	218.	0.16	274.	0.30	9627.	15.84	9627.	15.84	0.339	0.427	15.340	15.340	0.000
15	648135.	7.43	21524.	16.27	455.	0.51	19280.	31.72	19280.	31.72	36.296	0.702	29.748	29.748	0.000
20	687466.	7.65	65311.	45.16	695.	0.67	9896.	16.28	9896.	16.28	97.849	0.906	14.826	14.826	0.000
25	680123.	7.80	38767.	26.81	730.	0.81	5459.	8.98	5459.	8.98	56.950	1.072	8.019	8.019	0.000
30	570611.	6.54	12134.	8.39	733.	0.81	2551.	4.20	2551.	4.20	21.265	1.285	4.471	4.471	0.000
35	569310.	6.51	3649.	2.52	1020.	1.13	1716.	2.82	1716.	2.82	6.421	1.795	3.019	3.019	0.000
40	619246.	7.12	914.	0.63	1670.	1.86	1276.	2.10	1276.	2.10	1.480	2.612	1.936	1.936	0.000
45	636179.	7.29	71.	0.05	2697.	3.00	869.	1.43	869.	1.43	0.112	4.239	1.366	1.366	0.000
50	613212.	7.03	0.	0.00	4053.	4.51	579.	0.95	579.	0.95	0.000	6.609	0.944	0.944	0.000
55	362810.	4.15	0.	0.00	3728.	4.14	335.	0.55	335.	0.55	0.000	10.287	0.924	0.924	0.000
60	446503.	5.12	0.	0.00	7795.	8.67	356.	0.59	356.	0.59	0.000	17.456	0.797	0.797	0.000
65	386710.	4.43	0.	0.00	11623.	12.92	316.	0.52	316.	0.52	0.000	30.066	0.817	0.817	0.000
70	279016.	3.20	0.	0.00	14507.	16.13	215.	0.35	215.	0.35	0.000	51.990	0.771	0.771	0.000
75	166137.	1.90	0.	0.00	14615.	16.25	141.	0.23	141.	0.23	0.000	87.970	0.849	0.849	0.000
80	71394.	0.84	0.	0.00	10652.	11.84	90.	0.15	90.	0.15	0.000	145.138	1.226	1.226	0.000
85	47350.	0.54	0.	0.00	10524.	11.70	52.	0.09	52.	0.09	0.000	222.260	1.098	1.098	0.000
tot	8726990.	100.00	144608.	100.00	89949.	100.00	60779.	100.00	60779.	100.00					
gross											1.109	2.936	0.492	0.492	
crude(x1000)											16.570	10.307	6.964	6.964	0.000
m.age		35.18		24.37		66.72		20.45		20.45	24.49	78.79	22.97	22.97	
e(0)												70.90			

Appendix C

MULTIREGIONAL LIFE TABLE

APPENDIX C

Probabilities of dying and migrating.

region n.west

age	death	migration from n.west to n.west	north	n.east	s.west	south	s.east	sofia
0	0.026115	0.943658	0.006636	0.002669	0.000956	0.004174	0.000694	0.015098
5	0.002543	0.975828	0.006077	0.002318	0.000792	0.003179	0.000582	0.008681
10	0.001927	0.944298	0.017046	0.006407	0.005552	0.011268	0.001761	0.011742
15	0.003739	0.854100	0.027633	0.011121	0.007589	0.022987	0.002526	0.070306
20	0.005613	0.911470	0.010351	0.004888	0.001692	0.007945	0.000959	0.057082
25	0.006075	0.953350	0.007383	0.003072	0.001069	0.005273	0.000658	0.023121
30	0.006385	0.972365	0.003709	0.001652	0.000607	0.002603	0.000351	0.012328
35	0.009465	0.979450	0.001505	0.000798	0.000239	0.001198	0.000163	0.007183
40	0.012996	0.979768	0.001048	0.000460	0.000197	0.000921	0.000133	0.004476
45	0.024125	0.971004	0.000550	0.000306	0.000122	0.000613	0.000123	0.003156
50	0.032481	0.964473	0.000396	0.000170	0.000057	0.000453	0.000057	0.001914
55	0.048418	0.948214	0.000387	0.000193	0.000000	0.000338	0.000000	0.002399
60	0.083641	0.913341	0.000227	0.000152	0.000000	0.000228	0.000000	0.002410
65	0.152622	0.844146	0.000244	0.000082	0.000000	0.000247	0.000000	0.002658
70	0.188251	0.809561	0.000144	0.000071	0.000000	0.000141	0.000000	0.001833
75	0.299097	0.699048	0.000106	0.000000	0.000000	0.000102	0.000000	0.001647
80	0.449796	0.548431	0.000197	0.000000	0.000000	0.000187	0.000000	0.001389
85	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

region north

age	death	migration from north to n.west	north	n.east	s.west	south	s.east	sofia
0	0.027718	0.004056	0.953436	0.005523	0.000361	0.003526	0.001019	0.004361
5	0.002925	0.004210	0.977195	0.006707	0.000392	0.003848	0.001168	0.003554
10	0.002067	0.011635	0.948810	0.016060	0.002501	0.011701	0.003070	0.004155
15	0.002977	0.015052	0.917747	0.020904	0.002665	0.018027	0.003332	0.019296
20	0.004121	0.006474	0.948098	0.011703	0.000748	0.007775	0.001562	0.019519
25	0.004803	0.004059	0.972227	0.006355	0.000420	0.004468	0.000967	0.006701
30	0.006375	0.002527	0.980683	0.003598	0.000227	0.002313	0.000563	0.003713
35	0.008970	0.001391	0.982722	0.002307	0.000117	0.001391	0.000348	0.002754
40	0.012984	0.000973	0.981680	0.001310	0.000098	0.001022	0.000243	0.001691
45	0.020952	0.000671	0.975171	0.000908	0.000048	0.000768	0.000192	0.001290
50	0.032521	0.000495	0.965003	0.000519	0.000000	0.000540	0.000135	0.000762
55	0.046633	0.000298	0.950996	0.000591	0.000000	0.000446	0.000074	0.000961
60	0.083631	0.000175	0.914164	0.000464	0.000000	0.000291	0.000058	0.001216
65	0.154610	0.000125	0.843490	0.000311	0.000000	0.000252	0.000063	0.001150
70	0.210357	0.000125	0.787868	0.000181	0.000000	0.000241	0.000061	0.001166
75	0.331748	0.000184	0.666229	0.000175	0.000000	0.000261	0.000000	0.001404
80	0.494169	0.000171	0.503281	0.000159	0.000000	0.000315	0.000000	0.001904
85	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

region n.east

age	death	migration from n.east to n.west	north	n.east	s.west	south	s.east	sofia
0	0.032088	0.001179	0.007383	0.954042	0.000190	0.001784	0.001490	0.001844
5	0.002759	0.001051	0.008220	0.983387	0.000209	0.001637	0.001483	0.001295
10	0.001833	0.003237	0.021403	0.960881	0.001409	0.005473	0.004117	0.001647
15	0.004105	0.006494	0.040363	0.915029	0.002273	0.013105	0.006830	0.011801
20	0.004956	0.002239	0.015752	0.959714	0.000507	0.004557	0.002644	0.009630
25	0.005923	0.001232	0.008513	0.977442	0.000255	0.002288	0.001453	0.002894
30	0.006412	0.000825	0.004985	0.983580	0.000146	0.001308	0.000957	0.001787
35	0.010280	0.000472	0.002841	0.983353	0.000104	0.000934	0.000672	0.001444
40	0.012968	0.000331	0.002013	0.982625	0.000047	0.000659	0.000468	0.000888
45	0.023790	0.000241	0.001056	0.973374	0.000048	0.000482	0.000337	0.000672
50	0.032503	0.000200	0.000947	0.965202	0.000000	0.000400	0.000299	0.000448
55	0.057609	0.000162	0.000809	0.940369	0.000000	0.000324	0.000162	0.000565
60	0.083641	0.000064	0.000763	0.914323	0.000000	0.000255	0.000127	0.000826
65	0.155508	0.000069	0.000681	0.842697	0.000000	0.000207	0.000068	0.000770
70	0.242973	0.000096	0.000756	0.754912	0.000000	0.000185	0.000093	0.000984
75	0.379214	0.000140	0.000682	0.618948	0.000000	0.000263	0.000000	0.000753
80	0.557141	0.000001	0.000744	0.440781	0.000000	0.000236	0.000000	0.001098
85	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

region s.west

age	death	migration from s.west to n.west	north	n.east	s.west	south	s.east	sofia
0	0.028478	0.002840	0.001438	0.001073	0.952569	0.003531	0.000536	0.009536
5	0.002201	0.002623	0.001673	0.001234	0.981250	0.003406	0.000614	0.006998
10	0.001337	0.013631	0.007850	0.005478	0.934223	0.019396	0.002881	0.015204
15	0.003530	0.015631	0.008726	0.006472	0.875708	0.026238	0.002751	0.060944
20	0.005231	0.004253	0.002583	0.002176	0.939245	0.007071	0.000787	0.038655
25	0.006325	0.002938	0.001691	0.001288	0.967463	0.004558	0.000591	0.015146
30	0.006415	0.001795	0.000904	0.000678	0.979446	0.002236	0.000337	0.008189
35	0.010036	0.001190	0.000542	0.000539	0.978324	0.001708	0.000217	0.007448
40	0.012978	0.000867	0.000386	0.000289	0.979412	0.001243	0.000192	0.004632
45	0.019928	0.000511	0.000205	0.000204	0.974902	0.000916	0.000103	0.003232
50	0.032521	0.000425	0.000107	0.000106	0.964095	0.000636	0.000106	0.002003
55	0.048182	0.000334	0.000167	0.000166	0.948340	0.000499	0.000000	0.002311
60	0.083587	0.000132	0.000131	0.000131	0.913428	0.000261	0.000000	0.002331
65	0.108065	0.000144	0.000144	0.000001	0.888577	0.000290	0.000000	0.002779
70	0.241078	0.000205	0.000202	0.000000	0.755660	0.000197	0.000000	0.002661
75	0.376492	0.000001	0.000000	0.000000	0.621091	0.000281	0.000000	0.002134
80	0.553302	0.000001	0.000001	0.000000	0.443392	0.000502	0.000000	0.002802
85	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

APPENDIX C *Continued.*

region south

age	death	migration from south to n.west	north	n.east	s.west	south	s.east	sofia
0	0.028079	0.002673	0.002900	0.001947	0.000385	0.958294	0.002056	0.003666
5	0.002639	0.002127	0.002874	0.001822	0.000346	0.986152	0.001771	0.002269
10	0.002645	0.006293	0.007454	0.004696	0.002268	0.968834	0.004952	0.002857
15	0.003467	0.010847	0.012285	0.008204	0.003135	0.937464	0.007069	0.017528
20	0.004340	0.005079	0.006268	0.004941	0.000935	0.955490	0.003654	0.019293
25	0.005149	0.003091	0.003678	0.002573	0.000515	0.976318	0.002233	0.006443
30	0.006413	0.002033	0.002038	0.001549	0.000317	0.982509	0.001359	0.003782
35	0.008220	0.001119	0.001081	0.000980	0.000136	0.934682	0.000907	0.002876
40	0.012972	0.000770	0.000738	0.000553	0.000123	0.982553	0.000613	0.001679
45	0.019442	0.000513	0.000385	0.000352	0.000064	0.977552	0.000448	0.001245
50	0.032525	0.000420	0.000315	0.000210	0.000035	0.965416	0.000314	0.000767
55	0.049189	0.000282	0.000281	0.000280	0.000000	0.948794	0.000168	0.001006
60	0.083646	0.000177	0.000220	0.000176	0.000000	0.914422	0.000088	0.001272
65	0.138119	0.000096	0.000238	0.000143	0.000000	0.859846	0.000143	0.001418
70	0.252022	0.000145	0.000215	0.000070	0.000000	0.746052	0.000141	0.001354
75	0.392296	0.000106	0.000206	0.000100	0.000000	0.605872	0.000000	0.001420
80	0.574025	0.000193	0.000187	0.000179	0.000000	0.423932	0.000000	0.001485
85	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

region s.east

age	death	migration from s.east to n.west	north	n.east	s.west	south	s.east	sofia
0	0.030802	0.001501	0.002972	0.005074	0.000206	0.011205	0.944632	0.003607
5	0.001767	0.001374	0.003330	0.005340	0.000230	0.010437	0.978960	0.002562
10	0.002751	0.003346	0.007134	0.011326	0.001257	0.027795	0.943717	0.002675
15	0.003795	0.006937	0.013827	0.022571	0.002078	0.064989	0.866889	0.018914
20	0.004713	0.002864	0.006236	0.012256	0.000550	0.027665	0.927100	0.018616
25	0.005590	0.001599	0.003380	0.005932	0.000232	0.014316	0.963252	0.005698
30	0.006385	0.001168	0.002143	0.004164	0.000181	0.009188	0.972870	0.003902
35	0.009072	0.000506	0.000913	0.002224	0.000084	0.004609	0.980133	0.002460
40	0.012966	0.000371	0.000662	0.001173	0.000074	0.003297	0.980068	0.001388
45	0.018778	0.000223	0.000369	0.000808	0.000000	0.002353	0.976442	0.001027
50	0.032476	0.000169	0.000253	0.000505	0.000000	0.001682	0.964243	0.000672
55	0.049011	0.000141	0.000281	0.000557	0.000000	0.001399	0.947773	0.000837
60	0.083610	0.000110	0.000220	0.000438	0.000000	0.001096	0.913431	0.001094
65	0.145853	0.000001	0.000236	0.000354	0.000000	0.001071	0.851395	0.001091
70	0.239471	0.000165	0.000163	0.000159	0.000000	0.001106	0.757404	0.001532
75	0.374258	0.000001	0.000234	0.000227	0.000000	0.001127	0.622647	0.001505
80	0.550462	0.000001	0.000426	0.000408	0.000000	0.001210	0.445935	0.001508
85	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

region sofia

age	death	migration from sofia to n.west	north	n.east	s.west	south	s.east	sofia
0	0.026386	0.012829	0.005593	0.003455	0.001888	0.006593	0.002064	0.941191
5	0.002133	0.008403	0.004501	0.002641	0.001419	0.004435	0.001420	0.975049
10	0.002120	0.008213	0.003968	0.002223	0.003116	0.004829	0.001338	0.974193
15	0.002801	0.010539	0.004923	0.002988	0.003192	0.007503	0.001466	0.966588
20	0.003515	0.011948	0.006035	0.004289	0.002295	0.008474	0.001843	0.961600
25	0.004456	0.013548	0.006570	0.004179	0.002333	0.008764	0.002065	0.958083
30	0.006419	0.006872	0.002791	0.001903	0.001122	0.003615	0.000944	0.976333
35	0.007273	0.008255	0.003264	0.002721	0.001150	0.004961	0.001425	0.970950
40	0.012985	0.005543	0.002125	0.001438	0.000872	0.003497	0.000936	0.972604
45	0.019732	0.003824	0.001203	0.000973	0.000515	0.002521	0.000688	0.970545
50	0.032528	0.002767	0.000825	0.000531	0.000236	0.001650	0.000471	0.960992
55	0.051229	0.002514	0.000986	0.000872	0.000219	0.001969	0.000328	0.941883
60	0.083600	0.001630	0.000859	0.000687	0.000172	0.001460	0.000257	0.911336
65	0.099596	0.001231	0.001136	0.000663	0.000194	0.001815	0.000285	0.895081
70	0.304410	0.000861	0.000638	0.000209	0.000209	0.000831	0.000209	0.692632
75	0.465881	0.000922	0.000302	0.000293	0.000000	0.000871	0.000000	0.531732
80	0.667600	0.000551	0.000535	0.000000	0.000000	0.001012	0.000000	0.330302
85	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Expected number of survivors at exact age x in each region.

age initial region of cohort n.west

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	100000.	100000.	0.	0.	0.	0.	0.	0.
5	97389.	94366.	664.	267.	96.	417.	69.	1510.
10	97141.	92102.	1232.	491.	171.	722.	127.	2296.
15	96953.	87014.	2767.	1093.	684.	1773.	295.	3329.
20	96596.	74434.	5036.	2061.	1286.	3788.	511.	9480.
25	96088.	68021.	5665.	2469.	1364.	4363.	591.	13615.
30	95538.	65077.	6141.	2732.	1430.	4783.	662.	14714.
35	94927.	63410.	6330.	2855.	1460.	4949.	694.	15229.
40	94069.	62251.	6381.	2922.	1462.	5042.	721.	15290.
45	92847.	61089.	6373.	2934.	1459.	5077.	735.	15179.
50	90728.	59384.	6272.	2893.	1439.	5049.	741.	14947.
55	87780.	57322.	6093.	2820.	1394.	4932.	728.	14491.
60	83470.	54394.	5935.	2681.	1325.	4736.	696.	13803.
65	76490.	49705.	5362.	2473.	1213.	4367.	641.	12729.
70	65594.	41976.	4552.	2099.	1080.	3793.	550.	11544.
75	51363.	33993.	3603.	1591.	819.	2847.	420.	8089.
80	34046.	23772.	2408.	938.	509.	1738.	262.	4370.
85	17273.	13040.	1220.	436.	225.	747.	117.	1486.

APPENDIX C *Continued.*

age	initial region of cohort: north							
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	100000.	0.	100000.	0.	0.	0.	0.	0.
5	97228.	406.	95344.	552.	36.	353.	102.	436.
10	96945.	802.	93180.	1186.	74.	720.	213.	770.
15	96744.	1858.	88459.	2649.	313.	1814.	498.	1152.
20	96451.	2976.	81379.	4325.	540.	3422.	765.	3043.
25	96045.	3307.	77300.	5159.	586.	3997.	869.	4827.
30	95572.	3554.	75272.	5580.	618.	4334.	941.	5274.
35	94963.	3698.	73885.	5786.	633.	4478.	975.	5507.
40	94113.	3779.	72655.	5885.	636.	4555.	993.	5606.
45	92891.	3811.	71356.	5892.	636.	4580.	1007.	5609.
50	90933.	3774.	69601.	5809.	628.	4555.	1006.	5561.
55	87976.	3693.	67179.	5649.	607.	4450.	985.	5412.
60	83765.	3538.	63900.	5359.	577.	4268.	942.	5181.
65	76760.	3252.	58426.	4915.	528.	3932.	867.	4820.
70	65256.	2759.	49292.	4181.	470.	3407.	744.	4402.
75	50862.	2245.	38843.	3167.	356.	2560.	568.	3123.
80	33298.	1580.	25882.	1968.	221.	1565.	354.	1726.
85	16332.	872.	13029.	872.	93.	675.	158.	627.

age	initial region of cohort: n.east							
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	100000.	0.	0.	100000.	0.	0.	0.	0.
5	96791.	118.	738.	95404.	19.	178.	149.	184.
10	96524.	221.	1508.	93826.	39.	338.	284.	308.
15	96346.	536.	3449.	90187.	176.	871.	662.	466.
20	95957.	1117.	6944.	82626.	378.	2124.	1210.	1657.
25	95490.	1283.	7834.	79417.	410.	2518.	1363.	2665.
30	94939.	1400.	8334.	77705.	430.	2727.	1448.	2895.
35	94331.	1474.	8583.	76477.	439.	2829.	1495.	3033.
40	93390.	1522.	8668.	75240.	443.	2885.	1527.	3105.
45	92179.	1545.	8673.	73953.	442.	2911.	1539.	3117.
50	90045.	1537.	8542.	71997.	437.	2901.	1533.	3098.
55	87118.	1512.	8315.	69500.	422.	2843.	1503.	3023.
60	82264.	1456.	7969.	65365.	401.	2732.	1438.	2903.
65	75384.	1341.	7339.	59772.	367.	2524.	1323.	2719.
70	63898.	1140.	6235.	50375.	326.	2191.	1132.	2498.
75	48469.	942.	4953.	38030.	247.	1649.	864.	1794.
80	30227.	659.	3327.	23541.	154.	1013.	538.	995.
85	13544.	363.	1693.	10377.	68.	438.	240.	365.

age initial region of cohort s.west

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	100000.	0.	0.	0.	100000.	0.	0.	0.
5	97152.	284.	144.	107.	95257.	353.	54.	954.
10	96938.	537.	308.	228.	93473.	679.	113.	1601.
15	96805.	1803.	1052.	748.	87335.	2493.	384.	2991.
20	96466.	2987.	1858.	1330.	76516.	4746.	609.	8420.
25	95981.	3189.	2046.	1546.	71899.	5203.	667.	11377.
30	95407.	3434.	2292.	1692.	69594.	5552.	726.	12119.
35	94795.	3560.	2379.	1760.	68181.	5677.	753.	12479.
40	94093.	3688.	2432.	1817.	66720.	5781.	778.	12677.
45	93275.	3749.	2453.	1832.	65359.	5817.	791.	12672.
50	90809.	3723.	2427.	1814.	63726.	5785.	794.	12534.
55	87856.	3661.	2364.	1763.	61442.	5651.	781.	12188.
60	83565.	3525.	2276.	1688.	58270.	5421.	746.	11640.
65	78579.	3248.	2101.	1562.	53223.	4992.	685.	10764.
70	67902.	2764.	1796.	1325.	47299.	4329.	587.	9303.
75	51064.	2056.	1433.	1003.	35744.	3249.	448.	6931.
80	31405.	1585.	958.	624.	22200.	1986.	279.	3773.
85	13775.	872.	496.	276.	9843.	858.	124.	1317.

age initial region of cohort south

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	100000.	0.	0.	0.	0.	100000.	0.	0.
5	97192.	267.	290.	195.	38.	95829.	206.	367.
10	96936.	470.	564.	371.	72.	94509.	372.	579.
15	96681.	1053.	1261.	818.	288.	91592.	824.	845.
20	96346.	1936.	2363.	1561.	557.	85989.	1376.	2563.
25	95926.	2257.	2850.	1989.	616.	82266.	1605.	4343.
30	95431.	2483.	3142.	2209.	653.	80411.	1746.	4786.
35	94819.	2624.	3283.	2330.	674.	79056.	1817.	5035.
40	94031.	2704.	3340.	2396.	677.	77889.	1863.	5157.
45	92811.	2747.	3357.	2413.	678.	76563.	1881.	5172.
50	90978.	2730.	3314.	2387.	669.	74867.	1877.	5134.
55	88019.	2681.	3230.	2325.	649.	72294.	1847.	5003.
60	83671.	2577.	3100.	2215.	617.	68608.	1755.	4799.
65	76673.	2375.	2856.	2043.	564.	62748.	1611.	4475.
70	66143.	2017.	2432.	1745.	502.	53965.	1382.	4109.
75	49526.	1645.	1942.	1315.	380.	40267.	1056.	2931.
80	30194.	1157.	1298.	820.	236.	24402.	657.	1624.
85	12992.	640.	660.	366.	105.	10348.	293.	579.

APPENDIX C *Continued.*

age	initial region of cohort: s.east							
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	100000.	0.	0.	0.	0.	0.	100000.	0.
5	96920.	150.	297.	507.	21.	1120.	94463.	361.
10	96746.	284.	615.	1009.	41.	2095.	92102.	599.
15	96483.	605.	1285.	2036.	167.	4609.	86936.	844.
20	96119.	1214.	2543.	3900.	357.	10045.	75418.	2643.
25	95673.	1432.	3035.	4764.	398.	11757.	69977.	4310.
30	95148.	1591.	3310.	5145.	422.	12552.	67452.	4677.
35	94539.	1697.	3462.	5384.	437.	12988.	65651.	4921.
40	93695.	1758.	3510.	5476.	442.	13128.	64370.	5010.
45	92479.	1790.	3522.	5477.	444.	13139.	63104.	5005.
50	90684.	1782.	3475.	5395.	437.	13012.	61629.	4954.
55	87738.	1751.	3383.	5246.	423.	12679.	59434.	4821.
60	83389.	1687.	3248.	4976.	402.	12126.	56335.	4615.
65	76416.	1557.	2992.	4582.	368.	11159.	51461.	4296.
70	65489.	1322.	2547.	3895.	328.	9661.	43817.	3929.
75	49557.	1083.	2022.	2972.	249.	7261.	33190.	2812.
80	30774.	761.	1359.	1830.	155.	4440.	20666.	1563.
85	13687.	419.	696.	816.	69.	1910.	9217.	560.

age	initial region of cohort: sofia							
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	100000.	0.	0.	0.	0.	0.	0.	100000.
5	97361.	1283.	559.	345.	189.	659.	206.	94119.
10	97152.	2048.	984.	598.	320.	1077.	338.	91788.
15	96947.	2713.	1358.	818.	603.	1540.	457.	89457.
20	96669.	3315.	1825.	1101.	845.	2258.	557.	86767.
25	96316.	4089.	2326.	1486.	1003.	2960.	694.	83757.
30	95872.	5059.	2869.	1843.	1173.	3674.	856.	80399.
35	95257.	5490.	3077.	1994.	1245.	3933.	919.	78599.
40	94532.	6037.	3300.	2193.	1311.	4281.	1020.	76390.
45	93305.	6347.	3417.	2276.	1352.	4489.	1077.	74346.
50	91425.	6454.	3430.	2295.	1358.	4587.	1107.	72193.
55	88451.	6429.	3376.	2259.	1327.	4556.	1104.	69400.
60	83955.	6274.	3285.	2190.	1274.	4467.	1071.	65395.
65	76936.	5839.	3064.	2051.	1175.	4184.	996.	59628.
70	68463.	5003.	2656.	1770.	1055.	3710.	866.	53403.
75	48879.	4093.	2130.	1349.	809.	2815.	668.	37012.
80	27534.	2900.	1432.	846.	502.	1740.	416.	19698.
85	10395.	1602.	733.	374.	223.	760.	185.	6518.

Age–region distribution of the stationary population (number of years lived in each region by the initial unit cohort).

age	total	n.west	north	n.east	s.west	south	s.east	sofia
	initial region of cohort: n.west							
0	4.93471	4.85915	0.01659	0.00667	0.00239	0.01043	0.00173	0.03775
5	4.86324	4.66169	0.04740	0.01895	0.00667	0.02849	0.00490	0.09514
10	4.85235	4.47780	0.09938	0.03959	0.02138	0.06237	0.01053	0.14062
15	4.81872	4.03619	0.19506	0.07883	0.04925	0.13902	0.02015	0.32022
20	4.81710	3.56138	0.26751	0.11324	0.06625	0.20378	0.02756	0.57738
25	4.79066	3.32745	0.29513	0.13001	0.06984	0.22866	0.03132	0.70824
30	4.76164	3.21218	0.31178	0.13968	0.07223	0.24432	0.03388	0.74858
35	4.72491	3.14153	0.31779	0.14443	0.07305	0.24978	0.03536	0.76296
40	4.67289	3.08349	0.31884	0.14640	0.07305	0.25298	0.03640	0.76173
45	4.58939	3.01182	0.31611	0.14580	0.07246	0.25315	0.03689	0.75316
50	4.46272	2.91765	0.30912	0.14295	0.07083	0.24952	0.03671	0.73595
55	4.28127	2.79291	0.29819	0.13753	0.06799	0.24170	0.03561	0.70734
60	3.99900	2.60249	0.27991	0.12886	0.06346	0.22756	0.03343	0.66329
65	3.55210	2.29202	0.24784	0.11431	0.05734	0.20398	0.02978	0.60682
70	2.92393	1.89924	0.20387	0.09226	0.04748	0.16601	0.02427	0.49082
75	2.13521	1.44413	0.15026	0.06849	0.03318	0.11863	0.01705	0.31147
80	1.28296	0.92030	0.09070	0.03562	0.01815	0.06212	0.00946	0.14640
85	0.90616	0.73280	0.06053	0.01841	0.00958	0.03033	0.00499	0.04952

age	total	n.west	north	n.east	s.west	south	s.east	sofia
	initial region of cohort: north							
0	4.93071	0.01018	4.88359	0.01381	0.00090	0.00882	0.00255	0.01090
5	4.85432	0.03020	4.71308	0.04346	0.00275	0.02681	0.00787	0.03018
10	4.84222	0.06652	4.54098	0.09588	0.00967	0.06336	0.01778	0.04804
15	4.82987	0.12086	4.24596	0.17436	0.02132	0.13092	0.03158	0.10487
20	4.81239	0.15708	3.96699	0.23710	0.02815	0.18548	0.04084	0.19674
25	4.79044	0.17153	3.81431	0.26846	0.03009	0.20828	0.04524	0.25251
30	4.76337	0.18130	3.72894	0.28415	0.03125	0.22031	0.04790	0.26952
35	4.72689	0.18692	3.66350	0.29178	0.03171	0.22582	0.04933	0.27782
40	4.67511	0.18975	3.60026	0.29442	0.03181	0.22837	0.05014	0.28036
45	4.59561	0.18962	3.52393	0.29251	0.03161	0.22837	0.05033	0.27924
50	4.47272	0.18668	3.41952	0.28685	0.03087	0.22511	0.04978	0.27431
55	4.29353	0.18078	3.27698	0.27522	0.02960	0.21794	0.04819	0.26482
60	4.01313	0.16976	3.05815	0.25737	0.02762	0.20499	0.04523	0.25002
65	3.55040	0.15029	2.69296	0.22792	0.02494	0.18348	0.04027	0.23054
70	2.90295	0.12511	2.20319	0.18371	0.02065	0.14917	0.03280	0.18811
75	2.10393	0.09563	1.61814	0.12838	0.01443	0.10313	0.02305	0.12122
80	1.24073	0.06131	0.97279	0.07101	0.00798	0.05601	0.01279	0.05884
85	0.79243	0.04938	0.64524	0.03698	0.00416	0.02782	0.00675	0.02210

APPENDIX C *Continued.*

age initial region of cohort n.east

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	4.91978	0.00295	0.01846	4.88511	0.00048	0.00446	0.00372	0.00461
5	4.83289	0.00846	0.05616	4.73076	0.00146	0.01290	0.01034	0.01231
10	4.82177	0.01891	0.12393	4.60033	0.00539	0.03022	0.02366	0.01934
15	4.80757	0.04132	0.25713	4.32033	0.01385	0.07483	0.04680	0.05307
20	4.78616	0.06000	0.36695	4.05107	0.01971	0.11606	0.06433	0.10804
25	4.76072	0.06708	0.40419	3.92804	0.02101	0.13113	0.07028	0.13899
30	4.73174	0.07186	0.42291	3.85456	0.02174	0.13889	0.07358	0.14821
35	4.69302	0.07490	0.43127	3.79294	0.02207	0.14285	0.07555	0.15345
40	4.63923	0.07666	0.43352	3.72981	0.02213	0.14492	0.07664	0.15555
45	4.55559	0.07705	0.43035	3.64875	0.02197	0.14531	0.07679	0.15537
50	4.42907	0.07623	0.42143	3.53743	0.02147	0.14360	0.07590	0.15301
55	4.23455	0.07419	0.40712	3.37162	0.02058	0.14038	0.07353	0.14814
60	3.94121	0.06992	0.38270	3.12842	0.01919	0.13140	0.06903	0.14054
65	3.48204	0.06203	0.33935	2.75166	0.01733	0.11787	0.06139	0.13041
70	2.80917	0.05180	0.27971	2.21012	0.01434	0.09600	0.04990	0.10730
75	1.96740	0.03977	0.20700	1.53928	0.01002	0.06655	0.03503	0.06975
80	1.09426	0.02556	0.12550	0.84795	0.00554	0.03628	0.01944	0.03400
85	0.58602	0.02046	0.08447	0.43714	0.00289	0.01805	0.01026	0.01274

age initial region of cohort s.west

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	4.92881	0.00710	0.00359	0.00268	4.88142	0.00883	0.00134	0.02384
5	4.85226	0.02051	0.01129	0.00839	4.71824	0.02580	0.00417	0.06385
10	4.84359	0.05849	0.03401	0.02440	4.52019	0.07929	0.01244	0.11478
15	4.83178	0.11975	0.07277	0.05193	4.09629	0.18096	0.02482	0.28526
20	4.81118	0.15441	0.09886	0.07188	3.71038	0.24885	0.03188	0.49492
25	4.78471	0.16557	0.10970	0.08093	3.51731	0.26899	0.03482	0.58739
30	4.75505	0.17499	0.11677	0.08628	3.44437	0.28071	0.03698	0.61495
35	4.71721	0.18135	0.12027	0.08940	3.37254	0.28644	0.03828	0.62892
40	4.66420	0.18593	0.12213	0.09120	3.30198	0.28994	0.03928	0.63373
45	4.58708	0.18692	0.12199	0.09115	3.22714	0.29005	0.03967	0.63016
50	4.46661	0.18471	0.11979	0.08957	3.12920	0.28591	0.03937	0.61805
55	4.28552	0.17966	0.11600	0.08640	2.99280	0.27680	0.03817	0.59569
60	4.00361	0.16933	0.10942	0.08124	2.78745	0.26041	0.03577	0.56010
65	3.61205	0.15029	0.09742	0.07217	2.51317	0.23303	0.03181	0.51417
70	2.97417	0.12550	0.08071	0.05821	2.07607	0.18947	0.02597	0.41833
75	2.06173	0.09603	0.05978	0.04068	1.44861	0.13088	0.01816	0.26760
80	1.12951	0.06141	0.03610	0.02248	0.80103	0.07110	0.01008	0.12725
85	0.58760	0.04907	0.02416	0.01162	0.41806	0.03478	0.00532	0.04460

age initial region of cohort south

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	4.92980	0.00668	0.00725	0.00487	0.00096	4.89574	0.00514	0.00917
5	4.85320	0.01842	0.02136	0.01413	0.00276	4.75845	0.01443	0.02365
10	4.84042	0.03806	0.04564	0.02972	0.00900	4.65250	0.02988	0.03561
15	4.82566	0.07473	0.09061	0.05947	0.02114	4.43951	0.05499	0.08521
20	4.80679	0.10484	0.13031	0.08875	0.02934	4.20638	0.07452	0.17265
25	4.78392	0.11852	0.14978	0.10496	0.03174	4.06693	0.08477	0.22822
30	4.75625	0.12769	0.16061	0.11349	0.03317	3.98667	0.08908	0.24554
35	4.72126	0.13329	0.16558	0.11816	0.03376	3.92362	0.09202	0.25482
40	4.67106	0.13636	0.16743	0.12024	0.03358	3.86129	0.09362	0.25824
45	4.59473	0.13691	0.16677	0.12000	0.03369	3.78575	0.09395	0.25766
50	4.47493	0.13527	0.16360	0.11780	0.03297	3.67904	0.09284	0.25342
55	4.29225	0.13145	0.15825	0.11350	0.03165	3.52256	0.08981	0.24503
60	4.00859	0.12379	0.14891	0.10644	0.02953	3.28391	0.08416	0.23185
65	3.57038	0.10978	0.13219	0.09446	0.02666	2.91784	0.07484	0.21461
70	2.89172	0.09153	0.10909	0.07627	0.02207	2.35582	0.06095	0.17600
75	1.99302	0.07005	0.08074	0.05338	0.01542	1.61672	0.04283	0.11388
80	1.07965	0.04494	0.04893	0.02964	0.00853	0.86874	0.02376	0.05510
85	0.53982	0.03604	0.03294	0.01543	0.00445	0.41839	0.01255	0.02002

age initial region of cohort s.east

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	4.92299	0.00375	0.00743	0.01269	0.00052	0.02801	4.86158	0.00902
5	4.84166	0.01084	0.02280	0.03790	0.00160	0.09039	4.66412	0.02400
10	4.83073	0.02222	0.04750	0.07611	0.00526	0.16761	4.47593	0.03610
15	4.81505	0.04548	0.09570	0.14838	0.01310	0.36637	4.05883	0.08719
20	4.79480	0.06614	0.13944	0.21661	0.01888	0.54506	3.63486	0.17381
25	4.77050	0.07557	0.15863	0.24772	0.02049	0.60772	3.43571	0.22465
30	4.74218	0.08219	0.16930	0.26322	0.02146	0.63850	3.32756	0.23995
35	4.70585	0.08617	0.17429	0.27151	0.02196	0.65292	3.25053	0.24827
40	4.65435	0.08870	0.17579	0.27382	0.02215	0.65668	3.18685	0.25036
45	4.57909	0.08940	0.17492	0.27179	0.02204	0.65375	3.11833	0.24896
50	4.46055	0.08811	0.17147	0.26603	0.02151	0.64225	3.02659	0.24438
55	4.27818	0.08594	0.16577	0.25556	0.02064	0.62011	2.89423	0.23591
60	3.99514	0.08110	0.15599	0.23896	0.01927	0.58214	2.69491	0.22277
65	3.54763	0.07197	0.13848	0.21167	0.01741	0.52050	2.38196	0.20563
70	2.87615	0.06011	0.11422	0.17066	0.01443	0.42303	1.92518	0.16953
75	2.00328	0.04610	0.08452	0.11930	0.01008	0.29252	1.34639	0.10936
80	1.11151	0.02951	0.05138	0.06616	0.00558	0.15876	0.74706	0.05307
85	0.58744	0.02362	0.03458	0.03439	0.00291	0.07806	0.39441	0.01947

APPENDIX C *Continued.*

age — initial region of cohort = sofia

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	4.93404	0.03207	0.01398	0.00864	0.00472	0.01648	0.00516	4.85298
5	4.86284	0.08326	0.03858	0.02357	0.01273	0.04341	0.01362	4.64767
10	4.85247	0.11902	0.05855	0.03538	0.02308	0.06544	0.01989	4.53111
15	4.84039	0.15071	0.07960	0.04797	0.03621	0.09496	0.02536	4.40559
20	4.82462	0.18511	0.10378	0.06467	0.04621	0.13046	0.03128	4.26310
25	4.80470	0.22868	0.12938	0.08323	0.05441	0.16584	0.03976	4.10390
30	4.77824	0.26369	0.14865	0.09593	0.06045	0.19017	0.04438	3.97496
35	4.74474	0.28818	0.15941	0.10469	0.06388	0.20536	0.04848	3.87473
40	4.69593	0.30962	0.16791	0.11173	0.06658	0.21927	0.05242	3.76840
45	4.61823	0.32003	0.17116	0.11429	0.06777	0.22692	0.05459	3.66349
50	4.49689	0.32207	0.17013	0.11385	0.06713	0.22859	0.05528	3.53984
55	4.31015	0.31758	0.16652	0.11120	0.06501	0.22557	0.05438	3.36989
60	4.02226	0.30281	0.15871	0.10601	0.06120	0.21627	0.05167	3.12558
65	3.63497	0.27104	0.14299	0.09553	0.05574	0.19736	0.04654	2.82576
70	2.93356	0.22752	0.11965	0.07797	0.04659	0.16313	0.03834	2.26035
75	1.91034	0.17493	0.08905	0.05488	0.03277	0.11388	0.02709	1.41773
80	0.94822	0.11253	0.05413	0.03051	0.01812	0.06249	0.01503	0.65541
85	0.40318	0.09040	0.03668	0.01576	0.00946	0.03104	0.00794	0.21190

Survivorship proportions.

region = n.west

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.98553	0.95926	0.00640	0.00252	0.00088	0.00371	0.00064	0.01211
5	0.99776	0.96027	0.01146	0.00434	0.00314	0.00718	0.00117	0.01019
10	0.99718	0.90054	0.02210	0.00866	0.00646	0.01694	0.00211	0.04036
15	0.99536	0.88040	0.01930	0.00830	0.00496	0.01602	0.00180	0.06408
20	0.99415	0.93145	0.00899	0.00402	0.00141	0.00670	0.00082	0.04076
25	0.99376	0.96258	0.00558	0.00236	0.00084	0.00394	0.00050	0.01795
30	0.99209	0.97586	0.00262	0.00123	0.00043	0.00191	0.00026	0.00977
35	0.98877	0.97960	0.00128	0.00063	0.00022	0.00106	0.00015	0.00585
40	0.98148	0.97543	0.00080	0.00038	0.00016	0.00077	0.00013	0.00382
45	0.97174	0.96779	0.00047	0.00024	0.00009	0.00053	0.00009	0.00254
50	0.95968	0.95649	0.00039	0.00018	0.00003	0.00042	0.00003	0.00214
55	0.93441	0.93124	0.00031	0.00017	0.00000	0.00031	0.00000	0.00239
60	0.88341	0.88031	0.00023	0.00012	0.00000	0.00023	0.00000	0.00252
65	0.83090	0.82831	0.00019	0.00007	0.00000	0.00019	0.00000	0.00213
70	0.76205	0.76012	0.00012	0.00004	0.00000	0.00012	0.00000	0.00165
75	0.63876	0.63708	0.00014	0.00000	0.00000	0.00013	0.00000	0.00141
80	0.79827	0.79601	0.00017	0.00000	0.00000	0.00014	-0.00000	0.00195

region north

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.98451	0.00416	0.96503	0.00614	0.00038	0.00370	0.00110	0.00400
5	0.99750	0.00786	0.96321	0.01130	0.00144	0.00773	0.00211	0.00386
10	0.99747	0.01306	0.93382	0.01826	0.00256	0.01479	0.00316	0.01182
15	0.99645	0.01113	0.93202	0.01671	0.00174	0.01306	0.00249	0.01930
20	0.99554	0.00537	0.95981	0.00914	0.00059	0.00619	0.00128	0.01315
25	0.99442	0.00331	0.97638	0.00500	0.00032	0.00340	0.00077	0.00524
30	0.99233	0.00197	0.98169	0.00296	0.00017	0.00186	0.00046	0.00323
35	0.98903	0.00118	0.98220	0.00181	0.00011	0.00121	0.00030	0.00223
40	0.98306	0.00082	0.97845	0.00111	0.00007	0.00089	0.00022	0.00149
45	0.97333	0.00058	0.97015	0.00072	0.00002	0.00065	0.00016	0.00103
50	0.96054	0.00040	0.95813	0.00056	0.00000	0.00049	0.00010	0.00036
55	0.93531	0.00023	0.93304	0.00053	0.00000	0.00037	0.00007	0.00108
60	0.88245	0.00015	0.88041	0.00038	0.00000	0.00027	0.00006	0.00118
65	0.81930	0.00012	0.81804	0.00024	0.00000	0.00024	0.00006	0.00109
70	0.73606	0.00015	0.73426	0.00017	-0.00000	0.00024	0.00003	0.00121
75	0.60316	0.00017	0.60108	0.00016	0.00000	0.00026	0.00000	0.00149
80	0.66789	0.00051	0.66308	0.00038	0.00000	0.00073	0.00000	0.00280

region n.east

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.98232	0.00112	0.00784	0.96837	0.00020	0.00172	0.00148	0.00159
5	0.99770	0.00215	0.01470	0.97225	0.00081	0.00356	0.00276	0.00147
10	0.99704	0.00479	0.03054	0.93846	0.00182	0.00926	0.00537	0.00680
15	0.99547	0.00444	0.02888	0.93623	0.00142	0.00887	0.00491	0.01072
20	0.99456	0.00176	0.01230	0.96836	0.00038	0.00345	0.00208	0.00622
25	0.99383	0.00103	0.00678	0.98047	0.00020	0.00180	0.00121	0.00235
30	0.99166	0.00065	0.00392	0.98347	0.00012	0.00107	0.00082	0.00161
35	0.98838	0.00040	0.00243	0.98299	0.00008	0.00075	0.00057	0.00117
40	0.98166	0.00029	0.00154	0.97804	0.00005	0.00057	0.00040	0.00078
45	0.97190	0.00022	0.00100	0.96934	0.00002	0.00044	0.00032	0.00056
50	0.95516	0.00018	0.00088	0.95301	0.00000	0.00036	0.00023	0.00050
55	0.92976	0.00011	0.00078	0.92775	0.00000	0.00029	0.00014	0.00069
60	0.88201	0.00007	0.00071	0.88011	0.00000	0.00023	0.00010	0.00080
65	0.80443	0.00003	0.00070	0.80255	0.00000	0.00019	0.00008	0.00082
70	0.69832	0.00011	0.00069	0.69642	-0.00000	0.00021	0.00005	0.00083
75	0.55263	0.00003	0.00066	0.55083	0.00000	0.00023	0.00000	0.00082
80	0.51881	0.00000	0.00141	0.51546	-0.00000	0.00049	0.00000	0.00146

APPENDIX C *Continued.*

region s.west

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.98446	0.00275	0.00156	0.00116	0.96656	0.00389	0.00058	0.00938
5	0.99823	0.00806	0.00474	0.00334	0.95797	0.01132	0.00174	0.01106
10	0.99758	0.01432	0.00831	0.00595	0.90598	0.02265	0.00278	0.03760
15	0.99565	0.01052	0.00578	0.00449	0.90530	0.01730	0.00184	0.05041
20	0.99423	0.00367	0.00216	0.00174	0.95291	0.00589	0.00070	0.02716
25	0.99162	0.00236	0.00129	0.00098	0.97335	0.00340	0.00046	0.01178
30	0.99179	0.00150	0.00072	0.00061	0.97889	0.00198	0.00028	0.00781
35	0.98849	0.00102	0.00046	0.00041	0.97886	0.00147	0.00020	0.00606
40	0.98357	0.00069	0.00029	0.00025	0.97718	0.00108	0.00015	0.00394
45	0.97384	0.00047	0.00016	0.00015	0.96957	0.00077	0.00010	0.00262
50	0.95978	0.00038	0.00014	0.00014	0.95636	0.00057	0.00005	0.00214
55	0.93455	0.00023	0.00015	0.00015	0.93135	0.00038	0.00000	0.00230
60	0.90471	0.00013	0.00013	0.00007	0.90156	0.00027	0.00000	0.00253
65	0.82918	0.00017	0.00017	0.00000	0.82604	0.00024	0.00000	0.00257
70	0.70047	0.00011	0.00011	0.00000	0.69774	0.00022	0.00000	0.00229
75	0.55557	0.00000	0.00000	0.00000	0.55301	0.00035	-0.00000	0.00222
80	0.52621	0.00001	0.00001	0.00000	0.52186	0.00040	0.00000	0.00394

region south

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.98446	0.00242	0.00290	0.00190	0.00037	0.97192	0.00193	0.00301
5	0.99736	0.00419	0.00514	0.00325	0.00130	0.97757	0.00334	0.00256
10	0.99694	0.00841	0.00982	0.00640	0.00267	0.95349	0.00590	0.01025
15	0.99609	0.00818	0.00935	0.00666	0.00209	0.94600	0.00551	0.01830
20	0.99526	0.00416	0.00503	0.00379	0.00074	0.96564	0.00299	0.01291
25	0.99422	0.00257	0.00286	0.00206	0.00042	0.97936	0.00180	0.00514
30	0.99269	0.00158	0.00156	0.00127	0.00023	0.98358	0.00114	0.00332
35	0.98941	0.00094	0.00091	0.00077	0.00013	0.98362	0.00076	0.00228
40	0.98381	0.00064	0.00056	0.00045	0.00009	0.98007	0.00053	0.00146
45	0.97408	0.00047	0.00035	0.00028	0.00005	0.97155	0.00038	0.00100
50	0.95928	0.00035	0.00030	0.00024	0.00002	0.95725	0.00024	0.00088
55	0.93402	0.00023	0.00025	0.00023	0.00000	0.93206	0.00013	0.00113
60	0.89032	0.00013	0.00022	0.00016	0.00000	0.88835	0.00011	0.00133
65	0.80913	0.00012	0.00022	0.00011	0.00000	0.80724	0.00014	0.00131
70	0.68794	0.00012	0.00020	0.00008	0.00000	0.68616	0.00007	0.00131
75	0.53900	0.00013	0.00019	0.00012	-0.00000	0.53723	-0.00000	0.00133
80	0.48438	0.00020	0.00043	0.00015	0.00000	0.48140	-0.00000	0.00220

region s.east

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.98347	0.00145	0.00316	0.00524	0.00022	0.01091	0.95936	0.00312
5	0.99775	0.00236	0.00522	0.00828	0.00075	0.01898	0.95955	0.00262
10	0.99673	0.00506	0.01043	0.01669	0.00165	0.04567	0.90644	0.01078
15	0.99575	0.00499	0.01012	0.01796	0.00133	0.04786	0.89475	0.01873
20	0.99485	0.00227	0.00486	0.00924	0.00040	0.02138	0.94448	0.01222
25	0.99401	0.00138	0.00276	0.00506	0.00020	0.01181	0.96797	0.00482
30	0.99228	0.00084	0.00153	0.00321	0.00013	0.00693	0.97645	0.00318
35	0.99899	0.00044	0.00079	0.00170	0.00008	0.00396	0.98010	0.00193
40	0.98414	0.00030	0.00051	0.00099	0.00004	0.00282	0.97827	0.00121
45	0.97444	0.00030	0.00031	0.00066	0.00000	0.00201	0.97041	0.00085
50	0.95939	0.00015	0.00027	0.00053	0.00000	0.00154	0.95616	0.00075
55	0.93413	0.00012	0.00025	0.00050	0.00000	0.00124	0.93106	0.00096
60	0.88669	0.00006	0.00022	0.00039	0.00000	0.00107	0.88382	0.00109
65	0.81096	0.00008	0.00020	0.00025	0.00000	0.00105	0.80817	0.00123
70	0.70229	0.00009	0.00019	0.00018	0.00000	0.00106	0.69933	0.00144
75	0.55790	0.00000	0.00029	0.00028	-0.00000	0.00108	0.55486	0.00138
80	0.53294	0.00000	0.00039	0.00033	-0.00000	0.00199	0.52795	0.00227

region sofia

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	0.98559	0.01079	0.00510	0.00309	0.00167	0.00559	0.00177	0.95758
5	0.99788	0.00826	0.00425	0.00245	0.00226	0.00465	0.00138	0.97464
10	0.99753	0.00918	0.00445	0.00260	0.00311	0.00616	0.00138	0.97065
15	0.99634	0.01136	0.00542	0.00362	0.00278	0.00792	0.00166	0.96408
20	0.99602	0.01285	0.00631	0.00423	0.00233	0.00864	0.00196	0.95969
25	0.99458	0.01034	0.00471	0.00306	0.00175	0.00624	0.00152	0.96696
30	0.99315	0.00757	0.00302	0.00230	0.00113	0.00428	0.00118	0.97366
35	0.98989	0.00692	0.00270	0.00209	0.00101	0.00424	0.00118	0.97176
40	0.98366	0.00468	0.00167	0.00120	0.00069	0.00301	0.00081	0.97159
45	0.97394	0.00330	0.00101	0.00075	0.00038	0.00208	0.00058	0.96584
50	0.95828	0.00263	0.00090	0.00069	0.00023	0.00180	0.00040	0.95163
55	0.93301	0.00206	0.00091	0.00078	0.00019	0.00170	0.00029	0.92707
60	0.90968	0.00141	0.00097	0.00066	0.00018	0.00161	0.00027	0.90359
65	0.80355	0.00104	0.00088	0.00043	0.00019	0.00129	0.00024	0.79946
70	0.62939	0.00085	0.00047	0.00023	0.00011	0.00091	0.00011	0.62679
75	0.46394	0.00074	0.00036	0.00017	0.00000	0.00056	0.00000	0.45181
80	0.32586	0.00120	0.00106	0.00000	-0.00000	0.00130	0.00000	0.32210

APPENDIX C *Continued.*

Expectations of life by place of birth.

age — initial region of cohort — n.west

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	71.38895	52.97428	3.82663	1.69801	0.87476	2.96785	0.43002	8.61740
5	68.23620	49.40533	3.91220	1.73669	0.89576	3.01672	0.43977	8.80971
10	63.40357	44.71225	3.87337	1.72161	0.89118	3.01512	0.43585	8.73420
15	58.52183	40.20049	3.77777	1.68412	0.87086	2.95664	0.42593	8.60612
20	53.72889	36.17064	3.58980	1.60874	0.82310	2.82365	0.40654	8.30642
25	48.99956	32.65518	3.33016	1.49938	0.75850	2.62649	0.38001	7.74942
30	44.26731	29.36057	3.04062	1.37193	0.68977	2.40228	0.34942	7.05273
35	39.53600	26.16562	2.73174	1.23361	0.61811	2.16141	0.31598	6.30952
40	34.87408	23.06486	2.41885	1.09134	0.54610	1.91561	0.28127	5.55605
45	30.30018	20.04738	2.10728	0.94803	0.47461	1.66835	0.24577	4.80875
50	25.94923	17.19584	1.80807	0.80946	0.40583	1.42828	0.21085	4.09090
55	21.73681	14.44958	1.51665	0.67381	0.33878	1.19200	0.17611	3.38990
60	17.73006	11.84966	1.23771	0.54383	0.27481	0.96398	0.14254	2.71752
65	14.12004	9.52872	0.98473	0.42500	0.21693	0.75446	0.11184	2.09837
70	11.05011	7.61718	0.77044	0.32133	0.16555	0.56879	0.08502	1.52179
75	8.41920	6.03010	0.58700	0.23074	0.11895	0.40319	0.06133	0.98786
80	6.42194	4.85552	0.44421	0.15868	0.08203	0.27156	0.04245	0.57548
85	5.24627	4.24256	0.35047	0.10656	0.05545	0.17561	0.02891	0.28671

age — initial region of cohort — north

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	71.19080	2.32286	58.56873	3.46298	0.37952	2.69418	0.60242	3.16011
5	68.14902	2.37865	55.21559	3.54750	0.38941	2.76192	0.61697	3.23899
10	63.34102	2.35946	50.51545	3.51304	0.38771	2.74234	0.61065	3.21737
15	58.46711	2.29058	45.92635	3.42122	0.37052	2.68253	0.59354	3.17438
20	53.63754	2.17225	41.66397	3.25086	0.35757	2.55496	0.56260	3.07532
25	48.85384	2.01786	37.70953	3.01772	0.32978	2.37263	0.52245	2.88346
30	44.08264	1.84836	33.90497	2.75174	0.29992	2.16644	0.47770	2.63350
35	39.34971	1.66932	30.19599	2.47019	0.26894	1.94835	0.43033	2.36660
40	34.68226	1.48577	26.57583	2.18245	0.23767	1.72599	0.38179	2.09276
45	30.10557	1.30104	23.04962	1.89421	0.20655	1.50285	0.33284	1.81846
50	25.70013	1.12058	19.67074	1.61333	0.17624	1.28407	0.28466	1.55055
55	21.47992	0.94602	16.44503	1.34195	0.14707	1.07135	0.23765	1.29036
60	17.43400	0.77775	13.35958	1.08085	0.11913	0.86502	0.19207	1.03960
65	13.59692	0.62758	10.59476	0.84420	0.09402	0.67692	0.15068	0.80876
70	10.78838	0.50789	8.33570	0.64375	0.07237	0.51508	0.11554	0.59804
75	8.13411	0.40565	6.36270	0.46475	0.05225	0.36756	0.08374	0.39746
80	6.10606	0.33243	4.85933	0.32433	0.03647	0.25174	0.05469	0.24306
85	4.85212	0.30236	3.95085	0.22645	0.02550	0.17032	0.04134	0.13530

age initial region of cohort n.east

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.09219	0.91915	5.19235	59.36731	0.26114	1.69075	0.91668	1.74482
5	67.33297	0.94657	5.34542	56.28836	0.26931	1.74219	0.94322	1.79790
10	62.51218	0.94042	5.30201	51.54286	0.26854	1.73363	0.93460	1.79011
15	57.62302	0.92253	5.18317	46.86328	0.26345	1.70547	0.91177	1.77335
20	52.84703	0.88322	4.93606	42.55134	0.25008	1.63437	0.86671	1.72525
25	48.09309	0.82471	4.57591	38.51689	0.23066	1.52082	0.80358	1.62053
30	43.35762	0.75884	4.17672	34.60292	0.20987	1.39152	0.73421	1.48353
35	38.62114	0.68755	3.75533	30.73988	0.18819	1.25326	0.66094	1.33599
40	33.98487	0.61427	3.33135	26.98903	0.16646	1.11292	0.58670	1.18513
45	29.39960	0.53918	2.90482	23.29640	0.14464	0.97034	0.51126	1.03196
50	25.01612	0.46639	2.49574	19.79639	0.12367	0.83196	0.43810	0.88387
55	20.79328	0.39456	2.09584	16.40100	0.10317	0.69508	0.36569	0.73794
60	16.87256	0.32765	1.72461	13.27011	0.08425	0.56666	0.29788	0.60140
65	13.18437	0.26481	1.37435	10.33131	0.06648	0.44407	0.23350	0.46986
70	10.10499	0.21533	1.09032	7.87899	0.05131	0.33942	0.17949	0.35023
75	7.52574	0.17699	0.86029	5.82711	0.03806	0.24940	0.13155	0.24034
80	5.55832	0.15223	0.69467	4.25149	0.02789	0.17974	0.09825	0.15465
85	4.32693	0.15105	0.62472	3.22765	0.02135	0.13330	0.07577	0.09409

age initial region of cohort s.west

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.89665	2.27101	1.45475	1.06060	54.97632	3.44216	0.46822	7.22359
5	67.90153	2.33027	1.49370	1.08893	51.56330	3.53397	0.48056	7.41079
10	63.04601	2.31426	1.48535	1.08269	46.80994	3.51516	0.47733	7.36129
15	58.12895	2.25701	1.45225	1.05897	42.20470	3.43807	0.46513	7.25281
20	53.32485	2.14083	1.38193	1.00887	38.10697	3.26258	0.44104	6.98264
25	48.58131	1.99076	1.28591	0.93907	34.43353	3.01977	0.41005	6.50223
30	43.85985	1.82920	1.17868	0.85989	30.93331	2.75602	0.37602	5.92573
35	39.12579	1.65641	1.06311	0.77443	27.49946	2.47768	0.33948	5.31526
40	34.47753	1.47917	0.94522	0.68865	24.17167	2.19640	0.30193	4.69648
45	29.89804	1.29300	0.82587	0.59727	20.92655	1.91242	0.26352	4.07441
50	25.46099	1.11883	0.70849	0.50916	17.80275	1.63231	0.22525	3.46419
55	21.23279	0.94619	0.59596	0.42433	14.83940	1.36175	0.18800	2.87715
60	17.19456	0.77978	0.48775	0.34272	12.01939	1.10042	0.15198	2.31202
65	13.53505	0.62979	0.38916	0.26790	9.47644	0.86088	0.11914	1.79154
70	9.94516	0.48894	0.29564	0.19585	6.93624	0.62771	0.08752	1.26326
75	7.40017	0.40440	0.23507	0.14643	5.22432	0.46365	0.06572	0.86058
80	5.46761	0.35178	0.19187	0.10857	3.88202	0.33714	0.04903	0.54720
85	4.26563	0.35622	0.17535	0.08432	3.03488	0.25247	0.03862	0.32377

APPENDIX C *Continued.*

age initial region of cohort south

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.63345	1.61836	1.98000	1.38072	0.40072	61.23986	1.11311	2.88068
5	67.60186	1.67882	2.02974	1.41560	0.41130	57.97194	1.13998	2.95448
10	62.77389	1.66425	2.01307	1.40476	0.40954	53.21626	1.12811	2.93789
15	57.93291	1.62927	1.97117	1.37773	0.40131	48.54449	1.10018	2.90881
20	53.12573	1.55738	1.88398	1.32079	0.38077	44.10540	1.04693	2.83049
25	48.34735	1.45490	1.75638	1.23405	0.35185	39.91344	0.97383	2.66289
30	43.58511	1.33826	1.60854	1.13046	0.32041	35.85878	0.89110	2.43755
35	38.85019	1.21222	1.44953	1.01807	0.28750	31.88565	0.80291	2.19432
40	34.15479	1.08062	1.28559	0.90094	0.25400	27.98015	0.71177	1.94171
45	29.57086	0.94791	1.12209	0.78322	0.22084	24.18755	0.62026	1.68899
50	25.11640	0.81652	0.96139	0.66711	0.18826	20.51380	0.52950	1.43981
55	20.87654	0.69029	0.80784	0.55570	0.15714	17.02355	0.44182	1.20030
60	16.83160	0.56905	0.66068	0.44893	0.12747	13.69818	0.35745	0.96993
65	13.13973	0.45954	0.52677	0.35108	0.10059	10.66547	0.28031	0.75597
70	9.83361	0.36673	0.41077	0.26416	0.07629	7.95201	0.21179	0.55184
75	7.29405	0.30496	0.32833	0.19379	0.05733	5.86324	0.15978	0.38162
80	5.36349	0.26821	0.27114	0.14930	0.04297	4.26283	0.12025	0.24879
85	4.15514	0.27741	0.25354	0.11880	0.03425	3.22048	0.09657	0.15413

age initial region of cohort s.east

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.52206	1.05724	2.08222	3.18247	0.25928	7.71437	53.42505	2.80142
5	67.68390	1.08697	2.14073	3.27052	0.26699	7.93065	50.10689	2.88115
10	62.80067	1.07771	2.12099	3.23720	0.26582	7.86176	45.37567	2.86150
15	57.96558	1.05763	2.07756	3.16717	0.26110	7.70954	40.86066	2.83192
20	53.17522	1.01432	1.98585	3.02477	0.24845	7.35752	36.79239	2.75191
25	48.41187	0.94992	1.84918	2.81249	0.22988	6.82217	33.16493	2.58309
30	43.66515	0.87574	1.69286	2.56765	0.20961	6.22110	29.73697	2.36123
35	38.92994	0.79443	1.52467	2.30575	0.18826	5.58573	26.40949	2.12261
40	34.25847	0.70941	1.35240	2.03676	0.16651	4.93924	23.17737	1.87677
45	29.67575	0.62281	1.18009	1.76744	0.14475	4.29406	20.03589	1.63071
50	25.21374	0.53667	1.01056	1.50272	0.12332	3.65816	16.99386	1.38846
55	20.97648	0.45402	0.84906	1.24998	0.10294	3.04899	14.11491	1.15655
60	16.94003	0.37463	0.69454	1.00870	0.08356	2.46435	11.38027	0.93397
65	13.25765	0.30269	0.55378	0.78803	0.06597	1.92742	8.89208	0.72767
70	10.05269	0.24330	0.43473	0.59631	0.05038	1.45424	6.73862	0.53510
75	7.48067	0.20022	0.34401	0.44363	0.03747	1.06813	5.02015	0.36706
80	5.52077	0.17264	0.27934	0.32675	0.02753	0.76954	3.70922	0.23572
85	4.29201	0.17255	0.25269	0.25128	0.02126	0.57031	2.88168	0.14225

age initial region of cohort sofia

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.61577	3.79927	2.00937	1.29581	0.79207	2.59665	0.63022	59.49237
5	67.46176	3.86929	2.04946	1.32206	0.80869	2.65009	0.64200	56.12017
10	62.60156	3.79192	2.01416	1.30064	0.79733	2.61110	0.62937	51.45705
15	57.72918	3.67720	1.95804	1.26690	0.77521	2.54915	0.61019	46.89248
20	52.88762	3.53185	1.88132	1.22092	0.73998	2.45823	0.58571	42.46961
25	48.07253	3.35261	1.78048	1.15825	0.69471	2.33180	0.55538	38.19930
30	43.28334	3.12960	1.65324	1.07680	0.64117	2.16960	0.51753	34.09540
35	38.54667	2.87298	1.50786	0.98304	0.58185	1.98398	0.47428	30.14267
40	33.82307	2.59016	1.35080	0.87983	0.51873	1.78195	0.42663	26.27497
45	29.23514	2.29249	1.18861	0.77166	0.45420	1.57039	0.37605	22.58132
50	24.78500	1.98950	1.02584	0.66253	0.38942	1.35449	0.32403	19.03914
55	20.53413	1.69225	0.86793	0.55609	0.32662	1.14158	0.27247	15.67714
60	16.49996	1.40461	0.71613	0.45341	0.26667	0.93404	0.22228	12.50232
65	12.77726	1.13917	0.57517	0.35698	0.21145	0.73815	0.17540	9.58093
70	9.04910	0.88424	0.43749	0.26163	0.15620	0.54123	0.12912	6.63918
75	6.67302	0.77309	0.36799	0.20691	0.12346	0.42434	0.10241	4.67484
80	4.90808	0.73701	0.32984	0.16803	0.10016	0.33970	0.08342	3.14993
85	3.87867	0.86968	0.35291	0.15161	0.09098	0.29362	0.07635	2.03853

Expectations of life by place of residence.

age region of residence at age x n.west

	total	n.west	north	n.east	s.west	south	s.east	sofia
0	71.38895	52.97429	3.82663	1.69801	0.87476	2.96785	0.43002	8.61740
5	68.25554	50.90793	3.58967	1.58136	0.85458	2.80677	0.39612	8.11910
10	63.43617	47.05995	3.30516	1.45577	0.82453	2.64786	0.36343	7.77947
15	58.58295	44.60192	2.48963	1.11725	0.56896	2.07956	0.27003	7.45560
20	53.91317	46.57001	1.11927	0.52245	0.10317	0.88026	0.12205	4.51595
25	49.29919	45.74161	0.61784	0.27278	0.09500	0.46912	0.06815	2.03870
30	44.63446	42.82952	0.28162	0.13151	0.04560	0.22549	0.03131	1.08742
35	39.93211	38.96532	0.12989	0.06297	0.02014	0.11608	0.01559	0.62211
40	35.30559	34.72687	0.07446	0.03392	0.01121	0.07174	0.00924	0.37815
45	30.74801	30.39097	0.04069	0.01937	0.00483	0.04235	0.00486	0.24494
50	26.45448	26.22323	0.02568	0.01118	0.00141	0.02584	0.00143	0.16572
55	22.26495	22.09688	0.01664	0.00744	0.00004	0.01569	0.00006	0.12718
60	18.27593	18.16699	0.00928	0.00388	0.00002	0.00855	0.00003	0.08718
65	14.72269	14.65139	0.00601	0.00163	0.00001	0.00539	0.00001	0.05625
70	11.93579	11.89720	0.00317	0.00071	0.00000	0.00274	0.00000	0.03197
75	9.13125	9.10774	0.00197	0.00000	-0.00000	0.00167	-0.00000	0.01986
80	6.96736	6.95249	0.00148	0.00000	0.00000	0.00123	0.00000	0.01216
85	5.62620	5.61956	0.00001	-0.00000	0.00000	0.00001	0.00000	0.00762

APPENDIX C *Continued.*

age	region of residence at age x: n.east							
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.09221	0.91915	5.19235	59.36731	0.26114	1.69075	0.91668	1.74482
5	67.32406	0.86935	4.97335	57.07004	0.25635	1.61779	0.86879	1.66839
10	62.49411	0.80638	4.58699	52.95829	0.24425	1.51422	0.80306	1.58092
15	57.57641	0.63129	3.57896	49.94299	0.17212	1.19383	0.61707	1.44014
20	52.74570	0.26888	1.59592	49.26876	0.05165	0.48103	0.28743	0.79204
25	47.97385	0.14252	0.84427	46.21381	0.02467	0.24671	0.16251	0.33935
30	43.23323	0.08299	0.46558	42.21798	0.01284	0.14179	0.09893	0.21313
35	38.48903	0.04740	0.26343	37.87937	0.00676	0.08795	0.06068	0.14345
40	33.85906	0.02936	0.16092	33.47772	0.00290	0.05779	0.03676	0.09361
45	29.26832	0.01842	0.09706	29.02525	0.00137	0.03711	0.02214	0.06697
50	24.91929	0.01164	0.06905	24.75075	0.00002	0.02438	0.01321	0.05025
55	20.67119	0.00689	0.04792	20.55289	0.00001	0.01556	0.00644	0.04149
60	16.78136	0.00371	0.03371	16.69765	0.00001	0.00987	0.00351	0.03291
65	13.08459	0.00241	0.02314	13.02803	0.00000	0.00642	0.00165	0.02253
70	10.01406	0.00214	0.01652	9.99324	0.00000	0.00459	0.00093	0.01664
75	7.45272	0.00114	0.01103	7.42597	-0.00000	0.00168	-0.00000	0.01071
80	5.47840	0.00002	0.00816	5.45861	-0.00000	0.00262	0.00000	0.00889
85	4.22641	0.00001	0.00593	4.21220	-0.00000	0.00243	0.00000	0.00584

age	region of residence at age x: s.west							
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.89665	2.27101	1.45475	1.06061	54.97632	3.44216	0.46822	7.22359
5	67.90655	2.18157	1.39723	1.01917	52.57713	3.34580	0.44906	6.93659
10	63.05452	2.06003	1.29839	0.94742	48.52486	3.18028	0.41685	6.62670
15	58.14146	1.43376	0.84001	0.63234	46.74024	2.19318	0.26663	6.03529
20	53.37230	0.58586	0.32282	0.25345	47.98786	0.82162	0.10968	3.29201
25	48.66753	0.33573	0.17240	0.13249	45.91936	0.46087	0.06290	1.58378
30	43.97482	0.19199	0.09007	0.07114	42.37709	0.25316	0.03447	0.95690
35	39.24934	0.11336	0.05079	0.04237	38.21304	0.16112	0.01996	0.64919
40	34.63042	0.06699	0.02969	0.02240	34.00386	0.09892	0.01170	0.39665
45	30.05805	0.04791	0.01712	0.01314	29.66594	0.05963	0.00543	0.25888
50	25.62216	0.02322	0.01135	0.00758	25.36525	0.03495	0.00257	0.17724
55	21.40183	0.01299	0.00897	0.00523	21.21679	0.02073	0.00006	0.13705
60	17.36148	0.00627	0.00583	0.00209	17.23635	0.01161	0.00003	0.09929
65	13.72029	0.00430	0.00396	0.00004	13.63101	0.00818	0.00002	0.07078
70	10.08411	0.00245	0.00223	0.00001	10.02903	0.00516	0.00000	0.04522
75	7.49717	0.00005	0.00004	0.00000	7.46352	0.00425	-0.00000	0.02930
80	5.51847	0.00004	0.00004	0.00000	5.49162	0.00331	0.00000	0.02347
85	4.26382	0.00003	0.00003	0.00000	4.24712	0.00002	0.00000	0.01662

age	region of residence at age x	south						
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.63345	1.63836	1.93000	1.38072	0.40072	61.23936	1.11311	2.88068
5	67.59923	1.53678	1.85703	1.29443	0.38877	58.75158	1.03915	2.73149
10	62.76911	1.43512	1.70047	1.19095	0.37116	54.50790	0.95878	2.60472
15	57.92192	1.14614	1.30498	0.93567	0.25927	51.10854	0.73618	2.43114
20	53.10471	0.59861	0.66366	0.50169	0.09725	49.27723	0.40076	1.56550
25	48.32401	0.33345	0.34981	0.25594	0.04853	46.42393	0.22986	0.68349
30	43.55835	0.18939	0.18080	0.13996	0.02482	42.48185	0.13226	0.40919
35	38.82154	0.10417	0.09650	0.07720	0.01167	38.19009	0.07793	0.26393
40	34.12191	0.06203	0.05671	0.04202	0.00662	33.74393	0.04549	0.16511
45	29.53686	0.03689	0.03305	0.02479	0.00265	29.29320	0.02633	0.11500
50	25.07250	0.02238	0.02258	0.01544	0.00086	24.91334	0.01429	0.08362
55	20.83085	0.01239	0.01549	0.01094	0.00002	20.71614	0.00720	0.06867
60	16.77905	0.00686	0.01034	0.00584	0.00001	16.69919	0.00418	0.05266
65	13.03276	0.00414	0.00732	0.00337	0.00001	13.02799	0.00301	0.03692
70	9.77939	0.00317	0.00474	0.00184	0.00000	9.74401	0.00141	0.02482
75	7.23401	0.00197	0.00322	0.00153	-0.00000	7.20977	-0.00000	0.01752
80	5.29137	0.00158	0.00233	0.00120	-0.00000	5.27352	-0.00000	0.01274
85	4.05497	0.00002	0.00218	0.00000	-0.00000	4.04236	0.00000	0.00992

age	region of residence at age x	s.east						
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.52206	1.05724	2.08222	3.18247	0.25928	7.71437	53.42505	2.80142
5	67.68530	0.99159	1.95822	3.01645	0.25122	7.40947	51.38840	2.66994
10	62.80039	0.91248	1.76879	2.76262	0.23630	6.96343	47.62579	2.53098
15	57.96694	0.73814	1.38254	2.24687	0.17004	5.75711	45.28290	2.38935
20	53.18761	0.34754	0.64822	1.16858	0.05623	2.69493	46.80348	1.46863
25	48.43932	0.17904	0.33083	0.59450	0.02475	1.41927	45.27234	0.61859
30	43.70234	0.10043	0.17552	0.33664	0.01345	0.79921	41.90031	0.37678
35	38.97048	0.04895	0.08620	0.17114	0.00569	0.43449	37.99746	0.22653
40	34.30688	0.02917	0.05248	0.09238	0.00249	0.27185	33.71648	0.14203
45	29.72609	0.01674	0.03120	0.05628	0.00006	0.17005	29.35114	0.10063
50	25.24805	0.01034	0.02112	0.03499	0.00003	0.10792	24.99888	0.07478
55	21.01223	0.00630	0.01551	0.02416	0.00002	0.07134	20.83319	0.06172
60	16.96696	0.00350	0.01037	0.01417	0.00001	0.04687	16.84341	0.04863
65	13.28789	0.00171	0.00735	0.00804	0.00001	0.03264	13.20277	0.03538
70	10.13224	0.00196	0.00485	0.00425	0.00000	0.02292	10.07096	0.02741
75	7.53809	0.00004	0.00406	0.00352	0.00000	0.01605	7.49580	0.01862
80	5.55432	0.00003	0.00320	0.00274	-0.00000	0.01168	5.52348	0.01320
85	4.29791	0.00002	0.00002	-0.00000	-0.00000	0.00841	4.27934	0.01013

APPENDIX C *Continued.*

age	region of residence at age x							
***	**********							
	total	n.west	north	n.east	s.west	south	s.east	sofia
0	70.61578	3.79927	2.00937	1.29581	0.79207	2.59665	0.63022	59.49238
5	67.44496	3.27521	1.69851	1.09942	0.71301	2.24743	0.53129	57.88009
10	62.57119	2.90967	1.43523	0.94041	0.64560	1.99310	0.45928	54.18790
15	57.68541	2.57087	1.21913	0.81764	0.49760	1.73790	0.39623	50.44604
20	52.82013	2.11296	0.97370	0.66780	0.34468	1.37404	0.32853	47.01841
25	47.97009	1.59056	0.68822	0.46632	0.24087	0.98431	0.24577	43.75402
30	43.13889	1.01476	0.39828	0.28540	0.14102	0.60818	0.15826	40.53298
35	38.38428	0.74649	0.28808	0.21213	0.09744	0.47027	0.12230	36.44757
40	33.62393	0.45155	0.17118	0.11665	0.05695	0.29758	0.07233	32.45769
45	29.01718	0.27651	0.10451	0.07293	0.02967	0.19100	0.04353	28.29904
50	24.53904	0.17162	0.07250	0.04766	0.01578	0.12532	0.02530	24.08086
55	20.27133	0.10771	0.05463	0.03679	0.01061	0.09042	0.01486	19.95624
60	16.22183	0.05916	0.03704	0.02125	0.00668	0.05580	0.00903	16.03288
65	12.46629	0.03422	0.02513	0.01159	0.00429	0.03633	0.00546	12.34927
70	8.55651	0.01842	0.01087	0.00369	0.00208	0.01574	0.00209	8.50362
75	6.19899	0.01215	0.00570	0.00233	-0.00000	0.01106	-0.00000	6.16774
80	4.41795	0.00647	0.00574	0.00000	0.00000	0.00806	0.00000	4.39767
85	3.26092	0.00604	0.00533	0.00000	-0.00000	0.00435	-0.00000	3.24519

Appendix D

MULTIREGIONAL POPULATION PROJECTIONS, TOTAL POPULATION, 1975–2025

LEGEND

m.ag: mean age of population
sha: percentage of population in each region
lam: intrinsic growth ratio
r: intrinsic growth rate

APPENDIX D

Multiregional population projections.

year 1975

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	677101.	70735.	94489.	128208.	54841.	176623.	71533.	80672.
5	636856.	68705.	88645.	119420.	56775.	172151.	65419.	65741.
10	627571.	67596.	87050.	114958.	57325.	174996.	66863.	58834.
15	648115.	65875.	96363.	110758.	54799.	179789.	65342.	75198.
20	667466.	63065.	99415.	117401.	51104.	167740.	64351.	104390.
25	680723.	69433.	107113.	117679.	51062.	163737.	65928.	105771.
30	570611.	56939.	87569.	102594.	44287.	140672.	55426.	83074.
35	568310.	62510.	85945.	95274.	46536.	146625.	59787.	72132.
40	639246.	75297.	101386.	104962.	51672.	160455.	67050.	78424.
45	616179.	80024.	102018.	101531.	48194.	152826.	66486.	85100.
50	613212.	85561.	107536.	96852.	45676.	138376.	57404.	81807.
55	362410.	49280.	64098.	58489.	28664.	84676.	33938.	43266.
60	446563.	60716.	78928.	72057.	35108.	104357.	41830.	53297.
65	386710.	52595.	63375.	62408.	30594.	90368.	36223.	46147.
70	279016.	56418.	64896.	41540.	19544.	54575.	24286.	17787.
75	166137.	33591.	38639.	24727.	11637.	32494.	14459.	10590.
80	73194.	14819.	17069.	10924.	5141.	14455.	6388.	4678.
85	47150.	9574.	11012.	7047.	3317.	9261.	4121.	3018.
total	8726990.	1042803.	1400117.	1486719.	696456.	2164076.	866334.	1069975.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.7587	6.7832	6.7487	8.6236	7.8742	8.1616	8.2522	7.5396
5	7.2975	6.5885	6.3313	8.0325	8.1519	7.9549	7.5469	6.1442
10	7.1912	6.4821	6.2173	7.7256	8.2308	8.0864	7.7135	5.5032
15	7.4266	6.3171	6.8825	7.4498	7.8669	8.3079	7.5380	7.0280
20	7.6483	6.0476	7.1005	7.8967	7.3376	7.7511	7.4237	9.7563
25	7.8002	6.6583	7.6503	7.9153	7.3316	7.5661	7.6056	9.8854
30	6.5385	5.4650	6.2544	6.9007	6.3588	6.5003	6.3941	7.7641
35	6.5121	5.9944	6.1028	6.4083	6.6817	6.7754	6.8972	6.7415
40	7.3249	7.2206	7.2413	7.0600	7.4192	7.4145	7.7350	7.3295
45	7.2898	7.6739	7.2864	6.8292	6.9193	7.0620	7.6700	7.9535
50	7.0266	8.2049	7.6805	6.5145	6.5583	6.3942	6.6223	7.6457
55	4.1527	4.7257	4.5780	3.9341	4.1155	3.9128	3.9152	4.0436
60	5.1170	5.8224	5.6422	4.8467	5.0696	4.8222	4.8256	4.9811
65	4.4312	5.0436	4.8835	4.1977	4.3927	4.1758	4.1788	4.3129
70	3.1974	5.4102	4.6350	2.7934	2.8062	2.5219	2.8017	1.6624
75	1.9037	3.2212	2.7597	1.6632	1.6709	1.5015	1.6680	0.9897
80	0.8410	1.4210	1.2191	0.7348	0.7382	0.6613	0.7369	0.4372
85	0.5426	0.9181	0.7865	0.4740	0.4763	0.4279	0.4754	0.2821
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
mag	35.1706	38.9736	37.8669	33.8111	34.1915	33.6021	34.3251	34.3684
shr	100.0000	11.9492	16.0435	17.0359	7.9806	24.7975	9.9328	12.2605

year 1930

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	707692.	69484.	93444.	133991.	55268.	187968.	74764.	89774.
5	666805.	69943.	93878.	125935.	53347.	173921.	69480.	79902.
10	615364.	68804.	89701.	118858.	55250.	172034.	64134.	66533.
15	625782.	65731.	87945.	112695.	53563.	175069.	62915.	66364.
20	645509.	62788.	97382.	103740.	50925.	178048.	60584.	87042.
25	664177.	61856.	99356.	116611.	49282.	165998.	61944.	109130.
30	676725.	69037.	106983.	117125.	50084.	162819.	64555.	106122.
35	566243.	56817.	87105.	101801.	43538.	139572.	54530.	82881.
40	562039.	62085.	84633.	94231.	45679.	145075.	58892.	71493.
45	628418.	74035.	99693.	103044.	50589.	157947.	65824.	77235.
50	619205.	77915.	99280.	99669.	46779.	148981.	64687.	82893.
55	587959.	82188.	103288.	92503.	43706.	132805.	54992.	78437.
60	339326.	46033.	59940.	54379.	26704.	79105.	31634.	40531.
65	397276.	53562.	69705.	63526.	31842.	92898.	37003.	48736.
70	314902.	43645.	56061.	50145.	25281.	73091.	29307.	37372.
75	199247.	42925.	47711.	28949.	13639.	37522.	16994.	11506.
80	95386.	21421.	23260.	13636.	6435.	17506.	8023.	5105.
85	43494.	11829.	11350.	5642.	2683.	6951.	3373.	1667.
total	9976200.	1040148.	1417219.	1540479.	704593.	2247399.	883639.	1142723.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.0964	6.6802	6.9463	8.6980	7.8439	8.3638	8.4608	7.8562
5	6.6841	6.7243	6.6241	8.1750	7.5713	7.7388	7.8630	6.9922
10	6.0783	6.6148	6.3290	7.7157	7.8414	7.6570	7.2580	5.8223
15	6.2716	6.3194	6.3113	7.3156	7.6020	7.7898	7.1199	5.8076
20	7.1913	6.0364	6.8714	7.0588	7.2276	7.9224	6.8562	7.6171
25	7.3993	5.9469	7.0106	7.5698	6.9944	7.3862	7.0101	9.5500
30	7.5391	6.6372	7.5488	7.6032	7.1082	7.2448	7.3055	9.2868
35	6.3083	5.4624	6.1462	6.6084	6.1791	6.2104	6.1711	7.2529
40	6.2620	5.9689	5.9718	6.1170	6.4830	6.4552	6.6648	6.2564
45	7.0009	7.1226	7.0344	6.6891	7.1799	7.0280	7.4491	6.7589
50	6.8983	7.4908	7.0053	6.4051	6.6391	6.6290	7.3206	7.2540
55	6.5502	7.9016	7.2881	6.0048	6.2030	5.9111	6.2233	6.8640
60	3.7691	4.4256	4.2294	3.5300	3.7899	3.5198	3.5800	3.5469
65	4.4259	5.1494	4.9185	4.1233	4.5192	4.1336	4.1881	4.2649
70	3.5082	4.1961	3.9557	3.2551	3.5880	3.2523	3.3166	3.2704
75	2.2197	4.1268	3.3666	1.8792	1.9357	1.6696	1.9232	1.0069
80	1.0627	2.0594	1.6413	0.8852	0.9133	0.7789	0.9079	0.4467
85	0.4845	1.1373	0.8008	0.3662	0.3809	0.3093	0.3817	0.1459
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
mid	35.6103	39.3756	38.0412	34.1437	35.0763	34.1231	34.9884	34.9109
sha	100.0000	11.5378	15.7886	17.1618	7.8496	25.0371	9.8442	12.7406
lam	1.028556	0.997454	1.012215	1.036160	1.011669	1.033503	1.019137	1.067991
r	0.005631	-0.000510	0.002428	0.007104	0.002320	0.007556	0.004940	0.013156

APPENDIX D *Continued.*

year 1985

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	700248.	68580.	95660.	132298.	54616.	191721.	71832.	85540.
5	699483.	68898.	97323.	131623.	53781.	185054.	72630.	88676.
10	664845.	70154.	94926.	125319.	52020.	173931.	68091.	80354.
15	633558.	66875.	92030.	116451.	51717.	172265.	60461.	73759.
20	623255.	62429.	90864.	110324.	49767.	173299.	58361.	78210.
25	642418.	61183.	97219.	108134.	49072.	175676.	58362.	92471.
30	660280.	61748.	99369.	116014.	48348.	164943.	60696.	109163.
35	671554.	68847.	106375.	116278.	49255.	161603.	63522.	105674.
40	560051.	56575.	86289.	100653.	42753.	138158.	53750.	81872.
45	552576.	61132.	83248.	92500.	44723.	142792.	57819.	70362.
50	611657.	72144.	97017.	100128.	49098.	153936.	64042.	75292.
55	593688.	74880.	95382.	94236.	44761.	143004.	61958.	79465.
60	588386.	76781.	96594.	86012.	40721.	124128.	51261.	73390.
65	300988.	40608.	52889.	47941.	24082.	70419.	27988.	37061.
70	323493.	44450.	57153.	51044.	26312.	75139.	29942.	39453.
75	221636.	33236.	41244.	34953.	17644.	50248.	20509.	23802.
80	114816.	27370.	28720.	15965.	7542.	20216.	9429.	5573.
85	57505.	17073.	15462.	7043.	3358.	8479.	4236.	1854.
total	9179819.	1013163.	1428267.	1586919.	709571.	2325071.	894879.	1201970.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.6281	6.6378	6.6976	8.3368	7.6971	8.2458	8.0270	7.1167
5	7.6089	6.6686	6.8090	8.2942	7.5793	7.9591	8.1162	7.3775
10	7.2424	6.7902	6.6463	7.8970	7.3312	7.4833	7.6079	6.6852
15	6.9016	6.4728	6.4435	7.3382	7.2884	7.4090	6.7563	6.1365
20	6.7894	6.0425	6.3618	6.9521	7.0137	7.4535	6.5217	6.5068
25	6.9971	5.9412	6.8068	6.8141	6.9158	7.5557	6.5218	7.6933
30	7.1927	5.9766	6.9573	7.3106	6.8137	7.0941	6.7826	9.0820
35	7.3155	6.6637	7.4479	7.3273	6.9415	6.9505	7.0993	8.7917
40	6.1009	5.4759	6.0415	6.3427	6.0252	5.9421	6.0064	6.8115
45	6.0195	5.9170	5.8286	5.8289	6.3028	6.1414	6.4611	5.8539
50	6.6631	6.9828	6.7927	6.3096	6.9194	6.6207	7.1565	6.2640
55	6.4673	7.2477	6.6782	5.9383	6.3082	6.1505	6.9236	6.6113
60	5.9793	7.4316	6.7630	5.4201	5.7398	5.3387	5.7282	6.1058
65	3.2788	3.9305	3.7030	3.0210	3.3939	3.0287	3.1275	3.0833
70	3.5240	4.3023	4.0016	3.2165	3.7082	3.2317	3.3460	3.2824
75	2.4144	3.2169	2.8877	2.2026	2.4865	2.1611	2.2918	1.9802
80	1.2507	2.6992	2.0108	1.0060	1.0629	0.8695	1.0537	0.4637
85	0.6264	1.6525	1.0826	0.4438	0.4733	0.3647	0.4733	0.1543
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.ag	36.0324	39.5952	38.2110	34.5191	35.8489	34.5922	35.6065	35.5638
sha	100.0000	11.2547	15.5597	17.2870	7.7297	25.3280	9.7481	13.0936
l.am	1.022687	0.993284	1.007796	1.030146	1.007065	1.034561	1.012720	1.051847
r	0.004497	-0.001348	0.001551	0.005940	0.001408	0.006795	0.002528	0.010109

year 1990

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	693499.	68601.	94084.	133268.	53317.	191475.	69659.	81096.
5	689187.	67974.	95096.	129942.	53142.	188628.	69811.	84593.
10	696847.	69324.	93910.	130974.	52479.	185024.	71176.	88960.
15	662958.	68307.	97231.	122716.	49879.	174435.	64114.	87276.
20	651005.	63510.	93382.	113849.	48122.	170641.	56186.	85312.
25	620163.	60873.	90887.	109530.	47940.	170923.	56225.	83785.
30	638546.	61123.	97162.	107642.	48116.	174250.	57208.	93045.
35	655242.	61719.	98882.	115150.	47555.	163646.	59753.	108517.
40	664218.	68577.	105358.	115009.	48382.	160016.	62624.	104253.
45	550566.	55802.	84883.	98785.	41870.	136027.	52795.	80404.
50	537847.	59563.	81031.	89877.	43405.	139155.	56256.	68560.
55	586445.	69382.	93203.	95620.	46977.	147731.	61339.	72227.
60	554217.	69979.	80222.	87622.	41704.	133602.	57748.	74339.
65	488423.	67739.	85237.	75837.	36726.	110517.	45353.	67014.
70	245089.	33700.	43365.	38522.	19900.	56957.	22644.	30000.
75	227568.	33850.	42049.	35580.	18164.	51656.	20954.	25116.
80	124793.	21208.	24843.	19276.	9757.	27067.	11380.	11263.
85	69904.	21812.	19039.	8246.	3936.	9791.	4978.	2049.
total	9336516.	1024023.	1431920.	1627496.	710570.	2391542.	990505.	1249310.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.4278	6.7057	6.5673	8.1888	7.5018	8.0063	7.7382	6.6487
5	7.3816	6.6444	6.6419	7.9844	7.4788	7.8873	7.7550	6.7685
10	7.4637	6.7764	6.8979	8.0478	7.3855	7.7366	7.9067	7.1178
15	7.1007	6.6710	6.7808	7.5404	6.8788	7.2938	7.1222	6.9831
20	6.7585	6.2081	6.5124	6.9956	6.7724	7.1352	6.2415	6.8260
25	6.6423	5.9503	6.3383	6.7302	6.7467	7.1470	6.2458	6.7038
30	6.8392	5.9748	6.7760	6.6142	6.7714	7.2861	6.3551	7.4447
35	7.0181	6.0350	6.8960	7.0755	6.6924	6.8427	6.6377	8.6827
40	7.1142	6.7039	7.3475	7.0668	6.8089	6.6909	6.9566	8.3415
45	5.8969	5.4546	5.9197	6.0699	5.8924	5.6879	5.8648	6.4333
50	5.7607	5.8222	5.6570	5.5226	6.1055	5.8186	6.2493	5.4856
55	6.2812	6.7782	6.5002	5.8755	6.6112	6.1772	6.8139	5.7790
60	5.9360	6.8404	6.2223	5.3840	5.8690	5.5865	6.4150	5.9480
65	5.2313	6.6215	5.9444	4.6599	5.1685	4.6211	5.0380	5.3620
70	2.6251	3.2942	3.0282	2.3670	2.8006	2.3816	2.5155	2.4008
75	2.4374	3.3068	2.9354	2.1863	2.5564	2.1599	2.3277	2.0096
80	1.3366	2.0721	1.7345	1.1844	1.3731	1.1318	1.2641	0.9012
85	0.7487	2.1322	1.3293	0.5067	0.5539	0.4095	0.5530	0.1639
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
mag	36.3685	37.5868	38.3065	34.8626	36.4738	34.9955	36.1920	36.1659
sha	100.0000	10.9572	15.3382	17.4310	7.6107	25.6149	9.6418	13.3363
lam	1.017068	0.990186	1.003958	1.025518	1.001408	1.028599	1.005951	1.039801
r	0.003385	-0.001973	0.000790	0.005044	0.000281	0.005638	0.001187	0.007806

APPENDIX D *Continued.*

year 1995

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	701764.	69306.	95693.	137195.	51651.	192041.	69617.	86259.
5	682580.	67955.	93560.	130851.	51882.	188342.	67721.	82230.
10	687570.	68381.	96232.	129282.	51853.	188404.	68465.	84953.
15	694868.	67812.	101288.	128237.	49371.	185256.	67039.	95945.
20	660297.	65016.	98553.	119930.	45625.	173074.	59530.	93568.
25	627881.	61970.	93374.	112968.	46391.	168396.	54187.	90595.
30	616515.	60506.	90924.	108929.	46993.	169490.	55114.	84558.
35	633671.	61009.	96641.	106873.	47309.	172692.	56331.	92815.
40	648092.	61623.	97992.	113882.	46718.	162002.	58930.	106944.
45	652972.	67654.	103629.	112898.	47392.	157583.	61518.	102300.
50	535884.	54833.	82627.	95971.	40642.	132593.	51306.	78232.
55	515660.	57274.	77864.	85827.	41530.	133535.	53884.	65743.
60	547449.	64808.	87183.	88899.	43766.	137994.	57170.	67624.
65	493268.	61754.	78152.	77255.	37612.	118939.	51068.	67870.
70	397671.	56219.	69893.	60941.	30350.	89403.	38695.	54169.
75	172409.	25664.	31904.	26852.	13889.	39157.	15847.	19097.
80	128038.	21600.	25328.	19622.	10155.	27826.	11626.	11877.
85	71492.	16913.	16532.	9953.	5092.	13101.	6008.	3893.
total	9468035.	1009916.	1437974.	1666363.	708221.	2449831.	902158.	1293573.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.4119	6.8626	6.6547	8.2332	7.2931	7.8390	7.7168	6.6683
5	7.2089	6.7287	6.5064	7.8525	7.3256	7.6890	7.5065	6.3568
10	7.2620	6.7709	6.6922	7.7583	7.3216	7.6905	7.5890	6.5673
15	7.3391	6.7166	7.0438	7.6956	6.9712	7.5620	7.4310	7.4093
20	6.9740	6.4378	6.8536	7.1971	6.4422	7.0647	6.5987	7.2358
25	6.6316	6.1362	6.4934	6.7793	6.5503	6.8738	6.0064	7.0035
30	6.5115	5.9912	6.3230	6.5369	6.6354	6.9184	6.1092	6.5368
35	6.6927	6.0410	6.7207	6.4135	6.6799	7.0491	6.2441	7.1751
40	6.8451	6.1018	6.8146	6.8342	6.5965	6.6128	6.5322	8.2674
45	6.8966	6.6989	7.2066	6.7751	6.6917	6.4324	6.8189	7.9083
50	5.6599	5.3899	5.7461	5.7593	5.7386	5.4123	5.6959	6.0478
55	5.4463	5.6711	5.4148	5.1505	5.8641	5.4509	5.9728	5.0823
60	5.7821	6.4172	6.0632	5.3349	6.1797	5.6328	6.3371	5.2277
65	5.2098	6.1147	5.4366	4.6361	5.3108	4.8550	5.6628	5.2467
70	4.2001	5.5667	4.8605	3.6571	4.2854	3.6494	4.0675	4.1876
75	1.8210	2.5412	2.2187	1.6114	1.9611	1.5933	1.7565	1.4763
80	1.3523	2.1388	1.7614	1.1775	1.4339	1.1358	1.2887	0.9181
85	0.7551	1.6747	1.1497	0.5973	0.7190	0.5348	0.6659	0.3010
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.ag	36.5881	39.2856	38.2647	35.0905	37.0318	35.3577	36.6475	36.5938
sha	100.0000	10.6666	15.1877	17.5999	7.4801	25.8748	9.5285	13.6625
lam	1.014086	0.987189	1.002827	1.023913	0.990694	1.024373	1.002169	1.035015
r	0.002793	-0.002579	0.000565	0.004726	-0.000662	0.004816	0.000433	0.006883

year 2000

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	721020.	69900.	98613.	142149.	50462.	196348.	71087.	92461.
5	590672.	68674.	95164.	134674.	50279.	188920.	67694.	85268.
10	630317.	68317.	94747.	130120.	50636.	183051.	66452.	82625.
15	685616.	66909.	93696.	126554.	48780.	188245.	64575.	91857.
20	692086.	64874.	102665.	125320.	46134.	183622.	62258.	107214.
25	657041.	63590.	98532.	119001.	44053.	170979.	57193.	103488.
30	624191.	61631.	93399.	112318.	45439.	167048.	53153.	91143.
35	611300.	60320.	90484.	108096.	46198.	167946.	54269.	84497.
40	626753.	60800.	95713.	105709.	46461.	170810.	55560.	91680.
45	637130.	60875.	96418.	111785.	45766.	159513.	57905.	104863.
50	635562.	66004.	100866.	109697.	46007.	153627.	59830.	99481.
55	513740.	52391.	79401.	91636.	38890.	127265.	49231.	74926.
60	481355.	53546.	73947.	79790.	34632.	124730.	50223.	61526.
65	487193.	57193.	76955.	78374.	39470.	122828.	50576.	61798.
70	401408.	51263.	64591.	62079.	31032.	96207.	41331.	54855.
75	279472.	42814.	51423.	42481.	21183.	61470.	25680.	34420.
80	96398.	16377.	19217.	14809.	7681.	21092.	8793.	9030.
85	73217.	17227.	16855.	10132.	5300.	13969.	6138.	4097.
total	9596190.	1002704.	1446597.	1704714.	705572.	2502171.	902202.	1335231.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.5136	6.9712	6.8169	8.3386	7.1824	7.8471	7.8792	6.9247
5	7.1974	6.8489	6.5785	7.9001	7.1564	7.5502	7.5032	6.3860
10	7.0959	6.8132	6.5490	7.6329	7.2073	7.5155	7.3655	6.1880
15	7.1447	6.6728	6.4827	7.4238	6.9430	7.5233	7.1575	6.8795
20	7.2121	6.4699	7.0970	7.3514	6.5665	7.3385	6.9007	8.0296
25	6.8469	6.3419	6.8113	6.9807	6.2702	6.8332	6.3620	7.7505
30	6.5046	6.1464	6.4565	6.5887	6.4760	6.6761	5.8915	6.8260
35	6.3754	6.0157	6.2549	6.3404	6.5756	6.7120	6.0151	6.3283
40	6.5313	6.0636	6.6178	6.2010	6.6130	6.8265	6.1582	6.8662
45	6.6394	6.0711	6.6651	6.5574	6.5140	6.3750	6.4182	7.8539
50	6.6231	6.5826	6.9726	6.4349	6.5484	6.1397	6.6371	7.4505
55	5.3536	5.2250	5.4888	5.3755	5.5153	5.0862	5.4567	5.6115
60	5.0161	5.3402	5.0358	4.6806	5.5072	4.9849	5.5667	4.6079
65	5.0769	5.7039	5.3197	4.5975	5.6180	4.9089	5.6058	4.6292
70	4.1830	5.1125	4.4650	3.6416	4.4241	3.8449	4.5811	4.1084
75	2.9123	4.2699	3.5548	2.4920	3.0150	2.4567	2.8464	2.5778
80	1.0108	1.6333	1.3284	0.8687	1.0932	0.8430	0.9746	0.6764
85	0.7630	1.7180	1.1651	0.5943	0.7543	0.5581	0.6804	0.3069
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.a	36.7135	39.1167	38.2312	35.2032	37.4701	35.5093	36.8833	36.7526
sd.	20.0000	10.4490	15.0747	17.7695	7.3214	26.0746	9.4917	13.9142
lam	1.013515	0.994857	1.005991	1.023015	0.992028	1.021365	1.000049	1.032204
r	0.002689	-0.001439	0.001196	0.004551	-0.001602	0.004223	0.000010	0.006439

APPENDIX D *Continued.*

year 2005

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	735334.	69317.	100105.	145359.	49812.	201684.	71655.	96804.
5	709625.	69337.	98072.	139524.	49144.	193173.	69133.	91240.
10	689950.	69042.	95355.	133862.	49116.	188642.	66445.	85588.
15	679001.	66784.	97280.	127263.	47663.	187759.	62741.	89511.
20	682869.	63985.	100160.	123652.	49579.	186226.	60046.	103220.
25	698682.	63652.	102665.	124360.	44571.	181344.	60040.	112050.
30	653185.	63352.	98559.	118322.	43251.	164723.	56296.	103681.
35	619420.	61467.	92942.	111933.	44743.	165566.	52363.	90907.
40	605113.	60054.	89658.	106866.	45364.	166090.	51523.	83558.
45	616159.	60002.	94172.	103771.	45505.	168082.	54596.	90032.
50	620153.	59448.	93867.	108611.	44431.	155490.	56374.	101931.
55	609312.	61534.	96922.	104754.	44026.	147473.	57342.	96241.
60	479526.	49016.	74299.	85183.	36234.	118891.	45893.	70015.
65	429454.	47264.	64109.	70341.	34895.	111018.	44431.	56197.
70	396439.	47479.	63117.	62974.	32616.	99339.	40916.	49999.
75	281468.	35048.	47533.	43275.	21694.	66143.	28922.	34853.
80	157037.	27122.	30975.	23429.	11714.	33117.	14249.	16232.
85	55470.	13061.	12788.	7646.	4003.	10209.	4642.	3134.
total	9706297.	993764.	1453769.	1740626.	694467.	2549971.	899637.	1374164.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.5758	7.0355	6.8859	8.3510	7.1737	7.9092	7.9649	7.0446
5	7.3110	6.9772	6.7460	8.0158	7.0776	7.5755	7.6846	6.6397
10	7.0990	6.9476	6.5619	7.6904	7.0736	7.3978	7.3857	6.2284
15	6.9955	6.7203	6.6916	7.3113	6.8643	7.3642	6.9740	6.5138
20	7.0353	6.4387	6.8897	7.1039	6.5641	7.3031	6.6745	7.5115
25	7.0952	6.4051	7.0620	7.1446	6.4189	7.1116	6.6738	8.1541
30	6.7295	6.3750	6.7796	6.7977	6.2289	6.6559	6.2576	7.5450
35	6.3816	6.1853	6.3932	6.4019	6.4437	6.4929	5.8204	6.6154
40	6.2342	6.0431	6.1673	6.1395	6.5332	6.5134	5.9494	6.0807
45	6.3480	6.0378	6.4778	5.9617	6.5534	6.5915	6.0696	6.5518
50	6.3892	5.9821	6.4568	6.2398	6.3998	6.0977	6.2664	7.4176
55	6.2775	6.1933	6.6669	6.0182	6.3405	5.7833	6.3772	6.9301
60	4.9404	4.9324	5.1102	4.8938	5.2183	4.6625	5.1013	5.0951
65	4.8442	4.7561	4.4092	4.0411	5.0254	4.3537	4.9387	4.0895
70	4.0844	4.7777	4.3416	3.6179	4.6972	3.8956	4.5481	3.6395
75	2.8999	3.5293	3.2696	2.4861	3.1242	2.5939	3.2149	2.5363
80	1.6179	2.7293	2.1307	1.3460	1.6870	1.2987	1.5838	1.1812
85	0.5715	1.3143	0.8797	0.4393	0.5772	0.4004	0.5160	0.2266
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.ag	36.7030	38.8185	38.0809	35.2323	37.7504	35.7111	36.9095	36.7546
sha	100.0000	10.2383	14.9776	17.9330	7.1538	26.2713	9.2686	14.1574
ism	1.011474	0.991035	1.004958	1.021066	0.988322	1.019104	0.997157	1.029158
r	0.002282	-0.001791	0.000989	0.004169	-0.002349	0.003785	-0.000569	0.095748

year 2010

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	739136.	69729.	99976.	146873.	49046.	204691.	70871.	98000.
5	723714.	69422.	99574.	142668.	48527.	198393.	69703.	95423.
10	707958.	69774.	99284.	138650.	48060.	192887.	67866.	91437.
15	687091.	67486.	93927.	130813.	46313.	188378.	62765.	92410.
20	676278.	63811.	98816.	124241.	44556.	185626.	58396.	100831.
25	679508.	62760.	100209.	122690.	44030.	183747.	57942.	108129.
30	684644.	63551.	102709.	123659.	43778.	179984.	58895.	112068.
35	648200.	63259.	98081.	117396.	42560.	169287.	55456.	103159.
40	612653.	61221.	92095.	110169.	43946.	163773.	51663.	89785.
45	594874.	59227.	88211.	104881.	44426.	163419.	52593.	82117.
50	599747.	58553.	91667.	100830.	44172.	163773.	53155.	87597.
55	594520.	57266.	90214.	103715.	42519.	149248.	54020.	97537.
60	568746.	59448.	90677.	97389.	41022.	137789.	53485.	88935.
65	426938.	43288.	65584.	75090.	32680.	105842.	40606.	63844.
70	343527.	39245.	52755.	56519.	28835.	89783.	35945.	45445.
75	278005.	36168.	46449.	43896.	22764.	63286.	28632.	31809.
80	157536.	24923.	28619.	23367.	11997.	35630.	16048.	16433.
85	89729.	21790.	20614.	12098.	6113.	16034.	7523.	5557.
total	9817805.	990922.	1464986.	1775983.	685345.	2595525.	895564.	1410519.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.5285	7.0367	6.8267	8.2725	7.1564	7.8844	7.9135	6.9478
5	7.3714	7.0058	6.7993	8.0356	7.0836	7.6438	7.7831	6.7651
10	7.2110	7.0413	6.7794	7.8093	7.0125	7.4315	7.5781	6.4825
15	6.9958	6.8105	6.4155	7.3679	6.7576	7.2578	7.0034	6.5515
20	6.8883	6.4395	6.7475	6.9978	6.5013	7.1518	6.5206	7.1485
25	6.9212	6.3335	6.8426	6.9104	6.4246	7.0794	6.4699	7.6659
30	6.9735	6.4133	7.0133	6.9650	6.3877	6.9344	6.5763	7.9452
35	6.6023	6.3839	6.6973	6.6122	6.2101	6.4837	6.1923	7.3136
40	6.2402	6.1782	6.2885	6.2051	6.4123	6.3098	5.7688	6.3654
45	6.0591	5.9770	6.0234	5.9073	6.4823	6.2962	5.8726	5.8217
50	6.1088	5.9090	6.2593	5.6792	6.4452	6.3098	5.9353	6.2103
55	6.0555	5.7791	6.1601	5.8416	6.2041	5.7502	6.0319	6.9150
60	5.7930	5.9992	6.1918	5.4854	5.9856	5.3037	5.9722	6.3052
65	4.3486	4.3685	4.4766	4.2294	4.7685	4.0779	4.5341	4.5263
70	3.5000	3.9604	3.6023	3.1834	4.2074	3.4591	4.0138	3.2219
75	2.8316	3.6500	3.1717	2.4724	3.3214	2.4389	3.1971	2.2552
80	1.6046	2.5151	1.9545	1.3163	1.7505	1.3728	1.7919	1.1651
85	0.9139	2.1990	1.4076	0.6814	0.8920	0.6178	0.8400	0.3940
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
mean	36.7295	38.7236	38.0704	35.2892	37.9677	35.7923	36.8309	36.7713
sha	100.0000	10.0931	14.9166	18.0839	6.9806	26.4369	9.1218	14.3669
lam	1.011438	0.997140	1.007372	1.020003	0.997007	1.017865	0.995471	1.026956
r	0.002285	-0.000573	0.001469	0.003961	-0.002616	0.003541	-0.000907	0.005222

APPENDIX D *Continued.*

year 2015

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	742014.	69368.	100189.	143950.	48053.	206158.	70174.	98622.
5	727456.	69259.	99472.	144137.	47790.	201270.	68959.	96568.
10	722013.	69927.	100823.	141753.	47490.	198041.	68447.	95533.
15	705945.	68288.	101898.	135426.	45408.	192602.	64120.	93203.
20	684337.	64487.	100481.	127607.	43354.	186276.	58446.	103685.
25	672948.	62551.	93996.	123218.	43048.	184098.	56376.	105760.
30	675524.	62644.	100277.	121989.	43244.	182271.	56859.	108240.
35	679424.	63548.	102222.	122693.	43090.	178449.	58022.	111396.
40	681125.	63072.	97196.	116071.	41825.	166523.	54717.	101719.
45	602278.	60195.	90610.	108119.	43045.	161165.	50779.	83166.
50	579019.	57771.	85875.	101893.	43123.	159217.	51204.	79936.
55	574939.	56373.	88088.	96288.	42269.	157142.	50936.	83894.
60	554920.	53613.	84418.	96421.	39619.	139839.	50354.	91056.
65	506458.	52505.	80051.	85859.	37000.	123677.	47325.	81041.
70	347111.	35958.	53808.	60332.	27008.	85610.	32857.	51538.
75	244016.	29001.	38830.	33496.	20125.	61716.	25154.	28895.
80	155562.	23086.	27986.	24209.	12538.	36779.	15887.	15027.
85	88372.	19880.	19067.	12324.	6261.	17245.	8472.	5632.
total	9904011.	933127.	1470187.	1806691.	674339.	2635678.	889093.	1944891.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.4921	7.1067	6.8147	8.2484	7.1260	7.8218	7.8927	6.8256
5	7.3451	7.0448	6.7660	7.9779	7.0869	7.6364	7.7561	6.6834
10	7.2901	7.1127	6.8578	7.8460	7.0424	7.5138	7.6985	6.6118
15	7.1279	6.9460	6.9310	7.4958	6.7337	7.3075	7.2118	6.7966
20	6.9097	6.5594	6.8346	7.0630	6.4292	7.0675	6.5736	7.1760
25	6.7947	6.3624	6.7268	6.8201	6.3838	6.9869	6.3408	7.3196
30	6.8207	6.3720	6.8207	6.7521	6.4127	6.9155	6.3951	7.4912
35	6.8601	6.4638	6.9530	6.7913	6.3899	6.7705	6.5259	7.7096
40	6.8734	6.4155	6.6111	6.4246	6.2023	6.3180	6.1542	7.0399
45	6.0812	6.1431	6.1631	5.9844	6.3833	6.1148	5.7113	6.1019
50	5.8463	5.8763	5.8411	5.6397	6.3948	6.0408	5.7591	5.5323
55	5.8056	5.7341	5.9916	5.3295	6.2682	5.9621	5.7289	5.8062
60	5.6030	5.4534	5.7420	5.3369	5.8753	5.2904	5.6647	6.3012
65	5.1137	5.3406	5.4450	4.7523	5.4969	4.6545	5.3228	5.6038
70	3.5047	3.6575	3.6600	3.3394	4.0051	3.2481	3.6955	3.5669
75	2.4638	3.0414	2.6412	2.1805	2.9843	2.3415	2.8292	1.9993
80	1.5707	2.3483	1.9036	1.3399	1.8668	1.3954	1.7868	1.0400
85	0.8973	2.0221	1.2969	0.6821	0.9284	0.6543	0.9529	0.3891
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.ag	36.6416	38.2864	37.8784	35.2578	38.0251	35.8043	36.7110	36.8330
sha	100.0000	9.9266	14.8444	18.2420	6.8087	26.6122	8.9771	14.5890
lam	1.008731	0.992134	1.003891	1.017600	0.983941	1.015470	0.992779	1.024369
r	0.001748	-0.001579	0.000777	0.003489	-0.003238	0.003070	-0.001449	0.004815

year 2020

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	750954.	70385.	101566.	152360.	47076.	208538.	70336.	100692.
5	730287.	69403.	99693.	146150.	46832.	202742.	68298.	97163.
10	725744.	69787.	100756.	143183.	46790.	200835.	67747.	96646.
15	719961.	68536.	103504.	138418.	44930.	197609.	64702.	102262.
20	703120.	65344.	101479.	132052.	42578.	190460.	59721.	109485.
25	680370.	63231.	100561.	126509.	41913.	183771.	56439.	108546.
30	669001.	62408.	98979.	122483.	42282.	181595.	55337.	105917.
35	670373.	62629.	99814.	121035.	42562.	180659.	56029.	107646.
40	672014.	63430.	101311.	121322.	42354.	176573.	57253.	109772.
45	630269.	62263.	95634.	113918.	40981.	163912.	53781.	99780.
50	586218.	58922.	88210.	105036.	41786.	157039.	49448.	85778.
55	555039.	55600.	82530.	97290.	41264.	152761.	49066.	76589.
60	536719.	52753.	82416.	89519.	39383.	146765.	47488.	78394.
65	494276.	47370.	74540.	85004.	35716.	124138.	44567.	82920.
70	411760.	43616.	65670.	68990.	30580.	99238.	38295.	65372.
75	242464.	27407.	39607.	42052.	18850.	58354.	22994.	32699.
80	136176.	19088.	23399.	21726.	11129.	33238.	13057.	13618.
85	87471.	18416.	18633.	12500.	6569.	17796.	8487.	5169.
total	10002878.	980592.	1490307.	1839544.	661595.	2676523.	884843.	1470468.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.5074	7.1778	6.8611	8.2825	7.0941	7.7914	7.9580	6.8505
5	7.3008	7.0777	6.7150	7.9449	7.0574	7.5748	7.7273	6.5719
10	7.2554	7.1168	6.8065	7.7836	7.0510	7.5036	7.6650	6.5369
15	7.1975	6.9393	6.9520	7.5246	6.7706	7.3831	7.3205	6.9167
20	7.0292	6.6638	6.9004	7.1785	6.4163	7.1160	6.7570	7.4053
25	6.8077	6.4483	6.7932	6.8772	6.3161	6.8660	6.3857	7.3418
30	6.6881	6.3644	6.6864	6.6583	6.3717	6.7847	6.2609	7.1680
35	6.7018	6.3869	6.7428	6.5796	6.4138	6.7498	6.3392	7.2809
40	6.7182	6.4685	6.8439	6.5952	6.3824	6.5971	6.4777	7.4247
45	6.3009	6.3495	6.4604	6.1927	6.1756	6.1241	6.0849	6.7849
50	5.8605	6.0088	5.9589	5.7099	6.2970	5.8673	5.5947	5.8018
55	5.5494	5.6701	5.5752	5.2888	6.2182	5.7074	5.5514	5.1803
60	5.3656	5.3797	5.5675	4.8664	5.9348	5.4834	5.3729	5.3024
65	4.9413	4.8308	5.0355	4.6209	5.3852	4.6380	5.0424	5.6085
70	4.1164	4.4479	4.4363	3.7504	4.6082	3.7077	4.3327	4.4216
75	2.4239	2.7950	2.6756	2.2860	2.8496	2.1989	2.6016	2.2117
80	1.3614	1.9466	1.5807	1.1811	1.6771	1.2418	1.5791	0.9225
85	0.8745	1.8781	1.2587	0.6795	0.9900	0.6649	0.9590	0.3496
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.ag	36.5932	38.0025	37.7791	35.2338	38.0943	35.8495	36.5310	36.9067
sha	100.0000	9.8031	14.7938	18.3901	6.6140	26.7575	8.8359	14.7904
lam	1.009932	0.997421	1.006884	1.018184	0.984068	1.015497	0.994096	1.023238
r	0.001987	-0.000516	0.001372	0.003604	-0.003212	0.003076	-0.001184	0.004594

APPENDIX D *Continued.*

year 2025

population

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	763717.	70937.	103341.	156095.	46309.	212279.	70888.	103868.
5	739083.	69934.	101074.	149473.	45894.	205078.	68468.	99162.
10	728568.	69933.	101007.	145141.	45878.	202263.	67123.	97223.
15	723682.	68436.	103503.	139762.	44307.	200243.	64091.	103340.
20	717082.	65679.	105139.	134938.	42176.	195300.	60295.	113556.
25	699665.	64146.	103563.	130894.	41195.	187923.	57681.	114262.
30	676977.	63100.	100644.	125727.	41185.	182282.	55409.	108630.
35	663899.	62375.	98530.	121504.	41617.	179969.	54539.	105364.
40	663062.	62501.	98930.	119672.	41842.	178717.	55295.	106113.
45	660642.	62662.	99689.	119073.	41505.	173801.	56277.	107635.
50	613462.	60773.	93104.	110672.	39790.	159743.	52372.	97008.
55	561939.	56716.	84778.	100239.	39937.	150685.	47390.	82149.
60	518137.	52016.	77223.	90438.	38446.	142664.	45745.	71605.
65	477925.	46596.	72761.	78921.	35521.	130621.	42022.	71484.
70	401696.	39364.	61163.	63302.	29535.	100914.	36066.	66352.
75	287481.	33246.	48334.	48089.	21344.	68228.	26801.	41438.
80	134829.	17503.	23864.	23189.	10424.	31702.	12759.	15385.
85	75967.	15230.	15584.	11217.	5808.	16081.	7369.	4679.
total	10107861.	981147.	1492228.	1873196.	652753.	2717994.	830589.	1509754.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.5557	7.2300	6.9253	8.3322	7.0944	7.8101	8.0500	6.8798
5	7.3120	7.1278	6.7734	7.9787	7.0308	7.5452	7.7753	6.5681
10	7.2079	7.1277	6.7689	7.7475	7.0284	7.4416	7.6225	6.4397
15	7.1596	6.9751	6.9361	7.4603	6.7877	7.3673	7.2782	6.8448
20	7.0943	6.6941	7.0458	7.2029	6.4612	7.1855	6.8471	7.5215
25	6.9220	6.5378	6.9401	6.9870	6.3110	6.9140	6.5503	7.5693
30	6.6975	6.4313	6.7445	6.7112	6.3094	6.7065	6.2922	7.1952
35	6.5681	6.3574	6.6029	6.4858	6.3757	6.6214	6.1935	6.9789
40	6.5599	6.3702	6.6297	6.3880	6.4086	6.5751	6.2793	7.0285
45	6.5359	6.3866	6.6805	6.3560	6.3585	6.3945	6.3909	7.1293
50	6.0692	6.1941	6.2393	5.9076	6.0958	5.8772	5.9473	6.4254
55	5.5599	5.7806	5.6810	5.3533	6.1259	5.5440	5.3816	5.4412
60	5.1261	5.3016	5.1750	4.8275	5.8898	5.2489	5.1948	4.7429
65	4.7283	4.7491	4.8760	4.2127	5.4417	4.8058	4.7720	4.7348
70	3.9741	4.0121	4.0987	3.6459	4.5247	3.6944	4.0957	4.4280
75	2.8441	3.3885	3.2391	2.5669	3.2693	2.5102	3.0435	2.7447
80	1.3339	1.7839	1.5995	1.2378	1.5970	1.1664	1.4489	1.0190
85	0.7516	1.5522	1.0443	0.5988	0.8893	0.5916	0.8369	0.3099
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
m.age	46.5454	37.8098	37.6769	45.1382	38.1332	35.8349	36.3650	36.8817
sha	100.0000	9.7068	14.7630	18.5341	6.4579	26.8899	8.7119	14.9364
lam	1.010495	1.000566	1.003053	1.018403	0.983661	1.015434	0.996313	1.021161
r	0.002083	0.000113	0.001604	0.003647	-0.004295	0.004075	-0.000739	0.004188

Stable equivalent to original population.

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	662975.	54276.	94175.	176039.	18833.	181081.	46201.	93375.
5	644237.	53583.	92667.	168139.	18436.	175942.	44712.	90964.
10	635178.	53643.	92385.	164015.	18254.	173012.	43847.	89519.
15	625890.	52489.	90473.	156194.	18016.	169707.	41728.	93082.
20	615383.	50157.	95038.	149352.	17418.	165079.	39090.	100199.
25	605717.	49034.	94115.	145019.	16949.	160730.	37646.	102242.
30	595937.	48642.	93105.	141929.	16652.	157447.	36727.	100585.
35	583579.	48233.	91609.	138818.	16415.	154158.	35907.	98438.
40	570392.	47703.	89747.	135427.	15933.	150682.	35124.	95775.
45	554064.	46652.	87284.	131225.	15487.	146529.	34192.	92694.
50	532874.	45079.	83937.	125908.	14890.	141090.	32958.	88963.
55	504675.	42955.	79778.	118743.	14096.	133785.	31250.	84068.
60	465153.	39769.	73781.	109023.	12989.	123485.	28815.	77496.
65	409172.	34742.	64486.	94934.	11586.	108615.	25216.	69694.
70	328042.	28541.	52213.	75355.	9471.	86901.	20181.	55480.
75	225550.	21515.	37999.	51893.	6537.	59955.	13964.	34697.
80	123159.	14588.	22629.	28270.	4573.	31370.	7657.	16073.
85	65221.	10726.	14903.	14415.	1842.	14792.	4995.	5149.
total	8747563.	741279.	1594775.	2122489.	247175.	2133360.	559203.	1389276.

percentage distribution

age	total	n.west	north	n.east	s.west	south	s.east	sofia
0	7.5733	7.3220	6.9514	8.1995	7.6191	7.7605	8.2618	6.7571
5	7.3648	7.2284	6.8400	7.9216	7.4183	7.5360	7.9956	6.5476
10	7.2606	7.2366	6.8532	7.7275	7.3846	7.4147	7.8409	6.4429
15	7.1545	7.0742	6.9734	7.3684	7.2886	7.2711	7.4620	6.7001
20	7.0418	6.7663	7.0187	7.0178	7.0467	7.0747	6.9903	7.2123
25	6.9296	6.6148	6.9469	6.8325	6.8572	6.8834	6.7321	7.3594
30	6.8029	6.5619	6.8724	6.6869	6.7370	6.7476	6.5676	7.2401
35	6.6713	6.5068	6.7619	6.5404	6.6006	6.6067	6.4210	7.0925
40	6.5206	6.4353	6.6245	6.3806	6.4462	6.4577	6.2809	6.8939
45	6.3339	6.2935	6.4427	6.1826	6.2657	6.2797	6.1144	6.6721
50	6.0917	6.0812	6.1993	5.9321	6.0240	6.0466	5.8937	6.4035
55	5.7693	5.7947	5.8387	5.5945	5.7027	5.7336	5.5882	6.0512
60	5.3199	5.3650	5.4460	5.1366	5.2550	5.2922	5.1528	5.5781
65	4.6776	4.6867	4.7525	4.4728	4.6875	4.6549	4.5092	5.0165
70	3.7501	3.8503	3.8540	3.5503	3.8318	3.7200	3.6038	3.9934
75	2.5784	2.9024	2.8041	2.4449	2.6445	2.5266	2.4971	2.4975
80	1.4079	1.8431	1.6703	1.3319	1.4452	1.3414	1.3692	1.1570
85	0.7570	1.4469	1.1000	0.6792	0.7453	0.6425	0.7143	0.3850
total	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
mean	36.4213	37.3667	37.4585	35.5094	36.3593	36.0902	35.5103	37.2422
std	100.0000	8.4741	15.4875	24.2648	2.8256	26.6744	6.3927	15.8819
lam	1.011943	1.011942	1.011944	1.011946	1.011942	1.011940	1.011942	1.011942
r	0.002374	0.002374	0.002375	0.002375	0.002374	0.002374	0.002374	0.002374

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(continued overleaf)

NATIONAL CASE STUDIES *(continued)*

THE AUTHOR

Dimiter Philipov studied mathematics, mathematical statistics, and probability theory at the University of Sofia and was a research scholar in the Demographic Section of the Scientific Institute of Statistics in Sofia before coming to IIASA in 1977. His scientific interests center on the mathematics of populations and demoeconomics, he has been concentrating on the comparative study of migration and settlement and urban change while at IIASA.